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Contents

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Reliability and concurrent validity of the modified sphygmomanometer in cranio-cervical flexion test on asymptomatic individuals

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Objective

To establish intrarater and interrater reliability and (concurrent) validity of the modified sphygmomanometer unit (MSU) in cranio-cervical flexion test (CCFT) on asymptomatic individuals.

Design

Cross-sectional, observational study.

Setting

Manipal College Of Allied Health Sciences (MCOAHS), India.

Participants

Thirty asymptomatic subjects (15 males and 15 females, age 33.7 ± 8.55 years) participated in the procedure for interrater reliability. Five subjects (3 males and 2 females, age 24.0 ± 1.87 years) participated in the procedure for intrarater reliability.

Methods

For investigating interrater reliability and concurrent validity, the participants were made to perform CCFT to assess cranio-cervical flexors performance using pressure biofeedback unit (PBU) and MSU with three trials for both the equipments in the presence of three raters. First and second rater scored the trials while the third rater administered the procedure. For intrarater reliability, first rater did video recording of the CCFT procedure for 5 subjects with 3 trials for each of them with MSU. Intraclass correlation coefficients (ICC) for interrater reliability of PBU and MSU was analysed using the two repeated scores out of the three trials for 30 subjects. ICC for intrarater reliability of MSU was calculated using the scores obtained from videographic analysis of 15 trials on two different occasions within an interval of 5 days. ICC was used to establish concurrent validity of MSU with PBU using first rater scores.

Measurements

The CCFT scores were recorded in millimeters of mercury (mmHg).

Results

The ICC value of 0.88 and 0.93 implied a high interrater reliability for MSU and PBU respectively. For MSU, the ICC value of 0.96 implied very high intrarater reliability. ICC value of 0.91 for MSU and PBU scores of first rater implied high concurrent validity.

Conclusion: Based on these results, a MSU could be used as a valid alternative for PBU to assess cranio-cervical flexor performance in a reliable manner among asymptomatic individuals. Future studies are needed to investigate reliability of the MSU in patient population suffering from neck disorders.

Key words

Cranio-Cervical Flexors, asymptomatic individuals.

Neck disorders are a common problem in the community, affecting approximately 70% of people at some point in their life[1]. Exercises to improve the performance of cervical spine muscles have been shown to be an effective means of alleviating chronic neck pain[2]. For exercise prescription, objective assessment of neck muscle impairment becomes inevitable. A number of methods for evaluating the cervical muscles have been reported in the literature, including manual muscle testing,[3] handheld dynamometry,[4] modified sphygmomanometer dynamometry,[5] and various forms of isokinetic[6] and isometric equipments[6,8]. All these methods evaluate both superficial and deep cervical musculature as a whole but specific measurement methods for Cranio-Cervical Flexor (CCF) muscle performance are less common.

The specific assessment of these CCF muscles is warranted because, compared to other cervical flexor muscles, the attachment of the CCF muscles (primarily the longus capitis and rectus capitis anterior muscles) to the head, affords them functional autonomy in orientation and stability of the specialized upper cervical motion segments[9]. Theoretically, deficits in the contractile capacity of the CCF muscles would destabilize the cranio-cervical region with a tendency for it to extend and as such, poor performance of these muscles has been implicated in abnormal head on neck posture[10,12].

Various methods for evaluating the CCF muscles have been reported in the literature, including cranio-cervical flexion dynamometry,[13] conventional cervical flexion exercise protocol,[14,15] Electromyographic analysis[16] and Cranio-Cervical Flexion Test (CCFT)[17]. Out of all these methods, the CCFT appears to be an easy and feasible clinical method. This method utilizes a pneumatic pressure sensor called pressure biofeedback unit (PBU) placed behind the upper cervical spine to monitor the capacity of the CCF muscles to flatten the cervical lordosis.

The PBU was first developed in the year 1990 by Gwendolen Jull and other physical therapists at the University of Queensland to provide indirect feedback on positional changes of the abdominal wall, lower back, and pelvis. Later PBU has been used for measuring cranio-cervical flexor

endurance in asymptomatic and diseased populationx[10,19,21]. The PBU is a simple pressure transducer consisting of a three-chamber air-filled pressure bag, a catheter and a manometer gauge (Chattanooga Group Inc., Hixson, TN). The pressure bag is 16.7 x 24cm in size and made from a non-elastic, latex material. The gauge has a measuring range from 0 – 200mmHg analog pressure with an accuracy of +/- 3 mmHg pressure[28]. The PBU has come in to general use in physiotherapy practice, frequently used as an aid in stabilization re-education for all parts of the body[29,30]. Kjersti Storheim[31] and her colleagues, evaluated intra-tester reproducibility of the PBU in measurement of transversus abdominis function conducted on a test-retest design found out that coefficient of variance (CV) was 21.0% and the SD of difference between the two tests was 1.59. She arrived at a conclusion that intra-tester reproducibility was low and the method used should be improved for scientific purposes. This study was claimed to be the first one to evaluate the intra-tester reproducibility of the PBU.

The PBU has also been used in both assessing the performance and training of the deep cervical flexors[10,19,21]. This equipment is unavailable in most of the Indian clinical settings, which necessitates the use of alternative cheap and easily available equipment to assess CCF muscle performance quantitatively in a reliable manner. One such equipment may be the modified sphygmomanometer.

A modified sphygmomanometer is made when a conventional sphygmomanometer is adapted by removing the outer sleeve of the cuff, folding the remaining inflatable bladder in thirds, and inserting the bladder into an inelastic casing (12.5 X 9 X 1.5 cm)[22].

Keagi C et al[22] stated that the first documented use of a modified sphygmomanometer unit (MSU) was in 1958 by Lansbury J for the evaluation of grip strength of patients with rheumatoid arthritis. In 1981, Helewa et al[23] expanded the application of the modified sphygmomanometer to the evaluation of the muscle forces other than those associated with the grip strength. In subsequent studies, the modified sphygmomanometer was used to measure the force of shoulder abductors[24,25], shoulder flexors[25], elbow flexors and extensors[25], hip flexors and extensors[25], hip abductors[13], knee flexors and extensors[25], abdominals[26,27] and neck muscles[5]. The reliability of this method has been found to be good and validated in the geriatric and arthritic population[22]. No studies have been documented on the use of MSU in assessing CCF performance.

Vernon HT[5] and his colleagues did an analytic survey and evaluated neck muscle strength in 40 asymptomatic and 24 symptomatic (8 with whiplash-type injuries and 16 with nontraumatic chronic neck pain) subjects with a modified sphygmomanometer dynamometer (MSD). Differences between paired trials were analyzed by intraclass coefficients, which were very high (0.95-0.99) indicating a high degree of test-retest consistency. They concluded that MSD has been found to be a reliable instrument for evaluation of isometric neck muscle strength in normal and symptomatic subjects. But however in this study they have not investigated cranio-cervical flexor performance.

The reliability of MSU method has been found to be good and validated in various muscle groups among the geriatric and arthritic population and even in chronic neck pain patients. But as concerned to our knowledge, the usage of MSU for assessing cranio-cervical flexors has not been reported yet. For use in the clinical settings and research purpose instead of PBU for assessing CCF performance, the validity and reliability of MSU need to established.

Objectives of the study

1. To establish intrarater and interrater reliability of modified sphygmomanometer in the cranio-cervical flexion test on asymptomatic individuals.
2. To establish concurrent validity of modified sphygmomanometer with that of pressure biofeedback in the cranio-cervical flexion test on asymptomatic individuals.

Methods

Subjects:

Convenience sampling was used for recruiting the subjects. Thirty asymptomatic subjects (15 males and 15 females, age 33.7 8.55 years) participated in the procedure for interrater reliability. Five subjects (3 males and 2 females, age 24.0 ± 1.87 years) participated in the video recording procedure for intrarater reliability.

Asymptomatic individuals were recruited from Manipal College Of Allied Health Sciences (MCOAHS), Manipal University, Manipal during the years 20005-2008. The Ethical Committee of Manipal College Of Allied Health Sciences (MCOAHS), Manipal University granted ethical approval for this study. The subjects were screened using a subjective screening form based on the following criteria:

Inclusion criteria

1. Asymptomatic individuals between 20-50 years
2. Subjects from both sex

Exclusion criteria

1. Past or present history of cervical or upper thoracic pain

Fig.1: Pressure Biofeedback Unit.

Fig.2: Modified Sphygmomanometer Unit.

Fig.3: Starting position for the Cranio-Cervical flexion Test.

2. Fixed postural abnormalities of spine or lower limbs
3. Post-operative conditions in neck and shoulder areas
4. Temporomandibular joint disorders
5. Hearing impairments
6. visual impairments not corrected by lenses
7. Severe psychiatric illness

Instrumentation and measurement

Instruments

- Pressure stabilizer – pressure biofeedback unit (Chattanooga Group Inc., Hixson, TN) shown in Figure 1
- Modified aneroid sphygmomanometer (Profix pressure guard, Wuxi medical instrument factory, China) shown in Figure 2
- Video camera (Sony Cybershot, MPEG Movie, DSC-W55,7.2 Mega pixel)
- Couch
- Towels
- Metronome
- Audio player
- Wooden stool

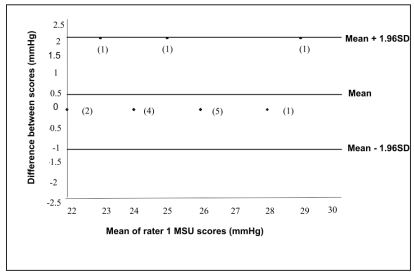
Three qualified physiotherapists participated in the study. The primary investigator/first rater was a qualified physiotherapist with 2 years of postgraduate student experience; second rater was a qualified manipulative physiotherapist with 5 years of academic and clinical experience in Orthopaedic and Manipulative Physical Therapy; third rater was a qualified physiotherapist with 1 year of postgraduate student experience.

The pressure level at which the subject can hold the position steadily for 10 secs without resorting to a retraction action, without the obvious use of the superficial neck flexors and without a quick jerky cranio-cervical flexion movement was recorded in millimeters of Mercury (mmHg) and was used as the outcome measure.

A stabilizer pressure biofeedback (Chattanooga Group Inc., Hixson, TN) and a portable aneroid sphygmomanometer with a dial divided into increments of 2mmHg, transformed in to modified sphygmomanometer were used. Both PBU and MSU were calibrated at biomedical department, KMC hospital, Manipal, Karnataka.

The stability and reliability of the pressure measurements taken with the PBU and MSU were tested prior to the commencement of data collection. Known weights (200 to 800gm) covering the range of 20 to 30 mmHg were used. The weights were placed on the inflated cuff with increments of 100gm, with a consistent baseline reading of 20 mm Hg. [42] The output was read and recorded on a calibration sheet. To verify that the equipments gave consistent readings, calibration tests were also performed halfway through and at the termination of data collection.

Fig.5: Bland-Altman plot depicting intrarater reliability of modified sphygmomanometer unit.



Note: number of values falling at each point is shown in brackets

Procedure for interrater reliability

The procedure was explained to the subjects and the informed consent was obtained.
All data were collected in a calm and comfortable environment. Subjects participated in one testing session, ranging from 50 to 60 minutes. During testing session, subjects performed 3 trials of CCFT with either equipment with 5 minutes interval between trials and 15 minutes interval for the second equipment.

Three raters were present during the trials out of which first and second raters' scored the trials while third rater only administrated and supervised the test procedure.

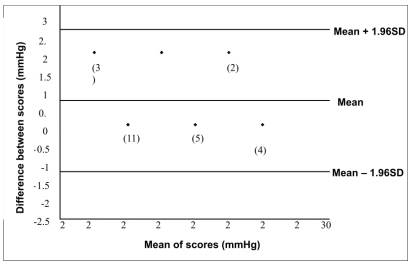
Subjects were taught how to perform the CCFT with standardized instructions about the steps to be followed by the third rater. Subjects were comfortably positioned in supine lying on a couch with hips flexed around 70^0 and knees flexed around 90^0, the legs were supported on a wooden stool. A custom-made stand was fixed to the couch near the head end for positioning the manometer at an appropriate angle for viewing the pressure dial without any parallax error.

The starting position was standardized by placing the cranio-cervical and cervical spine in a mid-position such that the subject's forehead and chin were in the horizontal plane and an imaginary line, extending from the tragus of the ear to bisect the neck longitudinally, was parallel to the plinth. Layers of towel were placed under the head to achieve the neutral position, as necessary (Figure 3). The first and second raters sat on either side of the patient's head in order to observe the anterolateral aspect of neck while the third rater sat near the head end of the couch. The subject's anterolateral neck was adequately exposed to observe chin tuck and other substitution strategies. The testers and subject were refrained from verbal and nonverbal communication during testing procedure in order to avoid distraction.

The air bag was placed under the upper cervical region and inflated to a baseline pressure of 20 mmHg. The subjects were explained to do 'gentle nod movement, like saying yes'. Subjects were given sufficient time to practice the cranio-cervical flexion movement and were oriented at least once to all the 5 stages of CCFT with 2 mmHg increments from 20-30 mm Hg. The subjects were then instructed to placethe tongue on the roof of the mouth, lips together but teeth just separated. This was to discourage substitution with the platysma or hyoids.

During practice session in order to ensure that all subjects performed the test correctly, the third rater closely observed

Fig. 6: Bland-Altman plot depicting concurrent validity between modified Sphygmomanometer and Pressure Biofeedback units.



Note: number of values falling at each point is shown in brackets.

and verbally guided for avoiding any signs of incorrect performance or substitution movements like posterior retraction of the neck to push the neck directly back on to the air bag, excessive use of superficial neck muscles, jaw clenching, holding breath, quick jerky nodding movement resulting in overshooting of the target pressure. The excess superficial neck flexor muscle recruitment was discouraged by verbal feedback. Each subject was instructed to perform the cranio-cervical flexion movement at five different levels (22, 24, 26, 28 and 30 mmHg), holding each level for 10 sec. The subjects were guided for 10 seconds hold and 30 second rest at regular intervals using a metronome. The testing procedure was terminated when the subjects completed all the 5 levels.

First and second raters recorded the target pressure level that was achieved by each subject without substitution strategies. The values of three trials for either equipment were noted down on a scoring sheet individually by first and second raters and then folded and given to the third rater. After the evaluation sessions, the third rater compiled the scoring sheets of other raters' pertaining to each subject and retained them until the end of the study.

Procedure for intrarater reliability

The first rater did video recording of the CCFT procedure for 5 subjects with 3 trials for each of them with MSU. A total of 15 trails were recorded and analysed. The subjects were positioned in the same way as mentioned above and digital camera was mounted on a stand, at a distance of 50cm from the sternal notch at an angle of 45 degrees. No camera zoom was used for all the recordings. The same CCFT procedure was followed as mentioned above. The order of videographic analysis was randomised by lottery method by the third rater and scoring was done by the first rater on two different occasions with an interval of 5 days. The target pressure level scoring was done purely based on observational analysis of substitution strategies.

Statistical analysis

The data were analyzed using SSPS version 11.5. Intraclass correlation coefficients (ICC) for interrater reliability of PBU and MSU was analysed using the two repeated scores out of the three trials for 30 subjects. In addition, ICC value for intrarater reliability of MSU for first rater was calculated using the scores obtained from videographic analysis of 15 trials (3 trails for 5 subjects).

ICC was used to establish concurrent validity of MSU with

Fig. 4: MSU Manometer.

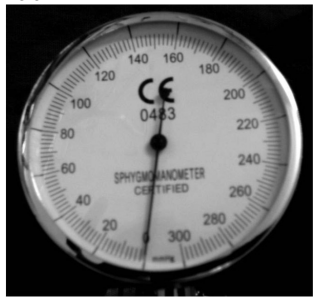


Fig. 5: PBU Manometer.

PBU using first rater scores. Reliability coefficients were interpreted according to the following criteria: low (r=.26 – .49), moderate (r=.50 –.69), high (r=.70 –.89), and very high (r=.90-1.0).[32] The Bland-Altman plot method[33] of comparison was used to depict the data graphically for intrarater reliability and concurrent validity. A significance level of 0.05 was set for all analyses.

Results

Thirty individuals (15 males and 15 females) were investigated for interrater reliability of MSU. The ICC value of 0.88 (CI, 0.76 – 0.94) implied a very high interrater reliability.

Fifteen trials (3 trials for 5 subjects) were analyzed for intrarater reliability of MSU by the first rater. The ICC value suggesting intrarater reliability for MSU was 0.96 (CI, 0.87 - 0.98). This shows very high intrarater reliability. This shows very high intrarater reliability. The Bland-Altman plot method depicted in Figure 5 shows intrarater reliability of modified sphygmomanometer. All the values were found to lie within mean ± 1.96SD (0.4 ± 1.62) and there were no outliers in the data. This shows significant intrarater reliability for MSU.

ICC value for MSU and PBU scores of first rater was 0.91 which implied a very high concurrent validity between the two equipments. The Bland-Altman plot method depicted in Figure 6 shows the comparison between MSU and PBU scores of first rater. All the values were found to lie within mean ± 1.96SD (0.67 ± 1.88) and there were no outliers in the data. This shows significant concurrent validity for MSU.

Discussion

In this study, investigation of the intrarater and interrater reliability and concurrent validity of MSU in the cranio-cervical flexion test (CCFT) on asymptomatic individuals was done. Various factors related to equipments, subjects and CCFT that may influence the reliability and validity are discussed below.

Equipments

In our study, we used simple known weights from 200 to 800 gm for calibration of the equipments to determine the relationship between the applied load and the pressure change over a range from 20 to 30 mmHg, the pressure variations expected in the CCFT. For MSU, weights of 200, 400, 500, 600 and 700gm correlated with 22, 24, 26, 28 and 30 mmHg respectively. For PBU, weights of 200, 400, 600, 700 and 800gm correlated with 22, 24, 26, 28 and 30 mmHg respectively. The variation in calibration may be due to difference in the size of the air bag, compliance of the rubber material, precision or accuracy of the equipments and sensitivity of the manometers. However, for particular equipment, consistent pressures were achieved with the said weights. In 1993, Jull and Richardson et al[34] in their calibration study on PBU used a computer to register the pressure measurements and found that there was a linear relationship between the applied load and the pressure change, with only a 7% variation over all starting weights over a range from 40 to 60 mmHg. In our simple method of calibration using known weights, both equipments gave consistent readings when calibrated on three different occasions. Therefore, we suggest that the same equipment (either MSU or PBU) must be used successively for meaningful comparisons to be made. Interchange of equipments for monitoring change in performance over time is not advisable.

The primary difference between the two methods studied here (i.e., PBU Vs MSU) is in the compliance of the walls and the size of the air bag. The difference in compliance may be due to difference in stiffness of the rubber latex of PBU, and from the rubber bladder and sewn cotton covering of MSU. Due to this variation in dimensions of the bags, the area of contact tends to vary.

According to the manufacturers, the precision of both the equipments is ±3mmHg. The material of the pressure bags of MSU and PBU may have different degree of hysteresis. The measuring scale of the manometers (range 0-200 mmHg for PBU and 0-300 mmHg for MSU, in intervals of 2mmHg) may have different sensitivity. All these factors may account for difference in calibration.

Subjects

Two subjects were excluded from the study. One subject was excluded due to inability to return to cervical neutral position after completion of each level of CCFT producing a significant drop in the pressure level even after assuring that there was no downward slippage of the air bag. This may be attributed to poor kinaesthetic sense of the subject. The second subject was excluded due to development of neck pain during testing.

When the subject does a nodding action, a contact force is generated between the air bag and neck. This force is counterbalanced by the pressure of the air in the air bag and by stresses in the walls of the air bag in case of PBU. In MSU, there will be additional stress from the cotton covering of the bag. If the walls are complaint (i.e., flexible), then the major part of the applied force will be counterbalanced by the bag pressure. In this case, for a given force applied to the bag, the resulting pressure will depend on the area of contact between the subject's neck and the air bag. The pressure measured by the manometer dial of either PBU or MSU will be proportional to the applied force, if the same contact area is always achieved. Helewa et al suggested this in 1986 for MSU[24].

Both first and second raters felt that they had difficulty in identifying over activity of superficial neck muscles in an obese subject because of excess skin folds over the neck. In this subject scoring was done based on identifying other faulty patterns and substitution strategies.

Many subjects in the present study felt that it was easier to perform CCFT with MSU when compared to PBU. In addition, some subjects reported that markings on the pressure dial of MSU (Figure 4) were smaller and it was difficult to visualize when compared to PBU

Many subjects felt that it was easier to visualize the five different coloured markings on the pressure dial of PBU, from 20 mmHg to 30 mmHg while this additional advantage was absent in MSU. Further, the markings are smaller in MSU manometer because it covers a pressure range from 0 – 300 mmHg while PBU covers only from 0 – 200 mmHg.

Each subject was tested on both equipments during the same session. Individual subject variability and subject's muscular effort at the time of testing may have influenced the test scores. Since both raters scored the trials at the same time, this would have resulted in very high correlation suggesting significant reliability for MSU, as the test was based on subjects' performance.

The ICC value suggesting intrarater reliability for MSU was 0.96 (CI, 0.87 - 0.98). Since the same trial was analysed on two different occasions using video graphic analysis, this may have increased the reliability.

Other studies by Keagi et al[22] and Helewa at al[24] reported reliability based on raters testing at different occasions. However, since muscle testing is effort dependent, we recommend testing on same occasion by the raters blinded to each other.

Cranio-cervical flexion test (CCFT)

The testing was done with the raters blinded to each other and scores were not compared until the end of the study. These were done to decrease bias.

In this study, if there was over prominence of superficial neck muscles or if phasic, erratic movements occurred as the subject attempted to hold the target pressure was considered to be because of excess superficial neck muscle activity. According to Jull et al[17] one of the substitution strategies for CCFT is excess superficial neck muscle activity.

The raters rated the trials solely based on observation of substitution strategies on the same side of the neck. The palpation of anterolateral neck muscles was not used in order not to hinder the performance of the subject during testing.

For all the subjects, first rater observed on the right side while second rater observed the left side of the anterolateral neck and the sides were not randomized. If there are chances for asymmetrical activation of superficial muscles, then it may have had an effect on the test scores. Falla et al[16] analyzed EMG of both CCF muscles and superficial muscles (SCM and AS) during CCFT. However, these authors did not report any asymmetrical activation of SCM and AS during incremental

stages of CCFT even though their activity was recorded at each stage of the test.

Another substitution strategy during CCFT is overshooting or undershooting the target pressure[17]. Assuming that our subjects were able to maintain the target pressure level without any deflection, the trials were scored. Efforts were not taken to monitor overshooting or undershooting of the needle in the pressure dial. The subjects' ability to maintain at the desired level of pressure was an assumption of the study.

Clinical implication

From the results of the study, it can be implied that Modified sphygmomanometer can be used as a valid alternative for pressure biofeedback to assess cranio-cervical flexor performance in a reliable manner.

Limitations of the study

No specialized software was used for video graphic analysis method in this study for intrarater reliability. However, steps were taken to standardize the technique by using constant distance and camera zoom in order to obtain reproducible measures.

Future recommendations

The future reliability studies on MSU can be done in patient population suffering from neck disorders. The EMG analysis of superficial muscles can be incorporated to objectively monitor their level of activity during successive stages of CCFT. If pressure levels in mmHg for assessing CCF performance can be correlated with standard method of assessment employing weights in grams or kilograms, then this will provide additional guidelines for calibration.

Conclusion

Modified sphygmomanometer is a reliable tool for assessing cranio-cervical flexion test on asymptomatic individuals. Modified sphygmomanometer has a very high concurrent validity with pressure biofeedback in cranio-cervical flexion test on asymptomatic individuals.

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Comparison of myofascial release and positional release therapy in plantar fasciitis – A clinical trial

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Abstract

Purpose of study

The objective was to study the effectiveness of Myofascial release therapy and Positional release therapy in chronic plantar fasciitis on pain and functional ability.

Material and methods

60 participants with chronic plantar fasciitis were randomly assigned to Group A (Myofascial Release) and Group B (Positional Release Therapy) during the study period of April 2008 to January 2009. The outcome measures were visual analogue scale (VAS) and functional ability in terms of foot function index (FFI). Pre and post session intervention values of outcome measures were noted on 1st and 10th day of intervention.

Results

The participants treated within groups showed a statistically significant decrease in pain, improvement in functional ability as per FFI with $p<0.0001$, but there was no statistically significant difference when compared between groups in decreasing pain ($p=0.256$) and improvement in functional ability as per FFI ($p=0.545$) at 10th day of intervention.

Conclusion

Both MFR and PRT along with Ultrasound therapy for chronic plantar fasciitis showed improvement following 10 days of treatment as per significant decrease in pain (VAS) and improvement in functional ability as per FFI which can be used as an effective treatment regime in participants with chronic plantar fasciitis.

Keywords

Plantar Fasciitis; Myofascial Release; Positional Release Therapy; Manual therapy; Strengthening exercise.

Introduction

Plantar fasciitis is one of the most common causes of foot pain[1]. Plantar fasciitis has been experienced by 10% of the population[2]. Degenerative changes can cause acute and chronic inflammation, may also cause calcification at the origin of the plantar fascia and bony traction spur formation[3]. In the presence of aggravating factors the repetitive movement of walking or running can cause micro-tears in the plantar fascia. The affected site is frequently near the origin of the plantar fascia at the medial tuberosity of the calcaneus[2].

Plantar fasciitis is often characterized by progressive pain with weight bearing, especially the first few steps in the mornings. Patients suffering from plantar fasciitis typically present with inferior heel pain on weight bearing and the pain often persist for months or even years. Pain associated with plantar fasciitis may be throbbing, searing or piercing, especially with the first few steps in the morning or after periods of inactivity. Medical treatment for the condition includes non steroidal anti inflammatory drugs (NSAIDs) or local cortisone injections and surgical treatment[4].

Various physiotherapy treatment protocols have been advocated in the past such as rest, taping, orthosis-night splint, silicon heel cups, stretching, myofascial release and positional release therapy. Electrotherapy modalities in the form of ultrasound, phonophoresis, laser, microwave diathermy, iontophoresis, cryotherapy, contrast bath have been given in past[3].

Myofascial release (MFR) has been one of the physical therapy treatments given in the chronic conditions. Myofascial release is a soft tissue mobilization technique. Myofascial release techniques stem from the foundation that fascia, a connective tissue found throughout the body, reorganizes itself in response to physical stress and thickens along the lines of tension. By myofascial release there is a change in the viscosity of the ground substance to a more fluid state which eliminates the fascia's excessive pressure on the pain sensitive structure and restores proper alignment. Hence this technique is proposed to act as a catalyst in the resolution of plantar fasciitis[5].

Positional release therapy (PRT) originally termed as Strain Counterstrain is an osteopathic manual therapy technique proposed to increase muscle flexibility by placing the muscle in a shortened position to promote muscle relaxation in contrast to placing the muscle in a lengthened or stretched position. PRT or Strain Counterstrain has been defined by Yates and Glover as an indirect myofascial technique focused on the neurologic component of the neuro-vascular myofascial somatic dysfunction. Several of the characteristics of positional release therapy which may be

Photograph 1

Photograph 2a

Photograph 2b

shared with other therapeutic models, can be identified. These include the use of body positioning, the use of tender points to identify the lesion and to monitor the therapeutic intervention and an indirect approach with respect to tissue resistance[6].

Thus this study intends to compare the effectiveness of myofascial release and positional release therapy in subjects with chronic plantar fasciitis.

Methodology

Source of Data

Data was collected from physiotherapy OPD of KLES Dr. Prabhakar Kore Hospital and MRC, KLES Ayurved Hospital and Research Center, Belgaum during the study period of April 2008 to January 2009.

Study design

The study design used for this research was randomized clinical trial. For this R.C.T ethical clearance was obtained from the institutional ethical committee, JNMC, Belgaum before commencement of the study

Study sample

The study sample had 60 participants consisted of both male and female participants referred to the physiotherapy outpatient department with clinical diagnosis of chronic plantar fasciitis.

Inclusion criteria

1. Age between 18 to 65 years.
2. Participants with clinical diagnosis of chronic plantar fasciitis.
3. Duration of more than 3 months.
4. Those who are willing to participate in the study.

Exclusion criteria

1. Clinical disorder where therapeutic ultrasound is contraindicated.

Photograph 3

2. Subjects with clinical disorder where myofascial release is contraindicated such as dermatitis.
3. Ankle ankylosis, congenital foot deformity, arthritis.
4. Corticosteroids injection in heel in past 3 months.
5. Neurological pain like sciatica.
6. Subjects unwilling to participate in the study

Procedure

All the participants with clinically diagnosed as plantar fasciitis were screened after finding their suitability as per the inclusion & exclusion criteria were requested to participate in the study & were briefed about the nature of the study & the intervention. After briefing them about the study, their informed written consent was taken. The demographic data of all the participants consisting name, age, sex, height, weight & BMI were collected. The side affected and duration of symptoms was noted & initial evaluation for their complaints & brief focused history including history of smoking, claudication, previous foot infection, & ulcer was obtained. This was followed by objective assessment of the involved foot for tenderness, temperature, swelling, pain on plantar fascia stretch and pain intensity in terms of the Visual Analogue Scale (VAS). In addition to this functional assessment was carried out using Foot Function Index. Following this participants were randomly allocated to two groups.

Group A:

a. Therapeutic ultrasound with continuous mode, intensity of 1W/cm^2 & with frequency of 1MHz for five minutes was given in prone lying for ten sittings with one sitting per day. (Photograph 1)

b. Myofascial release by using thumb, plantar cupping by using heel of hand and fingers technique for 10 min in supine lying. This was given for ten sittings with one sitting per day.

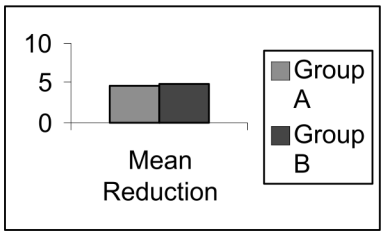
c. Exercises for intrinsic muscles strengthening in the form of -Towel curl up, Active ankle exercise, TA stretching, Plantar fascia stretching with tennis ball. (Photograph 2A and 2B)

Group B:

a. Following the conventional treatment such as therapeutic ultrasound and strengthening exercise as mentioned in Group A participants were then treated with the positional release technique.

b. Positional release technique where participant were made to lie supine with the affected limb out of the plinth and then by application of brief mechanical pressure on tender point with one fingertip in order to determine tenderness. The foot should then be positioned, most probably into pure plantarflexion and gentle fine tuned

Graph. 1: Comparison of VAS between the groups



by rotation, until the score in the tender point has reduce by at least 70%. This position is held for 90 sec with 3 repetitions i.e. total of 270 seconds was given. (Photograph 4)

All the participants received the selected treatment ten sessions over a period of ten days. VAS score and FFI score were measured pre and post intervention.

Results

The result of this study was analysed in terms of decrease in pain as per VAS and improvement in functional ability in terms of FFI.

Statistical analysis

Statistical analysis was done by the statistical package of social science (SPSS) version[13]. Statistical measures such as unpaired 't' tests and paired 't' tests were used to analyze the data. The results were concluded to be statistically significant with $p < 0.05$. Paired 't' tests were used to compare the differences of scores on day 1 and day 10th within a single group. Unpaired 't' tests were used to compare differences between the two groups, Myofascial release and Positional Release Therapy.

Demographic profile

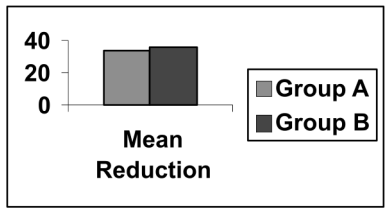
Each group had 30 participants each. The mean age of the participants in Group A was 37.7 years ± 14.39 years and the mean age of the participants in Group B was 33.2 years ±13.10 years. The difference in mean age of two groups was not statistically significant (p= 0.211). The gender ratio of Group A was 16:14 (16 males and 14 females) and Group B was 19:11(19 males and 11 females) and this was not statistically significant ($\div^2$=0.617, p=0.432). Therefore both the groups are matched with respect to age and gender.

Clinical parameters

The participants treated within groups showed a statistically significant decrease in pain as per VAS and improvement in functional ability in terms of FFI with p<0.0001.

In the Group A, the mean VAS score on 1st day presession was 7.4 ± 1.50 which was reduced to 2.1 ± 1.93 on post session i.e. on the 10th day with (p<0.0001) and in Group B, it was reduced from 6.9 ± 1.63 to 2.1 ± 1.96 on the post session i.e. on 10th day with (p<0.0001). On comparing the pre session and post session values, the results between the two groups using unpaired 't' test revealed that there was no statistically significant difference seen with p value of 0.22 and 0.256 respectively.

Graph. 2: Comparison of FFI between the groups.



In the Group A, the mean FFI on 1st day pre session was 47.32% ± 13.53 which reduced to 12.32% ± 10.6 on post session i.e. on the 10th day with (p<0.0001). In Group B, from 46.75% ±13.41 it reduced to 11.05% ± 10.98 on post session i.e. on the 10th day with (p<0.0001).

On comparing the pre session and post session values, the results between the two groups using unpaired 't' test revealed that there was no statistically significant difference seen with p values 0.870 and 0.545.

Discussion

The present clinical trial was conducted to compare the effectiveness of MFR and PRT in Chronic Plantar Fasciitis with a conventional treatment of Therapeutic ultrasound and strengthening exercises to both the groups.

There was significant decrease in pain in terms of VAS for both the groups with the usage of therapeutic ultrasound in the present study and a similar study was performed by Hana Hronkova[7] in 2000 and Young and Dyson[8] concluded that ultrasound plays the vital role in plantar heel pain by mild heating which have the effect of reducing pain, muscle spasm and promoting healing process[9].

The study done by Marisa M. Wynne[10], et al on positional release therapy and Suman Kuhar[11], et al on myofascial release concluded that these treatment regimes are useful in treating patients with plantar fasciitis.

The FFI is a self-administered index consisting of three domain or subscale, ie., activity limitation, pain and disability. Participants were asked to answer the questions related to their pain and activity who were asked to score each question on a scale from 0 (no pain) to 10 (worst pain imaginable)[12]. FFI was used in the present study as it includes all the activities which are part of our daily normal function.

Positional release therapy, with the treatment time selected for this study produced significant pain relief. The treatment time of 90 seconds used in this study was chosen from the evidence available. PRT for 90 seconds in a position of comfort for plantar fasciitis was used since it is preferred in

Table. 1: Comparison of VAS between the groups.

Groups	Pre session	Post session	Mean
A	7.4±1.50	2.7±2.07	4.7±1.93
B	6.9±1.63	2.1±1.96	4.8±1.96
't'	1.236	1.153	0.199
DF	58	58	58
'p' value	0.22	0.256	0.843

Table . 2: Comparison of FFI between the groups.

Groups	Pre session	Post session	Mean
A	47.32±13.53	12.32±10.69	34.6±13.6
B	46.75±13.41	11.05±10.43	35.7±12.81
't'	0.164	0.611	0.322
DF	58	58	58
'p' value	0.870	0.545	<0.0001

cases of somatic dysfunctions as preferred by available evidence suggested by Jones DO[13]. Pain relief could have occurred due to decrease in the intrafusal and extrafusal fiber disparity and reset of the inappropriate proprioceptive activity. Korr has provided a conceptual model how different manipulative techniques like isometrics and stretching may be effective in treatment of somatic dysfunction[14].

The goal of MFR is to release fascia restriction and restore its tissue. This technique is used to ease pressure in the fibrous bands of the connective tissue function, or fascia which is given in chronic conditions[15]. MFR technique have been shown to stimulate fibroblast proliferation, leading to collagen synthesis that may promote healing of plantar fasciitis by replacing degenerated tissue with a stronger and more functional tissue[16,17].

Study done by Shirat Ling, DO, 1999, concluded that direct MFR is a highly effective technique for plantar fasciitis patients who need to recover quickly[18].

All the treatment methods are equally beneficial in the treatment of plantar fasciitis and concluded that MFR is an effective therapeutic option in the treatment of plantar fasciitis.

Limitation

1. Small sample size.
2. Duration of the study was short.
3. There was no long term follow up.

Conclusion

In conclusion, this randomized clinical trial which was performed on 60 participants consisting of males and females with a diagnosis of chronic plantar fasciitis with interventions in the form of therapeutic ultrasound, myofascial release technique and strengthening exercise (Group A) and therapeutic ultrasound, positional release technique and strengthening exercise (Group B) showed that, both the physical therapy regimen can be useful in alleviating the chronic plantar fasciitis in reduction of pain and improvement in functional ability in terms of VAS and FFI respectively. Hence, it can be concluded that both the interventions are effective therapeutic options in the treatment of plantar fasciitis.

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The relative efficacy of high-power pain threshold static ultrasound technique versus interferential currents in the treatment of active myofascial trigger points of upper trapezius

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Backround

Majlesi (2004), studied the effects of a high-power, pain threshold, static ultrasound (HPPTU) vs. conventional ultrasound in active Myofascial trigger points (MTrPs) of the upper trapezius and concluded that HPPTU was more effective than conventional ultrasound in reducing pain but no significant difference was found in the cervical ROM. Both IFT and HPPTU have been reported for significant reduction of pain and increase in cervical ROM.

Purpose

To investigate the analgesic effects of HPPTU technique and IFT and to compare these techniques in the management of active MTrPs in upper trapezius.

Methods/design

Forty-five subjects with a history and examination results consistent with upper trapezius trigger points (TrPs) participated in the study. The subjects were randomly assigned to HPPTU (Group A), to IFT (Group B) and to Stretching of upper trapezius (Group C). Three subjects were lost to follow-up, leaving 42 subjects for analysis. Follow-up was after 3 weeks. The outcome measures were Numeric Pain Rating Scale, Cervical lateral ROM and NPDI. Analysis was performed using post HOC, One way ANOVA, Paired and Unpaired t tests.

Results

It was revealed that HPPTU reduces pain to a greater extent but IFT increases cervical lateral ROM more than HPPTU.

Discussion and conclusion

HPPTU was more effective in reducing pain intensity than IFT but IFT was more beneficial in improving the cervical ROM in patients with upper trapezius TrPs.

Key words

Analgesia, Interferential currents, High-Power, Pain-Threshold, Static Ultrasound and Stretching.

Introduction

Travell defined a Trigger Point as “a hyperirritable spot in skeletal muscle that is associated with a hypersensitive palpable nodule in a taut band. The spot is tender when pressed and can give rise to characteristic referred pain, motor dysfunction and autonomic phenomena[1].

Trigger points are classified as being active or latent, depending on their clinical characteristics[2]. An active trigger point causes pain at rest. It is tender to palpation with a referred pain pattern that is similar to the patient’s pain complaint[3]. The pain is often described as spreading or radiating[4]. Referred pain is an important characteristic of a trigger point.

A latent trigger point does not cause spontaneous pain, but may restrict movement or cause muscle weakness. Electromyographic (EMG) studies of Trigger Points have indicated spontaneous electrical activity (SEA) in Trigger Points, while adjacent muscle tissues are electrically silent[5]. The aetiology of trigger points is not clear, but the two most widely accepted theories are energy crisis theory and motor endplate hypothesis, when combined, they provide a plausible explanation.

A schematic outline of the Simons expanded trigger point hypothesis[6]. Muscle injury results in the release of substances that activate muscle nociceptors and cause pain. CGRP is released from the motor terminal and from injured muscle. Calcitonin gene relate peptide (CGRP) inhibits AChE, facilitates ACh release, and up-regulates AChRs.The end result is increased ACh activity with increased frequency of motor end plate potentials (MEPPs), sarcomere hypercontraction, and the formation of taut bands.

Srbely JZ, Dickey JP proved the antinociceptive effect of ultrasound on trigger point sensitivity[7]. Hseuh (1997), investigated the immediate effectiveness of Electrical nerve stimulation (ENS) and Electrical muscle stimulation (EMS) on Myofascial trigger points in the upper trapezius. Their study concluded that for pain relief, ENS was significantly better than EMS, but for improvement of Range of motion, EMS was significantly better than ENS[8]. Majlesi (2004), studied the effects of a high-power, pain threshold, static ultrasound technique vs. conventional ultrasound in active Myofascial trigger points of the upper trapezius. They concluded that high-power ultrasound was more effective than conventional ultrasound in reducing pain but no significant difference was found in the cervical ROM[9].

This High- power ultrasound technique had been studied and reported very less in literature. Both EMS and High-power ultrasound have been reported for significant reduction of pain and increase in cervical ROM. It has also been proved from the previous studies that EMS had long lasting effects than ENS.

Methods

The Institutional Review Boards at M.M.Medical College & Hospital, Ambala, India had granted approval for the study.

Study sample

42 patients with myofascial trigger points in one side or dominant side of the upper trapezius were involved in the study. Over a period of one year, patients were recruited from:

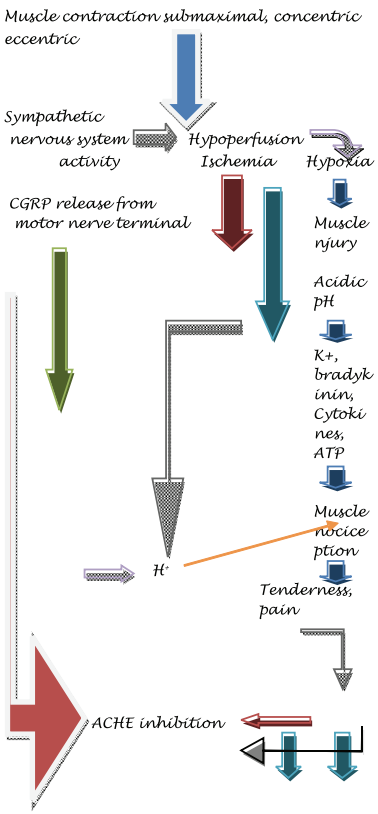
The Outpatient Department of Orthopedics and Physiotherapy of M.M.University Hospital, Mullana, Ambala. The study will include the patients who meet the following inclusion criteria:

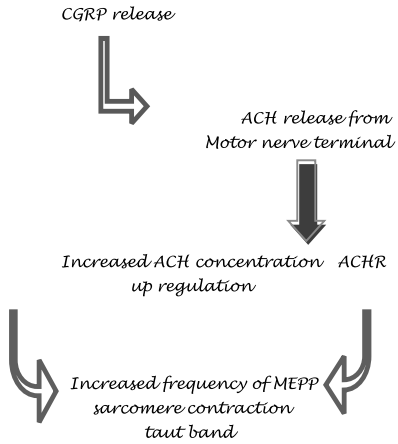
i. Both male and female patients were included in the study.
ii. Age of patients varied from 20- 30 years.
iii. Patients with myofascial trigger points in the upper trapezius muscle on one side or dominant side were included.
iv. Symptoms lasting from 0-2 weeks.
v. Patients with primary MFPS (no pain at any other area than the corresponding trigger point; pain mostly on contralateral bending of head; negative spurling test).
vi. Patients without application of any medications to relieve pain.

The following exclusion criterion was used for this study:

i. Age less than 20 years and more than 30 years.
ii. Acute or serious illness.
iii. Mental Retardation.
iv. Neurologic deficits involving the upper limb.
v. Advanced osteopathic or arthropathic disorder of cervical spine or shoulder.
vi. Patients should have had no physical therapy or injection therapy, within the last 2 months on Myofascial trigger points.

Design of the study





Randomised controlled design

42 subjects were divided randomly into 3 groups. 14 subjects were included in each group and treated as follows:

- Group A – High-Power Static Ultrasound + Stretching of upper trapezius
- Group B – Interferential Currents + Stretching of upper trapezius
- Group C – Stretching of upper trapezius (Control Group)

All participants provided written consent prior to participation.

The instrumentation for data collection included:

Numeric Pain Rating Scale (NPRS)
Range of Motion (ROM)
Neck Pain and Disability Index (NPDI)

Procedures

Patients were screened according to the inclusion and exclusion criteria. 42 patients who met the criteria were included in the study. They were allocated into three groups by simple random sampling. Procedures were explained to the patient and duly signed written consent was taken. All the patients of group A and group B received stretching sessions of upper trapezius for 20-30 seconds.

The trial comprised of a one-week intervention period and three weeks follow up.

Participants were assessed:

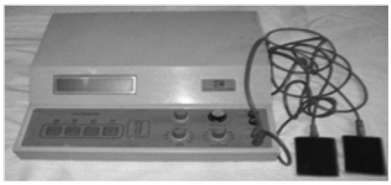
- Before treatment (baseline)
- After one week of treatment (final assessment)
- At three weeks after final assessment (follow up)

High-Power Pain Threshold, Static Ultrasound Technique

Patient was made to sit on the treatment chair and exact site of trigger point was located. High – Power Ultrasound was applied in watts/cm^2 in continuous mode to treat the patients of group A, with the probe placed directly on the trigger point and held motionless. To elicit threshold pain, the ultrasound probe must be kept static on the trigger point. Intensity was gradually increased to the level of maximum pain the patient could bear. It was kept at that level for 4-5 seconds and then reduced to half- intensity level for another 15 seconds. This procedure was repeated 3 times. Each patient receives the treatment everyday for 7 days. Patients were instructed to continually report their pain level, its localization and nature.

The equipments used were:
Goniometer., Stopwatch., Ultrasound modality (Phyaction)

Interferential Currents modality (Electrocare)



Groups	Mean pre pain	Mean pre ROM	Mean pre NPDI
GPA	6.5±1.74	39.64±3.65	30.71±10.48
GPB	5.71±1.43	38.21±3.72	18.57±9.13
GPC	5.79±1.52	37.14±4.25	23.96±6.78

After 1 week of treatment, the mean and standard deviation of post pain, post ROM and post NPDI were as follows:

Groups	Mean post pain	Mean post ROM	Mean post NPDI
GPA	2±1.2	43.57±4.56	8.21±3.59
GPB	3.43±.938	43.92±4.46	9.46±5.64
GPC	4.07±1.63	39.64±4.14	15.21±5.5

Following 3 weeks after treatment, Pain, ROM scores were again taken. The mean and standard deviation scores of follow up were as follows:

Groups	Follow up Pain	Follow up ROM
GPA	2.36±1.21	42.85±3.77
GPB	4.07±1.07	43.21±3.72
GPC	4.71±1.81	37.85±4.25

Interferential currents

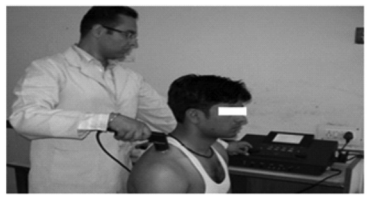
An Interferential Current was used to treat the patients in Group B. The negative electrode was placed on the Myofascial trigger point of the upper trapezius muscle and the positive one is on the acromial tendon insertional site. The current frequency was set at 10 Hz and the intensity at a level that allowed the contraction of the upper trapezius muscle to be visible. The total duration of the application is 20 min. Each patient received the treatment every day for 7 days.

Stretching

All the patients were given passive stretching of the upper trapezius muscle at the end of each therapy session. The patient was in a sitting position. The therapist was standing behind the patient. One hand of the therapist stabilises the patients shoulder and with the other hand the neck is slightly flexed forwards and then bending (side flexion) it to the opposite side. The stretch is maintained for 20-30 seconds and is repeated 3 times each day for 7 days.

Data analysis

Means and standard deviations were used as descriptive statistics. A within-subject and between subject design was used to evaluate the effect of 2 independent variables:



treatment conditions (high-power ultrasound and interferential current) and a no treatment group/control group (stretching of upper trapezius). Pain, cervical lateral ROM and NPDI as dependent variables of high-power ultrasound and interferential current. Significant interactions and main effects were further explained with post HOC (multiple comparisons, bonferroni) test of simple effects. SPSS software (version 13.0, SSPS. Inc, Chicago, Illinois, USA) was used in statistical analysis, and level of significance was set at $p<.05$.

Results

No statistically significant difference existed between the groups in terms of age and gender. Before the application of treatment, the mean and standard deviation of pre pain, pre ROM, pre NPDI scores for 3 groups were as follows:

Post hoc analysis for pain scores

According to Bonferroni, multiple comparisons, it was revealed that there is no significant difference between GP A, B & C in terms of pre pain scores.

There exists a significant difference when GP A was compared with GP B and GP C in terms of post Pain and follow up Pain scores.

Paired sample test analysis for pain scores

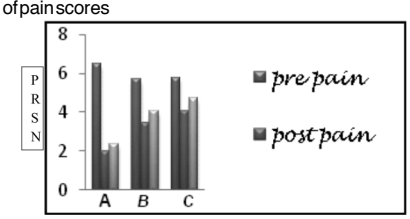
There was a significant difference between pre pain and post pain measurements and pre pain and follow up pain measurements in all 3 groups.

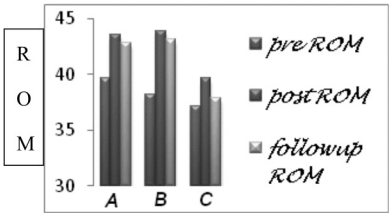
Post hoc analysis for cervical lateral ROM scores

The results revealed that there is no significant difference between GP A, B & C in terms of pre ROM scores.
There exists no significant difference when GP A was compared with GP B and GP C in terms of post ROM scores.

Paired sample test analysis for cervical lateral ROM scores

Comparison of pain scores





There was a significant difference between pre ROM and post ROM measurements and pre ROM and follow up ROM scores in all 3 groups with one exception i.e.in GP C there was no significant difference between pre ROM and follow up ROM scores (p value = .165)

Post hoc analysis for NPDI scores

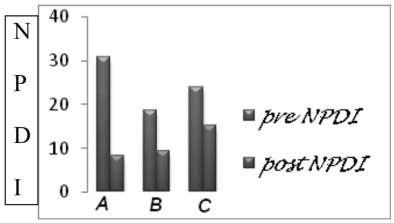
The results revealed that there exists a significant difference between GP A and GP B but no difference was noted between GP A and GP C (p value =.158) & GP B and GP C (p value =.355) in terms of pre NPDI scores.
In terms of post NPDI, no significant difference existed between GP A and GP B (p value = 1) but a significant difference was there between GP A and GP C (p value =.002) & GP B and GP C (p value = .012).

Paired sample test analysis for NPDI scores

There was a significant difference between pre NPDI and post NPDI scores in all the 3 groups.
The measured values for assessment of effectiveness were standardised as per percentage of improvement, calculated by: % improvement = data before treatment – data after treatment/data before treatment

High-power, ultrasound reduced the pain by 70% after treatment sessions but when 3 weeks follow up was done, the reduction in pain level was found to 64%. It showed 10% increase in the cervical ROM and this gain in ROM was decreased to 8% after 3 weeks of treatment. It reported 72% change in NPDI scores.

Interferential currents reduced the pain by 39% but after 3 weeks of follow up the reduction level in pain were found to be 28%. Interferential currents reported 15% increase in cervical ROM and this gain was seen to reduce to 13.5% after 3 weeks of treatment. It reported 50% change in NPDI score.
Stretching reduced the pain by 32% but reduction in pain level after 3 weeks follow up was only 19%. The cervical ROM was increased by 7% and after 3 weeks of follow up it was just 2%.



Discussion

The important findings in this study included:

High-power, static ultrasound was very effective in reducing pain intensity (no matter how severe the pain was) but was not so much effective in improving range of stretch in muscles with Myofascial trigger points. It also reduced the overall scores of NPDI in the patients.

Interferential currents were also effective in reducing the tightness of muscles associated with myofascial trigger points. Interferential currents were more beneficial in improving the cervical ROM in patients with upper trapezius trigger points, but hardly any significant difference was noted when compared with high-power ultrasound.

Stretching also reduced the level of pain in Myofascial trigger points. No significant changes were reported in the cervical ROM in muscles of patients with Myofascial trigger points.

When a follow up after 3 weeks of treatment was done, high-power, static ultrasound showed 6% increase in pain level from post pain scores and the post ROM was decreased by 2%. Interferential currents showed 11% increase in pain level from post pain scores and post ROM scores decreased by 1.5%. Stretching showed 13% increase in pain levels and post ROM scores were decreased by 7%.

In this study, it was found that interferential currents (IFC), reduce the pain level in all cases but the reduction was not more than 38%. For myofascial trigger points, interferential currents involve currents that cause visible muscle contraction. The rhythmic muscle activity may improve local circulation to increase oxygen and energy supply and to break the vicious cycle of energy crisis in myofascial trigger points and subsequently may cause relief of pain and tightness of muscles with trigger points[10]. However, because of strong current stimulation by IFC, not only large fibers but also nociceptive fibers are stimulated. When a patient had severe myofascial trigger point pain, the strong electrical currents used during treatment might aggravate nociceptive impulses to increase pain sensation. The effect of "gate control" mechanism would be masked and the counter-irritation mechanism (hyperstimulation analgesia)[8] for apparent pain relief might be unremarkable in cases of myofascial trigger points.

Hsueh TC, Cheng PT et al, concluded that ENS was significantly better than EMS in terms of pain relief, but for improvement of ROM, EMS was significantly better. It was also concluded that ENS is more effective for immediate relief of myofascial trigger points than EMS and EMS has better effect on immediate release of muscle tightness than ENS. The long term effectiveness of electrotherapy was not investigated in this study[8].

Mark I Johnson et al, revealed that there was no difference in magnitude of analgesia between IFC and TENS[11].

Javed Majlesi et al, reported that high-power, static ultrasound, technique applied to trigger points before stretching the muscle was more effective than conventional ultrasound and it also significantly decreased the length of therapy. They also reported that pain generated when ultrasound is applied on active trigger points subsides when those trigger points shift to latent or prelatent states. This pain generation can be a diagnostic tool and can be an objective measure of trigger point irritability. Care must be taken not to

apply high-power, static ultrasound on trigger points in the vicinity of bony and neural structures. Patients will report discomfort and unbearable pain and burning when ultrasound waves meet periosteum, sympathetic chains and peripheral nerves. They recommended that the technique not to be used for active trigger points of fascial or paraspinal muscles or muscles adjacent to nerve and bone structures (eg. Extensor carpi radialis, tibialis anterior, rectus femoris). They reported that no patient had any short or long term adverse effects. No long term follow up and no measures of functional improvements were taken and the technique was compared only with traditional ultrasound. The above limitations are dealt appropriately to certain extent in this study[12].

Weaver SL, Demchak TJ, et al, reported similar intramuscular temperature increases can be observed among ultrasound treatments (10-minute duration, 1-MHz frequency, 100% continuous duty cycle, 1.5 W/cm2 intensity, within an area twice the size of the transducer head), with transducer velocities of 2 to 3, 4 to 5, and 7 to 8 cm/s[13].

Jan Hendrik Demmink et al, revealed that temperature increase patterns were measured with a 0.5-min interval during an insonation using a circular and stationary technique. The treatment time was 5 and 2.5 min, respectively. In all experiments, temperature peaks in the superficial tissue layers were obtained regardless of the technique used. It is concluded that temperature peaks on the inside and frontal of the bone are avoided when using a moving technique. Physical therapists should take into account that the moving technique decreased the overall temperature compared with the stationary technique[14].

High–power pain threshold static ultrasound increases the temperature of soft tissues temporarily to increase their extensibility, increasing the length gained for the same force of stretch while also reducing the risk of tissue damage. This increased ease of stretching is thought to be the result of altered viscoelasticity of collagen and alteration of collagen matrix.[10]

Deep heating produced by 1 MHz continuous ultrasound, at 1-2.5w/cm^2 has been shown to be more effective in increasing joint ROM than superficial heating. Continuous ultrasound of sufficient intensity increases the tissue temperature which increases soft tissue extensibility, thereby combating soft tissue shortening and increasing joint ROM when applied in conjunction with stretching. For optimal effect it is recommended that stretching should be applied during heating by ultrasound and maintained for 5-10 minutes after ultrasound application while tissue is cooling. Studies have shown that continuous ultrasound at 1 MHz frequency is more effective in controlling pain than treatment with other thermal agents. Persons treated with ultrasound reported less pain, decreased tenderness on pressure, decreased restricted ROM and swelling than those treated with other thermal agents. Ultrasound also improves circulation and accelerates the process of inflammation and healing of involved tissues[10].

High –power ultrasound is not invasive and seems to be free from adverse effects if applied after accurate diagnosis with knowledge of regional anatomy. It is free from the serious complications such as infection, I/v injection, nerve damage and even pulmonary and cardiac arrest that may accompany injection of trigger points[12].

The technique requires good communication and concentration for both patient and therapist. The procedure is painful as trigger point injection, but the intensity of pain can be immediately controlled. In contrast to injection techniques, the procedure can be terminated or interrupted whenever necessary.

There are certain limitations of the study. The technique requires good communication and concentration for both patient and therapist. Sample size is small. Despite of many published articles/studies on cervical spine ROM measurement tools, these tools have not been fully tested for reliability, particularly in terms of adequate sample size and appropriate analysis techniques. The technique requires additional training and experience for the treating therapist. The long term effectiveness of the treatment is noted only for 3 months after the treatment sessions.

The High Power Pain Threshold Static Ultrasound technique has been reported very less in literature. In the past it was compared to conventional ultrasound and in this study with interferential currents. There is a need of greater long term follow up with this technique to know its efficacy. Future research is necessary so that all the issues mentioned are dealt appropriately.

Conclusion

High power pain threshold static ultrasound resolves trigger point pain more rapidly than does the treatment with interferential currents. Interferential currents are better for release of muscle tightness and increase the cervical spine lateral bending to a greater extent than high power ultrasound.

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Effect of core stabilization training on dynamic balance in non-professional sports players

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Abstract

Background

Most of the studies concerned with injury prevention strategies have been conducted on competitively active population however No study actually tries to focus on reducing the incidence of injury during recreational sport participation.

Purpose

The purpose of our study was to determine the effect of lumbar core stability training on the dynamic balance performance & core stability (CS) performance in non-professional outdoor sports players.

Method

30 non-professional players who were recreationally active were randomly allocated into three groups[1] Core stability training group (CSTG),[2] conventional balance training group (BTG) and (3) control group (CTG). To determine the effect of training, on measures of dynamic balance the SEBT (Star Excursion balance test) performance was measured prior to & after the intervention. CS performance was evaluated using PBU (Pressure Bio-feedback) Sahrmann's Core stability test.

Results

CSTG & BTG had significant improvement on the scores of dynamic balance. CS performance was improved only in CSTG. CTG showed no significant improvement in balance or core stability performances.

Conclusion

Core stability training (CST) & Balance training (BT) improve dynamic balance among non-professional otherwise uninjured players. CST further causes improvement in CS performance while BT does not improve it. CST provides dual advantages while BT (balance training) provides only balance enhancement. Control group improves neither dynamic balance nor core stability performance.

Keywords

Core stability training, Balance training, TrA, Multifidus, Swiss ball, SEBT, PBU, Sahrmann's test

Introduction

Due to increased health and fitness concerns, more people have started participating in sports either regularly or irregularly. Unfortunately it also leads to a proportional increase in the incidence of activity induced musculo-skeletal injuries[9].

Patrick and Carl[22] documented that ankle sprains are among the most common injuries in the physically active population Beside this, the Low back pain(low back pain) is a common problem in any sport that requires significant trunk motions or where previous lower extremity injury may have altered the normal mechanics of the kinetic chain. Therefore it is not uncommon to observe that asymptomatic individuals (without any pain or medically reported pathology) whenever participate in recreational sports, also sustain injuries which might be related to their fitness factors which definitely were not adequate and sufficient to avert this injury.

Balance is a complex motor skill that describes the dynamics of body posture in preventing fall[1]. Dynamic balance refers to a person's ability to move the COP (center of pressure) in a given direction within the LOS (limits of stability)[1]. Ability of maintaining a stable base of support while completing a prescribed movement[8]. It requires the subject to maintain balance on a single limb while manipulating the other limb[15]. Diminished balance makes person more prone to recurrent ankle sprain or diminished lower extremity performance.

While promoting a physically active life-style, efforts in injury prevention strategy are needed not only in the high-risk and competitively active population, but also among people practicing less demanding activities (recreational population) as they constitute 'high injury risk' population. Thus a preventive strategy to reduce the incidence of injuries during recreational sport participation is warranted.

Recently fitness training & injury prevention programs that incorporate spinal musculature training, including core strengthening and stability exercises have become popular because the core is considered to be the anatomic and functional centerpiece[17] and the powerhouse of the body. All motions are generated from the core and are translated to the extremities[17]. During performance of sports skills, a stable core provides a foundation upon which the muscles of the upper and lower extremities can accelerate body segments and transfer force between distal and proximal body segments[12].

Recently fitness training & injury prevention programs including core strengthening and stability exercises, have become popular because the core is considered to be the anatomic and functional centerpiece[17] and the powerhouse of the body & it is believed that all motions are generated from the core and are translated to the extremities[17]. During performance of sports skills, a stable core provides a foundation upon which the muscles of the upper and lower extremities can accelerate body segments and transfer force

Table 1: Protocol for core stability training.

Week1	
Abdominal Muscle Contraction in Crook Supine Lying Position	3x15 repetitions.
Abdominal Muscle Contraction in Prone Lying Position	3 x 15 repetitions
Abdominal Muscle Contraction In Quadruped Position	3x15 repetitions.
Abdominal Muscle Contraction While standing on single limb	1x10 repetitio n on each leg
Abdominal Muscle Contraction in Crook Supine Lying Position	3x15 repetitions.
Week 2 (Session 4-6)	
Abdominal Muscle Contraction In crook lying (base position)	1x20 repetitions
Base position + foot lift	2X10.
Bird dog Extension- [3, 17, 27]	15 repetitions each leg
Seated Medicine Ball Rotation [22]	3x15
Week 3 (Session 7-9)	
Abdominal Muscle Contraction	1x20
Seated on Swiss ball [5]	3 x 15 repetitions
Squat With Swiss Ball [3]	3x 10 repetitions
Superman	2 x 10 repetitions
Week 4 (session 10-12)	
Abdominal Muscle Contraction	1x20 contractions
Multi direction lunges [16,27]	2 x 10 repetition each extremity
Oblique pulley with side shuffle [21]	15 repetitions each side rotation
Standing wall cross toss [27]	15 repetitions on each side
Week 5 (session 13-15)	
Abdominal contraction	1x20 contractions
Diagonal Curls on Swiss ball	10 repetitions each side
Twist on Swiss Ball [21]	10 repetitions each side
Week 6 (session 16-18)	
Front Plank Stability Ball [5]	2x10 repetitions.
Back Bridge On Stability ball [3,5,11,13,21,27]	2x10 repetitions
Stability ball Pitcher Squat	10 repetitions each lower extremity
Front Plank Stability Ball [5]	2x10 repetitions.

between distal and proximal body segments[12,8]. Core stability[13] is defined as the ability to control motion of the lumbar spine and pelvis relative to an arbitrarily defined neutral position. It consists of static (endurance) and functional components.

Some authors do mention about the benefit of core stability training for injury prevention and performance optimization including balance enhancement yet in literature the confusion exists regarding the relationship between core stability training/performance and the balancing abilities. Very few studies focus on reducing the balance deficit related injuries among the recreationally active players.

Therefore the purpose of the present study is to clear out this confusion and evaluate that whether core stability training actually has or not any relation with the dynamic balancing abilities in recreationally active asymptomatic individuals.

Methodology

Subjects :

30 non-professional players (15 males, 15 females), without any known neuromuscular, orthopedic, or cardiovascular conditions, volunteered to participate in the study. Subjects were recruited from those who voluntarily reported at the physiotherapy department of the Majeedia Hospital, and from the students of various courses reporting at the department as well as the at the exercise therapy laboratory of the university.

Subjects were randomly assigned to 3 different intervention groups: group A was controlled group (CTG) which didn't receive any training, group B was Core stability training group (CSTG) which received six week of core stability training, and the third group C was the balance training group (BTG) which received four week balance training. Each group had 10 subjects.

Table 2: Protocol for balance training program.

Three sessions per week for six weeks (total 18 sessions) of the following exercises:-
Week 1 & 2
Walking backward 11 meter in a straight line between two marked points (repeat procedure 3 times).
Tandem walking 11 meters in a straight line between two marked points, keeping heel of forward foot in contact with tip of toe of rear foot (Repeat procedure 3 times).
Walking on toes 11 meter forward (repeat procedure 3 times).
Walking on both heels 11 meter (Repeat procedure 3 times).
Alternate toe-raise and heel rise in weight bearing condition in both feet simultaneously for 30 seconds (Repeat procedure 3 times).
Week 3 & 4
Shallow forward knee bend (from stride standing position) on the knee and then come back to starting position (15 repetitions on each leg)
Standing on one limb on floor and catching and throwing a ball (15 catches in each leg)
Standing on one limb on trampoline, and catching and throwing a ball (15 catches on each leg)
Week 5 & 6
One leg standing on trampoline and doing partial squat on one limb, 15 repetitions each leg
Alternate toe-raise and heel rise in weight bearing condition in both feet simultaneously for 30 seconds (Repeat procedure 3 times).

Table 3: Descriptive statistics of participants (group wise).

Groups	Age (years) Mean ± SD	Height (cms) Mean ± SD	Weight (kg) Mean ± SD
CTG (n=10)	24.02 ± 1.1	169.48 ± 2.6	67.6 ± 7.2
CSTG (n=10)	24.35 ± 1.5	168.55 ± 3.8	66.6 ± 11.4
BTG (n=10)	25.05 ± 1.2	167.48 ± 3.1	60.60 ± 8.5

Variables :

Dynamic balance in this study is defined as testing maneuvers that required dynamic limb segment or whole body movements whilst maintaining balance on a single foot. Star Excursion Balance Test (SEBT) is a validated measure of dynamic balance ability, it is a simple and highly portable test that could be employed in a range of clinical environments as showed by Hertel and Miller.

The Core stability (CS) was measured through PBU (Sahrmann's Core stability test). In the present study dynamic balance was measured by SEBT Star excursion balance test)[8], carried out on the dominant lower extremity. All readings were taken at pre-test & at post test session.

Procedure :

The potential volunteered candidates were explained nature and purpose of the study and those who agreed to participate were given the screening questionnaire to judge their suitability for the study. Eligible candidates underwent consent taking and after random allocation to one of the three groups, received familiarization trials specific for the each group.

Descriptive variables of all subjects, such as age, height, sex and limb length were recorded. After familiarization trials the baseline measurement of dependent variables was taken after one week rest on Core performance test and the balance performance test.

Protocol of the training:

Interventions were given to the participants according to their

respective groups. The CTG didn't participate in any training and their post test readings were taken after the 6 week interval from the pre-testing day. CSTG and BTG subjects participated in a 6-week regime of 3 sessions per week for 6 weeks (total 18 sessions). Each session lasted for approximately 40 minutes-45 miutes

The exercise program for CS training consisted of progression over the period of 6 weeks. Initial exercises focused on the training of the deep lumbar stabilizer in isometric fashion in variety of positions. Then the progression consisted of utilizing this contraction through a variety of functional positions. (Protocol is in table 1). In the absence of the consistent and universally applicable protocol, the drills for training of CSTG were chosen from previously documented drills in the literature[14,24,26] and according to recommendations from various authors[19,20,21]. These training were one on Swiss ball, plane surfaces in single as well as multiple planes of movements.

The exercise protocol for BTG during first two weeks consisted of drills primarily focused to target the ankle musculature while the last two weeks drills targeted the balance ability in more functional way and it consisted of standing on one limb, one limb standing on unstable surface (trampoline) and doing ball catching activities in one limb standing.

Participants were required not to change their training schedule or activity level acutely during the period of whole study.

Post-test measurement :

The post-test data was recorded in all three groups after the six week from the pre-test recording day.

The reach distance for the SEBT test in all eight directions was normalized to the true limb length of the participant to neutralize the influence of height, gender or individual characteristics on the reach distance. It was recommended by Jay Hertel (2003)[8]

Data analysis

Data analysis was done using SPSS (version 15) software system & MS-excell 2007 version. Demographic data of subject descriptively summarized. The SEBT performance for within group comparison was done Paired t- test for while that for the ordinal variables the PBU Sahrmann's core stability score was done using Kruksal wallis for between group comparison and the Wilcoxon signed ranks test for within group comparison. Analysis of variance (ANOVA) was

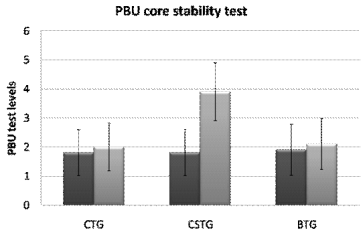

Figure 2. shows the core stability performance using PBU test

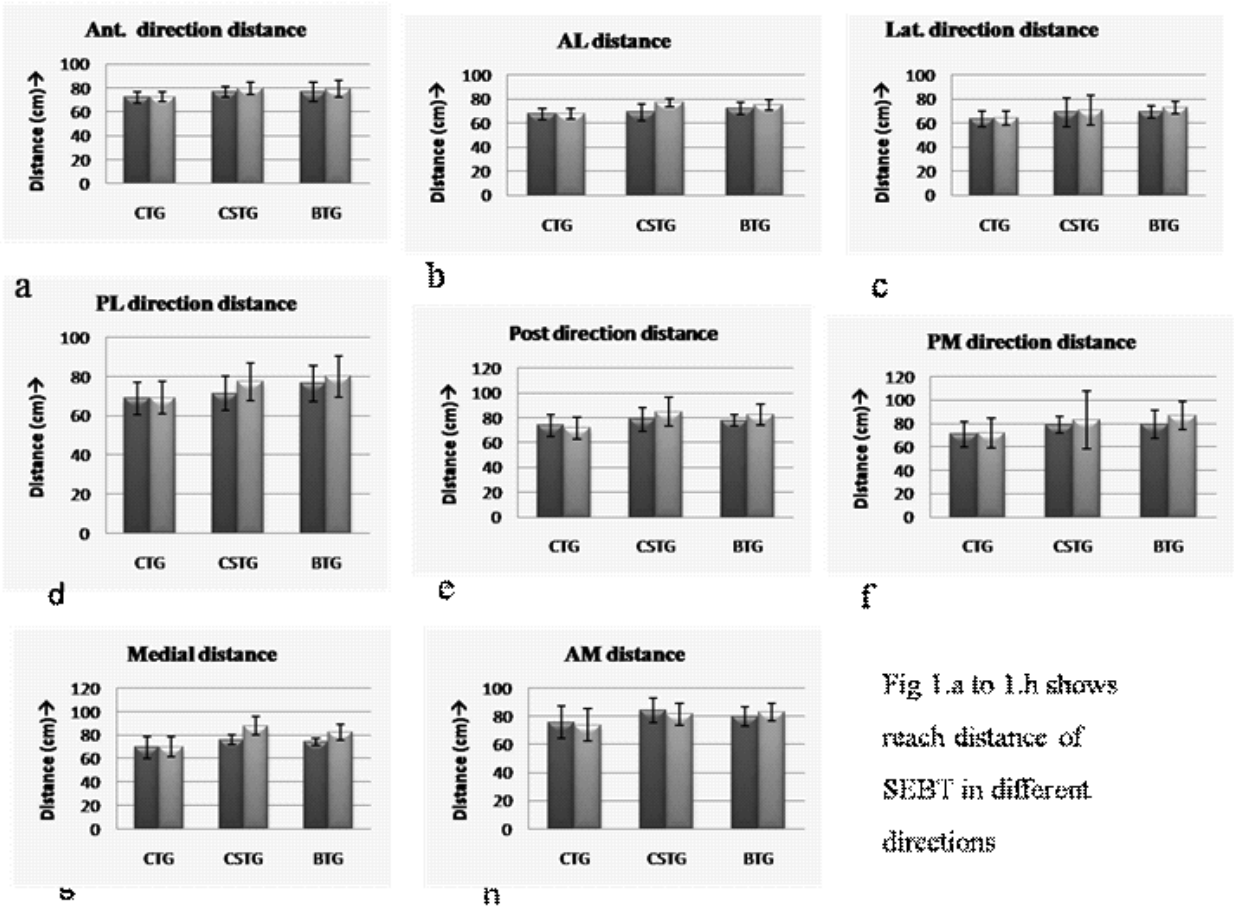

Fig 1.a to 1.h shows reach distance of SEBT in different directions

used for SEBT reach distance performance for between-group analyses. A value of $p<0.05$ was accepted as significant. Confidence interval was chosen as 95%.

Results

Descriptive variables

Demographic details of all the three groups are reported in Table 3. There was no significant difference between the groups on demographic information and the groups were found to be homogenous

Results of data analysis for the anterior direction reach distance of SEBT test revealed that the score improved significantly in both CSTG as well as BTG. Similar results were found for anero-lateral, lateral, postero-lateral, posterior, anteromedial, and medial directions too; however the mean improvement in the CSTG was more than that of the BTG. (figure 1)

For postero-medial direction reach distance the significant difference were found in BTG & CSTG however for it the BTG mean improvement was more than that of the CSTG.
Pre and post treatment results for PBU core statibility test reveals that the CS performance improved significantly only in CSTG group.

Discussion

The primary aim of the present study was to evaluate the effect of lumbar core stabilization training and balance training on dynamic balance and core stability performance.

Results showed that both training groups (BTG & CSTG) had statistically significant improvement on the scores of SEBT (dynamic balance test). Also results revealed that performance score of core stability tests improved only in case of CSTG.

Core Stability Performance

CS performance depends on the ability of deep lumbar stabilizer muscles to sustain sub maximal isometric contraction for extended time period[18]. It is considered to be the function of local muscles therefore CS performance may be the direct reflection of the functioning of local muscle stabilizer groups[11]

Clearly CSTG improved better than the BTG & CTG, thus possibly our 'core Stability program' (CST) brought about an increasing functional activation of the spinal stabilizer muscles. In other words, it shows that recruited healthy and asymptomatic individuals used in this study had potential to be trained further, for improving the core muscle performance.

This finding is similar to that of the Davies (2005)[16] who found that even normal & asymptomatic individuals may have dysfunction & endurance deficit of the TrA (transverse abdominis) & multifidus muscles. They also reported that by specific training of these muscles, the core stability performance (on core stability endurance test) may be augmented in these individuals.

Another possible explanation of increase in the performance timing of CSTG may come from the work of Hodge & Eriksson (2004)[23] who found increased IAP (intra-abdominal pressure) may provide mechanical support to the spine and also reduces the muscle work of spinal stabilizers. They had previously demonstrated the early activation of TrA relative to the global muscles during upper or lower extremity movement[10], during reaction based tasks, as well as unexpected trunk loading (like Swiss ball). Activation of TrA (transverse abdominis) muscle increases IAP and thus reduces work of stabilizer musculature so that probably, they can perform their stabilization role for relatively longer duration without undergoing early fatigue

Conclusion

Six week core stabilization training significantly improves dynamic balance, to a better extent then the improvement observed with balance training. Only core stability training improves the core stability. Balance training improves only balance without benefitting the core performance. Without either training (in control group) neither core stability improves and nor the balance performance.

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Promoting continence in stress urinary incontinent female– A case study

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Abstract

Introduction

International Continence society (ICS) defines incontinence as, "Involuntary loss of urine that is a social or hygienic problem". Globally, urinary incontinence (UI) affects the quality of life of at least one third of women. This problem is more pronounced in India, where women usually do not seek treatment for their reproductive health problems and do not vocalize their symptoms. In patients with urinary incontinence, biofeedback couples the physiological recruitment of the proper muscle groups in pelvic floor exercises with observable stimuli, typically visual or audio cues.

Objective

To improve the severity of stress urinary incontinence and quality of life by improving the pelvic floor muscle strength using Pelvexiser.

Design

A case study

Case presentation

A 54 Year female who have attained menopause and had stress urinary incontinence was given pelvic floor muscle training using biofeedback equipment– Pelvexiser for 6 weeks. The treatment was given both with and without a pre set pressure as a resistance. The Pelvic floor muscle strength was assessed using clinical scale for grading digital evaluation and by using the Pelvexiser before, during and after the treatment program. The quality of life was assessed using the Incontinence Quality of Life Scale (I-QOL). The pelvic floor muscle strength increased from 2 to 4 in the clinical scale for grading digital evaluation and the severity of incontinence was found to be improved from 5 to 8 cm in the Visual analogue scale. Her quality of life score showed a good improvement from her pretest value of 76.13% to her posttest value of 23.86%. The Pelvexiser readings showed a good improvement from a pre treatment pressure of 20 mm Hg to a last post treatment pressure of 56 mm Hg (without resistance) and from a resisting pressure which was set as 20mm Hg initially up to 50 mm Hg at the end of the treatment program.

Conclusion

Although it is widely accepted that continent surgery is the most effective treatment for severe or persistent stress incontinence, conservative measures are usually the first line of treatment for women with urinary incontinence and usage of Pelvexiser for pelvic floor muscle training is very effective in reducing the frequency of accidents of urine leak and in promoting continence.

Keywords

Stress incontinence, Pelvexiser, Quality of life, Pelvic floor strength, Pelvic floor exercises

Introduction

International Continence society (ICS) defines incontinence as, "Involuntary loss of urine that is a social or hygienic problem"[8]. Globally, urinary incontinence (UI) affects the quality of life of at least one third of women. This problem is more pronounced in India, where women usually do not seek treatment for their reproductive health problems and do not vocalize their symptoms. There is a "culture of silence" and low consultation rate among Indian women regarding such problems. Women in India have also been reported to have a high tolerance threshold for seeking treatment. Embarrassment, shyness, lack of money/time, fear of surgery and pain are usually the reasons given by women for non-consultation[9]. Stress urinary incontinence (SUI) has an observed prevalence of between 4% and 35%[4]. The prevalence of urinary incontinence in a community is as high as 30%. Some patients do not disclose the incontinence because of fear of invasive testing[10]. Incontinence can affect the quality of life and activities of daily living (Van Der Vaart et al, 2002), and has large resource implications for both the individual (Doran et al, 2001) and the health service (The Continence Foundation, 2000).

Urinary continence is maintained by passive and active forces at the bladder neck and along the urethra. Pelvic floor exercises can improve these forces, provided there is

Fig.1: Pelvexiser.

sufficient muscular awareness, nerve supply and intact muscles. Instructions in the exercises must include a test for correct muscle use. Biofeedback methods seem superior[6]. Biofeedback involves the monitoring of a learned or naturally occurring physiological process in a way that information about the process can be given back to the patient. In patients with urinary incontinence, biofeedback couples the physiological recruitment of the proper muscle groups in pelvic floor exercises with observable stimuli, typically visual or audio cues[1]. The Perineometer can measure intravaginal pressure when placed in the vagina and an objective recording of pelvic floor muscle strength is made. It can show the women the strength of each contraction they generate, thus acting as a biofeedback which helps to motivate the patient [5].

Study design

A case study.

Case presentation

A 54 year old female who had attained menopause diagnosed as having mixed urinary incontinence (Stress more than Urge) was studied. In April 2008, she had the complaints of urinary incontinence both of stress and urge type. She was referred by the Gynecologist to a physiotherapist in PSG Hospitals. She was assessed and was diagnosed to have both stress and urge incontinence. Bladder retraining and pelvic floor exercises were taught.

Table 1: Pre and Post test values of Pelvic floor muscle strength, Severity of Incontinence and Quality of life score.

	Pelvic floor muscle strength (Digital Evaluation grade)	VAS in cms	I – QOL in %
Pretest	2	5	76.13%
Posttest	4	8	23.86%

*VAS - Visual Analogue Scale
*I – QOL – Incontinence Quality of Life

She could perform the exercises but was not regular. She revisited the physiotherapy department after 10 months with her major problem of stress urinary incontinence. Again the patient was assessed; and pelvic floor muscle training using biofeedback equipment was accepted by the patient after receiving a brief description of the Pelvexiser equipment and the importance of training the pelvic floor muscles through Pelvexiser (Figure 1).

The initial pelvic floor muscle strength with digital palpation and with the Pelvexiser was recorded after getting the consent from the patient. The BMI of the patient was 30 indicating she was overweight.

Outcome measures

Pelvic floor muscle strength was assessed using clinical scale for grading digital evaluation (Diane K. Newman, 2007) and by using the Pelvexiser before, during and after the treatment program. The quality of life was assessed using the Incontinence Quality of Life Scale [I-QOL] (Bushnell DM et al, 2005). The severity of incontinence was subjectively assessed with Visual Analogue scale (VAS). The dependent variables in this study are Severity of Incontinence and Quality of life and the independent variable is pelvic floor muscle strength.

Treatment procedure

The treatment duration was fixed as 6 weeks and the patient was made to come for treatment thrice weekly. During her each visit for treatment; she was treated with the Pelvexiser for 30 minutes with rest intervals. As soon as the vaginal probe was inserted, the resting vaginal pressure was noted. Then the patient was asked to contract her pelvic floor muscles to her maximum without breath holding and was made to hold the contraction for 6 seconds. After that she was made to relax for 6 seconds. The patient was made to perform 10 contractions. After 2 minutes, she was given a minute rest. This was repeated thrice.

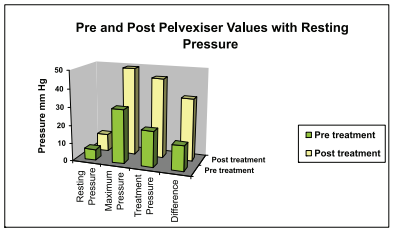
Table 2: Pelvexiser Vaginal Squeeze Pressure Values (Using resting pressure mm Hg).

	Resting Pressure	Maximum squeeze pressure from resting pressure	Maximum pressure held for 6 seconds (treatment pressure)	Difference between resting and treatment pressure
Pre Treatment value	6	30	20	14
Week				
1	8.6	40	32	23.3
2	10	40	34.6	24.6
3	10	48	41.3	31.3
4	10	50	48.6	38.6
5	10	56.6	53.3	43.3
6	10	60	57.3	47.3
Mean Post treatment values	9.76	49.1	44.51	34.73
Mean Difference	**3.76**	**19.1**	**24.51**	**20.73**

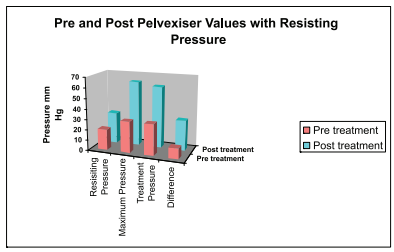
Table 3: Pelvexiser Vaginal Squeeze Pressure Values (Using resisting pressure mm Hg).

	Resisting Pressure	Maximum squeeze pressure from resisting pressure	Maximum pressure held for 6 seconds (treatment pressure)	Difference between resisting and treatment pressure
Pre Treatment value	20	30	30	10
Week				
1	20	46.6	41.3	21.3
2	23.3	43.3	43.3	20
3	23.3	53.3	53.3	30
4	36.6	70	66.6	30
5	36.3	72	70	33.3
6	41.6	91	81.6	40
Mean Post treatment values	30.13	62.7	59.35	29.1
Mean Difference	**10.13**	**32.7**	**29.35**	**19.1**

Graph: 1.



Graph: 2.



Then the resistance was increased and the contractions were repeated as before. The maximum squeeze pressure both with and without resistance were noted. The maximum squeeze pressure where the patient could hold the contraction for 6 seconds was also noted. The total treatment period involved 60 pelvic floor contractions.

The pelvic floor muscle strengthening exercises were reviewed and the protocol was set for 6 weeks wherein, the patient had to gradually progress her exercises. The exercise for strengthening both the fast and slow twitch muscle fibers was taught. The patient was advised to perform the exercises thrice daily at home. The weight reduction exercises were taught to her on the third week of treatment program.

Results

The pelvic floor muscle strength increased from 2 to 4 according to the clinical scale for grading digital evaluation of muscle grading at the end of the treatment program. Her quality of life score showed a good improvement from her pretest value of 76.13 % to her posttest value of 23.86%. The Pelvexiser readings showed a good improvement from a pre treatment pressure of 20 mm Hg to a last post treatment pressure of 56 mm Hg (without resistance). The patient could contract the pelvic floor muscles from a resisting pressure which was set as 20mm Hg initially and then from 50 mm Hg at the end of the treatment program. The patient also subjectively explained her improvement through the Visual analogue scale from 5 to 8 cm (Table 1).

The mean values of the resting pressure, maximum squeeze pressure from the resting pressure, treatment pressure and the difference between the resting and treatment pressures for each week were calculated. The same were calculated with that of the resisting pressures.

The resting pressure improved with a mean difference of 3.76 mm Hg. Mean improvement in the maximum squeeze pressure from the resting pressure and the treatment pressures were 19.1 and 24.51 respectively.

The resisting pressure improved with a mean difference of 10.13 mm Hg. Mean improvement in the maximum squeeze pressure from the resisting pressure and the treatment pressures were 32.7 and 29.35 respectively.

The mean difference between the resting and the treatment pressure was 20.73mm Hg. Similarly the mean difference between the resisting and the treatment pressures was 19.1, indicating the improvement of the vaginal squeeze pressure following the treatment.

Discussion

Pelvic floor muscle exercises can be very effective in the management of incontinence (Berghmans et al., 1998). The pelvic floor muscle must be correctly identified and contracted. Bump et al. (1991) reported that only 49 per cent of women given verbal instruction on performing pelvic floor exercises had an ideal result, i.e. as a significant increase in the force of urethral closure. They concluded that verbal instruction does not adequately prepare a patient about to start a pelvic floor muscle exercise programme. More worryingly 25 per cent displayed a technique that could potentially promote incontinence. It is imperative that the patient can correctly identify her pelvic floor muscle prior to starting an exercise programme. In our study, the patient could understand the pelvic floor muscle contraction. Initially she was trying to use her abdominal muscles along with her pelvic floor muscle but with the proper verbal commands she could improve her exercise by concentrating only on her pelvic floor muscles. As with any other muscle training programme the exercise must be client specific. Therefore the patient needs to exercise maximally incorporating Type I (slow twitch) and Type II (fast twitch) fibres, concentric and eccentric exercise plus sub-maximal contractions and function (Joanne Whitehead, 2001) and for this patient exercises for both these types of muscle fibers (Quick and Slow Kegel Exercises) were taught.

Conclusion

Urinary incontinence can affect the quality of life but some women never seek medical help for their problems or they only present after several years of misery. Many women have the misconception that there is nothing else available in the treatment of their incontinence except by surgical means. Although it is widely accepted that continent surgery is the most effective treatment for severe or persistent stress incontinence, conservative measures are usually the first line of treatment for women with urinary incontinence and usage of Pelvexiser for pelvic floor muscle training is very effective in reducing the frequency of accidents of urine leak and in promoting continence.

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Role of physiotherapy in palliative care

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Introduction

In palliative care settings, physical therapists strive to promote quality of life. Minimal research exists; however, to guide therapists working with patients with terminal illness[1]. Physical therapy for patients receiving palliative care is directed at achieving symptom control, maximizing remaining functional abilities, providing caregiver education, and contributing to interdisciplinary team communication[1].

There is a paucity of physical therapy literature to educate, guide, and support therapists involved in caring for patients who are dying[1]. The World Health Organization estimates that 15 million people will develop cancer in 2015, up from approximately 9 million people in 1985. Based on this information, the number of older adult patients with cancer who require services, including physical therapy, will continue to grow[1].

Palliative care

Palliative care is the active total care of patients whose disease is unresponsive to curative treatment. Palliative care aims to relieve suffering and improve the quality of life for patients with advanced illnesses and their families through specific knowledge and skills, including communication with patients and family members; management of pain and other symptoms; psychosocial, spiritual, and bereavement support; and coordination of an array of medical and social services[1].

The 6 fundamental principles of palliative care are:

1. Affirm life and regard dying as a normal process.
2. Neither hasten nor postpone death.
3. Provide relief from pain and other distressing symptoms.
4. Integrate the psychological and spiritual aspects of patient care.
5. Offer a support system to help patients live as actively as possible until death.
6. Offer a support system to help family members cope during the patient's illness and their bereavement[1].

It is based on an interdisciplinary approach that is offered simultaneously with other appropriate medical treatments and involves close attention to the emotional, spiritual, and practical needs and goals of patients and of the people who are close to them[2]. Palliative care providers respect and attend to the individual needs of each patient from a perspective of "total pain," defined as physical pain, emotional pain, psychological pain spiritual pain[1].

Palliative care should be offered simultaneously with all other medical treatment[2]. Integration of palliative care as a component of comprehensive intensive care is now seen as more appropriate for all critically ill patients, including those pursuing aggressive treatments to prolong life[3]. It can bring considerable improvements in function and quality of life for seriously ill people and their families and can reduce psychological and spiritual distress[4]. It is an approach that can give a patient the opportunity to find purpose, self-worth, and control at a time when they are experiencing a loss of independence[4].

Disability in patients with advanced cancer often results from bed rest, deconditioning, and neurologic and musculoskeletal complications of cancer or cancer treatment[5].

Physiotherapist in palliative care

The value of physiotherapy in palliative care has been increasingly recognized over the past few decades, with a shift in emphasis from a predominantly medical/nursing model of care, which focused primarily on symptom control, to a more inter-disciplinary, rehabilitative approach[6]. In patients with advancing disease, where functional limitations are unavoidable, the physiotherapist is the expert in helping both patients and carers cope with these changes, whilst maximizing their potential to achieve realistic goals and thereby achieve optimal quality of life[6].

Physiotherapy in the palliative setting should aim to enhance the patient's quality of life. This may be achieved by improving function, or where this is not possible, by improving the patient's and carer's ability to cope with the patient's deterioration. A fundamental goal of palliative care is the relief of pain and other symptoms[7].

Safe, effective physiotherapy intervention involves:

- Medical screening prior to referral to physiotherapy;
- Thorough assessment and regular reassessment of the patient's physical status with an acute awareness of their psychological, social, and spiritual well-being;
- An awareness of the multidimensional nature of symptoms such as pain, dyspnoea, and fatigue and an holistic approach to their assessment and management;
- Appropriate goal-setting according to the patient's identified problems and priorities;
- Modification of goals as the patient's condition changes;
- A problem-solving approach to management;
- Clear and sensitive communication with the patient, carers, and the inter-disciplinary team;
- Effective communication between hospital, hospice, and community settings;
- The fostering of hope and prevention of feelings of abandonment[6].

Physiotherapy approaches and techniques included are

Education and instructions

Physical therapy should focus on patient education regarding comfortable and safe positions in which to rest or sit[5]. Comfortable or relaxed positioning with pillows for relief of cancer pain,especially pain caused by bone metastasis and abdominal discomfort[8]. The physiotherapist may employ general relaxation techniques to control anxiety that often augments other symptoms, including pain.

Patients with vertebral metastasis are taught not to rotate the back. Education in care giving techniques, such as transfer training and positioning for comfort, of any person construed by the patient as a family member may decrease a family's perceived stress of providing care and a patient's concern about being a burden.[1]Instruction by physical therapists in "hands-on" techniques reassures families that they will not hurt patients and that it is important to touch, thus fostering social relationships and continuity in ways of relating that may have been disrupted by age and terminal illness[1].

Therapists could provide opportunities to discuss the patients' values and beliefs.Physical therapists who are able to listen to patients and discover the particular strategies the patients are using may more effectively support these strategies and integrate them into the format, focus, and goal setting used in physical therapy interactions and interventions[1]. Therapists who possess knowledge of their patients' self-defining roles, routine pursuits, and valued relationships may be better equipped to tailor treatment to the individual[1].

By providing patients with opportunities to voice concerns, grief, and reflections related to what they are going through and by attentively listening to all that is said and intimated, clinicians may gain an understanding of their patients' death-related anxieties. An intact knowledge of the physiological processes of death and variability in psychological reactions will enable physical therapists to share with patients and families answers to general questions related to physiological signs and symptoms of active dying and the typical sequence of events. Openly communicating about the dying process, the normality of fluctuating emotional levels and anticipatory grief may reduce patients' fear of the unknown and reinforce coping abilities[1].

Therapeutic exercise

Therapeutic exercise aimed at improvement in muscle strength, range of motion and balance. Weak muscles are found and strengthened.Active, active assisted, passive and stretching exercises relieve and prevent joint contracture, muscle spasm and deep vein thrombosis of the lower limbs. Proper sitting balance is an important function, because it increases individuality and activity and decreases complications of the bed ridden[8]. Exercise can counteract the effects of inactivity and improve psychologic status. There is also some evidence that immune function may be improved by moderate exercise. Intensity of exercise should be at the lower end of the range[5]. Pain related to a specific activity or the impact of pain on the performance of daily activities must be considered when prescribing exercise[5]. Exercise is an effective holistic intervention as the patient may experience physical benefits such as improved endurance, muscle strength and power, flexibility, and balance in addition to psychological benefits such as improvements in body image, confidence, social interaction, and depression[6].

Activities of Daily Living (ADL) exercises comprised bed exercises such as changing and maintaining positions, transfer from bed to wheelchair and from wheelchair to toilet, as well as wheelchair exercises and ambulatory exercises. These exercises are designed to enable patients to function with even a minimal level of independence at the late terminal stage[8].

Endurance training aimed at physical fitness helps to increase pulmonary and cardiovascular function. Chest physiotherapy included diagraphmatic breathing exercises, relaxation exercises and postural drainage[8].

Physical modalities

The use of physical modalities such as massage, heat, and cold can be implemented at bedside and aid in the pain management of patients. Their use may decrease the need for pain medications. Heat can be applied as hot packs, moist heat, and heat lamps. Heating soft tissues prior to a range of motion exercises and activity can decrease pain and muscle spasm and decrease joint stiffness. Heat should not be applied to skin areas that are insensitive, have been exposed to radiation, or are atrophic or acutely inflamed. Ice is usually applied as ice packs, ice compression wraps, or ice massage. Cold packs should be sealed, flexible enough to conform to body contours, and applied to produce a comfortable and safe intensity of cold. Cold therapy as heat is contraindicated for areas of atrophic skin or skin that has been exposed to radiation therapy. Cold therapy is also contraindicated for patients with Raynaud phenomenon or on ischemic limbs[5].

Transcutaneous Electrical Nerve Stimulation (TENS) is the most frequently used form of electro-therapy in the palliative setting, generally used in the treatment of neuropathic, bone, and chronic pain. Physiotherapists working in palliative care are now increasingly using acupuncture to treat pain in palliative patients[9].

Assistive devices

The prescription of assistive devices, such as canes, walkers, and crutches, and the teaching of compensatory techniques for mobility can aid in ambulation[5]. Environmental modification and simple equipment such as tub benches, raised toilets, and handlebars can have a significant impact in patients' overall function and aid in preserving independence in activities of daily living. [5] Supportive measures such as the provision of collars, slings, splints can also reduce pain whilst optimizing function and mobility[5].

Basically though the principles and approaches of physiotherapy are the same, in palliative care precise observations, frequent evaluations, sound clinical reasoning and compassionate attitude is more important. Routine assessment has been shown to identify overlooked and unreported symptoms, facilitate treatment, and enhance patient and family satisfaction Improved treatment of symptoms has been associated with the enhancement of patient and family satisfaction, functional status, quality of life, and other clinical outcomes.

Palliative care and rehabilitation share common goals and therapeutic approaches. Both disciplines have a multidisciplinary model of care, which aims to improve patients' levels of function and comfort The rehabilitation of

terminally ill patients has received little attention, and there is scarce data to support its efficacy[5]. Rehabilitation is the process of helping a person to reach the fullest physical, psychological, social, vocational, and educational potential consistent with his or her physiologic or anatomic impairment, environmental limitations, desires, and life plans[5]. During the rehabilitation of terminally ill patients, maintaining a balance between optimal function and comfort becomes a key issue. Rehabilitation is unlikely to restore a premorbid level of function to these patients but may provide a reasonable degree of independence and quality of life[5]. Rehabilitation goals for patients with advanced cancer must be realistic and take into consideration the stage of the disease; the patient's medical status, cognition, and prognosis; and the site of planned discharge[5].Rehabilitation becomes an essential component of palliative care rather than an additional luxury[10]. It is an approach to care that focuses on setting goals, re-enabling patients, and in helping them to adapt to their changed circumstances so that they may live fulfilling lives

Rehabilitation in palliative care differs from rehabilitation in general medicine. In palliative care, a rehabilitation programme must be seen in the context of an illness that is uncertain and will cause deterioration. Consequently, both patients and professionals need to understand the implications of a poor prognosis[10].

Palliative care clearly has an important role in patients with non-cancer conditions who are in the advanced stages of their illness and imminently dying[10].

The rehabilitative approach in palliative care is appropriate in all health care settings. Physician, Nurses Physiotherapists, occupational therapists, speech therapists, dietitians, social services, counselors are the main members of the palliative care team[10].

Physiotherapy is an important part of the rehabilitation service. The inclusion of physiotherapists in palliative care teams in hospitals, hospices, and in the community is therefore of vital importance in helping to minimize patients' discomfort and maximize functional potential[6].

Factors related to functional improvement following a PT course were a higher albumin level and a diagnosis of dementia. Prospective trials of PT in palliative care patients are needed to better define response rate and predictors of response[9].

Patients must be supported with strategies to cope with a life-threatening illness and, where possible, to come to terms with impeding death. In these circumstances, goals that foster insight and understanding may be more important than those that facilitate physical independence. For some individuals, the focus may be their comfort, ease, and solace[10].

Palliative care clearly has an important role in patients with non-cancer conditions who are in the advanced stages of their illness and imminently dying. The most common serious chronic diseases that are relevant to a non-cancer rehabilitation practice are chronic pulmonary disease, end-stage cardiac disease, and neurological disease. Chronic renal failure and end-stage liver disease (ESLD) are also important to consider. Need for rehabilitation in respiratory, cardiac, neurology patients, etc., is unquestionable[10].

Conclusion

The physiotherapist has a vital role to play in maintaining an optimal level of physical functioning in the palliative patient. This must be achieved via a process of realistic goal-setting with the patient, being aware of the patient's psychosocial needs, constant reassessment of the patient, and appropriate goal-modification. This translates to maximizing the patient's independence, and maintaining their hope in the face of progressive disability.

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Normative data of developmental test of Visual Motor Integration (VMI) for Chennai children

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Abstract

Objective

The purpose of this study was to establish normative data of the developmental test of Visual Motor Integration(VMI) for chennai children. To identify the influence of gender on the performance of VMI.

Method

Primary investigator administered the developmental test of VMI on 500 subjects which were selected from regular school located in North,South and Central zones of the Chennai.

Results

There was statistcallly significant difference ($p<0.001$) in performance on the VMI between each age group. It depicts that when the age increases child performances on VMI also increases. There is no statistically significant difference in gender performance on developmental test of VMI.

Conclusion

Norms produced in the study forms the cut off scores for the use of the developmental test of VMI as screening tool as well as outcome measures to find out effectiveness of therapy.

Introduction

Visual motor integration is the degree to which visual perception and finger hand movements are well co-ordinated[1] (Berry, 1983[1]). Visual perception is ability to interpret, analyze and give meaning to what is seen. Visual perceptual skills include visual discrimination, visual memory, visual spatial relation, visual spatial orientation, visual form constancy, visual closure, and visual figure ground perception[2].

Visual perception is defined as the total process responsible for the reception and cognition of visual stimuli[3] (Zaba, 1984). The visual receptive component is the process of extracting and organizing information from the environment[4] (Solan & Ciner, 1986), and visual cognitive component is the ability to interpret and use what is seen. These two components allow a person to understand what he or she sees, and they are both necessary for functional vision. The term visual information analysis has been used to define this ability to extract and organize information from the visual environment and integrate this information with other sensory information, previous experience, and higher cognitive functions[5] (Tsurumi & Todd, 1998). Therefore integration of the visual receptive and visual cognitive system is essential for functional vision.

In reading, children must be able to recognize individual letter symbols. This requires visual attention, visual memory and visual discrimination[6] (Levine, 1987). Problems with visual perception might be suspected in a child who appears to be better at understanding what was read that at actually decoding the words. This child has good language abilities. But some trouble in processing written words.

Children with impaired processing of simultaneous visual stimuli may have difficulty with spelling. These children exhibit spelling inaccuracies that reflect good phonetic approximation but are inaccurate. Visual sequential memory is necessary for remembering the sequence of letter in a word[7] (Border, 1973).

Visual cognitive abilities may affect writing[8] (Chapman & Wedell, 1972). Children, with problems in visual attention may have difficulty with correct letter formation, spelling, mechanics of grammar, punctuation, and capitalization and the formulation of a sequential flow of ideas necessary for written communication[9] (Ziviani, Hayes & Chant, 1990). Children with poor visual memory, he or she may difficulty recalling the shape and formation of letters and words, mixing small letters and capital letters within a sentence, the same letter written many ways on the same page, and inability to print the alphabet from memory[10] (Tseng & Cermak, 1993).

If the child has figure ground perception problem, he or she may have difficulty in copying because he or she is unable to determine what is to be written. Therefore, child may omit important letters while copying. A child with visual closure difficulty always needs to see the complete presentation of what he or she is to copy[11] (Case Smith, 2002). Visual spatial problems can affect the child's handwriting in many ways. The child may show reversals of letters, over spacing and under spacing and have trouble keeping within the margins, unable to relate one part of letter to another part of letter and therefore show inconsistency in letter size.

Visual motor skills can be thought of as being multifaceted and influenced by number of factors[12] (e.g. pencil grip, fine motor skills, eye-hand co-ordination, kinesthesia, motor planning and visual perceptual skills) (Schneck, 1996). While each of these factors may have an impact on visual-motor skills necessary to succeed in pre academic and academic settings[13,14] (levine, oberkalaid & Meltza, 1981). A number of studies examined the relationship between visual motor integration and handwriting. Sovik (1975)[15] found that visual-motor integration was the most significant predictor of handwriting performance in 180 American and Norwegain children aged 7 to 11 years. Children with poor hand writing were significantly lower in visual motor integration scores

than children with good handwriting[16] (Rubin & Henderson, 1982).

Failure on visual motor tests[17] may be caused by underlying visual cognitive deficits, including visual discrimination, poor fine motor ability, inability to integrate visual-cognitive and motor processes, or combination of these abilities. Poor visual motor integration might contribute to poor spatial organization of written work[18] (Carmen, et al., (2005)). Children with poor VMI skills have problem in alignment of numbers, organization of math problems, spacing errors of letters and words (Carmen, et al., 2005). A significant relationship was found between children performance on VMI and ability to copy letters legible[19]. If Visual motor integration skills are increased simultaneously handwriting legible also increased[20] (Weil, et al., 1994). Visual motor Integration problem can affect children's performance in games and Activities of Daily Living skills especially dressing skills like buttoning, unbuttoning, shoe lacing etc.

Developmental test of Visual Motor Integration (VMI) was developed to screening the children with visual motor integration problem from school. Standardization of VMI was done in U.S. children. Norms for visual-perceptual tests are appropriate for specific cultural groups being assessed[21]. The significant difference was found in visual motor development between Hong Kong and USA children[22] (Chan, et al 2001). Literature strongly suggested that culture variation[23,24] influence visual perception skills. Inorder to avoid this culture influence, current study was carried out to establish normative data of Developmental test of Visual Motor Integration among Chennai population.

Methodology

Samples

This is Quantitative research model. Five hundred subjects were included for this study from the age group of 3-7 years. The subjects were selected by means of convenience sampling method from regular schools located in the North Chennai, South Chennai and Central Chennai inorder to avert geographical variation.

Inclusion criteria

i) Subjects from age group of 3 to 7 years
ii) Both genders
iii) Normal and corrected vision
iv) Normal and corrected hearing

Exclusion criteria

i) Subjects with intellectual impairments
ii) Motor problems like cerebral palsy, infantile hemiplegia etc.

Instrument used for the study

Developmental test of visual motor integration

Keith E. Berry was developed the VMI in 1964. The most recent version of the VMI[25] (Berry, 1997) includes two supplemental tests (i.e., Visual Perception and Motor co-ordination) in addition to principal visual motor test. These supplemental tests were added to assist in separating out the components of visual perception and motor co-ordination from the primary visual motor test that assess both components as an integral skill (Berry, 1997). The recent version of the VMI (Berry, 1997) short form was used for this study. It consists of 18 items in the principal test of VMI, 27 items in the supplemental test of Visual Perception and 27 items in the supplemental test of Motor Co-ordination. The geometric forms are arranged to increase the in order of difficulty[26].

Reliability and validity

The average of Anastasi's[27] major reliability error sources provide the best indication of overall reliability. Interscorer reliability[28] were 0.94, 0.98 , 0.95 (i.e., VMI, Supplemental test of VP & MC respectively). Internal consistency reliability was 0.96 for VMI. Test-retest reliability were 0.87, 0.84 and 0.83(i.e., VMI, Supplemental test of VP & MC respectively). The overall reliability were 0.92, 0.91 and 0.89 (i.e., VMI, Supplemental test of VP & MC respectively). Content validity, concurrent validity[29,30], predictive validity[31,32] and construct validity[33] has been reported.

Scoring procedure

In the principal test of VMI, the subject score is calculated according to number of forms copied successfully up to three consecutive failures. The geometric forms were scored as either correct or incorrect according to the criteria in the VMI manual. 'One' (1) point is awarded for each correct items and 'zero' (0) point is awarded for each incorrect items up to 3 consecutive items. The maximum total raw score is 18. In the supplemental test of Visual Perception, 'one' (1) point is given for each correct response and 'zero' (0) point for incorrect response up to 3 consecutive incorrect items or the 3 minute time limit, whichever comes first. The maximum total raw score is 27. In the supplemental test of Motor Co-ordination, score is calculated according to correct or incorrect responses mentioned in the manual up to the 5-minute time limit. 'One' (1) point is given for each correct items and 'zero' (0) point for each incorrect items the maximum total raw score is [27].

Materials used in this study

VMI Manual (Berry, 1997), VMI short form booklet, pencil and stopwatch.

Procedure

Before the study was conducted, the purpose of the study was explained to the head of the institutions and the consent forms were obtained from respective parents. The general information about the subject's academic performance and participation in games has been collected from the respective class teacher. Subjects were tested at a table and chair appropriate for their height. The VMI was administered

Table 1: Normative data of Developmental test of Visual Motor Integration for Chennai children

Age interval	Principal test of VMI	Supplemental test of Visual Perception	Supplemental test of Motor Coordination
3.0–3.11	6.70±2.31	7.73±2.26	8.58±2.25
4.0–4.11	9.03±2.24	9.23±2.89	10.53±2.51
5.0–5.11	9.88±2.08	11.97±3.04	12.41±2.71
6.0 – 6.11	**10.84± 1.89**	**12.80± 2.92**	**14.17± 3.10**

individually in a separate class room without distraction, and good ventilation and lighting. The examiner was seated across the subjects. Primary investigator administered the Develomental test of VMI on 500 subjects. The sequence of testing procedure was followed according to the manual. Subjects were tested individually; instruction was given as mentioned in the manual.

Results

The data that was collected from 500 subjects and were analyzed with SPSS (11.5 version). One way ANOVA was used to compute the result. It shows that there is statistically significant difference between the age groups on the performance of principal test of VMI ($F = 60.287$, $p < 0.001$), Supplemental test of Visual Perception ($F = 66.320$, $p < 0.001$) and Supplemental test of Motor Coordination ($F = 73.105$, $p < 0.001$) at 0.001 level. There is no statistically significant difference in gender performance on principal test of VMI,Supplemental test of Visual Perception and Supplemental test of Motor Coordination.

Discussion

A result of the Chennai population performance on the VMI shows that there is significant difference between age groups. The obtained results were that the performance of the Chennai population was increased related to chronological age. In the VMI, geometric forms are arranged inorder of increasing difficulty according to developmental stage of form [34,35] and it was specifically designed to measure changes in eye hand co-ordination as children grow older. Similarly, the supplemental test of Visual Perception and supplemental test of Motor Co-ordination were designed to be developmental scales. The abilities measured by the VMI and its supplemental tests are in the frame of developmental sequences[36]. So the results from VMI will be related to chronological age. When the children age increases they may participate in games, musical class, dance class and special class for handwriting. This may contribute to the result related to chronological age. Keith E. Berry was reported in 1996, there is positive correlation between age and performance of subject on the VMI. Hence, this study result also showed that there was increased performance of the Chennai population on the VMI related to chronological age.

A result on comparison of VMI between boys and girls shows that there is no statistically significant difference between boys and girls. Keith E. Berry[37] was reported in 1983, there is no significant difference between both genders on the performance of the VMI. Hence this study also showed that there is no statistical significant difference between boys and girls.

Limitations

i) Convenience sampling procedure
ii) Subjects involved in extra curricular activities such as music, dance and other perceptual-motor tasks might have been influenced the performance in VMI.

Recommendations

i) In future research socio-economic status, rural and urban areas will be considered.
ii) This normative data can be used to evaluate the effectiveness of therapy program.

Conclusion

The present study established normative data of Developmental tests of Visual Motor Integration in Chennai population. There was statistically significant difference between each age group. It depicts that when the age increases, performance on the VMI increases. The norms produced in the study forms the cut-off scores for the use of the VMI as a screening tool[38] for examining the visual motor integration skills of normal school children as well as outcome measures to find out effectiveness of intervention programs.

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Sensory responses to slump test in Asian Indian hockey players

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Abstract

Background and objective

Slump test is described as neurodynamic or neural provocation test and documented method for assessing neural tension. The objective of this study was to identify sensory responses to slump test, its prevalence and intensity in young asymptomatic hockey players.

Materials and methods

40 asymptomatic national level hockey players were recruited in this study. Eligible participants were asymptomatic; aged between 15 – 25 years underwent the slump test.

Results

Result of the present study showed that all subjects had positive sensory responses to slump test. Pearson product movement correlation reveals significant correlation between plantar flexion scores and Visual analogue scale (VAS) scores. (r = 0.653, p = 0.00).

Conclusion

All subjects reported sensory responses to slump test which is not indicative of pathology and there was positive correlation between ankle range of motion and the intensity of the sensory responses.

Key words

Slump test, Hockey, Visual Analogue Scale (VAS), Range of motion (ROM).

Background & objectives

Hockey is one of the most popular team sports in the world and the national game of India. It has its root well laid in the Indian soil during the time of imperial rule[1]. In 1928, the Indian Hockey team won its first Olympic Gold Medal and until 1956, remained unbeaten in the Olympics, winning 6 Gold medals in a row. The total 8 Olympic Gold Medal won by the Indian team is the highest among all national teams. This game requires constant motion along with constant concentration and awareness for the players with well developed dynamic activity as well as good static activity[2]. Players bend forward at the hips most of the time while they are dribbling the ball or tackling on the opponent. Lumbar pain is a common complaint in overall population as well as among hockey athletes and identification of its anatomical source is very difficult. Neural tissues are well equipped to tolerate mechanical forces generated during positions or movements associated with daily and sports activities[3] and have been identified as the potential source of wide variety of signs and symptoms in recent years[4]. Maitland described (1978)[5], that the slump test has been widely advocated for assessment of patients with spinal and lower limb pain and thus proved and documented this method for assessing neural tension. Miller et al, 1999[6] stated that the slump test is one of the screening procedure for ominous pathology and reliable screening tool for pre-participation evaluation[7]. Slump test is described as neurodynamic or neural provocation test and it is a sequence of movements designed to assess the mechanics and physiology of that part of the nervous system by elongation of the nerve. Recent studies have shown the sensory responses and its correlation with range of motion components used in slump test[4]. The posture challenges the neurodynamic components to the optimal level as the hockey player sprints with his spine in a flexed position. Despite the widespread use of slump test, relatively little research in relation to its sensory responses on hockey players has been documented. Thus the aim of the present study was to identify sensory responses to slump test, its prevalence and intensity in young asymptomatic hockey players who spend most of their time in a stooped posture and this study was also intended to derive a correlation in between stages of slump test and the sensory responses.

Materials and methods

The prospective randomized control study was conducted at Madhya Pradesh Hockey academy, TT Stadium Bhopal India during the period from February – March 2009.

Participants

40 asymptomatic national level hockey players participated in this study after getting recruited from the Madhya Pradesh State Hockey academy. Before the study all participants and coaches were informed about the purpose and the procedure of the study and signed the informed consent form. The study was given approval by the concerned ethical committee. The intervention was employed after getting the clearance from the physician for the subjects to participate in the study.

Procedure

Eligible participants were asymptomatic, aged between 15 – 25 years with no history of back or leg pain. Subjects underwent a physical examination and a medical screening to exclude players with subjective or objective evidence of any injury and pathology. A pilot study was conducted to get

Table 1: Demographic data of study group with plantar flexion range and VAS score-

	Participants	Mean Age	Mean Plantar flexion	Mean VAS
Male	20(50%)	_	_	_
Female	20(50%)	_	_	_
Both	**40 (100%)**	**17.25±1.94**	**12.25±4.13**	**6.62±1.48**

an estimate range of motion. The subject sat on a plinth, with the edge of the plinth in contact with the popliteal fossa. The subject was instructed to slump i.e. slump his/her shoulder toward his/her hips, and tester A provided overpressure. The subject was then instructed to flex his/her neck and further overpressure was applied by tester A. Subject was instructed to extend the knee and to dorsiflex the ankle of the Left side as far as comfortable. Tester B recorded ankle ROM by Universal Goniometer. Three measurements were taken and then average was calculated. A subjective description such as pulling, tightness, or ache, or any pain and/or sensation that the subject perceived during procedure was recorded on VAS. The subject was then asked to extend his neck. Any change in sensation and ankle range was recorded.

Statistical analysis

Data were analyzed using SPSS 14.0 statistical software. Descriptive analysis of the demographic research data was done. Pearson correlation coefficient analysis was used to find co-relation between sensory responses to slump test and ankle range of motion.

The results of the present study showed that all the subjects had positive sensory responses to slump tests. The sensory responses were described mainly as stretch, pull, tightness etc. Majority of the sensory responses was reported during the stages of knee extension and ankle dorsiflexion. All subjects reported reduced sensations on neck extension.

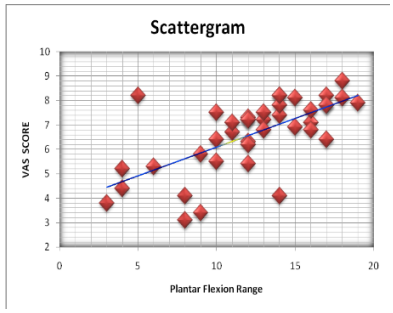
Pearson Product moment correlation reveals significant correlation between Plantar flexion scores and VAS scores (r=0.653, p=0.000).Strength of the correlation 42.64% of variance. The coefficient of determination is 0.4264 which says that 42.64% of the variance is explained by the linear relationship between plantar flexion range and the pain score in VAS.

Discussion

Today, hockey is one of the most popular and loved sports in India. Hockey players are always involves with bending, looking down at the puck, aiming, and hitting [8]. This constant bending motion can create aches and pains in the lower back area[8].

Slump test is used as a fast, low cost diagnostic tool in evaluation of leg and back pain disorders[4] and reliable musculoskeletal screening tool used in the screening protocol for sports participants[7]. Though, the current study was conducted on asymptomatic, flexible, young hockey players and has found that sensory responses to slump test were elicited in all the subjects and the sensory responses were located at the posterior aspect of thigh. Lew et al (1997)[9] studied the relationship between the cervical component of the slump test and change in hamstring muscle tension and he found that the posterior thigh pain caused by slump test

Graph 1: Relation between slump test sensory responses (VAS) and ankle range of motion



was relieved by cervical extension that arises from neural structures rather than hamstring muscle. Thus, caution should be advocated in stating the findings of a slump test as positive. Any "positive" slump tests should be further investigated by exploring the individual sensory responses further. Reproduction of original symptoms, differences between contra-lateral asymptomatic limb and significant deviation from the normative response should be taken into account before concluding a slump to be positive. In the current study while performing the slump test we also considered ankle range of motion and we found that the ankle moves into plantar flexion (12.25±4.13) from neutral position along with neck flexion among all subjects.

Yeung et al (1997), Walsh et al (2007), Lew and Briggs (1997), Kuilart et al (2005)[4] all reported a very high prevalence of positive slump tests. Cervical extension relieving the symptoms, ankle dorsiflexion increasing the symptoms and a positive correlation between the sensory responses and ankle ROM suggests that mechanical loading of the continuous nervous system was the reason of these responses.

Implication

Slump test can elicit significant sensory responses in asymptomatic, young, active subjects. Thus, sensory responses have to be expected in a wide range of subjects examined for neuromusculoskeletal disorders. The reason for positive responses is primarily neural. Caution has to be exercised during the administration and interpretation of Slump test. Neural tension can reduce ROM, increasing the susceptibility of injury.

Conclusion

All subjects reported sensory responses to slump test which is not indicative of pathology. A neural tissue pain disorder may be suggested only when the recognized original pain is reproduced, successfully screened locally and when the sensory responses are of significant difference. There was positive correlation between ankle ROM and the intensity of the sensory responses.

Limitation

- Only one limb was tested
- The sample size was small and consisted of mainly adolescents
- Further studies are needed to compare young hockey players with age matched controls to understand possible difference in presentation during slump test.

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Translation and validation of the reduced Western Ontario and McMaster Universities Osteoarthritis index (WOMAC) in Hindi speaking Indian patient with osteoarthritis of knee

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Abstract

Objective

The reduced WOMAC osteoarthritis index is a tested questionnaire to assess symptoms and physical functional disability in patients with OA of the knee and the hip. We adapted the rWOMAC for the Hindi language and tested its metric properties in 150 patients with symptomatic OA of the Knee.

Methods

Hindi translation was obtained with the use of forward and backward translation method. Adaptations were made after a pilot study. The rWOMAC was administered twice in a 24-48hr interval, demographic and other characteristics were also evaluated. Internal consistency was assessed using cronbach's alpha, test- retest reliability using intra-class correlation coefficient and relationships between r WOMAC domains and known determinants of function using spearman's correlations.

Results

The r WOMAC showed good internal consistency (alpha = 0.8) and good reliability, with intra-class correlation of 0.9. The index has convergent validity with VAS of pain and divergent validity with range of motion of knee.

Conclusion

The Hindi version of reduced WOMAC is a reliable and valid instrument for evaluating the severity of OA of the Knee, with metric properties in agreement with the original, widely used version.

Keywords

Osteoarthritis reduced WOMAC, Hindi, India.

Introduction

Osteoarthritis (OA) is a major cause of musculoskeletal pain, the single relevant cause of disability and handicap from arthritis, and an important community healthcare burden, in lost time at work and early retirement[1,2].

The functional status of patients with knee OA can be assessed either by a battery of tests quantifying physical activity restrictions, such as the 6-minute walk test, the stair climbing test, and the lifting and carrying weight test, or by questionnaires evaluating disability in daily living activities. This last method is relevant and appreciated for its simplicity. Moreover, it allows for assessing the patient's opinion of functional disability.

It is increasingly recognized that a key outcome measure for any health-care intervention for OA, as for many other conditions, is a change in health-related quality of life (HRQoL)[3].

The most widely used condition-specific instruments for the assessment of OA knee and hip is the Western Ontario and McMaster Universities (WOMAC) OA Index[4,5] which is recommended by the Outcome Measures in Rheumatoid Arthritis Clinical Trials (OMERACT)[6,7].

However, few years back, some redundancies were found in this scale and thence it was tapered to give rise to a new version called as reduced WOMAC. It is also equally reliable, valid and responsive as the original version itself[8] and is now recommended for use in researches and for clinical evaluation purpose of patients with osteoarthritis of knee and hip. It consists of two dimensions: pain (five items) and physical function (seven items).

Though numerous studies are being carried out for linguistic and cross culture validation of different health measure tools, but there have been no previous reports about translation of reduced WOMAC into Hindi language and checking its reliability and validity.

Materials and methods

Measure

Reduced WOMAC

Reduced WOMAC is a psychometrically valid and responsive 12 item, disease specific outcome measure for knee and hip OA and replacement, assessing pain and physical function using five point Likert scales.

Translation and cultural adaptation[9]

Recent guidelines for cross-cultural adaptations were followed in order to establish the cultural equivalence of the original English version of the WOMAC. Two independent bilingual translators, whose mother tongue is Hindi, prepared the Hindi translation of the English version of the reduced WOMAC. One of the translators is a physiotherapist and was informed of the concept of the questionnaire, whereas the other translator is a professional translator, and this latter was not informed about the project. The translators and one of the committee members compared both translations (T1 andT2) and reached a consensus (T12). A back translation was subsequently done by two other independent, bilingual-English and Hindi- translators. These back translators were unaware of the original English version and the application of the questionnaire. The obtained Hindi version was then compared with the original

English version by a review committee comprising the original English-to Hindi translators, the back translators, one orthopedician, two physiotherapists and a Master of physiotherapy student. This committee worked for detecting possible misinterpretations and exercised an effort to locate nuances that might have been missed. The resulting version was then finalized with slight changes that were proposed by consensus.

Pre-testing

For pre-testing, a sample of 30 patients with Knee OA answered the translated questionnaire in order to test for misunderstanding and acceptability of the questions.

Testing the scale

Patients

Recruitment of patients

A total of 150 patients were recruited from physiotherapy department of NRCH, Delhi. All the subjects diagnosed by attending orthopedician as having Osteoarthritis knee and the absence of other forms of arthritis or other lower limb conditions (e.g. a fracture) causing immobility had been asked to fill the Hindi translated version of reduced WOMAC osteoarthritis index and their demographic (age, sex, height, weight) and clinical data (duration of disease), VAS of pain, grade in Kellgren and Lawrence scale and range of motion for knee flexion was taken at the baseline visit. The questionnaire was given to patients twice during 48 hr interval. Exclusion Criteria is as: Restricted knee range of motion due to knee joint surgery or trauma, knee infection, any neurological disease leading to uncooperative patient, Patient who cannot read and understand Hindi, refusal to participate.

Psychometric properties of the scale

Reliability

In this study, test- retest reliability of the reduced WOMAC was analyzed using intra-class correlation coefficients (ICCs) Values of ICC vary from 1 (perfectly reliable) to 0 (totally unreliable),values of 0.60 to 0.80 are regarded as evidence of good reliability and with those above 0.80 indicate excellent reliability. Internal consistency was checked using Cronbach alpha. A value of 0.8 is usually regarded as acceptable.

Validity

Face validity

Item acceptability was studied. Item by item analysis was performed to detect missing responses.

Construct validity

Construct validity was assessed by correlating the reduced WOMAC subscale scores with VAS pain (ranging from 0 to 10), ROM of knee flexion, grade on kellgren and Lawrence scale, BMI and age. Spearman's rank correlation coefficient was used. The coefficient was interpreted as follows: excellent relationship p >0 .91; good p= 0.71- 0.90; moderate p = 0.51- 0.70; fair p = 0.31- 0.50; and little or none p <0.30.

Table 1.1: Details of subjects.

	N	Mean	SD	Min	Max
Age	150	53.31	8.54	36	78
Wt	150	65.56	7.75	50	85
Grade	150	2.41	0.66	1	4
VAS	150	5.84	1.59	1	9
ROM	150	119.82	15.07	65	140
BMI	150	26.17	3.00	17.90	34.63

Statistical analysis

Data were entered into a Microsoft Excel spreadsheet and analyzed using SPSS 15 for windows. The tests were applied at 95% confidence interval and p values set at <0.05. Quantitative variables were described by using mean and standard deviation.

Results

Demographic data and clinical data

150 patients (42 males and 108 females) completed the index. The majority of patients were women (72%). The mean age of patients was 53.31 +- 8.54 years (36 – 78). The mean weight of patients was 65.56 +- 7.75 kg (50 – 85). The mean BMI of the patients was 26.17 +- 3 kg/m^2 (17.90 – 34.63). Nineteen patients (12.6%) were obese (BMI > 30 Kg/m^2), while eighty eight patients (58.5%) were overweight (BMI 25– 29.9 Kg/m^2). Table 1.1 gives the details of the mean, standard deviation, minimum and maximum of these subjects.

Reliability

The test retest reliability was measured through intra class correlation coefficient. ICC for pain, physical function and reduced WOMAC was 0.89, 0.86 and 0.92 respectively. Cronbach's alpha coefficient was acceptable for both dimensions of reduced WOMAC, according to the standard of Steiner and Norman. Cronbach's alpha for pain, physical function and reduced WOMAC was 0.78, 0.76 and 0.88 respectively (Table 1.2).

Validity

Face validity

The back translated version of Hindi reduced WOMAC index was comparable with the original English version. All of the 12 items of the Hindi version had face validity, according to the content experts' opinion

Construct validity

Statistical significant correlation was seen between reduced WOMAC subscales and VAS pain (p = 0.784, 0.749 and 0.788 respectively; p< 0.05). Weak correlation was seen between reduced WOMAC subscales and grade of osteoarthritis (p = 0.319, 0.390 and 0.358 respectively) while no or insignificant correlation was seen between reduced WOMAC subscales and age and BMI (age, p = 0.051, 0.061 and 0.060 respectively, for BMI, p = 0.070, 0.170 and 0.121 respectively). Contrary to this, divergent correlation was seen between ROM of knee flexion and reduced WOMAC and its subscales. Good correlation (0.873) was seen between the two subscales i.e. pain and physical function of reduced WOMAC (Table 1.3).

Discussion

Osteoarthritis of the knee has been identified as one of the most prevalent chronic disorders affecting adults and a major cause of discomfort (pain and stiffness) and physical

disability that results in extensive use of health-care resources[1,2,10,12]. In spite of the high prevalence of OA, presently, a few of validated health status measures exist for the evaluation of patients with OA, either in clinical practice or in clinical trials[13]. The reduced WOMAC is a validated two-dimensional disease-specific, self administered, health status measure assessing pain and function in patients with OA of the knee or hip and in total knee or hip replacement patients.

To enable comparison between assessments made in different countries, these measures need not only be translated, but also adapted for use in different cultures. The results of the present study show that the Hindi version of reduced WOMAC is a reliable and valid instrument for evaluating the severity of OA of the knee, with psychometric properties in agreement with the original widely used version.

The Hindi version of the reduced WOMAC was worded in simple and currently used literal Hindi language to allow for its use in the largest possible Hindi speaking Indian population. One difficulty is that literal terms are sometimes different from dialectic ones. e.g., P5 of reduced WOMAC is weight bearing and when it was translated as it is into literal Hindi language i.e. “bhar sahan”, then during pre testing it was found that majority of the patient population was either unable to understand it or misunderstood it. So for improving patient understanding of the concept behind the question asked, it was changed to “vishram avastha mein khade hue”, which though is not a literal translation but yet retained the sense of the question asked.

Questions considered not applicable to the target population or with an ambiguous meaning should also be omitted or modified during the development phase. Nevertheless, the meaning of the questionnaire must be conserved[14,15]. A term as simple as ‘sitting’ in item PF7 turned out to be ambiguous for many of our patients: difficulty when sitting and when sitting on a chair can be quite different. Since the original index was validated in an occidental population, for whom sitting is understood to be on a chair rather than on the floor, and since the lifestyle of Indian people involves both sitting on the floor and sitting on a chair, we chose to add ‘on a chair’ in this item.

In an another question, PF4, difficulty while getting in and out of a car was also ambiguous to some patients as car was not their mode of commutation. So another option of auto rickshaw was added, which is commonly used by majority of Indian population for traveling and also the amount of hip and knee flexion during both the activities is approximately the same.

The repeatability of the scale is excellent. It is unlikely that these results could be due to the short interval between the test and retest. Patients had to answer the questions at the beginning of the first visit. They were then asked several other questions about their family, social and professional status, and disease effects. When they answered for the second time, at a 24-48 h interval, patients might have remembered some questions but would be unlikely to remember their previous answers. Reliability was assessed in terms of internal consistency (Cronbach’s alpha coefficient) and test–retest reliability (ICC analysis). Cronbach’s alpha coefficients were acceptable for both dimensions of the reduced WOMAC, according to standards recommended by Steiner and Norman[16]; this indicates that each domain addressed a somewhat different aspect of functional disability. The cronbach’s alpha was 0.78, 0.76 and 0.88 for pain, physical function and reduced WOMAC respectively, which is similar to the original version. Values of Cronbach’s alpha of greater than 0.7 indicate adequate reliability for a scale, whereas values above 0.9 may indicate redundancies in the scale[17]. While values greater than 0.9 are necessary for reliable individual scores, they are redundant for group means, the usual focus of research. Thus, the reduced WOMAC scale maintains excellent internal consistency. The ICCs of the reduced WOMAC for pain (0.89) and physical function (0.86) subscales.

Construct validity is the main criterion of validity of a questionnaire[18]. Because no gold standard currently exists to assess pain and function in knee OA[19], we used convergent and divergent validities.

In this study, we investigated the convergent validity by evaluating the relationship between reduced WOMAC scores and pain on VAS. A good correlation of 0.78, 0.74 and 0.78 was found between the two subscales - pain, physical function and total reduced WOMAC scores respectively. The findings are similar to those seen by Wigler et al[20] in a validation study of Hebrew version. M Guermazi et al[21] and A Faik et al[22] found moderate correlation between VAS and WOMAC subscales. The divergent validity was seen between reduced WOMAC and its subscales and the main socio-demographic characteristics (age, sex and BMI), grading on Kellgren and Lawrence scale and knee flexion ROM. Insignificant correlation of 0.051, 0.061 and 0.060 was found with age. Previous researchers have failed to find an association between age and presence[23,24,25] or severity of pain and physical function in OA[33,29,27]. Female sex has been associated with increased reporting of knee pain in some community studies[26,25,27], but not in others[24]. Our results confirm earlier observations[26,25,27] that females tended to report greater severity of knee pain on WOMAC subscale. While BMI is clearly a strong risk factor for radiographic knee OA[28], its relationship with pain reporting is less certain[29,23,27]. We found that BMI was not associated with reduced WOMAC dimension subscales. A Faik et al[22] had similar findings in validation of Moroccan version of WOMAC. Ray Mark et al, in his study found that a high percentage of patients with end stage hip osteoarthritis were overweight, including younger adults and those with symptoms of 3- 6 months duration.

In this study, as in others[30,31,32,33,37,27], we found that radiographic severity as measured by K/L grade is not

Table 1. 2: Reliability of reduced WOMAC

	Pre		post		Reliability Statistics	
	Mean	SD	Mean	SD	α	ICC
Pain	9.04	3.28	9.03	3.27	0.78	0.898
Phy fun	12.44	4.30	12.27	4.20	0.76	0.866
reducedWOMAC	21.48	7.37	21.30	7.25	0.88	0.926

Table 1.3: convergent and divergent validities: spearman’s rank correlation coefficient.

	Spearman’s rank correlation coefficient		
	Pain	**Physical function**	**Reduced WOMAC total**
Age	0.051	0.061	0.060
BMI	0.070	0.170	0.121
VAS	0.784*	0.749*	0.788*
ROM	%0.422*	%0.490*	%0.469*
Grade	0.319	0.390	0.358
Pain	1.000	0.873	0.963

associated with pain severity. A p value of 0.31, 0.39 and 0.35 was seen. The findings of M Guermazi[21] are in concordance with the above results. There are limitations to use radiographs for ascertainment of OA. Recent evidence suggests that radiographs may underestimate the true prevalence of OA[35]. This may result in misclassification of patients as to disease[28]. In addition, early disease may not be detectable by radiography, and some pathologic processes such as osteophytes may not represent progressive disease, thus potentially resulting in misclassification. Also, self-reported knee pain or physical function, which are a common complaint of elderly people, may not be due to a pathological process of the knee but to pain from hip or back disease, thus confounding the analyses[31].

A fair negative correlation of -0.42, -0.49 and -0.46 was seen between range of motion of knee flexion and pain, physical function and reduced WOMAC scores respectively. The findings of Steultjens et al[40] are in concordance with the above results. They found that restricted ROM of knee flexion has a strong relationship with the presence and extent of locomotor disability compared to knee extension in patients with knee Osteoarthritis. And also that hip extension and external rotation limitation in hip Osteoarthritis patients is associated with locomotor disability. Contrary Odding et al[41] found that hip flexion and knee flexion restriction in hip , knee Osteoarthritis patients were strong risk factors for locomotor disability such as walking, climbing stairs, rising from and sitting down in a chair.

A good correlation, 0.87, was seen between the two subscales of reduced WOMAC. Vilai Kuptniratsaikul et al[42] also reported similar findings during validation of modified Thai version of WOMAC osteoarthritis index for knee osteoarthritis.

In construct validity, we have not examined the convergence between dimensions of the reduced WOMAC and the Lequesne index because this index is not translated and validated in Hindi.

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Physiotherapist's emotional quotient and patient satisfaction

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Abstract

Background

Emotional intelligence and job satisfaction are an important personal attributes involved in physiotherapy practice. However, there is hardly any study that has compared the relationship between physiotherapist's emotional quotient, job satisfaction and patient satisfaction.

Design

A cross sectional and co- relational survey research design.

Objectives

The main objective of this study was to find out any associations between Physiotherapist's emotional quotient, job satisfaction and patient physiotherapist relationship in terms of patient satisfaction at KLES Dr. P.B. Kore Hospital, Belgaum-590 010, Karnataka state, India.

Methods

A total of forty outpatients reporting to orthopedic, neurology, pediatrics and community physiotherapy departments and 18 physiotherapists who were treating these patients were surveyed. Data were collected by means of emotional intelligence questionnaire, Minnesota satisfaction questionnaire and physiotherapy patient satisfaction questionnaire.

Results

There was no significant correlation coefficient between physiotherapist's emotional quotient, job satisfaction and patient satisfaction.

Conclusion

It can be concluded that patient satisfaction may not depend on emotional quotient and job satisfaction of physiotherapist but probably depend on multiple factors like their knowledge, skills, experience and clinical expertise.

Key words

physiotherapists, emotions, intelligence, patient satisfaction, job satisfaction, psychology, trust

Introduction

The first use of the term emotional intelligence is usually attributed to Wayne Payne's doctoral thesis (1985), a study of emotion: developing emotional intelligence[1]. However, prior to this, the term emotional intelligence had appeared in Leuner (1966). Greenspan (1989) also put forward an emotional intelligence model, followed by Salovey and Mayer (1990), and Goleman (1995)[2]. We have been conditioned to believe that intelligence quotient is the best measure of human potential. In the past ten years, however, researchers have found that emotional intelligence quotient might be a greater predictor of success[3]. Emotional Intelligence, often measured as an emotional intelligence quotient, describes an ability, capacity, skill or a self-perceived ability, to identify, assess, and manage the emotions of one's self, of others, and of groups[2].

Caring is an important concept in the health profession[3,4]. definitions vary but include reference to both the physical actions and emotional concerns of the career as he/she supports and responds to the needs of others[5]. caring has also been described as a relationship that involves receptivity, engrossment and reciprocity of the one caring and the person being cared for.[3] In physiotherapy there is need for leadership and communication skills in order to work effectively in an ever changing complex system. Although several authors have theorized about the importance of emotional intelligence in the caring process[5,6,7]. We could find no literature quantifying relationship between physiotherapist's emotional quotient, job satisfaction and patient physiotherapist relationship in terms of patient satisfaction; hence this study was performed to find out the same.

Methods

An ethical approval was obtained from ethical review board of KLES Institute of Physiotherapy, Belgaum for this study. A total of forty outpatients reporting to orthopedic, neurology,

Table 1: Patient demographics

Variable	Number	Percentage
Gender		
Male	13	32.5
Female	27	67.5
Marital status		
Single	09	22.5
Married	31	77.5
Education		
Elementary	9	22.5
High school	5	12.5
Senior high school	18	45
College or higher	8	20
Category of department		
Orthopedics	15	37.5
Community	9	22.5
Pediatrics	8	20
Neurological	5	12.5
Obstetrics & gynecology	3	7.5

Table 2: Demographics of physiotherapists

Variable	Number	%
Gender		
Male	6	33.33
Female	12	66.66
Education		
Bachelor	5	27.77
Master	13	72.22
Department		
Orthopedics	6	33.33
Community	4	22.22
Pediatrics	5	27.77
Neurological	2	11.11
Obstetrics & gynecology	1	5.55

pediatrics and community physiotherapy departments and 18 physiotherapists who were treating these patients participated in this study. Participants were contacted through circulars, emails, phones and direct requests by researchers during 3rd October 2008 to 31st January 2009. All the participants were provided informed written consent. The measurement tools included emotional intelligence questionnaire (EIQ), Minnesota Satisfaction Questionnaire (MSQ) and Physiotherapy Patient Satisfaction Questionnaire.

Results

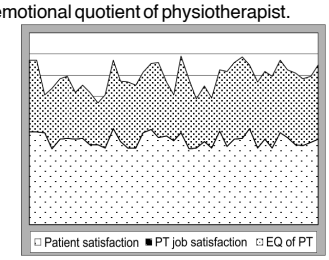
The comparison of outcome measures in form of emotional intelligence questionnaire, Minnesota satisfaction questionnaire and physiotherapy patient satisfaction questionnaire was done with Pearson's coefficients to determine the correlation coefficient. The patients who participated in this study were typically referred by clinicians (82.4%) in a tertiary care hospital and had no experience of prior physiotherapy (74%) and remaining 26% of patients reported in their filled questionnaire that this episode was not their first experience with physiotherapy. Female participants involved in this study were 67.5 percent. The patients typically were being managed for orthopedics (37.5%), pediatrics (20%), obstetrics and gynecology (7.5%), community physiotherapy (22.5) and neurological (12.5%) conditions (table1).

Emotional quotient score of participating physiotherapists (table 2) and post graduate physiotherapist was in the range of 37 to 52 with an average of 43.95 ± 3.961.The job satisfaction of physiotherapists was in the range of 36 to 76 with an average of 59.025± 9.641.Patient satisfaction pertaining to physiotherapy treatment received from participating physiotherapists at the study centre was in the range of 71 to 90 with an average of 79.25±5.986. There was no significant correlation (figure1) between patient satisfaction and physiotherapist's job satisfaction (r=0.179, p= 0.270), patient satisfaction and emotional intelligence of physiotherapist (r=0.187, p= 0.247) and physiotherapists job satisfaction and emotional intelligence (r=0.141, p=0.387).

Discussion

Probably the greatest challenge faced by physiotherapists is to retain or regain its humanity without loosing its essential foundations in science. The cornerstone of good physiotherapy care is believed to be the relationship between patient and physiotherapist. Although quality of care focuses on personal knowledge, skills and expertise of

Fig.1: Aassociations between patient satisfaction, physiotherapist job satisfaction and emotional quotient of physiotherapist.



therapists, it may also depend on the job satisfaction of treating physiotherapist. However, in the present study, we found that there was no significant co-relationship between physiotherapist's job satisfaction, emotional quotient and their patient satisfaction.

While there are numbers of studies pertaining to emotional intelligence of medical and Various other allied health care professionals[8,9,10,11,12,13,14,15,16], there is hardly any study at present that has focused Physiotherapist's emotional quotient, job satisfaction, patient satisfaction; comparison of the results of this study with other studies was out of the question. The limitations of the present study include convenience sample, all the participants were from a single clinical network, only outpatients participated and number of years of experience was not taken into consideration.

Hence, we recommend a study with a larger random sample taken from different clinical setups involving outpatients as well as inpatients.

Conclusion

It can be concluded that patient satisfaction may not depend on emotional quotient and job satisfaction of Physiotherapist but probably depend on multiple factors like their knowledge, skills, experience and clinical expertise.

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Prevalance of autism at Kattankulathur, Chennai

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Abstract

Objectives

To find out the prevalence rate of autism at Kattankulathur Area.

Method

Door to door survey was conducted among the age group 3 to 9 years (mean age = 5.6 yrs ± 1.5 yrs) using Diagnostic Statistical Manual IV (DSM IV) and Childhood Autism Rating Scale (CARS). Three hundred sixty (n= 360) subjects participated in this study.

Results

Shows that the prevalence rate of autism was 1.67. It was more prevalent in boys than girls.

Conclusion

The present study found that prevalence of autism at kattankulathur. The prevalence of the disorder suggests a need for program to educate parents, caretakers and teachers.

Key words

Autism, Prevalence

Introduction

Pervasive Developmental Disorder (PDD) is characterized by marked impairments in reciprocal social interaction, language, and communication and by the presence of repetitive, stereotypic patterns or behaviour and interest[1]. PDD refers to a cluster of disorders that is composed of several diagnoses, including autistic disorder. PDD Not Otherwise Specified (PDDNOS), Asperger syndrome, and Childhood Disintegrative Disorder (CDD). Rett disorder has been historically listed in the PDD to enhance differential diagnosis, but it is usually not included in studies of children with PDD. Autism is referred to as a spectrum disorder that the symptoms can occur in any combination and with varying degrees of severity and limited range of activities and interests, is the most characteristic and best studied PDD. There is no known single cause for autism, but it is generally accepted that it is caused by abnormalities in brain structure or function. Researchers are investigating a number of theories, including the link between heredity, genetics and medical problems. In many families, there appears to be a pattern of autism or related disabilities, further supporting a genetic basis to the disorder. While no one gene has been identified as causing autism, researchers are searching for irregular segments of genetic code that children with autism may have inherited.

When biomedical practitioners analyze the blood, urine, hair, feces and behavior of autistic patients they find the same underlying issues; gut dysfunction and malabsorption, toxicity, infection, allergies, impaired cognitive function, inflammation (in the form of asthma, eczema, gut dysfunction, and/or impairment in brain function)[2]. People with autism have found abnormalities in lobules VI and VII of the vermis, of the cerebellum[3]. Patients with autism have specific damage in the limbic system, particularly in the amygdala and hippocampus. Hippocampus is responsible for learning and memory. Autistic children have difficulty relating new information to previously stored information. When hippocampus is in damaged or removed, animal will display stereotypic self stimulatory behaviors and hyperactive[4]. Individuals with autism have unusual social, communicative and behavioral development and may have abnormalities in cognitive functioning, learning, attention, and sensory processing. Given the complex nature of autism and the spectrum of related disorder, current prevalence rates and whether rates have increased are highly debated[5,6]. Autism prevalence rates from studies published before 1985 are 4 to 5 per 10,000 children for the broader autism spectrum and approximately 2 per 10,000 for the more narrowly defined condition termed classic autism[7,8,9,10]. The recent study conducted in the United Kingdom reported a prevalence rate of 16.8 per 10,000 children for autistic disorder & 62.6 per 10,000 for entire autism spectrum. These reports raise concerns about possible increases in autism prevalence[11,12]. There is no literature related to prevalence of Autism in India. Hence, current study was carried out to find out prevalence rate of autism at Kattankulathur.

Methodology

Research design:

Qualitative research design, Survey type and cross sectional study

Sample:

Door to door survey was conducted among the age group 3 to 9 years (mean age = 5.6 yrs ± 1.5 yrs) using Diagnostic Statistical Manual IV (DSM IV) and Childhood Autism Rating Scale (CARS). Three hundred sixty (n=360) subjects participated in this study.

Screening criteria :

A. Inclusion criteria :
3 to 9 years of age group
Both gender

B. Exclusion criteria :

Children with motor disability

Instruments used :

1. Diagnostic Statistical Manual IV of autism disorder (DSM IV)

Description:

The Diagnostic and Statistical Manual of Mental Disorders IV (DSM IV), published by the American Psychiatric Association, is the standard classification of mental disorders used by mental health professionals in the United States. It is intended to be applicable in a wide array of contexts and used by clinicians and researchers of many different orientations (e.g., biological, psychodynamic, cognitive, behavioral, interpersonal, family systems). It also contains diagnostic codes (taken from ICD-9-CM) that can be used to satisfy record-keeping and reimbursement needs. Since all of the diagnostic codes are valid ICD-9-CM codes, users of the DSM automatically satisfy diagnostic coding requirements under HIPAA.

2. Childhood Autism Rating Scale (CARS):

Description:

Childhood Autism Rating Scale (CARS) was developed to identify children with autism and also distinguishes mild to moderate from severe autism. It consists of 15 items and can be used from 2 years. Total CARS score range from a fifteen to sixty with a minimum score of thirty serving as the cut off for a diagnosis of autism on the mild end of the autism spectrum. Internal consistency of the CARS was co-efficicient alpha of .94. The average reliability of. 71, validity is r = .83[13]. CARS has also shown to have 100% predictive accuracy when distinguishing between groups of autistic and mentally retarded children which was superior to the ABC and diagnostic checklist[14].

Data Collection Procedure :

The purpose of the study was explained to panchayat union leader at Kattankulathur, Tamil Nadu, India. Door to door survey was conducted and consent forms were obtained from concerned parents. DSM IV and CARS were used to screen the children. The items of the DSM IV and CARS were explained to the parents and information obtained. The collected data was used for the data analysis.

Discussion

Autism, the most common problem of a group of conditions called pervasive developmental disorder is the third most developmental disorder following mental retardation and cerebral palsy[15]. The prevalence rate of autism has been increasing over years for unknown reasons[16].The causative factors have been postulated though not proved and so the treatment effectiveness keeps varying. Autism is a disorder that affects the person's ability to communicate, form relationships with others and respond appropriately to the environment[17]. Though many of the symptoms of autism are the same, each person is affected differently and to a varying degree of severity. The purpose of present study was to identify prevalence rate of autism at kattankulathur. Three hundred and sixty subjects were participated. Six children were identified as positive in screening and prevalence rate was 1.67. The prevalence rate was low in compare to previous studies[18]. Since the results were based on CARS and DSM IV criteria which is supposed to be clinically observed and along with parents perception but the study was carried out only through parents perception which might have a influence on the results.

The results show that boys were more affected than girls. The prevalence ratio was 5:1. Several researchers have found similar differences between gender. In fact autism is found to strike males about four times more than females[19]. The female number was less in general too perhaps owing to the fact that male child receives priority in education over females in India. Moreover a female autistic child, unlike the male child often has accompanying intellectual disability[20] and may reach a special school for the retarded for that reason.

The standardized parent questionnaire was not available to screen the children with autism. CARS and DSM IV was used in the study. Since Clinical observation was not done due to lack of facilities in the community and the children were screened based on parents perception. Parents wouldn't have recognized some of the features in the child so the information produced by them may or may not be reliable. Confirmative test or diagnostic assessment was not carried out due to time constraint.

Table 1: The prevalence of autism at kattankulathur

Age interval	Total sample(N)	Prevalence	
		n	Prevalence rate (PR) %
3.0 - 3.11	47	1	0.28
4.0 - 4.11	52	2	0.56
5.0 - 5.11	75	0	0
6.0 - 6.11	70	1	0.28
7.0 - 7.11	69	1	0.28
8.0 - 8.11	47	1	0.28
3.0–8.11	360	6	1.67

The result shows that the prevalence rate of autism is 1.67%.

Conclusion

The present study found that prevalence of autism at kattankulathur. The early identification and intervention has been one of the key issues in the movement of the disability in the second half of the 19th century[21]. This focus has helped in reducing in handicapping effects of the disability. It is important to study different aspects of this disability from all possible angles. Clinical observation can also be included in the further studies. Further research of autism survey can be conducted in normal schools. Studies can be carried out in various geographical regions.

Acknowledgement

First and foremost I thank God Almighty for his pity and unfolding blessings helped me to do this study. I pay my sincere thanks to the chairman of SRM group of institutions and SRM University I express my sincere thanks to all the participants who have been the real pillars of this study. Last but not least, I thank all of them whose names have

Table 2: The prevalence of autism among gender at kattankulathur

Gender	Total sample(N)	Prevalence	
		N	Prevalence rate (PR)%
Boys	158	5	1.39
Girls	202	1	0.28
Total	360	6	1.67

This results shows that the boys (1.39) are more prevalent than girls (0.28). The prevalence ratio is 5:1

inadvertently fails my memory and who in their own unique way have made this project a reality.

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Normative data of evaluation tool of children handwriting – cursive(ETCH-C) in Chennai children

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Abstract

Objective

The purpose of this study was to establish normative data of ETCH-C for Chennai children.

Method

Five hundred eighty three (n= 583) children, aged 6 to 10 yrs (mean age = 7.58 years ± 1.14) were included. ETCH-C was administered individually to assess handwriting speed and legibility.

Results

There is statistically significant difference (t = -2.706; p = .007) for letter legibility and statistically no significant difference for word legibility (t = -1.796; p = .073), numerical legibility (t = -.638; p = .523) and speed in near point copying (t = -.732; p = .464) and far point copying (t = -.084; p = .933) in gender performance. There is positive correlation between age and speed (near point copying (r =.396), far point copying (r = .4)), age and word legibility(r = .253). There is no correlation between age and letter legibility(r = .010), age and numerical legibility (r = .028).

Conclusion

The normative data obtained from this study can be used as assessment tool as well as outcome measures.

Key words

Speed, Legibility, Cursive

Introduction

Handwriting is an important skill for school aged children. A student's ability to produce fluent and legible writing is important for expressing, communicating, and recording ideas as well as for educational development[1].Cursive (joint script) and Manuscript (print) are the important types of handwriting. A generally accepted sequence for handwriting instruction is manuscript writing for use in grades 1 and 2 , with children transitioning to cursive writing[2,3] at the end of grade 2 or beginning of grade 3.Cursive writing is beneficial for the following reasons: cursive movement patterns allow for faster and more automatic writing; reversal of individual letters and transpositions of words are less likely to occur than in manuscript; continuous, connected line enables the child to form words as units; cursive is faster than manuscript; it allows the poor printer a new type of written format that may be motivating the child's current maturity level[4,5]. Benbow, Hanft and Marsh[6] (1992) listed four prerequisite areas: dominant hand use, midline crossing with the dominant hand, proper posture and pencil grip, and ability to copy the first nine shapes of the Developmental Test of Visual-Motor Integration[7]. Another foundation skill for pre-handwriting and handwriting is shoulder and arm stability[8].

The factors that determine legibility are letter formation, spacing, size, slant, horizontal alignment and general appearance[9,10]. Factors affecting handwriting are internal and external factors. External factors are instructional procedures and materials used during writing[11]. Internal factors are abilities found within the student and these are visuo- motor skills, visual perception and kinesthetic awareness[12,13].

Handwriting is more emphasized in elementary grades and students who have difficulties in handwriting, develop low self-esteem and frustration because they are unable to express their knowledge in written form[14]. Difficulties with handwriting can be resistive to change even after several years of formal handwriting education[15]. Many students with handwriting difficulties are referred to occupational therapy either as the primary reason for referral or in conjunction with other issues[16]. Instruments commonly used by occupational therapists to asses handwriting includes, the children's Handwriting Evaluation Scale[17], the Children's Handwriting Evaluation Scale –Manuscript[18], the Denver Handwriting Analysis[19],the Test of Legible Handwriting[20], the Minnesota Handwriting Test[21], the Evaluation Tool of Children's Handwriting.

Amundson,[22] (1995) developed Evaluation Tool of Children's Handwriting (ETCH). The ETCH is a standardized handwriting assessment which assesses both manuscript and cursive handwriting that measures both legibility and speed of handwriting. The literature review[23] revealed that visuo-motor skills influence children's handwriting. Addis[24], (1999) has done normative data studies for ETCH to establish the handwriting legibility and speed ranges among first graders in USA population. Inorder to avert cultural influence, current study was carried out to establish normative data for ETCH-C in Chennai population.

Methodology

Sample:

Quantitative research design,Cross-sectional study. Six hundred children (n = 583) aged 6 -10 years (mean age = 7.58 years, S.D= 1.14) were recruited by means of convenience sampling procedure from normal schools located in North, South, Central Chennai in order to maintain geographical distribution.

Screening criteria:

A. Inclusion criteria:

- Good knowledge in cursive writing
- Age 6-8 years
- Both gender
- Normal or corrected vision
- Normal or corrected hearing

B. Exclusion criteria:

- Poor visual foundation skills
- Poor comprehension skills
- Frequent failures in the academic performance.
- Motor disabilities (upper limb).

Instrument:

The Evaluation Tool of Children's Handwriting - Cursive (ETCH-C):

The Evaluation Tool of Children's Handwriting-Cursive (ETCH-C) is a criterion-referenced tool designed to evaluate cursive handwriting skills of children in grades 1 to 6. Its focus is to assess a student's legibility and speed of handwriting tasks similar to those required of students in the classroom. The administration time is 20-30 minutes. It assesses legibility components, pencil grasp, hand preference, pencil pressure, manipulative skills with the writing tool and classroom observations.

ETCH - C legibility scores were correlated with handwriting grades from teachers to establish concurrent validity, the results indicated that there is significantly moderate correlation existed between cursive legibility percentage scores & teacher assigned handwriting grade and moderate correlation between legibility percentage scores of ETCH-C and classroom worksheets.

Materials used:

ETCH manual, response booklet, pencil, eraser, and stopwatch.

Data collection procedure:

The study was conducted in regular schools in North Chennai, South Chennai and Central Chennai. Before the study was conducted, the purpose of study was explained to the head of the institutions and the consent forms were obtained from respective parents. The general information about the subject's academic performance has been collected from the respective class teacher. Subjects were seated on a chair and table, appropriate for their height. ETCH-C was administered in a separate class room with good ventilation, lighting and without distractions. Then the response booklet was given to the subject and instructed as given in the manual. A stop watch was used to record the time taken to perform near point and far point copying. The legibility is calculated in percentages and speed in minutes. The data's were analyzed using SPSS (15.0 version)

Discussion

There is statistically significant difference in word legibility between the age groups and there is positive correlation between age and word legibility. Visual motor integration skills found to be the best predictors for handwriting legibility[25]. The literature strongly supported that there is positive correlation between age and visual motor integration. When child's visual motor integration skills increases the child handwriting skills improves[26]. Legibility increased with grade level which means that legibility increases as age increases[27]. There is no statistically significant difference in letter legibility and numerical legibility between the age groups and there is no correlation between age and letter legibility, numerical legibility which is contrast to previous studies[28]. This may be due to the fact that the practice of cursive writing in this context is not followed properly; most of the children mix cursive and manuscript letters while writing. The child learns numerals from early childhood and there is no confusion in numbers like alphabets (manuscript & cursive). It may have influenced the result.

The results showed that there is statistically significant difference between the age groups and positive but weak correlation between age and speed in near point copying and far point copying. The result depicts that when age increases children handwriting speed also increases and this result is supported by literature[29]. It found that there is significant differences existed in speed between the age groups due to the fact that there is a developmental trends in visual perception, visuomotor integration, and in hand manipulation skills[30].

There is negative correlation in letter legibility and word legibility with speed in near point copying. There is negative correlation between letter legibility and speed and there is no correlation between word legibility and speed in far point copying. It may be due to the reason that when child copies the sentence, they copies as it is from the chart like drawing due to inadequate practice in cursive so speed decreases. This would have influenced the result. There is statistically significant difference in letter legibility and girls write more legible than boys. Various researches[31,32] support the present findings. There is no statistically significant difference in word legibility, numerical legibility and speed in both near point and far point copying between the genders. It may be because of the reason that when there is a mixture of

Table 1: Normative data of letter legibility for ETCH–C

Age interval	Letter legibility %	Word legibility%	Numerical legibility%	Speed in NPC (lt/min)	Speed in FPC (lt/min)
6.0-6.11	85.80±8.1	91.20±8.0	88.30±9.1	19.96±8.0	19.57±7.5
7.0-7.11	86.33±7.8	93.15±7.4	87.86±9.4	23.47±10.6	22.45±10.2
8.0-8.11	85.21±9.2	93.99±6.4	88.63±9.0	27.79±11.0	26.88±11.2
9.0-10.0	86.10±8.1	96.06±4.7	88.76±9.0	32.51±13.2	33.00±15.1

NPC=Near point copying, FPC=Far point copying

Table 2: The correlation between age and legibility components of ETCH–C

Legibility components	r
Letter legibility	.010
Word legibility	.253
Numerical legibility	.028

r = Pearson correlation coefficient

Pearson correlation coefficient was used to find the correlation between age and legibility components. The result showed that there is no correlation for letter legibility (r =.010), numerical legibility (r =.028) and positive correlation for word legibility (r =.253).

Table 3: The correlation between age and speed of ETCH–C

Task	r
Near point copying	.396
Far point copying	.4

r = Pearson correlation coefficient

Pearson correlation coefficient was used to find the correlation between age and speed in handwriting. The results showed that there is positive correlation for near point copying (r =.396) and far point copying (r =.400).

manuscript and cursive letters in handwriting.

Recommendations:

Ergonomic factor should be considered. Norms can be established for various geographical areas. Further studies can be performed to find out relationship between pencil grasp and legibility & pencil grasp and speed.

Conclusion

Norms has been established for legibility and speed for ETCH – C among Chennai children between 6 to 10 years. The normative data obtained from this study can be used as reference score to identify children with illegible and slow handwriting. It can be used as assessment tool as well as outcome measures to identify the effectiveness of intervention program.

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First and foremost I thank my God for his pity and unfolding blessings helped me to do this study. I pay my sincere thanks to the chairman of SRM group of institutions and SRM University I express my sincere thanks to all the participants who have been the real pillars of this study. Last but not least, I thank all of them whose names have inadvertently fails my memory and who in their own unique way have made this project a reality.

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Assessment of quality of life in community dwelling Geriatrics

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Abstract

Background

Aging of population is a significant product of demographic transition. India is in a phase of this demographic transition. The increasing number of older people with higher expectations of a "good health" within society and with their high demand for health and social care has lead to international interest in the enhancement & measurement of Quality of life in older people.

Objectives

1. To assess quality of life in geriatrics under four domains and to find the most affected domain.
2. To assess the most affected component in each domain.
3. To compare the affection of various domains in young old, middle old and old old age group.
4. To assess limitations in different areas of life due to health problems.

Method

Design

Survey study

Study population

50 people, community dwelling above the age of 60 yrs were taken for the study.

Inclusion criteria

Community dwelling people above the age of 60yrs.

Exclusion criteria

1. People below 60yrs. Of age.
2. People staying in old age homes or other institutes.
3. People on psychiatric treatment or impaired cognitive status.
4. People unwilling to join the study.

Study factors

Basic demographic data, pre-validated questionnaire tailored to Indian population was used to assess quality of life in community dwelling geriatrics. It composed of four domains namely Physical, Psychological, Social and Environmental domains. There were 26 items with simple option of yes/no to each item. Data was collected by direct method and represented through bar and pie diagram.

Results

Our study shows that:

Physical domain (42.5%) was most affected and the Social domain (9.33%) was the least affected.

The component in the physical domain i.e. the need for elderly to take medical treatment to function in their daily life was most affected (76%).In psychological domain majority of people had feelings like depression, anxiety or mood swings (42%). The component of being dependent or feeling of being a burden on people is found to be the most affected (12%) in social domain. The feeling of not being safe in daily life was the component which was most affected (28%) in environmental domain.

The affection of various domains increased as age advances.

It was also found that because of the HEALTH PROBLEMS the most affected area of life was the ability of the elderly to go for vacations and outings independently.

Conclusion

Physical domain is the most affected domain among the elderly population.

The most affected component in physical domain is the need of some medical treatment to function in daily life, psychological domain is the feelings like depression, anxiety and mood swings, in social domain is being dependent or a feeling of being a burden on society and in environmental domain is feeling safe in daily life.

The various domains were most affected in old old age group and least affected in young old age group.

Health problems interfere most with the ability of going out for vacations and outings in elderly people.

Key words

Quality of life, geriatrics, community dwelling.

Introduction

Aging of population is a significant product of demographic transition. India is in a phase of this demographic transition. As per the 1991 census the population of elderly in India was 57million as compared with 20million in 1951. There has been a sharp increase in the number of elderly persons between 1991&2001 and it has been projected that by the year 2050 the number of elderly people would rise to about 324millon[8].

Indian classification:

60yrs-70yrs	Young old.
70yrs-80yrs	Middle old.
80yrs & above	Old old.

WHO measures QOL under 4 domains:

Domain	Facets incorporated within domains
1. Physical health	Activities of daily living Dependence on medicinal substances and medical aids Energy and fatigue Mobility Pain and discomfort Sleep and rest Work Capacity
2. Psychological	Bodily image and appearance Negative feelings Positive feelings Self-esteem Spirituality / Religion / Personal beliefs Thinking, learning, memory and concentration.
3. Social relationships	Personal relationships Social support
4. Environment	Financial resources Freedom, physical safety and security Health and social care: accessibility and quality Home environment Opportunities for acquiring new information and skills Participation in and opportunities for recreation / leisure activities Physical environment (pollution / noise / traffic / climate) Transport

Aging is a complex multifactorial and inevitable process. Aging is characterized by a failure to maintain homeostasis under conditions of physiological stress and this failure is associated with a decrease in viability and increase in vulnerability of the individual[1,4].

Aging occurs at different levels: social, chronological, behavioral, physiological, morphological, cellular and molecular.

Older people are classifiable into:

Aging is associated with several problems namely social isolation, poverty, apparent reduction in family support, inadequate housing, impairment of cognitive functioning, mental illness, widowhood, etc[2].

In addition, dependency due to physical or mental disease is also an important issue involving human resource. All these problems have an impact on the quality of life in old age & health care at the time of need[2].

Quality of life (QOL) is a multidimensional construct incorporating an individual's subjective perception of physical, emotional and social well-being including both, cognitive component (satisfaction) and an emotional component (happiness).

WHO defines QOL as an individual's perceptions of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns[9].

The value of QOL assessment is that it provides a conceptual framework for addressing health promotion goals.

Thus QOL helps in:

1. Monitoring health of the population.
2. Evaluating the effects of health and social policy.
3. Discovering etiological factors of the disease process.
4. Assessing prognosis.
5. Evaluating the effect of treatment.
6. As an outcome measure[5].

QOL may be conceived as either a desired outcome of health promotion practice or as a determinant of health among seniors that is differentiating between pathological, normal & optimal functioning among seniors[10].

In either case the focus upon and assessment of QOL in geriatrics appears to be a fertile area for public health planning and practice.

The increasing number of older people with higher expectations of a "good health" within society and with their high demand for health and social care has lead to international interest in the enhancement & measurement of Quality of life in older people[6].

Objectives

1. To assess quality of life in geriatrics under four domains and to find the most affected domain.
2. To assess the most affected component in each domain.
3. To compare the affection of various domains in young old, middle old, and old old age group.
4. To assess limitations in different areas of life due to health problems.

Methodology

Study design: survey study.

Study setting: Mumbai.

Population of study: Community dwelling above the age of 60 yrs were taken for the study.

Sample size: 50 people.

Inclusion criteria: Community dwelling people above the age of 60yrs.

Exclusion criteria:

1. People below 60yrs. Of age.
2. People staying in old age homes or other institutes.
3. People on psychiatric treatment or impaired cognitive status.
4. People unwilling to join the study.

Duration of study: The study was conducted in the month of December 2008 and January 2009.

Material used: Pre-validated Questionnaire.

Study factors: Basic demographic data, pre-validated questionnaire tailored to Indian population was used to assess quality of life in community dwelling geriatrics. It composed of four domains namely Physical, Psychological, Social and Environmental domains. There were 26 items with simple option of yes/no to each item. Data was collected by direct method and represented through bar and pie diagram.

Results

Data analysis:

Discussion

Assessment of quality of life in geriatrics gives a broader view and helps in having a holistic approach for the care of the elderly.

In our study we have assessed the QOL in geriatrics with the help of a questionnaire.

The questionnaire assessed the QOL under four domains namely PHYSICAL, PSYCHOLOGICAL, SOCIAL and ENVIRONMENTAL.

The study included 50 people above the age of 60yrs out of which 50% were males and 50% were females also in the study population 34% people were in the age group of 60yrs-70yrs (young old), 46% were between 70yrs-80yrs (middle old) and 20% were above 80yrs of age (old old), while 96% people were educated out which majority 44% people had received secondary education and 64% people were married while 36% were widowed.

Out of the four domains the study shows that the Physical domain (42.5%) was most affected followed by Psychological then Environmental and the Social domain (9.33%) was the least affected.

The PHYSICAL domain included components like health satisfaction, physical pain, need for medical treatment, energy level, ability to get around, satisfaction with sleep, ability to perform daily activities and total work capacity.
Elderly population are often unable to enjoy pain free physical activity due to various age related problems. Physical activity is also reduced due to painful degenerative joints.

Geriatric patients often have to take medications also with aging the number and mass of muscle fibres decrease, leading to a diminished lean body mass, fibrous tissue replaces some muscle fibre therefore there is decrease in muscle strength, endurance and speed thus leading to increase fatigability, decrease in work capacity and energy levels[2].

Studies have shown that there is dissatisfaction with sleep with increase in age[7]. Aging process can influence sleep either directly or indirectly. Direct influences are those which are due to change in the nervous system and physiological mechanisms which regulate sleep and waking. Indirect influences arise from age related social or biological events which can impinge upon sleep quality. Such events are age related in the sense that they become more likely with increasing age or that their occurrence is made more likely by old age.

Out of the components included in the physical domain by data analysis we found that the need for elderly to take medical treatment to function in their daily life was most affected (76%) which could probably be because of decline in several physical functions with age.

The PSYCHOLOGICAL domain which was the second most affected included the following components ability to enjoy life, feeling of life being meaningful, ability to concentrate on things to be done, accept bodily appearance self satisfaction and feelings like depression, anxiety or mood swings.

Psychological aspects of aging depend on the social situation of an individual and the availability of supports, be they financial, medical or social. Also there is the need to appreciate the powerful forces of personality[2].

During the experience of growing older person must adapt to losses that are usually frequent, multiple and profound including the losses of status, loved ones, physical capacities and income. Thus loss and the reaction to loss-grieving- are essentially ubiquitous in old age.

One of the great fears of growing old is losing one's power, independence, mastery and ability to make choices, thus making it difficult to concentrate on things to be done, accept bodily appearance, feeling of self satisfaction and enjoy life.

In the study we found that majority of people had feelings like depression, anxiety or mood swings. This may arise from biochemical and morphological changes in the aging brain and other organs, compromised immunity and unfavourable psycho-social-economic circumstances.

SOCIAL functioning is a broad concept embracing all human relationships and activities. SOCIAL domain encompasses important components like ability to perform social roles, relationships, social activities, resources (income, housing etc.), social support from family and friends and dependency on the family.

Fig 1: Affection of various domains.

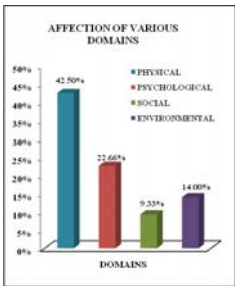


Fig 2: Components affected in Physical domain

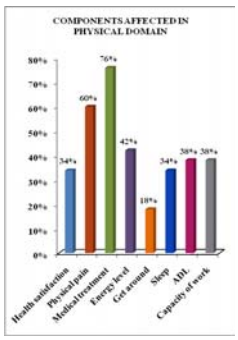


Fig 3: Components affected in Psychological domain.

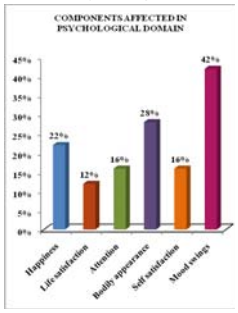


Fig 4: Components affected in Social domain.

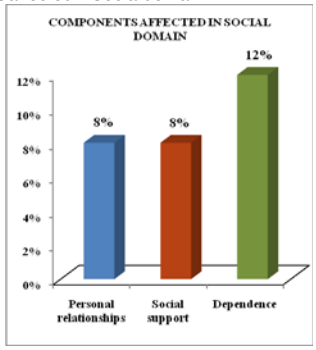


Fig 5: Components affected in Environmental domain.

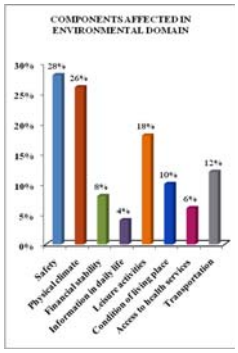
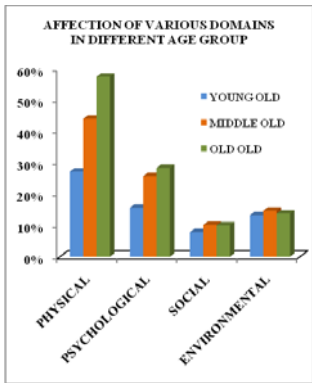


Fig 6: Comparision between affection of various domains in different age groups.



Amongst these the component of being dependent or feeling of being a burden on people is found to be the most affected by data analysis. As with increasing age there is decrease in the capacity and quality of performing activities, decrease in or no income, loss of family members probably give rise to the feeling of being a burden on people physically, emotionally and financially.

But on broader perspective SOCIAL domain was found to be least affected as in Indian culture it is the family and not the individual which forms the primary social unit.

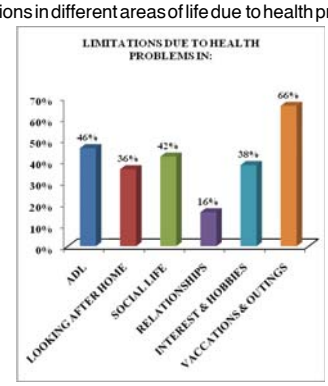
The family thus providing socialisation and religious initiation, functioning as a medium of therapy during times of distress or disease. The classical joint family may be on a decline but still the advantage is taken of family functions to get together and reinforce the care for the elderly may it be physical, emotional or social support.

In our study the ENVIRONMENTAL domain included components like safety, physical climate, financial stability, information needed in daily living, leisure activities, condition of living place, access to health services and ease of transportation.

From the data analysis it was seen that majority of people were satisfied and only 14% people showed affection of this domain. However the feeling of not being safe in daily life was the component which was most affected this could probably be because of the decline in the physical, psychological and socio-economic ability of an individual with growing age.

From the data analysis it is also seen that as age advances the level of affection of various domains also increases but however the physical domain remains to be the most affected.

Fig 7: Limitations in different areas of life due to health problems.



From the study it was found that because of the HEALTH PROBLEMS the most affected was the ability of the elderly to go for vacations and outings. This may be due to decrease in physical abilities with growing age.

Conclusion

From the study we can conclude that:

- Physical domain is the most affected domain among the elderly population.
- The most affected component in physical domain is the need of some medical treatment to function in daily life, psychological domain is the feelings like depression, anxiety and mood swings, in social domain is being dependent or a feeling of being a burden on society and in environmental domain is feeling safe in daily life.
- The various domains were most affected in old old age group and least affected in young old age group.
- Health problems interfere most with the ability of going out for vacations and outings in elderly people.

Implications in clinical practice:

While planning the rehabilitation programme for geriatric population it is not only the physical aspect that needs to be paid attention on, in fact the individual's psychological, social and environmental needs should be taken into consideration when dealing with an individual of geriatric group.

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Alteration in physical performance and body fat consequent to sixteen weeks of isometric exercise

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Abstract

Sedentary life style resulted in to decreased physical performance and obesity which is associated with decreased muscle strength and balance. It also leads to decreased physical performance .this study determined the effect of isometric exercise on different parameters related to physical performance and body fat. Fifty male subjects attending health club were exercising for 12 weeks regularly on machine like two arm curl, two arms presses etc. The different parameters studied were weight, body mass index, muscle girth and balance. All parameters were recorded before and after 12 weeks of exercise. It was observed that weight and body mass index is significantly decreased while body strength and balance are significantly increased after 12 weeks of exercise. This shows better endurance and increased cardiovascular function.

Key words

physical performance body fat isometric exercise

Introduction

Labor saving devices have relieved us of much of the physical activity which was earlier a part of life. Obviously such type of sedentary life style combined with our diet, rich in saturated fats and fatty acids and in refined sugars is toxic to our metabolism. All this resulted in to decrease physical performance and obesity. Decrease physical performance and obesity is associated with ischemic cardiopathy, high cholesterol, diabetes and also hypertension.

Sedentary life style is often accompanied by decreased muscle strength, aerobic capacity and balance, which can lead to impaired physical performance. Epidemiological data have demonstrated that low levels of physical activity are strongly related to functional decline. Sarcopenia has been defined as loss of muscle mass and strength due to decline in skeletal muscle protein, cross sectional area and infiltration of fat and connective tissue[1,2]

Yarasheskeiet[3] demonstrated that high intensity progressive muscle strength training can activate the muscle protein synthesis.

Balance is defined as maintenance of postural control which depends on the normal tone in the skeletal muscles and different postural reflexes. Physical performance helps in the maintenance of normal muscle tone and hence results in better balance.

Isometric exercise includes exercises in which there is no change in muscle length but there is increase in tension i.e. pushing the wall with both hands[4]. Most people say that use of isometric exercise is only for strengthening the muscles it has only limited value in weight loss programs because of the low total energy expenditure during training session[5]. Other study have said that weight reduction occurs only when aerobic and isometric exercise were combined[6].

The primary aim of this paper is to describe the effects of isometric physical training on physical performance i.e. muscle strength, balance and body fat.

Material and methods

Subjects were untrained male in the age group of 25-35 years. All subjects were from medium socioeconomic group attending SR power fitness health club in the Meerut city regularly. Fifty normal and healthy male were selected after detailed history and physical examination. None of the subjects were suffering from major diseases, taking medication that would limit exercise participation. Our study was approved by ethical committee of the institute. Written consent of each subject was taken before exercise program.

All the subjects were performing regular isometric exercise at least 1 hour/day for 12 weeks .one hour exercise duration consisted of 10 minutes for warm up exercises, then 40-45 minutes they were exercising on machine like two arm curl, two arm presses, bench press and leg press machine. Controlled exercise session was given to all the subjects with 3 to 20 repetitions / machine. Intensity volume and sets are gradually increased. Lastly the subjects were allowed to rest (warm down) for 5 minutes before leaving the health clubs.

Following parameters before and after 16 weeks of regular exercise were recorded:

Height (m), weight (kg), Body mass index (kg/m^2), muscle girth (cm), ability to balance on the ball of the foot (sec.) height and muscle girth in each subject was measured by soft plastic measuring tape. Weight was measured by routine weighing machine. BMI was then calculated as $weight/height^2$ ($kg/m^{2)}$ Balance was assessed by Stork Balance Stand Test[7].

Stork balance test: remove the shoes and place the hands on the hips, then position the non supporting foot against the inside knee of the supporting leg. The subject is given one minute to practice the balance. The subject raises the heel to balance on the ball of the foot. The stopwatch is started as the heel is raised from the floor. The total time in seconds is recorded. The score is the best of the three attempts.

Data was collected and presented as mean and standard deviation. Statistical analysis was done by using student's't' test.

Results

Table 1 shows that weight after regular exercise for 16 weeks

was reduced significantly (t=). There was significant reduction in body mass index and WHR. Also it was found that there is improvement in muscle strength and balance.

Discussion

Sedentary life style and obesity is linked to economic development and increasing urbanization in our society. Rather now a day it is said that obesity is a gift of sedentary behavior such as prolonged television watching[8]. Exercise testing has been a means of finding out the physical capabilities and physiological responses of an individual[9].A large number of studies have been done to observe the effects of isometric exercise on body composition .But there are only few studies which explore the effects of isometric exercise on body fat and physical performance simultaneously.

Our study revealed that all our subjects were from high socioeconomic group having sedentary behavior. Data from this study shows that body weight and BMI were significantly reduced after 16 weeks of exercise while muscle strength and capacity to balance were significantly increased.

Body weight (body mass) is an important parameter which determines increase and decrease in body fat. Whenever there is decrease in body fat there is decrease in body weight [10]. In our study body weight was significantly decreased after 16 weeks of isometric exercise (p<.01) .Our results were in line with other studies[11,12]. The decrease in body weight after 16 weeks of exercise may be because of change in energy balances which was positive before exercise and negative after exercise.

Further exercise enhances fat mobilization and utilization for energy. Active muscles uptake of fatty acids increases during 1 to 4 hours of moderate exercise. In the first hour of exercise about 50 % of energy comes from fat metabolism. As exercise continues in to the third hour fat contributes up to 70% of the total exercise energy requirement[5,10].

Body mass index (BMI) predicts body fat and disease risk better than the popular height weight tables. A high BMI links to increased risk of death from all causes like hypertension, cardiovascular disease, diabetes, osteoarthritis[13]. In our study BMI was significantly decreased after exercise (p<.01). Our results were in agreement with other studies[11,12]. The reduction in BMI after exercise may be because of reduction in weight as (BMI= wt. /ht^2).

Study has shown that during moderate exercise intensity, the energy supplied by fat is more rather than glucose. During warm-up and 1st half of exercise there is mobilization of fat and in 2nd half in which aerobic % is more, there is sufficient o_2 for the combustion of fat.

Muscle girth is an important parameter indicating size of muscle fibers and muscle strength. Increase in size of the muscle (hypertrophy) during strength training shows increase in muscle strength and performance. In our study muscle girth of Biceps muscle shows significant increase (p<.01) after exercise. The increase in muscle girth after exercise may be due to increase demand; the synthetic machinery of muscles is up regulated. Which leads to activation of second messenger system and family of immediate early genes(c-fos,c-jun and myc)leading to increase protein synthesis.

There was a small but significant (p<.01) difference between the time period of balance between pre exercise and post exercise candidate. The ability of stand for longer after 16 weeks of exercise may be due to increase muscle strength in lower limbs.

Table 1: All parameters before and after 16 weeks of exercise

Parameter	Before exercise (n=50) Mean±S.D.	After exercise (n=50) Mean±S.D.	Pvalue
Weight (kg)	69.94±12.47	64.44±11.49	<.01*
Body Mass Index (kg/m^a)	28.51±4.94	26.06±4.58	<.01*
Muscle strength (cm)	22.95±7.2	30.1±5.2	<.01*
Balance (seconds)	21.2±3.1	23.5±4.7	<.01*

*Significant

Interventions

We have worked with the factors like muscle strength, girth, endurance and balance but in a different manner to overcome the effect of exercise hypertension, exercise failure, exercise induced asthma etc. Balance between aerobic and anaerobic percentage has been maintained to avoid above problems. Adequate time to warm up is given. The selection of exercises for every week is like that-

Initially there is gradual increase in intensity during 1st half of exercise session. In the 2nd half we manage the intensity at minimum to moderate level. We have gradually increased and maintained the volume of exercises. By this procedure in 2nd half, the anabolic content or percentage is more.

Conclusion

Because in our study we have gradually increased the weight while maintaining the volume of exercise constant and muscles have become adapt to stress of exercise session. This shows better endurance and increased cardiovascular function.

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Short term effects of abdominal binder on FEV_1 and FVC in patients with spinal cord injury

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Background and purpose

This study was done in a community based setting to determine whether application of an abdominal binder is beneficial in improving pulmonary function in patients with spinal cord lesions above T_6.

Methodology

Ten patients with post trauma spinal cord injury (injury level, C_5-T_6) were selected. Subjects who fulfil the inclusion and exclusion criteria were included in the study. The set of patients included in this study constituted the experimental group. Subjects breathed into the spirometer using the mouthpiece and were instructed to hold the mouthpiece tightly and seal lips around it. They were asked to breathe normally a few times followed by taking in a deep breath as much as he can. This was followed with instruction to immediately blow out as hard and as fast as possible and keep breathing out till they could do so no more. Then they were asked to breathe in again. The spirometer digitally displayed the values of FEV1, FVC and FEV1/FVC. According to American Thoracic Society (2003) a minimum of 3 trials were obtained for FEV1, FVC and out of 3 trials the highest value was recorded. Then abdominal binder was applied to the patient and values were obtained again in the same manner and the pre - post readings were compared.

Results

Application of abdominal binder to patients was associated with significant increase in FEV_1 ($P<0.05$) and FVC ($P<0.05$).

Conclusion

Abdominal binder significantly improved FEV_1 and FVC in spinal cord injury patients by optimizing the operating lung volumes and decreasing abdominal compliance.

Key words

FEV1, FVC, Abdominal Binder

Introduction

Spinal cord injury is an insult to the spinal cord resulting in a change, either temporary or permanent, in its normal motor, sensory, or autonomic function in addition to having major functional, medical, and financial effects on the injured person, as well as an important effect on the individual's psychosocial well-being[1,2,3]. It is a central neurological disorder, with high cost disability, requiring tremendous change in an individual's life style[4].

The National Spinal Cord Injury Database has collected data on multiple patient variables. Ethnic distributions indicate that whites represent 66.6% of database, African-Asian 21%, Hispanics 9.7%, others 3.5%. In Asians incidences account for 1.6%, with male-to-female ratio of 4:1; i.e., males constitute about 80% of persons with Spinal Cord Injury[2,3]. The common causes of spinal cord injury are motor vehicle accidents accounting for 44.5%, falls 18.1%, violence 16.6%, and sports injuries 12.7%. Out of these motor vehicle accidents are the most common cause followed by falls, most common in persons at or above age 45 years.

Common clinical manifestations of spinal cord injury include spinal shock, motor and sensory impairments, postural hypotension, bladder-bowel dysfunction, autonomic dysreflexia and spasticity with specific manifestation of respiratory dysfunction as it is the most common cause of death for individual with spinal cord injury, with 71.2% of these cases being pneumonia[31]. The extent of dysfunction depends on the level of spinal cord segment involved. Higher and more complete the motor level of injury, greater the dysfunction[5,14,15]. High cervical cord lesions cause damage to all respiratory mechanics resulting in respiratory muscle changes and loss of pulmonary volumes and capacities. Respiratory insufficiency is due to paralysis of the respiratory muscles and is dependent on the level and completeness of the lesion[23].

Primarily, there is early reduction in lung compliance within a month after injury which is partially ascribed to reduced lung volume and partially to changes in mechanical properties of lung from alterations in surfactant, which can occur rapidly with ventilation at low lung volumes[6,16,17]. Compliance is the change in lung volume per unit change in airway pressure ("V/"P) or it is the ease with which lungs and chest wall expand[27]. Along with chest wall and abdominal compliances also change significantly. Chest wall compliance is reduced in tetraplegia, because abdominal compartment of chest wall is highly compliant, but rib cage may be stiff because of spasticity or abnormalities that develop in rib articulations with spine and sternum, due to poor inspiratory performance that prevents stretching to the predicted total lung capacity[18,19].

Impairment in both muscles of inhalation and exhalation causes a significant decrease in all lung volumes and capacities except residual volume and functional residual capacity which is associated with decrease in expiratory reserve volume (ERV). There is also reduction in vital capacity to 20-50% of predicted and generalised decrease in total lung volume. With regard to pulmonary function, the eventual outcome in cases of FEV1 and FVC depends on level and completeness of injury. Improvement in FEV1 occurs with time, most probably over the year following the injury.[6, 21]

Hand-held spirometer.

Fig.1: Subjects who fulfil the inclusion and exclusion criteria were included in the study

This decrease in pulmonary volumes and capacities as well as other measures are associated with decreased ability to sigh, ineffective coughing. Cough generation is primarily accomplished by internal intercostals and abdominals. Loss of their innervations reduces the ability to cough, sigh development, which helps in efficient expulsion of foreign particles as well as mucus clearance, thereby maintaining optimal pulmonary function. Also there is mucous hypersecretion, ineffective mucocilliary transport and, therefore, inability to clear airways[2,22]. All these factors contribute to high prevalence of mucus retention, atelectasis and persistence of infection, leading to pneumonia and respiratory failure which are the most common causes of increased hospital stay and death in spinal cord injury[9,12,13].

So, the respiratory dysfunction is a major cause of morbidity and mortality in spinal cord injury, which causes impairment of respiratory muscles, reduced vital capacity, ineffective cough, reduction in lung and chest wall compliance, and excess oxygen cost of breathing due to distortion of respiratory system.

Abdominal binders are most commonly used in subjects with lesions above T6[8]. The purpose of the abdominal binder is to support the trunk and the paralyzed abdominal muscles and improving diaphragmatic function, consequently improving lung volumes. They are being used with proven benefits in enhancing the respiratory muscle activity and reducing the

Table 1: The mean and standard deviation of age for the subjects was 29.70 ± 3.13 respectively.

	Mean ± SD
Age	29.70±3.13

Table 2 : The mean and standard deviation for the variable (FEV_1) were 2.262 ±0.49 and 2.453 ± 0.55. The mean and standard deviation for the variable (FVC) were 2.470 ± 0.66 and 2.609 ± 0.65 respectively.

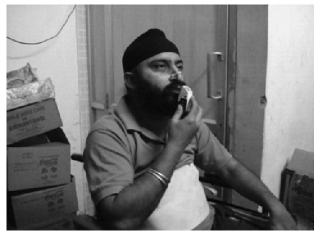
Variables	FEV_1 Mean ± SD		FVC Mean ± SD	
	Pre	Post	Pre	Post
	2.262±0.49	2.453±0.55	2.470±0.66	2.609±0.65

Table 3.

Variables	t- Value	P Value
FEV_1	5.364	P<0.05
FVC	5.579	P<0.05

Fig. 2:

Fig. 3:



expiratory effort in patients with spinal cord injury. This study will help us to determine the short term effective effect of abdominal binder in patients with spinal cord injury and the results can be elaborated for its use in spinal cord injury patients with abdominal muscle weakness.

Need for the study

Very few studies have been done to examine the effect of abdominal binder in retaining forced vital capacity in patients with spinal cord injury. The current study will explore the effectiveness of abdominal binder in upper spinal cord lesions. The main purpose of study is to find out whether the abdominal binder is effective in improving FEV1 & FVC in patients with Spinal Cord Injury

Objectives of the study

To evaluate the effect of abdominal binder on FEV1 & FVC in patients with Spinal Cord Injury

Hypothesis

Alternate Hypothesis: There is significant effect of abdominal binder on FEV1 and FVC in patients with Spinal Cord Injury.

Null Hypothesis: There is no significant effect of abdominal binder on FEV1 and FVC in patients with Spinal Cord Injury.

Significance of the study

The abdominal binder is to support the paralyzed abdominal muscles and improving diaphragmatic function, consequently improving lung volumes and cough mechanism in patients with Spinal Cord Injury. This study will give insight to physiotherapist regarding the short term and long term use of abdominal binder with their therapeutic prescription for spinal cord injury patients as well as clinical information will pass through patient community to use this low cost aid in their respiratory health.

Materials and methodology

Study design

Experimental study design

Study setting

Community based setting

Population and sampling

- **Population:** Spinal cord injury patients
- **Size:** 10 subjects
- **Method:** Convenient

Criteria for sample selection

Inclusion

- Both males and females.
- Age group: 20-35.
- Spinal cord injury with abdominal weakness & paralysis
- Grade T to 4- (KENDALL)
- Spinal cord injury at the level of C5 – T6.
- Patient is able to sit on chair with or without back support or belt.
- Post injury period 1 – 4 year.

Exclusion

- Patient with injury level below T6.
- Patient with postural hypotension.
- Patient with rib fracture.
- Recent history of cardiac surgery.
- Pressure sore on sacrum and ischial tuberosity.
- Uncontrolled hypertension.
- Patient with recent abdominal surgery.
- Recent respiratory infections (past 3 weeks).
- Recent MI or angina

Instruments and tools for data collection

Procedure

The set of patients included in this study constituted the experimental group. 10 patients were taken, to whom the procedure was explained. Written consent was signed by the patients to participate in the study. Subjects breathed into the spirometer using the mouthpiece and were instructed to hold the mouthpiece tightly and seal lips around it. They were asked to breathe normally a few times followed by taking in a deep breath as much as he/she can. This was followed with instruction to immediately blow out as hard and as fast as possible and keep breathing out till they could do so no more. Then they were asked to breathe in again.(fig 2)

The spirometer digitally displayed the values of FEV1 & FVC. According to American Thoracic Society (2003) a minimum of 3 trials were obtained for FEV1, FVC and out of 3 trials the highest value was recorded. No variation of 200ml was observed across the 3 trials, so no 4th, 5th and 6th trials were performed. Then abdominal binder was applied to the patient and values were obtained again in the same manner and the pre - post readings were compared.(fig 3)

Results

Patients: Ten consecutive subjects with spinal cord injury were recruited for clinical evaluations. All patients had a history of traumatic fracture or dislocation of the spine (all patients had tetraplegia and paraplegia), but none required any form of ventilator assistance.

Paired t- test was done within the group variable (FEV_1) for check the changes within the group. The't' value was 5.364 ($P < 0.05$). The result for the variable (FEV_1) was significant which showed that there were significant changes within the group. Paired t- test was also done within the group variable (FVC) for checking the changes within the group. The't' value was 5.579 ($P < 0.05$). The result for the variable (FVC) was significant which showed that there were significant changes within the group.

Summary and conclusion

Abdominal girdle provides support to the abdominal compartment, thereby improving the operating lung volumes, decreasing abnormally increased abdominal compliance and increasing diaphragm strength in patients with cervical traumatic spinal cord injury. Although there is an increase in diaphragmatic load, this is counterbalanced by an increase in the contractile properties of the diaphragm, which occurs as a result of both an increase in the operating length of the diaphragm and a reduction in abdominal compliance. This study has found an improvement in lung volumes when the abdomen is bound.

Abdominal binder significantly improved FEV_1 and FVC in spinal cord injury patients by optimizing the operating lung volumes and decreasing abdominal compliance.

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An evaluation of two approaches to exercise conditioning in pulmonary rehabilitation for COPD patients-A comparative study

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Abstract

Study objectives

To compare the effectiveness of two forms of exercise training in pulmonary rehabilitation for COPD patients

Design

A prospective, randomized 8 week study

Setting

A hospital-based outpatient pulmonary rehabilitation program.

Patients

30 patients (15 patients in each group) with COPD who were referred for pulmonary rehabilitation.

Interventions

We compared the short-term effectiveness of a high-intensity shuttle walking endurance program with a low-intensity, multicomponent calisthenics program for the rehabilitation of patients with COPD. The high-intensity group trained using the Shuttle Walking. The low-intensity group performed classroom exercises for approximately 30 min per session. For both groups, twice-weekly sessions were held for 8 weeks. The primary outcome measure was Quality of Life, measured using the Clinical COPD Questionnaire and Rate of perceived Exertion using Borg Scale.

Measurements and results

Both groups showed significant post rehabilitation improvement in exertional and overall dyspnea, functional performance, and health status. Patients in the low-intensity group showed greater increases in endurance and greater reductions in exertional dyspnea, whereas those in the high-intensity group showed moderate increases in endurance and exertional dyspnea.

Conclusions

It has been concluded that both the high intensity training and low intensity training showed improvement in quality of life, but low intensity training show marked improvement in terms of exertional dyspnea and quality of life as this training is easy to perform and less expensive.

Key words

COPD,Shuttle Walking Pulmonary Rehabilitation

Introduction

Pulmonary Rehabilitation is a multidisciplinary program of care for patients with chronic respiratory impairment that is individually tailored and designed to optimize physical and social performance and autonomy stated by the committee of American Thoracic society. The most successful rehabilitation programs are those in which services are provided by a variety of healthcare professionals to coordinate complex medical services. For example, a respiratory or physical therapist, a nurse, a doctor, a psychologist, a social worker and a dietician are often needed. Most people are enrolled in the program for about 8 to 12 weeks.

Chronic obstructive pulmonary disease (COPD) is a disorder characterized by reduced maximum expiratory flow and slow forced emptying of the lungs. The clinical manifestation may be irreversible in some cases and there may be reduced exercise endurance and tolerance. (The American Thoracic society and the European Respiratory society).

COPD is the fourth leading cause of death in the United States and its prevalence is increasing. Annually upto $40 billion is spent in the care of COPD patients. COPD is one of the most prevalent conditions in India and causes 1.5% of death annually. It tends to affect men (average prevalence 3.7%) more than women (2.8%)(S.K.JUIDAL,DBECHERA 2003) It is the most commonest lung disease and the major inclusive criteria for the development of Pulmonary Rehabilitation program for the past 25 years. The Pulmonary Rehabilitation program is the most important component for the management of COPD patients

(Bartolone R.Celli)

The rehabilitation program mainly focuses towards the following goals:

- Training in breathing techniques and energy conservation.
- Lessons in how to monitor the symptoms of the disease.
- Lessons in how best to use medications
- To improve exercise tolerance
- Patient education and dietary counseling
- Vocational and psycho-social counseling

Conventional Chest Physical therapy is referred to as a combination of postural drainage, airway clearance techniques such as percussion, clapping, vibration, shaking in acute cases to improve breathing and specific endurance

exercise to improve exercise tolerance. In a Pulmonary Rehabilitation program the exercise may be of high and low intensity to improve maximal oxygen uptake, and to increase exercise ability in chronic COPD patients and to improve Quality of Life.

In this regard, exercises may be prescribed as high intensity and low intensity exercises to focus mainly on improving the exercise endurance by giving exercises to lower extremity muscles and thereby recruiting slow oxidative fibers (SO fibers).

Based on the literature sources available favoring the two approaches to exercise conditioning in COPD patients in aspects of improvement of Quality of Life, dyspnea and other symptoms and also low intensity training is effective than high intensity training in aspects of exertion dyspnea. It is necessary that the study is done on the background of null hypothesis, which could be stated as

"There is no significant difference noted between the two approaches to exercise conditioning in Pulmonary Rehabilitation for COPD patients in aspects of dyspnea and Quality of Life and other symptoms".

Clinical copd questionnaire for measuring quality of life

Please check the number of the response that best describes how you have been feeling during the past week. (Only one response for each question.)

On Average, during the past week, how often did you feel: (symptom score)	Never	Hardly ever	A few times	Several times	Many times	A great many times	Almost all the time
1. Breathlessness at Rest?	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐
2. Breathlessness doing physical activities?	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐
3. Concerned about getting a cold or your breathing getting worse?	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐
4. Depressed (down) because of your breathing problems?	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐
5. Daily activities such as washing yourself, dressing.	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐
6. Minimal activities such as gardening, upper limb & lower limb exercises, cleaning house.	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐
7. Moderate physical activities, such as carrying weights, climbing stairs.	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐
8. Strenuous activities such as cycling, jogging, shuttle walking	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐

Calculate CCQ scores
Total CCQ Score
Symptom Score
Functional state score

Methodology

The study aims to use two approaches to exercise conditioning in Pulmonary Rehabilitation for COPD patients' namely High intensity exercise and Low intensity exercise.

The following tools are used to evaluate the patient's response.

1. A baseline evaluation chart is used
2. Stethoscope
3. Sphygmomanometer
4. Two cones
5. Stereo Cassette Player
6. Shuttle walk tape
7. Chair

This is an experimental study design conducted in which the samples were randomly selected in a chit method and allocated into two groups -Group I –patients who underwent Low Intensity training program and Group II –patients who underwent High Intensity training program The study was carried out in the Department of Pulmonology and Critical Care, Sri Ramakrishna Hospital, Coimbatore – 44 Tamilnadu India from July 2004-June 2005

Informed consent was obtained and the patients were treated after prior referral from the Physician. Before commencing with the recording and treatment, self – demonstration was performed and ensured that the patients under stood it and the patients were evaluated twice weekly for eight weeks and they were instructed to do the exercises in home also.

Inclusion

Patients who are referred to Physiotherapy through Department of Pulmnology and Critical care, Sri Ramakrishna Hospital, Coimbatore-44 with the diagnosis of Chronic Obstructive Pulmonary Disease with stable clinical signs and Forced Expiratory Volume in 1 second (FEV_1) = 30 – 49% predicted and they were stated as moderate COPD was considered for the participation in the study and allocated to both groups. Both the male and female patients of age 40 – 50 years.

Exclusion

Patients with pulmonary hypertension, left ventricular dysfunction, infectious diseases and severe dyspnea, patients underwent CABG, patients with acute exacerbations were not considered and also no formal Pulmonary Rehabilitation with the past 12 months.

The following parameters were assessed for the outcome.

- Dyspnea grade using Borg scale of rate of perceived exertion (RPE).
- Quality of life using Clinical COPD Questionnaire(CCQ)

Exercise training

If the exercise training intensity is of 90% of HR_{max}, then it may be considered as high intensity. An exercise heart rate of 70% maximum represents exercises with little or no discomfort may be designated low intensity exercise or calisthenics.

In this study, shuttle walking is considered as high intensity training for 30 minutes and chair exercises for 30 minutes are considered as low intensity training or calisthenics.

Discussion

By reviewing the clinical presentation of COPD patients, they had decreased exercise tolerance, breathlessness on exertion and also during various activities. These may lead to functional impairment and reduced health status. To overcome this, these patients are included in a Pulmonary Rehabilitation program to modify their quality of life and to reduce breathlessness during various activities.

In a Pulmonary Rehabilitation program, both the high and low intensity training was incorporated. These two exercise training was focused towards the improvement of exercise endurance and to reduce breathlessness during rest and activities. The two methods of training showed improvements in parameters of dyspnea and Quality of Life but low intensity training produced better significant in perception of dyspnea clinically and statistically than high intensity training.

Inspite of the proper instructions in training and education in aspects of smoking cessation, some of the patients smoked during the training period. This might interfere with the improvements. However the 't' value (independent and dependent) for parameters of dyspnea and Quality of Life using RPE Score and CCQ Score respectively has been quite significant at p= 0.05 indicating that the significance is not at the value of p=0.01 and that the' t' value is higher than the Table value for both the groups in dependent and independent 't' test. Moreover the patients performed these exercises with more dyspnea initially and after intervention, the perception of dyspnea was reduced significantly in both the groups. But the low intensity training group patients had greater ease than high intensity training because these exercises are performed at sub-maximal intensity. The Quality of Life was improved both clinically and statistically in both the groups and all the patients had no discomfort while doing functional activities. This study mainly focused on outpatient Pulmonary Rehabilitation and so there is less cost to the patient. These exercises are performed easily without any need of equipment and hence these two methods are cost effective and economical.

Conclusion

The outcome of the statistical analysis and literature review reveals that the two exercise training program improves exercise reconditioning in COPD patients. This two training reduces breathlessness and improves health status.

Hence based on the outcome of the dependent 't' test and independent 't' test and their values are higher than the Table value at p=0.05, it is concluded that the null hypothesis is excluded and thereby accepting the experimental hypothesis. Thus the study is stated in the light of experimental hypothesis which could be

" There is significant improvement in dyspnea and Quality of Life in COPD patients using two exercise training and low intensity training is effective in aspect of decreased exertional dyspnea than high intensity training."

Limitations and recommendations

1. The older age people were excluded and they may be included in the further studies.
2. Gender specific can also be considered because most of the male patients had a smoking habit and some had withdraw during the study period. This might alter the study.
3. This was a time bound small group study and a cost effective study. Further studies could be achieved by taking a larger sample with more parameters and a follow-up of 1 year.
4. Inspite of these barriers the Pulmonary Rehabilitation program has got its own value and efficacy in modifying the quality of life and health status in COPD patients.
5. Based on this study, we recommend that the Exercise Training may improve the endurance and exercise tolerance and reduce the breathlessness in COPD patients provided they can be taken along with other chest physical therapy techniques.
6. In developing countries like India, the Pulmonary Rehabilitation program may also be included in the treatment regime to improve exercise conditioning for COPD patients

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Appendix II

Chair exercises:

1 Head up and down (chin to chest)
2 Turn head to right and then left
3 Ear to shoulder (right and left)
4 Biceps curls (arms over side of chair with palms facing forward, bend elbow and raise hands up)
5 Shoulder circles (arms over side of chair, circle shoulders front and back)
6 More circles (hands on shoulders, circle front and back)
7 Arm stretch (arm straight up, then reach for center of back, right and left)
8 Wrist circles

9 Ankle circles (with leg extended)
10 Flex and point the toes (with leg extended)
11 Chest press

Weights

1 Biceps curls (elbows in toward body, palms facing forward, raise arms up)
2 Wrist curls (with arms over the sides of a chair)
3 Triceps exercise (using both hands bring weight over head then to the back)
4 Shoulder exercise (arms over the side of a chair, with arms extended raise them up and down)
5 Arm exercise (arms in front extended, raise them up and down)
6 Arms beautiful (standing, elbows in, weights to shoulders, press back then bring back up to shoulders)

Sticks

River dance (raise sticks up, over to the side [rotating right and left], back up and down on lap for 2 min)

Standing exercises

1. Circle torso over top of legs
2. Bend forward (back straight) then back
3. Crescent stretch (reach over head to side with right arm, then left)
4. Shoulder/chest stretch (clench hands in back, then bring shoulders back)
5. Clench hands in front, turn toward right then left
6. Calf raises
7. Quarter knee bends
8. Leg lifts to side
9. Lunge stretch (both heels on ground, front knee bent)
10. Reach for stars
11. March in place with fingertip taps (30 s)

Motor and cognitive rehabilitation in stroke and its influence on triple task performance

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Abstract

Purpose of the study

To evaluate changes in motor function after cognitive and motor training in stroke patients. and to evaluate triple task performance as complexity assessment tool.

Methodology

It is experimental study of different subject design. The study was conducted with 18 left hemiplegics between the age groups of 50-65 with normal right dominant side.

Procedure

It consist of two groups

Group A stroke patients who were given cognitive and motor rehabilitation for 15 days .

Group B stroke patients who were given motor rehabilitation for 15 days .

Assessment was done with triple task performance for one minute on first and fifteenth day

Result

1. ANOVA analysis suggested group A has significant changes ($p<.05$) in motor (2.501) and cognitive performance (4.310,3.23) as compared to group B
2. Comparison of mean difference between group A and group B showed significant result with triple motor (tvalue-2.505) as compared to single and dual.

Conclusion

This study concluded that more significant cognitive motor improvement was seen in group A(cognitive-motor). And triple task as sensitive tool for assessing complexity in stroke.

Key words

Stroke ,Cognition, Triple Task ,Concurrent Performance , Automacity

Introduction

Stroke is considered to be a leading cause of disability throughout the world[1]. It is third major cause of death worldwide[2]. In India a WHO study in 1990 quoted incidents of mortality due to stroke to be 73 per one lac per year[3]. Nine out of ten strokes occur in people over the age of 55[4]. Stroke Rehabilitation is the restoration of patient's to their previous physical, mental and social capability[5]. It includes rehabilitation of both effective and unaffected side. The occurrence of ipsilesional motor deficits following unilateral brain damage supports the role both hemisphere in control of unilateral arm and leg movement and has implication for functional performance. Deficits in the ipsilateral arm appear to be quite persistent and identified up to 15yrs post stroke[6]. The dominant hemisphere/arm has advantage for movement planning, initiation or sequencing and non dominant arm has advantage for reaction time and movement preparation. Right hemisphere damage tend to show deficits in positional accuracy and left hemisphere damage show deficits in trajectory control.

Task performance

During many activities people need to perform more than one task at a time without any conscious effort," automatically", writing while talking on phone. These concurrent performances involve execution of primary task, which is the major focus of attention and a secondary task performance at the same time. Multiple task performance is of importance because it places heavy demands on the human information processing system and provide deep insight into how system components are functionally organized and implemented. Stroke patients are often confused in performing tasks simultaneously.

Cognitive motor interferance

Stroke patient can perform a cognitive task and motor task in isolation, but in concurrent performance one or both the task are severely impaired, this is due to overlapping sets of motor and cognitive module called cognitive motor interference pattern.

Importance of study

A recovery of single task motor performance during rehabilitation may mask a more persistent difficulty with dual task situations and triple task situations. Therefore a motor assessment should take into account the cognitive context within which motor action occurs. Most daily living tasks involve concurrent movement and cognition, yet quantitative assessment after stroke typically treats these functions separately. Further retraining of one function takes into account status in other. Need of the study includes inclusion of measures of triple task interference in standard clinical assessment protocol and used to inform content of therapy program. The study examines the effect of motor and cognitive training on task performance in stroke patients

Aim and purpose of study

To evaluate changes in motor cognitive function after cognitive and motor training in stroke and to evaluate triple task performance as complexity assessment tool.

Review of literature

Patrick Haggard etal (2000) said that cognitive motor interference may arise because motor control ceases to be automatic. The previously automatic actions may revert to the status of' "controlled" processes ad may place heavy demands on available cognitive resources. (J Neurol Neurosurg Psychiatry 2004, 69: 479-486)[8]

Janet Cockburn etal (2003) said measures of multiple task performance should be included in assessment for functional recovery. Multitask performance may be harder to rehabilitate than single task performance(clinical Rehabilitation 2003;17:167-173[7]

Berner Y N etal (2004) concluded triple task CCT is a sensitive tool for identifying cognitive impairment affecting executive function and an important functional outcome predictor. (Arch Gerontol Geriatr 2004 Sept-Oct;39(2): 117 - 24)[9]

Canning C G etal (2006) in his study subjects walked under four counter balanced conditions: a single walking task, a dual –cognitive task, a dual manual task and a triple task. Velocity declined significantly across condition from the single to the dual cognitive to the dual –manual and finally to triple task. (Disabil Rehab 2006 ,jan,30)[10]

Methodology

This is an experimental study of different subject design. It is based on comparison of cognitive function in stroke patients who were only given motor rehabilitation and stroke patients who were given both motor and cognitive rehabilitation, by assessment through triple task performance. The duration of the study was ten months .

Table 1: Comparison of Pre and Post value within group A and group B.

Task	Gp A(cog-motor) t value			Gp B (motor) t value		
	1-7	7-15	1-15	1-7	7-15	1-15
SM	1.379	2.429*	4.944**	0.583	2.818*	1.260
DM	3.328*	0.351	2.703*	1.403	0.661	2.369*
TM	1.392	1.378	2.866*	2.461*	2.449*	1.364
SC	3.035*	1.454	2.602*	0.978	0.266	1.258
DC	1.366	3.924**	4.072**	1.00	0.250	1.233
TC	0.753	0.685	2.750*	2.357*	1.103	3.174*

* p value is significant
** p value is highly significant
Sm Single Motor Sc Single Cognitive
Dm Dual Motor Dc Dual Cognitive
Tm Triple Motor Tc Triple Cognitive

Table 2: ANOVA in group A and group B showing F value

	SM	DM	TM	SC	DC	TC
GROUP A	2.501*	1.945	1.235	1.243	4.310*	3.23*
GROUP B	0.91	0.150	1.805	0.176	0.220	0.853

*p value is significant

Table 3: Comparison of group A and group B (for mean differences)

GPA!	1	7	15	GPB!
SM	.811	1.609	1.687	SM
DM	.324	1.346	1.219	DM
TM	1.392	2.904*	2.505*	TM
SC	.075	1.145	1.891	SC
DC	.599	.408	.759	DC
TC	.700	.382	.442	TC

* significant p value

Sampling criteria

Inclusion criteria

The left hemiplegics age group 45 to 70 years,affected for minnimum3mths to 2yrs,with normal rt dominant side,TIS score 15-20/23,MMSE score 18-23/30.

Exclusion criteria

Hemiplegia due to trauma, head injury, brain tumour., Completely recovered from stroke.Comorbid conditions such as disabling arthritis, parkinsonism, severe cardio vascular disease, amputation. Patient had previous history of stroke. Bilateral involvement at multiple level.

Patient with vestibular, sensory and neurological deficits and with visual and auditory disturbances.

Assessment scale

Mini Mental State Examination (Mmse) ,Trunk Impairment Scale

Procedure

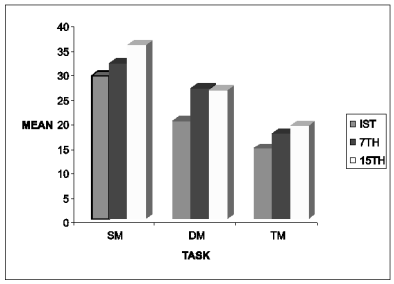
Procedure consists of two groups

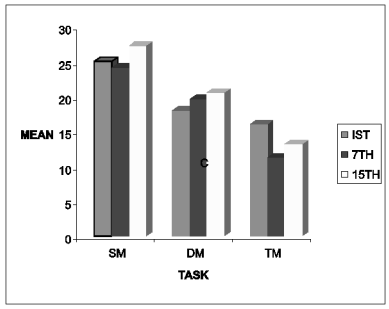
Group A stroke with cognitive and motor rehabilitation (on right dominant side) for 15 days.
Group B Stroke with motor rehabilitation (on right dominant side) for 15 days

Assessment was done with triple task performance for one minute. Triple task consist of one pure motor task, one pure cognitive task and one motor and cognitive task

Mean and standard deviation of motor performance

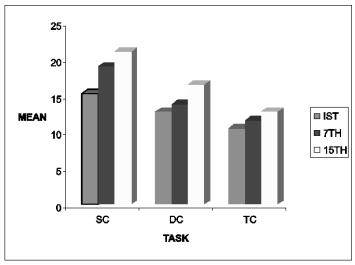
Graph 1: Group A
Graph 2: Group B

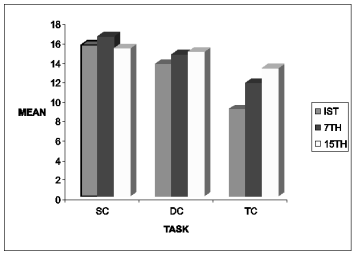




M ean and standard deviation of cognitive performance in group a

Graph 3: Group A
Graph 4: Group B





Data analysis

Result

1 ANOVA analysis suggested group A has significant changes ($p<.05$)in motor(2.501) and cognitive performance (4.310,3.23) as compared to group B
2 Comparison of mean difference between group A and group B showed significant result with triple motor (t value-2.505) as compared to single and dual.

Discussion

This study was designed to find the changes in task performance in stroke patients who were given motor and cognitive training. When group A was compared with group B, group A showed statistically significant results which are in general agreement with earlier studies by Janet Cockburn etal.

The main finding of present study is the cognitive –motor rehabilitation is effective for treatment in stroke with minimum duration of 15 days. Single, dual is less sensitive as compared to triple for complexity examination in stroke patients. Patient learns complexity more in triple task as Cognitive importance is at triple task level. Triple task is more sensitive assessment tool in stroke patients.

Though there is no reasoning for the decrement in cognitive motor interference till date and it is still under study but the decrement may be due to processing of information by parallel distributed processing as described by motor control theory.

The possible reason for improvement in patients may be the task switching paradigm in which switching back and forth between task configurations is controlled by a central executive system. The active processes of task setting (planning of appropriate sequence of action) and task disengaging (suppression of plan set for the first task in order to proceed in second task) are used during triple task performance.

This short duration study adds ample support to the fact that the degree of interference between motor and concurrent tasks is potent indicator of functional state of motor system during rehabilitation. It can also help in improving performance in therapy regime as it involves concurrent performance of cognitive and motor task. It also helps in contributing to informed goal setting and treatment planning.

Conclusion

This study concluded that more significant cognitive motor improvement was seen in group A (cognitive-motor).And triple task as sensitive tool for assessing complexity in stroke.

Limitation of study

- The study consist of a small sample size of patient population.
- The study is a short duration of 15 days.
- Treatment protocol does not include hemiplegic side.

Future scope of study

- The study can be performed in large sample and for long duration.
- Apply in near future on hemiplegic side.
- Comparative study can be done on right and left dominant side.
- The study can be done on Parkinson patients using multiple task paradigm.

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Thematic philately as a task oriented approach to improve cognition – A perspective

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A perspective

Philately is the study of stamps[1]. The word "philately" is the English version of the French word "philatélie", coined by Georges Herpin in 1864[2]. Philately is of various types: Traditional philately, Aerophilately, Thematic philately, Postal stationery, Postal history, Cinderella philately, Philatelic literature and Revenue philately.

Thematic philately is collecting stamps and other philatelic items that illustrate a theme: birds, insects, soccer, history, art, way of life, trees, sports etc. The term "theme" has a dynamic meaning implying the personal elaboration by the collector, who develops a full story around it. The outline of the story is presented as a Plan, showing the steps of the development of the theme. A thematic collection is built around an important concept, freely chosen by the collector. Normally this choice relates to a personal or professional interest: medicine or astronomy, gardening or fishing, chess or car races, computers or music... there is no limit to the choice of theme.[3]

The term cognition (Latin: cognoscere, "to know" or "to recognize") refers to a faculty for the processing of information, applying knowledge, and changing preferences. Cognition, or cognitive processes, can be natural or artificial, conscious or unconscious. These processes are analyzed from different perspectives within different contexts, notably in the fields of linguistics, anesthesia, neurology, psychology, philosophy, systemics and computer science. Within psychology or philosophy, the concept of cognition is closely related to abstract concepts such as mind, reasoning, perception, intelligence, learning, and many others that describe capabilities of the mind and expected properties of an artificial or synthetic "mind".

In particular, the field focuses toward the study of specific mental processes such as comprehension, inference, decision-making, planning and learning. The sort of mental processes described as cognitive are largely influenced by research which has successfully used this paradigm in the past, likely starting with Thomas Aquinas, who divided the study of behavior into two broad categories: cognitive (how we know the world), and affect (feelings and emotions). Consequently, this description tends to apply to processes such as memory, association, concept formation, language, attention, perception, action, problem solving and mental imagery[5].

Thematic Philately can be taken as a Task oriented approach to improve cognition. We can select a theme based on individuals' interest or even related to individuals' occupation/profession, e.g. sports stamps for individual who is actively involved in sport activities. The stamps are collected based on a selected theme and organized to form a story or a concept. Following components of cognition will be required for this task:

1. **Memory:** Memory is an organism's ability to store, retain and recall information[6]. Individual should be able to recall about the theme selected. He should be able to recognize and collect the stamps thematically from numerous stamps present in front of him. This further requires sustained attention, selective attention, figure-ground discrimination, visual gnosia and praxis.
2. **Association and concept formation:** Once he selects the stamps based on a theme, he should be able to arrange it systematically, associate and analyze for concept formation. This requires planning (praxis).
3. **Language:** After forming a concept, its expression either verbal or non-verbal requires his association areas in the cerebral cortex intact. He should be able to convert his idea into motor function (praxis).
4. **Attention:** Sustained/focused attention is required to complete the task. Selective attention is required to segregate stamps based on a theme. Individual having a short attention span will take long time to complete the task.
5. **Perception:** Individual should be able to distinguish stamps from the material it is placed (Figure-Ground Discrimination). He should be able to recognize (Visual gnosia) or distinguish various themes.
6. **Action:** It requires praxis. Individual should be able to plan, organize, form a concept and convert it into action or a motor function.

Philately is generally taken as a science of stamp collection. But it involves our cognition to a larger extent. Literature has proved that if we perform a certain activity regularly, the area in cerebral cortex responsible for that function, enlarges. One of the most fascinating advances of modern neurosciences is the realization that brain circuitry is not hard-wired but is significantly modifiable by experience. Brain attains a substantial capacity for adaptive modification in response to continuing interaction with the environment. The experience dependent plasticity is considered to be[1] the basis for learning and memory[2] crucial for recovery from brain damage and disease, and[3] by its relative absence, to be responsible for age related cognitive decline[7].

Evidence has been emerging in support of a pragmatic, functional and a task oriented approach to neurological rehabilitation[8]. Task oriented approach may increase motivation to participate in therapy and may improve the quality of life[9]. Cortical Re-organisation can be induced by task oriented training[10].

The advantage of using thematic philately as a task oriented approach to improve cognition will be[1] Theme will be of individuals' interest[2] Various components of cognition like attention, memory, concept formation, perception, action etc.

will be used while performing just a single task[3] it is not expensive4[4] It can be done by the individual even at home (5) Various themes can be tried to reduce boredom.

If we consider thematic philately as a task oriented approach to improve cognition, then we can assume that individuals involved in thematic philately are more cognitively strong than those who are not involved in any of these similar activities. Similarly, we can assume that this activity will be beneficial to individuals having problems with memory, attention or concept formation (cognition), as in case of head injury, parkinsonism, stroke, multiple sclerosis etc.

This idea is still in infancy stage and no literature is available on this concept. Further study will be done on this concept to see its efficacy.

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Effect of dominancy on H-reflex and F-wave and formulating dominancy corrective formula

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Abstract

Effect of Dominancy on MNCV and SNCV is well known but its effect on late responses i.e. H-reflex and F-wave has not been studied yet. In this study correlation between H-reflex of tibial nerve and F-wave of median nerve in dominant and non-dominant lower limb and upper limb was studied in 30 female subjects in age group between 19-25 years. Their dominancy was assessed by Edinburgh Handedness for upper limb and by Waterloo footedness questionnaire for lower limb. From the t-paired test t value is 0.870 for F-latency, 0.070 for F-velocity, 2.241 for H-latency and 0.438 for H/M and the correlation describes the correlation between right and left F-latency, right and left H-latency. It was concluded that there are no significant changes between F-wave and H-reflex in dominant and non-dominant upper limbs and lower limbs and there are no significant relationship between F-wave and H-reflex in dominant and non-dominant upper limbs and lower limbs. The formula for Dominancy corrective factor for F-latency is created by using the mean values of right and left F-latencies.

Key words

Dominancy, H-reflex, F-wave, handedness, footedness, Waterloo footedness questionnaire, Edinburgh Handedness

Introduction

The human body is seemingly symmetrical but actually functionally asymmetrical. Our hands, feet, eyes and even sides of face while seemingly the same, are actually quite different. Because of the differences between our right hand and arm and our left hand and arm, nature has provided a physical characteristic that we call dominance. “Dominancy is the preference that most humans show for one side of their body over the other, example right handedness or left footedness” it provides the basis for measurement of differences. It is also known as Brain Lateralization, it refers to the fact that the two halves of the human brain are not exactly alike and one hemisphere dominates over the other, the cerebral hemisphere that is more involved in governing certain body function such as controlling arm and leg used preferentially in skilled movements is known as dominant hemisphere. There are different ways of determinign hemispheric dominance in a person. The Wada test introduces an anesthetic to one hemisphere of the brain via one of the two carotid arteries. Once the hemisphere is anesthetized a neuro psychological examination is effected to determine dominance for language production, language comprehension, verbal memory, and visual memory functions. Less invasivetechniques, such asfunctional Magnetic stimulation etc are used to determine hemispheric dominance There is one another techniques to assess which hemisphere is dominant is by determining Handedness and Footedness of the individual. Handedness is defined as “when the arms and the hands are symmetrical in use and functions as to reliably favor one hand or other across a range of skillful acts. Footedness refers to a preference for one lower limb over the other.

In past decades, several researchers reported differences in the physiology between dominant and non-dominant upper limb like Fugl Meyer etal (1982) found a higher percentage of type1 muscle fiber in extensor carpi radialis of dominant arm compared with contra lateral limb Like wise various studies had conducted to show asymmetries in peripheral nervous pathways, ex Friedli et al (1987) reported a higher detection thresh hold for cutaneous electrical stimulation in the dominant arm, which the interpreted as a lateral asymmetry in sensory nerves. In contrast, a study by Rutherford and Jones (1988) showed no difference between dominant and non-dominant FDI in terms of twitch properties or contractile fatigue However, Sathiamoorthy A, Sathiamoorthy SS demonstrated higher median nerve conduction velocities (MNCV) in dominant arm for both left and right-handed subjects, Tan (1985) concluded that motor and sensory nerve conduction velocity in for right and left arm in right and left handed subjects did not differ.

These statements give lots of confusion regarding effect of dominancy on electric properties of nerves. In order to improve the diagnostic yield of electrophysiological studies in individual patients with various peripheral neuropathies, I have studied the efficacy of two easily elicit able late responses on dominancy, the F response which can be recorded from almost any skeletal muscle and the H reflex which can be easily recorded from the soleus muscle. So that, obtained database can be used in the formulation of dominancy corrective formula.

Hoffman described the H- reflex in 1918 and hence it is named as H-reflex. The H- reflex is a monosynaptic reflex elicited by sub maximal stimulation of the tibial nerve and recorded from the calf muscle. F-wave is another late response resulting from antidromic activation of motor neurons involving conduction to and from spinal cord and occurs at interface between peripheral and central nervous system. F-wave studies are used to assess the proximal segments of the motor nerve function.

Method

Study was performed on 30 female subjects were taken from the city Patiala with average age group of 18-25 years old. This was an experimental and correlation study, which was performed in the Punjabi university Patiala in

Neurophysiology lab of Department of Physiotherapy. Study was performed in accordance with ethical consideration of the institute and their consent was taken prior to the study.

Testing equipment and procedure

Nerve conduction studies were performed on (Neuroperfect) EMG/NCV/EP system, EMG 2000; Medicaid system ISO (9001:2000) certified.

Before beginning with the procedure, the subjects who were selected on the basis of convenient sampling by applying inclusion criteria were explained the entire procedure in detail. They were then assessed according to the assessment chart.

Parameters studied are H-latency, H/M for H-reflex and F-latency and F velocity for the F-wave

Procedure

The subject was made to lie prone comfortably on a plinth. They were given a 5 minute time for relaxation and her all physical activities was stopped prior to test. Any Metallic ornaments on the limb were removed. The right leg was exposed from foot to popletial fossa. The resistance of the skin of forearm was reduced using cotton dipped in alcohol. The room temperature was noted. The electrodes were placed first on the right leg to record H-reflex.

The pick up electrode: the patient is prone with feet suspended over the edge of table. The active surface electrode was placed on a point of bisection on the line connecting the popliteal crease and the proximal flare of the medial malleolus.

Reference electrode: over Achilles tendon.

Ground electrode: between site of stimulation and pickup.

Stimulating electrode: at tibial nerve, the cathode is proximal and is placed over the tibial nerve in the popliteal fossa at the level of the popliteal crease.

The sub maximal stimulation was given to the tibial nerve distally at the level of the popliteal crease and a motor response was recorded from the medial position of soleus muscle. A square wave pulse of 1ms duration is used for preferential stimulation of large sensory fibers. The stimuli are adjusted so as to evoke maximum H-response amplitude. At this strength a small M-response may also be present. Attention to M- response may help in monitoring the strength of stimulation. By increasing the stimulus strength to supramaximal maximum M response can be reordered and 3 M responses are measured for analysis. H/M ratio which is measured from peak to peak amplitude maximum H-reflex to maximum M – Amplitude (H/M) provides an easy estimate of motor neuron pool excitability. Repeat the same procedure with the left leg after 2minutes. The latency of H reflex is measured from the stimulus artifact to the first deflection from baseline. For F-wave recording the subject was made to lie supine comfortably on a plinth and upper limb was kept in adduction and supination for the recording of F-wave. Any Metallic ornaments on the limb were removed. The right arm was exposed from mid arm to the hand. The resistance of the skin of forearm was reduced using cotton dipped in alcohol. The electrodes were placed first on the right arm to record F-wave.

The pick up electrode: active surface electrode for median nerve over abductor brevis.

Reference electrode: over distal phalanx of the thumb. Ground electrode: between stimulation and pickup sites. The supra maximal stimulation was given to the median nerve over the wrist and multiple stimuli was applied at the same sites to record a series of 10 F-wave latencies and determined shortest and average F-wave latencies the resulted M wave and F response was recorded.

The dominancy corrective formula for F-wave latency was created and measured latency was putted in that formula to check corrected latency.

F-latency $_{\text{dominancy corrected}}$ **= (dominant/non-dominant value± CF)** ± 1.2

CF = correction factor for median nerve = 0.97

For F-velocity, distance was measured from the C7 spinous process to the distal stimulating point, with limb extended, pronated and abducted to 90 degree.
Repeat the same procedure with the left arm after 2minutes

Result and discussion

Mean and standard deviation for F latency of right and left is 30.9373±1.9941 and 31.1533±1.9178, F-velocity of right and left is 56.3540± 3.4594 and 56.3953± 4.1453, H-latency of right and left is 27.0047± 1.4925 and 26.7210 1.2179 and H/M of right and left is 0.5603± .3771 and 0.5923± .3720 as shown in table 1 and comparison of their means are shown in Figure 1,2,3,4.

Paired t-test was applied between parameters of both right and left limbs(table 2) and the t value, for F-latency is 0.870, 0.070 for F-velocity, and 2.241 for H-latency and 0.438 for H/M which shows that there is significant difference between H-latency. However, there is no significant difference between F-latency, F-velocity and H/M between right and left extremity.Karl Pearson Correlation was done to determine the correlation between upper limb and lower limb (table 3). The greatest correlation was found between right and left F-latency and comparatively less correlation between F-latency and H-latency. A negative correlation was found between F-latency and F-velocity and F-latency and H/M ratio. There isignificant correlation between right F-velocity and left F-velocity, between right H-latency and right F-latency.

The table 4.1: describes the Mean and Standard deviations and standard error of mean of leg length and arm length of both right and left side, height, weight and BMI. Mean and Standard deviation of right leg length is 86.0633 ±3.77015, left leg length 86.0567±3.6676, right arm length 74.8±3.0146, Left arm length 74.8367±3.1604, Height 161.2933±4.3196, Weight 57±6.3788, BMI is 21.8493±1.9234

The table 4.2 describes the Mean and Standard deviations of all the values of F-wave and H-reflex recorded. Mean and standard deviation for F latency of right and left is 30.9373±1.9941 and 31.1533±1.9178, F-velocity of right and left is 56.3540± 3.4594 and 56.3953± 4.1453 , H-latency of right and left is 27.0047± 1.4925 and 26.7210 1.2179 and H/M of right and left is 0.5603± .3771 and 0.5923± .3720

Table 4.3 describes the t value, it is -.870 for F-latency, -.070 for F-velocity, 2.241 for H-latency and -.438 for H/M.

Table 4.1: Mean and standard deviation

Mean and standard deviation				
	Mean	N	Std. Deviation	Std. Error Mean
Right leg length	86.0633	30	3.7701	0.6883
Left leg length	86.0567	30	3.6676	0.6696
Right arm length	74.8	30	3.0146	0.5504
Left arm length	74.8367	30	3.1604	0.577
Height	161.2933	30	4.3196	0.7887
Weight	57	30	6.3788	1.1646
BMI	21.8493	30	1.9234	0.3512

Fig. 4.1: Graph of Mean and Standard deviation of F-latency of right and left upper limb

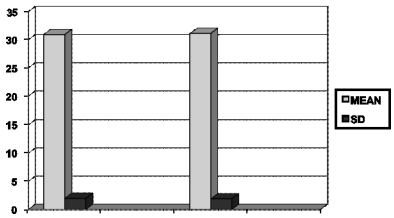

Fig. 4.2: Graph of Mean and Standard deviation of F-velocity of right and left upper limb

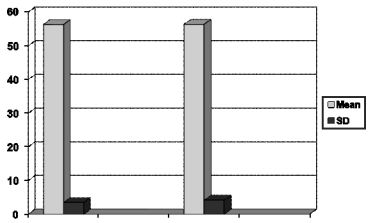

Table 4.2: Mean and standard deviation

Std. Deviation	N	Mean		
1.9941	30	30.9373	F-lat right	Pair 1
1.9178	30	31.1533	F-lat left	
3.4594	30	56.3540	F-vel right	Pair 2
4.1453	30	56.3953	F-vel left	
1.4925	30	27.0047	H-lat right	Pair 3
1.2179	30	26.7210	H-lat left	
.3771	30	.5603	H/M right	Pair 4
.3720	30	.5923	H/M left	

Table 4.3: Paired t-test

Sig. (2tailed)	t		
.392	.870	F-lat right–F-lat left	Pair 1
.944	.070	F-vel right F-vel left	Pair 2
.033	2.241	H-lat right H-lat left	Pair 3
.665	.438	H/M right H/M left	Pair 4

Fig. 4.3: Graph of Mean and Standard deviation of right and left H-latency of lower limb

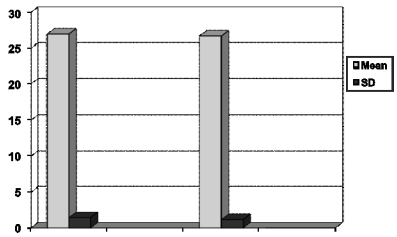

Fig. 4.4: Graph of Mean and Standard deviation of right and left H/M of lower limb

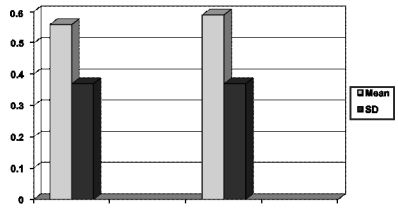

Table 4.4: Correlations

		F-lat right	F-lat left	F-vel right	F-vel left	H-lat right	H-lat left	H/M right	H/M left
F-lat right	Pearson Correlation	1	0.759	-0.551	-0.187	0.501	0.462	-0.387	-0.055
	Sig. (2-tailed)	.	0	0.002	0.322	0.005	0.01	0.035	0.773
F-lat left	Pearson Correlation	0.759	1	-0.401	-0.457	0.43	0.453	-0.279	-0.004
	Sig. (2-tailed)	0	.	0.028	0.011	0.018	0.012	0.135	0.985
F-vel right	Pearson Correlation	-0.551	-0.401	1	0.656	-0.181	-0.03	0.019	0.012
	Sig. (2-tailed)	0.002	0.028	.	0	0.338	0.877	0.919	0.949
F-vel left	Pearson Correlation	-0.187	-0.457	0.656	1	-0.134	-0.035	-0.094	-0.014
	Sig. (2-tailed)	0.322	0.011	0	.	0.479	0.854	0.621	0.942
H-lat right	Pearson Correlation	0.501	0.43	-0.181	-0.134	1	0.889	-0.502	-0.19
	Sig. (2-tailed)	0.005	0.018	0.338	0.479	.	0	0.005	0.316
H-lat left	Pearson Correlation	0.462	0.453	-0.03	-0.035	0.889	1	-0.427	-0.148
	Sig. (2-tailed)	0.01	0.012	0.877	0.854	0	.	0.019	0.436
H/M right	Pearson Correlation	-0.387	-0.279	0.019	-0.094	-0.502	-0.427	1	0.429
	Sig. (2-tailed)	0.035	0.135	0.919	0.621	0.005	0.019	.	0.018
H/M left	Pearson Correlation	-0.055	-0.004	0.012	-0.014	-0.19	-0.148	0.429	1
	Sig. (2-tailed)	0.773	0.985	0.949	0.942	0.316	0.436	0.018	.

** Correlation is significant at the 0.01 level (2-tailed)., * Correlation is significant at the 0.05 level (2-tailed).

Table 4.4 describes the correlation between right and left F-latency, right and left H-latency

Discussion

This was an experimental co-relational study done to see the efficacy H-reflex and F-wave in limb dominancy. Conduction velocity in peripheral nerves is known to be influenced by various factors including fiber diameter, presence or absence of myelin, temperature, age, height etc. By reviewing literatures it was found that various studies had conducted to show asymmetries in peripheral nervous pathways and dominancy is also an important factor that effects the conduction of nerves. Like Friedli et al (1987) reported a higher detection thresh hold for cutaneous electrical stimulation in the dominant arm, which the interpreted as a lateral asymmetry in sensory nerves. Similarly, Sathiamoorthy A, Sathiamoorthy SS demonstrated higher median nerve conduction velocities (MNCV) in dominant arm for both left and right-handed subjects. However, the results of my study do not demonstrates the significant magnitude of difference in side to side variables as demonstrates by other researches like Fugl-Meyer et al. (1982) found a higher percentage of type I muscle fibers in the extensor carpi radialis brevis of the dominant arm compared with the homologous muscle of the contralateral arm. An

indication of contralateral differences in fiber composition of the first dorsal interosseous (FDI) muscle was reported by Tanaka et al. (1984) who measured a longer force twitch rise time and higher fatigue resistance in the dominant hand. But the data of this study support the concept that there is a definite relationship between the upper limb dominance and lower limb dominancy, but that relation is not as significant as told by Uner Tan (1990), it was re-established that there is an inverse relationship between hand skill and the excitability of motoneurons innervating the postural soleus muscle in right-handed female subjects. It was concluded that there is a spinal motor asymmetry in postural leg muscles to handedness. Similarly there is even a suggestion by Yokolev & Rakic based on dissection of brains of human fetuses and neonates that the anterior horn cells on the dominant side of the spinal cord have greater cortiocospinal innervations than those on other side. So further studies have to be designed to investigate the relationship of dominancy with late responses by using large samples and reducing the limitations so that their corrective factor can be formulated.

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Effect of inverted body positions at different angles on autonomic nervous system and muscle excitaion in normal adolscents

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Keywords

inverted position,electromyogram, pulse rate, body temperature, Blood pressure

Method and procedure

sAn experimental study design. A sample of 30 healthy adolescents with the mean age of 22.46 yrs participated in the study. Subjects were made to lie supine on tilt table for five minutes and instructions were given regarding study. tilt table was inverted to various angles of inversion (30^0,45^0 and 90^0) for seven minutes and EMG (spontaneous activity), blood pressure, pulse rate, body temperature were recorded at every minute. After inversion at every angle, patient was brought to 0^0 inversion for five minutes. The data was analysed to compare values of these variables at each these variables among three angles at every minute.

Results & conclusion

there was a significant improvement angle at every minute and to compare the values of in values of spontaneous activity of soleus, tibialis anterior at all three angles of inversion and SBP at 90 degree of inversion and non significant changes were seen in DBP, Pulse rate and body temperatute at any angle .On comparison of three angles of inversion, there were significant differences in values of EMG of soleus and tibialis anterior, SBP and body temperature where as non significant changes were seen in pulse rate and pulse rate and DBP.

Introduction

Basmajian states that "…among mammal,man has the most economical of antigravity mechanisms once the upright posture is attained"[10]. Through evolution, human beings have assumed an upright erect or bipedal posture. The advantage of an erect posture is that it enables the hands to be free and the eyes to be farther from the ground so that individual can see farther ahead. During the early years of life, the child develops an incredible repertoire of skills, including crawling, independent walking and running and manipulation of objects in a variety of ways. The emergence of all of these skills requires the development of postural activity to support the primary movement[3], In the series of short papers Magnus (1920) described some studies performed with decerebrate cat, which entailed the progressive positioning of the cat until its head was in inverted position. Magnus discovered that the inverted position activated the cilia of the vestibular system ,which in turn promoted "extension maximum"[11]. Tokizane T (1951) replicated Magnus work with human subjects and used a tilt table apparatus and electromyographic readings to gather data. Total inversion produced maximal extensor tone and normal upright position elicited maximum flexor tone[14]. Farber recommended its use as an inhibitory technique. Because the carotid sinus stimulates the parasympathetic system, the topographic system is influenced and muscle activity is reduced .This has been found to be beneficial to the patients with upper motor neuron lesions and children with hyperkinetic disorders. Heinger and Randolph report that severe spasticity in the upper extremity is noticeably reduced. The other benefit of the inverted position is an increased tonicity of certain extensor muscles. Therapists have capitalized on this reaction to activate specific extensor muscles of the neck, trunk and limb girdles[8]. Vestibular reflexes are known to be mediated by input from both canal and otolith afferents Angelaki and Hessi (1996) responding to dynamic changes of head position and steady state head position relative to gravity respectively[1]. Perlmutter et al (1999) stated in cases where there is no head to body rotation, vestibular afferent signal the body's angular velocity in space while static tilts activate otolith afferent and angular rotation activate both canal and otolith[12].

There is a physiologic evidence that vestibular system influences autonomic control through brainstem autonomic centers. Yates B J(1992) concluded in their study that vestibular system has prominent effect on sympathetic outflow and blood pressure [9]. It was demonstrated by Doba and Reis (1974) that bilateral transaction of the vestibular nerves in paralyzed, anesthetized cats impaired reflex compensation for orthostatic hypotension produced by head up tilt .This finding suggested that the vestibular system was involved in blood pressure regulation during postural changes [6]. Chester A .Ray (2000) concluded in his study that the otolith organs but not the horizontal semicircular canals participate in the regulation of sympathetic nervous system in humans [4]. A key role of central nervous system is to provide homeostasis or a stable internal milieu.

As there is need for quantification of amount of stimulation of vestibular system and its effects on various systems like heart, muscle and body temperature, their outcomes ,blood pressure, pulse rate, temperature, EMG (spontaneous activity) which they influence can be measured.

So the effects of stimulation on various systems like heart, lungs,muscle can be demonstrated by analyzing through their measuring devices like blood pressure by Omron oscillometric blood pressure monitoring device which measures blood pressure by oscillometric method. This is measured by tying a cuff at the elbow over brachial artery . The cuff is inflated thereby occluding the brachial artery and then cuff pressure reduces monitoring arterial counter pressure oscillations and converting these counter pressure

oscillations to voltage signals determining systolic and diastolic pressure[38].

Electromyography (EMG) is the recording or testing of the status and function of peripheral nerves,motor units and muscle fibers. As vestibular system affects the tone of postural muscles. So response can be measured by measuring the EMG status of any particular muscle of extensor group(soleus)[37]. Spontaneous activity is noted in soleus and tibilias anterior. The subject is asked to remain relax during the experiment and spontaneous changes in muscle tone are recorded.

Body temperature is measured by digital thermometer.

So the different angles of inversion bring about the vestibular response, this study analyze the effect of different angles of inversion on vestibular and autonomic nervous system .

Statement of the study

Most of the studies done on inversion at different angles include physiological variables like heart rate, blood pressure, body temperature and EMG. But the indices were measured either before or after the session but not during the session. Furthermore no time limit have been determined up to which we can keep the subjects in inverted position till these variables get stabilizes or come to baseline measurements. So this study tries to note the effect on blood pressure, pulse rate, body temperature and EMG at 30°,45° and 90° of inversion.

Inclusion criteria

Subjects with normal blood pressure between 120-130 mmHg An age group of 18-25 years was selected.A body mass index of between 19-25 kg/m^2 was selected[5]. The normal body temperature range of 98.0°-98.6° F was selected[9]. The resting respiratory rate,a range between(12-17/min) was selected.

Table : Comparison of mean values for SBP at different minutes for the subjects at 30 degrees, 45 degrees and 90 degrees

PR	30°		45°		90°	
	Fvalue	Pvalue	Fvalue	Pvalue	Fvalue	Pvalue
0Vs2 Vs3 Vs4 VS5 Vs6 Vs7	0.160	P>0.05	0.061	P>0.05	0.164	P>0.05

Table 2: Comparison of mean values for DBP at different minutes for the subjects at 30 degrees, 45 degrees and 90

DBP	30°		45°		90°	
	Fvalue	Pvalue	Fvalue	Pvalue	Fvalue	Pvalue
0Vs1 Vs 2Vs3 Vs 4Vs5 Vs 6Vs7	0.124	P>0.05	0.490	P>0.05	0.250	P>0.05

degrees

Table 3: Comparison of mean values for PR at different minutes for the subjects at 30 degrees, 45 degrees and 90 degrees

SBP	30°		45°		90°	
	Fvalue	Pvalue	Fvalue	Pvalue	Fvalue	Pvalue
0Vs1 Vs2 Vs 3Vs4 Vs5 Vs 6Vs7	0.685	P>0.05	0.813	P>0.05	5.100	**P < 0.05**

Subjects with normal blood pressure between 120-130 mm hg of systolic BP and 75 -90 mm hg of Diastolic BP were elected[13]. According to the normal healthy adult, the range for the pulse rate was taken as 70-80/min[13]. Subjects with no history of motion sickness .

Exclusion criteria

Subjects with history of hypertension /hypotension.subjects apprehensive to inverted position. Any undiagnosed/ referred pain. Neurological disorders like peripheral nerve injuries, ANS involvement, CNS involvement ,spinal cord involvement. Any history of congenital anomalies of heart. Any history of head trauma, brain tumor, coma. Any sort of vestibular disorders- dizziness, vertigo, motion sickness, nystagmus. On any sort of medication for at least past 3 months.

Musculoskeletal disorders like any deformities or any soft tissue and muscle injuries.

Method

Before beginning with the procedure, the subjects who were selected on the basis of inclusion criterion were explained the entire procedure in detail and their consent was taken. They were then assessed according to the assessment chart. Subjects were made to lie down initially for 5 minutes in supine relaxed position in order to make them adapted with experimental environment to allow for the accommodation of the ANS . The atmosphere of the research laboratory was kept free from noise.

Positioning of the subject

Subjects were made to lie down supine comfortably on tilt table while elastic bands were positioned around the trunk, crossing shoulders and around the lower limbs kept them from moving. Subjects were instructed not to flex or rotate their heads to eliminate potential activation of asymmetric and symmetric tonic neck reflexes. Both upper limbs were supported by the table and were positioned next to their body .Subjects were also asked to keep their eyes closed during

Table 4: Comparison of mean values for BT at different minutes for the subjects at 30 degrees, 45 degrees and 90 degrees

BT	30°		45°		90°	
	Fvalue	Pvalue	Fvalue	Pvalue	Fvalue	Pvalue
0Vs 1Vs 2Vs 3Vs 4Vs 5Vs 6Vs 7	0.092	P>0.05	1.108	P>0.05	2.556	P>0.05

Table 5: Comparison of mean values for Soleus (SO) at different minutes for the subjects at 30 degrees, 45 degrees and 90 degrees

SO	30°		45°		90°	
	Fvalue	Pvalue	Fvalue	Pvalue	Fvalue	Pvalue
0Vs1 Vs2 Vs3 Vs4 Vs5 Vs6 Vs7	8.592	**P < 0.05**	13.167	**P < 0.05**	17.17	**P < 0.05**

the experiment. Then the subject's blood pressure, pulse rate, body temperature, electromyographs of soleus and tibialis anterior were recorded.

Preparation of the subject

Blood pressure

The right arm was exposed above the elbow till the insertion of the deltoid. The inflatable cuff was strapped and inflated and apparatus was kept at the level of heart and recordings were noted by oscillometric method.

Body temperature

Subjects were made to hold thermometer under their tongue and readings were noted.

Electromyogram

Subject preparation-the muscle groups tested were exposed and skin was prepared by cleaning with alcohol.

Placement of electrodes

Surface electrodes (small metal discs-5 mm diameter placed at constant distance from each other) were affixed to the surface of the skin overlying the muscle to be tested. Electrode gel was applied beneath the surface electrode to facilitate the conduction of electrical potentials.

Soleus(L_5 ,S_1 and S_2)

Subject in supine lying. Cathode was placed two hand breadth from popliteal crease and medially. Anode wad placed 3 centimeters distal to the cathode towards the insertion. Ground electrode was placed distally over the lower end of tibia .Subjects were instructed to remain relaxed as possible and spontaneous potentials were recorded .

Tibialis anterior(L_4 ,L_5 ,S_1)

In supine lying, cathode was placed four finger breadth distal to tibial tuberosity and one finger breadth lateral to the tibial crest. Anode was placed 3 centimeters distal to the cathode towards the insertion. Ground electrodes was placed distally at the lower end of tibia. Subject was asked to remain relaxed as possible and spontaneous potentials were recorded.

1. Subject was securely tied on tilt table with belts and tilted to 30^0 of inversion in sagital plane and all the recordings (EMG, BP, PR, body temperature)were taken at the interval of one minute for seven minutes. Then subject was brought back to 0^0 and subject was given 5 minutes rest for accommodation of the ANS .
2. Again baseline readings were recorded and subject was then tilted to 45^0 of in sagital plane and all the recordings (EMG, BP, PR, body temperature) were taken at every minute up to seven minutes. Then subject was brought back to 0^0 and subject was given 5 minutes rest for accommodation of the ANS.
3. Baseline readings were recorded and subject was then tilted to 90^0 of inversion in sagital plane and all the recordings (EMG, BP, PR, body temperature) were taken at every minute up to seven minutes . Then subject was brought back to 0^0 and subject was made to lie down for 5 minutes till the parameters were settled to baseline.

In this way the study shows the change in these parameters at different angles of inversion of body.

Data analysis

The data was analyzed using statistical tests which were performed using SPSS11.0 software package. Results were calculated by using 0.05 level of significance.

Discussion

This was an experimental study which determined the effectiveness of inversion of body at three different angles of inversion (30^o,45^o,90^o) over the muscle (spontaneous activity) of soleus and tibialis anterior, blood pressure, pulse rate, and body temperature and also to find changes in all these parameters in every minute for seven minutes . All these variables in all three angles were compared at every minute. After the analysis of data it was found that there was significant changes in values of EMG (both soleus and tibialis anterior)in all three angles and SBP at 90^o of inversion. Particularly noteworthy were the findings of DBP, body temperature and pulse rate which failed to achieve significance at all three angles.

On comparison of 30^o,45^o and 90^o of inversion on these variables at every minute it was found that there was significant difference in values of systolic blood pressure at 2 and 3 minutes of inversion,diastolic blood pressure at 1,6 and 7 minutes, EMG values (spontaneous activity) of soleus and tibialis anterior at 1,2,3,4,5,6,7 minutes of inversion and body temperature was significantly affected by change of angles at 1,2,3and 7 minutes.

In the current investigation the results showed a significant increase in spontaneous EMG activity of soleus at all three angles. However at 30 degree of inversion ,spontaneous activity of soleus muscle significantly increased up to 2 minutes as compared to baseline measurement and spontaneous activity reduced significantly after 6 minutes as compared to spontaneous activity at 1 minute and 2 minutes. At 45 degree of inversion, spontaneous activity of soleus muscle remain significantly increased up to 4 minutes as compared to the baseline measurement and spontaneous activity reduced significantly at 6 minutes and 7 minutes as compared to spontaneous activity at 1 minute. At 90 degree of inversion of body spontaneous activity of soleus muscle remain increased for 5 minutes as compared to baseline measurement and significantly redced after 6 minutes .comparison of EMG values (spontaneous activity) of soleus muscle at 30,45 and 90 degree of inversion showed significant increase in spontaneous activity at 1,2,3,4,5,6,7 minutes between 30-90 degree of inversion and 1,2,3,4,5,6 minutes at 45-90 degree of inversion.

Table 6: Comparison of mean values for Tibialis Anterior (TA) at different minutes for the subjects at 30 degrees, 45 degrees and 90 degrees

TA	30^o		45^o		90^o	
	Fvalue	Pvalue	Fvalue	Pvalue	Fvalue	Pvalue
0Vs1 Vs2Vs 3Vs4 Vs5Vs 6Vs7	6.519	**P< 0.05**	5.720	**P< 0.05**	6.07	**P< 0.05**

This soleus activity is presumably mediated by tonic descending influences from vestibular system responding to changes in static orientation of body relative to gravity. Perlmutter (1999) stated that in cases where there is no head to body rotation, vestibular afferent signal the body's angular velocity in space while static tilts activate the otolith afferents and angular rotation activate both canal and otolith nerve afferents[12]. In all subjects, body axis tilt in sagital plane induced a significant facilitation of soleus muscle.lateral vestibular neurons also receive afferent input from the otolith receptors, which the latter known to sense the orientation of the head in respect to gravity. Static orientation would be expected to excite afferent fibres of otolith receptor.

The reports from the present study suggested the significant changes in spontaneous activity of tibialis anterior at all three angles of inversion. Spontaneous activity in tibialis anterior muscle significantly reduced at 5 minutes,6 minutes and 7 minutes as compared to spontaneous activity at 1 minute at 30 degre inversion. At 45 degree inversion, spontaneous activity in tibialis anterior significantly reduced at 6 mintes and 7 minutes as compared to be at 1 minute. At 90 degree inversion, spontaneous activity in tibialis anterior increased significantly up to 3 minutes as compared to baseline measurement and then decreased significantly at 6 and 7 minutes as compared to 1 minute.the study also suggested significant difference in spontaneous activity of tibialis anterior between 30,45 and 90 degrees of inversion. there was significant increase in spontaneous activity of tibialis anterior between 30-45 degrees of inversion at 1,2,3,4 minutes; between 30-90 degree and 45-90 degree at 1,2,3,4,5,6,7 minutes of inversion. Tokizane et al described the specific pattern of muscle facilitation resulting from vestibular mechanisms in the upright and inverted positions. Their research on healthy human beings demonstrated the presence of a maximum extensor muscle tone in upside down position and minimal extensor tone in upright position , however flexor tone showed the reverse changes in accordance with the law of reciprocal innervation as measured by EMG[14].

In the current investigations,the results showed a significant increase in SBP during 90 degree of inversion. Noteworthy there were no significant changes in SBP at 30 degree and 45 degree of inversion and DBP at every angle .it was found. That there has been significant increase in SBP for 3 minutes at 90 degree inversion. when systolic blood pressure at three angles of inversion for 7 minutes, it was found signinificant increase in systolic blood pressure at 3 and 4 minutes between 30-90 degree. Although changes in diastolic blood pressure were not found to be significant at any angle but on comparison of DBP at three angles, it was found DBP to be significantly increased at 1, min between 45-90 degree and at 6 minutes between 30-90 degrees of inversion. several studies using various technique have reported changes in blood pressure as a result of head down tilting from horizontal plane with varying results.it has been seen that changes regarding blood pressure have varying results. Changes in SBP can be hypothesized as a response to hydrostatic pressure changes during postural changes with respect to gravity. when an individual shifts from the supine to the standing position approximately 500 ml of blood pools in the legs because of gravity. Possibly, then,at inversion ,the heart must pump an increase of venous blood. based on the principle of starling's law cardiac output would increase and systemic blood pressure would rise.

According to the findings of this study there has been no significant changes in pulse rate and on either of the three angles at any minute. Thus the non significant changes in pulse rate were found in conjunction with the works of Vendy Rehault (1985) who could not find a significant changes in pulse rate during inversion in normal subjects[17].

Conclusion

Thirty normal subjects were investigated to determine the effectiveness of 30°,45°and 90° of inversion of body on tilt table on EMG of soleus and tibialis anterior(spontaneous activity), BP, body temperature and pulse rate . the study also compared three angles at every minute for seven minutes on EMG,BP, body temperature and pulse rate. Significant changes were seen in in EMG of both soleus and tibialis anterior at all three angles of inversion and SBP at 90 degree of inversion where as non significant changes were seen in DBP, PR and body temperature at any angle.

Moreover on comparision of three angles of inversion (30,45,90 degree) there were significant difference in values of EMG of soleus and tibialis anterior, SBP and body temperature where as non significant changes were seen in pulse rate and DBP. thus the alternate hypothesis is partially valid.

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Community based intervention models in neuro physiotherapy

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Background and purpose

With the shift in paradigm of traditional movement therapy (active or passive) to the concept of neural plasticity and functional cortical reorganisation in recovery mechanisms after any central nervous system insult has led to the invention models being available in the market with the evidence backdrop of motor re-learning, practice and biofeedback.

However the applications or feasibility of using these modernized equipments with respect to majority of Indian community remains less. This may be due to the reason that all the equipments coming up with high safety and computerized software oriented features are in high cost consumption such that neither all the physiotherapy centres are affordable to implement for their patients nor any individual patient will be affordable for independent home use in terms of long term rehabilitation. This forces the physiotherapy population to appreciate the new intervention models as part of only awareness rather than clinically implementing and studying the efficacy of the same.

Therefore a thought was given if physiotherapists attempts to understand the concept behind the equipments in functional recovery and basic biomechanical guidelines insisting the design and the make, rather than blindly following the procedure of working with the equipments, will help us to grow by designing many cost affective designs with the backdrop of novel recovery approach with respect to various population in the community,so that the benefits of the updated designed models reach and benefit the majority of patients in our country.

1. Community based intervention models

Computerised Body weight support unweighing harness for gait training.

Introduction

"A system to decrease an individual's affective body weight by a predetermined amount using a supporting harness and counter balance system that accommodates the rise and fall of body during treadmill ambulation (Murray et al 1993). The interactive training with graded weight support in adult spinal cats has led to the idea of Body Weight Support Treadmill Training (Finch et al 1991).

A several week of training protocol which includes suspending complete thoracic spinal cord injury (SCI) cat in quadripod position over treadmill partially supported by sling around trunk with manual assistance provided the rhythmic loading and unloading of limbs with appropriate kinematics. It was believed the ability to regain stepping has been attributed to oscillating neural circuits in the lumbosacral spinal cord caudal to the lesion on respond to the peripherally mediated information and produce a co-ordinated adaptable locomotor pattern in the absence of supraspinal influence.

Training method

The patient is brought near the system with respect to their aetiology, the harness is applied over the patient in either supine, sitting or standing position with the level of lesion and patient comfort. Once the patient is made to stand with manual support within the system, the velcros of the harness are fasten to ensure a snug fit around the patient's thorax. Now the weight of the patient to be unweighed is calculated with respect to the body weight from the informative unloading display chart available with the system usually 20-40 % of the body weight is unweighed for a partial weight bearing ambulatory training. Before unweighing the patient, the inflation of the harness system is ensured. The parameters of biofeedback system are set as required and a natural heel to toe walking pattern is facilitated by supporting the kinematics of the limbs (passive or active assisted) to progress in gait training. The results are interpretated at the end of the training and progressed further.

Highlights

1. The single point design with the suspension system allows necessary pelvic rotation and tilts which helps in proceeding towards learning normal gait.
2. The continuous oscillation of COG (centre of gravity) of about 5 cms is attained through the dynamic suspension which mimics the COG oscillation during normal human gait.
3. The partial weight bearing achieved through harness also helps in reducing parasympathetic tones thereby reducing muscle tension giving way to easy increase kinematic.
4. The weight bearing allowed on the involved side (hemiparesis) by constraining the uninvolved side improves the static balance and proprioception, also recruiting newer functional motor units thereby showing a transfer effect in gait parameters.
5. The biofeedback system attached with the treadmill helps in better motor learning program.

Recovery mechanisms

Spinal cord injury (SCI) – the sensorimotor cuing provided in the foot promotes the available neural circuits within spinal level irrespective of presence or absence of supraspinal influence.

Stroke/traumatic brain injury – safe and error free environment of gait re-education post stroke/ TBI provided by the harness system promotes neural plasticity and functional cortical reorganization aiding in better motor re-learning program.

Benefits

1. Improves tempo- spatial parameters of gait (stride length, cadence, speed, decrease in percentage of stance in double limb support) in SCI as well as stroke. [Hesse et al 1987]
2. Effect of true weight bearing helps in the recovery of the limbs. [Miller et al 2001]
3. This training is inter task dependent however skill transfer can be seen within similar task.
4. Improves cardiovascular status in patients. [Gardner 1998].

Newly designed manual unweighing harness system for gait training(musgt)

Construction

A simple construction was aimed by connecting harness to a two way pulley system through a strong metal cord which in turn ends in the manual unweighing handle. A stain gauge meter (weighing meter) is attached above each pulley to ensure the loading and unloading on both the lower limbs individually. The stain gauze meter along with the two way pulley method is supported by the single bar frame which forms the roof of the whole system. The frame proceeds downwards with its two bars to form a four point support base connecting a wheel system with locking and unlocking mechanism. The whole system can be attached to a treadmill initially for training and also can be progressed further for on ground training

Fig. 1: Body weight support treadmill training [bwstt] (lateral view)

Mechanism of working

The procedure and mechanism of working will be as similar as the one in Body Weight Support TreadmillTraining (BWSTT). The patient is unweighed through a manual system by harness (MUSGT) the amount of weight unloaded is ensured through the weigh meter and gait re-education program is initiated.

Cost of the equipment

1. The above mentioned computer monitored BWSTT harness system cost ranges from 7 to 10 lakhs INR.

   The newly designed MUSGT addressing Feasibility of usage for all community people cost varies from 35,000 to 40,000 INR.

Highlights of manually designed harness system

1. Low cost, easy, affordable for all categories of physiotherapy centres.
2. Easy affordable for even individual patient for their rehabilitation goals during home program.
3. The two way pulley method connected to two weigh meters ensures the weight shifts in involved and uninvolved limbs.
4. This system is more sensitive in allowing true weight bearing in involved side in acute, sub acute stroke patients.
5. The benefits attained through this system are generalized for other neurological disorders (cerebral palsy, traumatic brain injury, multiple sclerosis, spinal cord injury).
6. Applicable in amputee patients during prosthetic gait training, gait training in Total Knee Replacement(TKR) patients, as an assisting device ensuring safe partial weight bearing in post operative rehabilitation of limb fractures in all obese patients.

Fig. 2: Newly designed manual unweighing harness system for gait training(musgt)

Fig. 4: Pillow manometer for push up clearance_:

7. Wide application in improving dynamic balance in gait in elderly population.
8. Maintenance, reduction of over weight during treadmill workouts in normal and neurologically deconditioned patients.

Discussion

Inspite of the fact that we were able to design the unweighing harness system with the wide difference in cost factor without major changes in the biomechanical construction and its application. The absence of dynamic suspension rope and pneumatic harness system remains as missing components when considered in comparison. The presence of double way pulley designs may not be a replacement for single point design in BWSTT however the safety of the patient and the environment aiding the motor re-learning through neuro recovery mechanisms are not compromised. Future suggestions are to have the newly designed manual harness system in two models (both single and double point design) for their respective biomechanical uses..

Conclusion

The newly designed manual unweighing harness system for gait training(MUSGT) by the author projects to have multiple benefits in training wide variety of patients in physiotherapy. Future trials and suggestions regarding the modifications and development in the design will help us to understand in a better way and grow further. Thus we suggest in implementation of this model in daily practice considering affordability of patients and feasibility of application in all needed physiotherapy centres.

Pillow manometer

A novel tool to measure pressure relief in patients with spinal cord injury (SCI).

Fig. 5: Model for pressure clearance training

Background and purpose

Pressure sores are one of the major complication in post spinal cord injury patients. Hence adequate training in wheel chair for frequent pressure relief becomes mandatory, this becomes a high challenging task in obese SCI patients. A good push up clearance/ lift off is essential for wheel chair dependent spinal injury patients for their transfer skills & other activities. Push up clearance has been measured mostly through the traditional measuring tape method by measuring the clearance from bed level. A minimum of 2.5 inches is considered to be the essential push up clearance needed for transfer activities and physiological standing with crutches. However this method had less sensitivity in obese SCI patients as they had large fat accumulation in gluteal region resulting in skin contact on surface inspite of enormous effort produced by them in lift off. Hence a trial was given to develop a cost effective tool which with the back drop of feedback mechanism to motivate obese SCI patients within both push up clearance and pressure relieving methods with - better reliable measurements.

Modified pillow manometer for push up clearance

Construction

The construction of this novel tool was aimed by developing through few medical accessories used in daily practice. A pillow being connected to two ends, having mercury manometer at one end (to measure the pressure drop). ,relating it with pressure relief and cuff at the other end to inflate the air into pillow.

Training procedure

The air pillow is inflated with the cuff and the patient is made to sit in a high sitting position on a table / wheel chair / bed. The rise in the mercury column in the manometer is noted and now the patient is asked to do the push up clearance, at the end of the attempt the fall in the mercury column is noted. The

amount of push up clearance was objectively recorded as indicated by the pressure drop in the mercury column in the manometer.

Uses

The objective readings can be used as an assessment tool before training patients and the biofeedback mechanism provided by the manometer in front of the patient can be used for training method for the patient.

Pillow manometer for pressure clearance

The above model failed to measure the pressure relieving from the bilateral gluteal region alternatively in preventing pressure sores at sacrum due to the reason of air circulation within the same pillow when weight shifting from right to left and vice versa being attempted. So a modification of the above mentioned pillow manometer was essential and developed.

Construction

Two independent so called hot fermentation water bags were collected and connected independently with one end to the manometer & other to the cuff respectively.

Training procedure

The air is inflated into the right and left hot fomentation bags placed on the wheel chair /table and manometer attached to the arm rest via special attachment. The initial level of rise in the mercury column is noted on both the sides. Now patient is instructed to shift his maximum weight to either sides in alternative manner. The mercury falls in the right manometer and rises in the left manometer attached when patient shifts weight from right to left side and it applies same for vice versa.

Uses

The feedback mechanism provided by the manometer provides high motivation for high obese SCI patients in learning and performing the task.

The objective readings attained through this model will be reliable to measure the initial & final assessment of pressure relief in obese SCI patients.

Conclusion

This model can also be developed with modifications of replacing air pillow into high quality tailor made air mattress and manometer can be replaced with biofeedback software monitors however the high cost factor for the needed modification will be a hindrance factor for low and middle socioeconomic status population. Hence this model developed by the author is easy to construct and the cost ranges from just Rs 450 to Rs 600/- only which will help major variety of primary and secondary rehabilitation centres to train the patients.

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Comparison of high frequency and low frequency TENS in management of type I complex regional pain syndrome

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Abstract

Background

TENS is being used as an analgesic modality for the variety of chronic pains, but the parameters used have never been focused with reference to particular disease process. TENS has been used in complex regional pain syndrome successfully but the type of TENS which produces greater pain relief have not been studied. So this study was intended to find the impact of high and low frequency TENS on CRPS type I patients.

Methods

30 subjects including both male and female were included after fulfilling inclusion and exclusion criteria. Subjects were divided into three groups each consisting of 10 patients. Group A received high frequency TENS (70 Hz) plus exercise protocol, Group B received low frequency TENS (2 Hz) with exercise therapy and Group C received only exercise therapy. Outcome variables were measured; viz pain, range of motion (wrist joint) and hand function (Michigan hand outcomes questionnaire).

Results

Statistically significant improvement in pain, range of motion and hand function has been seen in all groups with group A showing maximum improvement.

Conclusion

High frequency TENS produces more analgesia as compared to low frequency TENS and exercise therapy alone.

Key words

CRPS type I, high and low TENS, RSD, physical therapy, Michigan hand outcome.

Introduction

Reflex Sympathetic Dystrophy is also known as Complex Regional Pain Syndrome (CRPS). Complex Regional Pain Syndrome is a multi-symptom, multi system, syndrome usually affecting one or more extremities, but may affect virtually any part of the body[1].

CRPS is a disease of relatively young people ranging from 36 to 42 years and occurs more frequently in women[2]. Female to male ratio is 3:1. Little epidemiologic data is available on the incidence of CRPS. The incidence varies from 7% to 37% for wrist fractures[3].

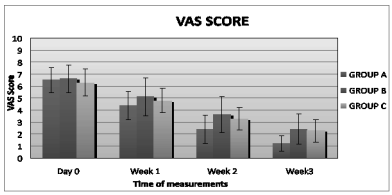
If untreated, CRPS can become extremely expensive due to permanent deformities and chronic pain[1]. Mortality associated with CRPS is negligible, though morbidity is extremely high[4]. The first description of CRPS may date back to the 17th century. During the civil war, Mitchell described several cases of soldiers suffering from burning pain secondary to gunshot wounds, that he referred to as causalgia. In 1900, Sudeck described complications of trauma to the limbs, characterized by therapy-resistant pain, swelling, and limitations of motor function. Other names that were used include minor causalgia, post traumatic pain syndrome, post traumatic painful arthrosis, Sudeck's dystrophy, post-traumatic edema, reflex dystrophy, shoulder-hand syndrome, chronic traumatic edema, algodystrophy, peripheral tropho- neurosis and sympathalgia, among others[5].

The terms CRPS type I and type II have been used since 1995, when the International Association for the Study of Pain (IASP) felt the respective names reflex sympathetic dystrophy and causalgia were inadequate to represent the full spectrum of signs and symptoms[1]. IASP defines CRPS as a condition initiated by an injury. Pain is disproportionate to inciting event. It is associated at some point with edema, changes in skin, blood flow, abnormal sweating, allodynia and hyperalgesia. The site is usually distal extremity with a distal to proximal gradient[6]. CRPS type I follows a initiating event; features spontaneous pain or allodynia / hyperalgesia beyond the territory of a single peripheral nerve (s), and is disproportionate to the inciting event. CRPS type II is similar to type I with the exception that CRPS II follows nerve injury[5]. A possible genetic predisposition has been suggested specially in patients who are resistant to therapy[7].

The clinical picture of CRPS I is characterized by sensory, autonomic, tropic and motor abnormality as well as sometimes inflammatory symptoms[8,9,10]. Sensory symptoms include burning spontaneous pain felt in the distal part of the affected extremity[11,12]. Characteristically the pain is disproportionate in intensity to the inciting event. Stimulus evoked pains are striking clinical feature, these include mechanical and thermal allodynia and / or hyperalgesia. Autonomic abnormalities include swelling and changes of sweating and skin blood flow[13].

CRPS is a relatively common disabling disorder of unknown pathophysiology. Changes in peripheral and central somatosensory, autonomic and motor processing and a pathologic interaction of sympathetic afferent systems are described as underlying mechanisms. Wasner and colleagues demonstrated a complete functional loss of cutaneous sympathetic vasoconstrictor activity in an early

Inter group comparison of VAS



stage of RSD / CRPS I with recovery. This autonomic dysfunction originates in the CNS[14].

Methods

30 patients were included in the study after fulfilling the below mentioned criteria. Inclusion criteria included both males and females (12 males and 18 females), age group- 35 to 45 years, diagnosed CRPS type I (Stage I and II), VAS between 4-8, Upper limb CRPS with history of trauma around wrist. The subjects having following features were excluded from the study Stage III of CRPS type I, CRPS type II, diabetes, hormonal imbalance, active infection, malignancy, severe Osteoporosis (T- score of less than -2.5 standard deviation), shoulder hand syndrome, hemiplegics patients with CRPS, lower limb CRPS, patients on ganglionic blocks, patients on steroids, uncooperative patient.

In group A High Frequency TENS (frequency 70 Hz and pulse duration 100 milliseconds) with exercise protocol was given. In group B Low Frequency TENS (frequency 2 Hz and pulse duration 200 milliseconds) with exercise protocol and in group C only exercise protocol was followed. Time duration for the application of TENS was 30 minutes. Exercise therapy protocol included mobilization of the wrist joint (regular oscillations at 2 or 3 per second for one minute), stress loading, elevation and common home exercise program which consisted of active movements of the wrist joint with in the available range.

Study design

Pre Test - Post Test Control group design.

Equipment used during the study was TENS Unit. Other measuring Tools included - Half scale Goniometer, Michigan Hand Outcomes Questionnaire and Visual Analogue Scale.

Dependent variables were Pain, range of motion (flexion, extension, radial deviation and ulnar deviation at wrist joint) and hand function.

Independent variables were High frequency TENS, Low frequency TENS, ROM exercises and Stress loading.

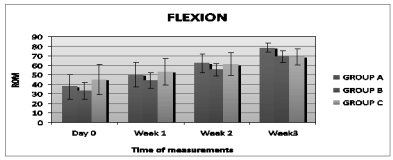
Results

The results of this study which included a sample size of 30 (n=30), with mean age 39.73 ± 3 with male: female ratio 2:3. Statistically significant improvement in VAS, Range of motion and Michigan Hand Outcomes Questionnaire has been seen.

Vas

VAS scores showed statistically significant change in pain scores in all the three groups, when within group analysis

Inter group comparison of Flexion ROM.



was done (P < 0.00). Inter group comparison on day 0 revealed no significant difference, which signifies the homogeneity of the sample within the three groups. Significant differences were found at third during between group analysis, group A versus group B (P< 0.01), group A versus group C (P< 0.01) except between group C versus group B (P< 0.93). At first and second week no significant differences were found during between group analysis. Significant change between group A and B (P< 0.01) shows that in group A pain relief was better when compared with group B and group C.

Range of motion

Highly significant results were obtained for flexion during within group analysis was done for flexion at week 1, week 2 and week 3 when compared with Day 0 readings (P< 0.00) in Group A, B and C patients. During between group analysis no significant differences were found at first week and second week in group A, group B and group C. significant difference was found at third week (P< 0.005), group A versus group B (P< 0.013), group A versus group C (P< 0.014) and group B versus group C (P< 1.000).

Extension

Statistically significant improvements were noticed in extension when the observations of first, second and third week were compared with Day 0 (P< 0.000) in Group A, Group B and Group C during within group analysis. No statistically significant improvement in extension was observed at first and second week when between group analysis was done. Significant difference was found at third week during inter group comparison (P<0.018). Group A versus group C showed (P<0.02), group A versus group B (P<1.00) and group B versus group C (P<0.08), indicating better improvement in group A patients.

Radial deviation

Statistically significant improvements in radial deviation were observed in all the three groups when within group analysis was done (P<0.00). Improvement seemed to be very significant at third week (P< 0.00) and P< 0.01 and 0.04 at second and first week respectively in group A patients. Improvement is less significant in group B; P< 0.001, 0.02 at third and second week respectively and no significant improvement was noticed at first week. Group C patients also showed significant improvement at third week (P< 0.00). When between groups analysis was done no significant differences has been observed between groups A, B and C.

Ulnar deviation

Statistically significant improvement in ulnar deviation has been observed in all the three groups especially at third week P< 0.00. In group A highly significant improvement in ulnar

deviation has been observed at first week, second week and third week (P< 0.000), whereas in group B; P< 0.008 at first week and P< 0.008 at second week has been observed. In group C significant improvement has been seen at first, second and third week during within group analysis (P<0.000 at first week, P<0.000 at second week and P<0.000 at third week). During inter group analysis significant differences were observed at first and second week between group A, B and C. at third week significant difference was observed between group A, B and C with P<0.002; group A versus group B (P<0.03), group A versus group C (P<0.003) and group B versus group C (P<1.000). Results indicate better improvement in group A patients.

Michigan hand outcome questionnaire Statistically significant improvement in hand function has been observed in all the three groups (P< 0.000) when observations at first week, second week and third week were compared with Day 0 during within group analysis. During inter group comparison at first week of MHOQ significant difference was found (P< 0.003). Group A versus group b (P< 0.27), group A versus group C (P< 0.03) and group B versus group C (P< 1.00). At second week significant difference (P< 0.001) was found. Group A versus group B (P< 0.09), group A versus group C (P< 0.001) and group B versus group C (P< 0.18). At third week significant difference (P< 0.001) was found. Group A versus group B (P< 0.50), group A versus group C (P< 0.001) and group B versus group C (P< 0.03). These results suggest greater improvement in group A patients with reference to hand function.

The results of this study indicate that in group A patient's improvement was more pronounced than group B and group C with reference to VAS, Range of Motion and Hand function. Although significant improvements has been observed in group B and group C also, the superiority of improvement in group A results makes the protocol used with these patients more effective.

Discussion

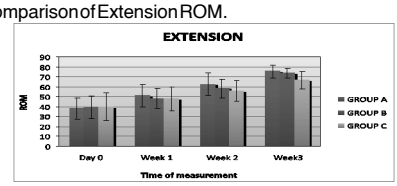
The management of CRPS has been a multi-disciplinary approach starting with conservative strategies and then if no significant relief is achieved, invasive techniques are tried. Physical Therapy approach towards CRPS has shown significant clinical outcomes in the past. Physical Therapy management includes exercise therapy and electrotherapy techniques for CRPS management. Pain has been seen as a debilitating symptom which affects the patient drastically.

Transcutaneous Electrical Nerve Stimulation (TENS) has been found to be effective in CRPS patients[15,16,17,18,19] but the issue remains unclear from most of the studies due to varied range of parameters used in these studies.

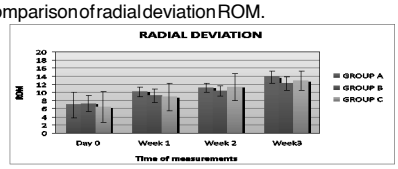
This study has chosen to use two different types of TENS frequencies (High TENS at 70 Hz and Low TENS at 2 Hz). In this study significant improvement in pain, range of motion and hand function has been observed. Reduction in pain in this study is in agreement with several other studies[20,21]. Several other studies which have concluded that there is no difference in effectiveness with different frequencies of TENS but they found all the three types of TENS used in their study significantly reduced the pain intensity[16,22]. It has been advocated that TENS should be used with CRPS patients in managing their pain before going for invasive techniques like implantable spinal cord stimulators, ganglionic blocks, sympathectomy etc. TENS being non invasive and having very rare side effects like skin irritation, allergic reaction to electrodes but these side effects are usually overcomed by changing the type of electrode used[21]. The proposed mechanism behind pain relief with high frequency and low intensity TENS may be due to the stimulation of A beta mechanoreceptor fibers which block transmission of nociceptive stimuli[23]. This is in confirmation with the Melzack's Central Gate control theory. The other mechanism which could be responsible; may be release of enkephalins as has been found in the study done by George S in 1984. The onset of analgesia in high frequency low intensity TENS is less than 10 minutes and continues for approximately for 30 minutes after stimulation is terminated[24]. Although the reduction in pain has also been found with low frequency TENS but the pain reduction is not as significant as with high frequency TENS. The improvement in pain has also been found with low frequency TENS in study done by Han et al in 1991[25]. The probable mechanism behind improvement with low frequency TENS is through the release of beta – endorphin[24].

The next priority is to improve the patient's range of motion and hand function. But the prerequisites for achieving secondary goal is achieved by significantly decreasing the pain. The other modalities recommended for pain relief other than TENS are contrast baths, desensitization, splinting, ultrasound, wax therapy, fluidotherapy etc. Exercise therapy is an integral part of physical therapy treatment in CRPS patients. Two prospective studies indicate that

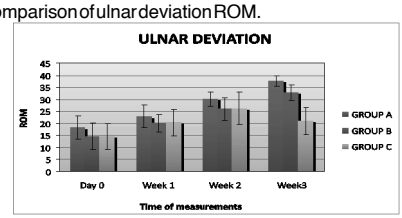
Inter group comparison of Extension ROM.



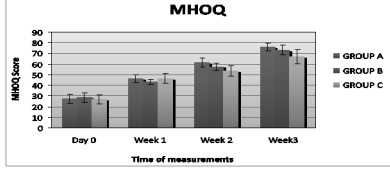
Inter group comparison of radial deviation ROM.



Inter group comparison of ulnar deviation ROM.



Inter group comparison of Michigan Hand Outcomes Questionnaire.



physiotherapy is of utmost importance to achieve recovery of function and rehabilitation[26,27]. Gentle active range of motion and active assisted range of motion exercises are started early in the course of CRPS treatment, they must be very gentle and must not increase patients pain[28,29]. Stress loading has been emphasized by Watson and Carlson in the management of CRPS patients due to its effectiveness, simplicity, safety and non invasiveness. Stress loading restores the normal neurovascular relationship rapidly as CRPS is associated with contractures and fibrosis. Passive movements may produce increase synovitis, increase metabolic needs, and an increased potential for cellular damage. The program consists of active traction and compression exercises that provide stressful stimuli to the extremity without joint motion[7,30]. The results in this study also showed significant improvement in group C patients which mostly contained exercise therapy including stress loading. The beneficial effects seen are in agreement with the study done by Oerlemans et al in 2000 and Sherry et al in 1999[26, 27].

Hand function in CRPS patients is affected due to pain, swelling and limited range of motion of wrist and hand joint. Physical therapy has been shown to have clinically relevant therapeutic effect on impairment associated with CRPS patients. Michigan hand outcome questionnaire (MHOQ) was used to assess the disability in hand function. MHOQ is a multi-dimensional instrument that was developed to measure outcomes in patients with different types of hand disorders. Significant improvement in hand function was demonstrated in all the three groups of patients which may be secondary to decrease in pain and improvement in joint range of motion. But the greater improvement was seen in group A patients. The only study done by Oerlemans et al in 2000 has found out significant reduction in impairment following physical therapy. None of the studies has stressed on hand function in CRPS patients directly.

Conclusion

This study supports the hypothesis that high frequency TENS is more effective than low frequency TENS in reducing pain, improving range of motion and hand function in Complex Regional Pain Syndrome. These findings suggest the use of high frequency TENS in the management of CRPS type I patients apart from routine physical therapy, which includes exercises, stress loading wax bath and splinting etc.

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Acute effects of prone traction technique on cardiovascular responses of subjects with low back pain

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Abstract

Purpose

Prone traction technique which originated from inversion therapy was reported to be one of the effective tools of treating lumbar problems. The effects of the method have not been adequately evaluated on blood pressure and pulse rate of patients.

Methods

Sixty subjects (34 males and 26 females) with low back pain were purposively selected for the study. The systolic and diastolic blood pressures of each participant were measured using standard mercury sphygmomanometer while pulse rate was measured with stop watch. Prone traction which was indicated for each participant was administered. The systolic, diastolic and pulse rate were measured before and during the process of prone traction; and 5 minutes after the technique. The data were analyzed using Analysis of Variance.

Results

The result revealed that there were no significant differences in the cardiovascular parameters measured at different phases (initial, during and post) of prone traction application.

Conclusion

This study concluded that prone traction technique might not immediately affect systolic and diastolic blood pressure; and pulse rate.

Keywords

Prone Traction, blood pressure, pulse rate.

Introduction

Gravitational traction with a tilt table is one of the few methods that are less frequently used in applying traction force[1]. The physiologic effects of traction suggest that the proprioceptive receptors are being stimulated and this may alter or inhibit abnormal neural input from ligaments around the vertebrae but there is inadequate empirical evidence to fully support this theory[1].

Traction has enjoyed a long history of clinical acceptance based upon very little scientific understanding of its mechanism of action or efficacy. Very few studies examined the use of traction by physical therapists[2,3]. Two surveys reported extensive use of traction by physical therapists for the treatment of low back pain. Significant questions exist regarding duration of symptom relief and other benefits derived. Given the difficulty of objective documentation of the benefits of traction, it is not surprising that there has been a reduction in its use.

Body weight theoretically should provide enough pull to distract lumbar vertebrae and eliminate mechanical devices. Gravity traction is applied almost exclusively in the lumbar region. After 10 minutes of inversion traction, documented increases in intervertebral separation are noted; however, side effects also are frequently reported, including increased blood pressure, periorbital petechiae, headaches, blurred vision, and contact lens discomfort[4]. There have been wide clinical acceptance of traction but there was very little scientific understanding of its mechanism of action or efficacy[4]. Akinbo et al,[5] monitored systolic and diastolic blood pressure, heart rate, rate pressure product, and electrocardiogram (ECG) during administration of cervical traction of 7.5%, 10%, or 15% of the patient's Total Body Weight (TBW). They observed an insignificant decrease in the systolic and diastolic blood pressure and rate pressure product for all subjects in each of the 3 groups who had traction force of 7.5% TBW but significant decrease in those subjects with traction force for the 10% and 15% TBW groups. However, there was no significant difference in heart rate or ECG variables in all the groups.

Among the physiotherapeutic treatment modalities available for amelioration of Low Back Pain are short wave diathermy, ultrasound therapy, infrared rays, exercise, message, cyotherapy transcutaneous electrical nerve stimulation (TENS) and interferential therapy[7]. Physical therapists have become more interested in the application of different spinal manual therapy technique in the management of LBP[8]. The manipulative techniques being employed usually are vertical oscillatory pressure, lumbar rotatory technique[9], spinal traction, rotation maneuvers, flexion maneuver and hyper extension[6]. Other manipulative techniques are Mckenzie[6] and prone traction technique[10].

Prone traction was adapted from inversion therapy[11] which involves hanging upside down or at an inverted angle with the intention of therapeutic benefits. Inversion therapy is a method of treating back pain by diminishing the influence of gravity, reducing the compression of the vertebrae and discs and allowing the muscles and ligaments that encase the spine to rela[12]. Inversion therapy is particularly beneficial for the spine in that it relieves pressure on the discs and nerve roots; this in turn allows discs to recover lost moisture and to return to their original shape, decreasing the pressure they can exert on nerves. Traction can be a tool to restore proper alignment to the spine, which may assist in maintaining

proper posture when later righted[13]. The method reduced intra discal pressure by 20-30% and allowed vertebral body separation, decreasing compression force on the nerve root by increasing neuroforaminal size and stretching spinal musculature[14]. Previous studies proved that the technique is effective in treating LBP of spondylotic origin, LBP with radicular pain and of disc prolapse[10,15,16].

High blood pressure is a serious health condition that generates many possible contraindications especially in Yoga postures that invert the head below the level of the heart[17]. There is dearth of information and documentation on the response of blood pressure and pulse rate on the prone traction due to the inversion procedure it involves. The main aim of this study was to determine the effects of prone traction technique on some selected cardiovascular parameters.

Material and methodology

Sixty subjects (34 males and 26 females) with low back pain participated in the study. The inclusion criteria were radiographic evidence of degenerative changes at the lumbar and sacral vertebrae; and pain must be the major clinical symptom. Also, the period of onset must not exceed 3 months. Excluded from the study are subjects with medical history of trauma, infection and tumour at the spine and visceral organs.

Procedure

The anthropometric parameters (height, weight and Body Mass Index) and age of the participants were taken and recorded. The systolic and diastolic blood pressures of the patients were measured using mercury sphygmomanometer[18]. The cuff of the sphygmomanometer (Bresco Mercurial blood pressure gauge, Brethren Corporation, Tokyo) and blood pressure was measured using standard protocol. The reading was recorded to the nearest 1mmhHg. The initial measurement (pre) was taking after the subjects had sat for 5 minutes before application of prone traction technique. Pulse rate was measured with stop watch in the same position.

Prone traction was administered as described by Dawodu[10] Three pillows were used to support the subject at the level of umbilicus while the patient lies prone transversely on a couch. The two lower limbs were on one side of the couch, the trunk and two upper limbs were on the other side of the couch hanging. The researcher crossed his two hands in the opposite direction pressing the posterior dimples and the level of the first vertebrae. Each Participant maintained the prone traction position for 3 minutes. The Systolic, diastolic blood pressure and pulse rate were measured in this position. Each subject was allowed to rest after the technique for 5 minutes and all the cardiovascular parameters were re-measured.

Table 1: Anthropometric parameters of participants

	Minimum	Maximum	Mean	SD
Age (Years)	24.00	68.00	53.80	11.00
Weight (Kg)	49.02	84.07	67.91	9.00
Height (m)	1.54	1.79	1.65	0.07
***BMI** (Kg/m^2)	19.04	35.42	25.12	4.43
****WHR**	0.76	1.03	0.92	0.08

Table 2: Comparison of the Blood pressures and Heart rate at different phases of prone traction technique

	Mean	SD	F	P
Systolic bp				
Initial	136.76	21.11		
Mid	144.99	15.77		
Final	134.52	23.82	4.01	0.14
Diastolic bp	Initial	81.79	11.12	
Mid	106.90	17.24		
Final	84.66	11.65	3.10	0.19
Heart rate	Initial	73.83	9.83	
Mid	78.69	10.21		
Final	74.21	10.94	3.10	0.20

Data analysis

The data were analyzed using both descriptive (mean and standard deviation) and inferential statistics (ANOVA). The Analysis of variance (ANOVA) was used to compare the selected cardiovascular responses before, during and after application of prone traction technique. The level of significance was set at 0.05.

Results

The physical characteristics of the participants were presented in Table 1. The result of the study showed that there was no significant difference between systolic blood pressure before, during and after the administration of prone traction technique. Similarly, there were no significant differences in the diastolic blood pressure and pulse rate before, during and after the prone traction.

Discussion

Theoretically body weight should provide enough pull to distract lumbar vertebrae and eliminate mechanical devices. Gravity traction is applied almost exclusively in the lumbar region. This current study is suggestive that the process of inversion has no significant effect on systolic and diastolic blood pressure, and pulse rate of normotensive low back pain subjects. This study contradicts the finding of Balogun et al.,[19] though; their work suggested that cervical traction and vertical oscillatory pressure are suspected to induce perturbation of patients' cardiovascular system. The perturbation may be due to pain in the arm, weakness due to over exertion, a sensation lack of equilibrium, a mild headache. On the other hand, these current findings supported the report of Egwu et al[20], which reported that the natural response of systolic blood pressure in adults assuming a prone lying posture was insignificantly decreased after one minutes. Similarly, Egwu et al;[20] observed no significant difference between the diastolic blood pressure and heart rate in the recumbent position of patients undergoing vertical oscillatory technique. They also, observed that the parameters returned to the base line values after one minute of treatment.

However, Best and Taylor[21], in their study reported that the recumbent posture induced a reduction in air space and this reduced the maximal inspiratory effort which consequently reduced the vital capacity and the systolic blood pressure but it increased the diastolic blood pressure. After 10 minutes of inversion traction, documented increase in inter-vertebral separation are noted; however, side effects also are frequently reported, including increased blood pressure, periorbital petechiae, headaches, blurred vision, and contact lens discomfort[4]. Akinbo et al[5], recommended monitoring cardiovascular parameters before and

immediately following application of cervical traction, especially in at-risk patients, or those with known blood pressure or cardiac problems.

Conclusion

This study concluded that prone traction technique did not immediately alter the systolic and diastolic blood pressure; and pulse rate of normotensive low back pain participants. However, it is still important that blood pressure of patient is monitored when considering the application of this technique.

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Effectiveness of coccygeal manipulation in coccydynia: A randomized control trial

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Abstract

Effectiveness of coccygeal manipulation in coccydynia: A randomized control trial

Purpose

The purpose of this study was to find out the effectiveness of coccygeal manipulation in the management of coccydynia.

Design

Randomized control trial where the subjects were randomly allocated to control & experimental groups.

Setting

Physiotherapy outpatient department of KLES Hospital, Belgaum, Karnataka state, India - 590 010.

Participants

Subjects with idiopathic coccydynia.

Interventions

Phonophoresis, TENS & coccygeal manipulation.

Main outcome measures

Intensity of pain on visual analogue scale & pain free sitting time.

Methods

Control group subjects were treated with phonophoresis, use of coccygeal pillow and TENS only. Experimental group subjects were treated with coccygeal manipulation in addition to above protocol of the treatment.

Results

Subjects treated with coccygeal manipulation had statistically and clinically better out come in terms of pain relief and pain free sitting time at the end of tenth treatment session.

Conclusions

Idiopathic coccydynia is somewhat common in obese individuals as it determines the way a subject sits. Coccygeal manipulation could be of help and can be used as an addition to the conventional physiotherapy treatment.

Keywords

coccydynia, manipulation, physiotherapy.

Introduction

The sacrococcygeal junction remains movable throughout life but, rarely, may fuse. Because of its muscular attachments, the coccyx is in constant motion, particularly in the act of defecation. Pressure is exerted against the posterior aspect of the bone in sitting, the coccyx acting as a shock absorber and moving forward. Pain about the coccyx results from local conditions or is referred from other regions. Coccydynia or coccygeal pain is a well-known but rarely studied painful syndrome affecting the coccyx region[1].

Coccydynia is one of the painful conditions that limits sitting. Patients with traumatic injuries of the coccyx present with clear-cut picture such as acute pain and tenderness localized to the coccyx. At other times the symptoms are so obscure that the patients are considered neurasthenics. In addition to the pain while sitting on hard surfaces, individuals who suffer from coccydynia may complain of pain on passing hard stool and on sit to stand transfers, possibly because of gluteal muscles contraction or sacroiliac dysfunction[2]. Coccydynia may occur due to various causes such as fall on the bottom of seat, a kick, obstetric trauma, passage of hard stool, hyper mobility of the sacroiliac joint, idiopathic[3,4], coccygeal fracture, coccgeal subluxation & dislocation [5], obesity[6], sacral haemangioma[7], anatomical variation[8,9] and avascular necrosis of the coccyx[10].

Most of these causative factors may strain or tear the sacrococcygeal ligaments and the condition becomes chronic because the acts of sitting and defecation continually strain the already injured ligaments. A constant annoying discomfort is experienced and accentuated when sitting on a hard surface or during defecation. Occasionally, bending forward is painful. The sacrococcygeal joint is tender, and movement of the coccyx on rectal examination reproduces the pain[11,12].

Healthcare practitioners and patients themselves have tried different clinical & non-clinical interventions so as to alleviate the symptoms of coccydynia with variable outcomes. These interventions include NSAIDS, tropical application of analgesic ointment, local anesthetic injection, local steroid injection[13], manipulations[14,15], coccygectomy[16,17], Cryoanalgesia[18,] stiz bath[19], coccygeal pillow, coccyx cushions (donut, doughnut, ring, roof rack) inflatable ring, bottom up sits, chairs (director's chair, reclining chairs, kneeling chairs, chairs with coccyx cut outs, collapsible wheelchairs, use of two chairs without arms), stools (folding, tripod), sitting modifications (reclining, side sitting), advice on how to politely deny sitting and work more in standing and physiotherapy.

However, the conservative treatment approaches like physiotherapy is well accepted. Physiotherapy treatment interventions like Diathermy with rectal electrode[20], Levator anus massage[15], joint mobilization[15], or mild levator stretch[15], ultrasound therapy, phonophoresis[20,21] and TENS have been used with variable outcomes.

Although physiotherapists in India witness and treat coccydynia victims, there is very little information available about incidence, prevalence & methods of treatment used and their efficacy. The present trend suggests that many of the physiotherapists use local application of ultrasound, phonophoresis, TENS & advice to avoid prolonged sitting, use coccygeal pillow. However, the use of manual therapy techniques such as levator anus massage, coccygeal manipulation & mild levator stretch etc are not commonly practiced due to varieties of reasons such as unawareness by various clinicians who refer these patients, lack of practical skill on Physiotherapists part & the reluctance by these patients to undergo these manual therapy techniques. Hence it was planned to study the effectiveness of coccygeal manipulation as one of the manual therapy technique in the physiotherapy management of coccydynia.

Method

Subjects

Thirty-six male & female subjects aged 20 to 55 years (mean age 31.06± 8.87) who had clinical diagnosis of idiopathic coccydynia without any radiological change and referred to physiotherapy outpatient department at KLE Hospital & Medical Research Center, Belgaum, India 590010 during 21.04.2001 to 28.2.2007 participated in this study. The duration of symptoms was in the range of 15 days to 2 years with an average of 57±6 days. These subjects were selected in a consecutive manner. However they were randomly allocated to either control or experimental group. The inclusion criteria used was subjects with idiopathic coccyx pain and who were willing to undergo coccygeal manipulation if required. Subjects were excluded if they were unwilling to undergo coccygeal manipulations, had local anesthetic injection in past three months and coccygeal fracture.

Procedure

All the subjects were assessed prior to the intervention and if they satisfied the inclusion criteria then their pain intensity score in Visual Analogue Scale was noted and their sitting time without pain was noted. Subjects were randomly assigned to control group or experimental group. Control group subjects were treated with phonophoresis and TENS. For phonophoresis purpose, pulsed therapeutic ultrasound with 1MHz frequency and output of 0.5 W/cm^2 for 3 minutes in acute cases or 1W/cm^2 for 8minutes in chronic cases along with Pirox gel as a coupling medium. For TENS, High Frequency TENS (Normal mode) was given for 20 minutes in acute cases and Low Frequency TENS (Normal mode) was given for 30minutes in chronic cases. The treatment was continued for ten successive days with an exception of one weekly holiday. Experimental group subjects were treated with coccygeal manipulation[22] in addition to above protocol of the treatment with phonophoresis and TENS. For coccygeal manipulation a member of the subject's sex accompanied the investigator. During manipulation subject were instructed to relax and take few deep breaths then the gloved and lubricated index finger of the right hand of investigator was inserted into the anal passage so that it comes to rest against the anterior surface of the coccyx. The thumb of the other hand of the investigator, also gloved but not lubricated was placed on the dorsum of the coccyx to get a good grasp between the two fingers. The actual technique consisted of distraction of the coccyx along its long axis for initial few treatments and then subsequently an attempt was done to correct the alignment by controlled force in coronal plane. Both the group participants were advised to use the coccygeal pillow as early as possible and continue it for 3 months in future. All the participants who participated in the study were advised to take Dolonex-DT 20mg (dispersible tablet) once a day at night which was an oral analgesic for ten days and the topical application of Pirox gel whenever they felt that their pain was severe during the ten days of treatment. Patients were also strictly advised not to take any sort of heat therapy till the completion of the study.

Results

The results of study were assessed in terms of the pain relief on VAS scale and pain free sitting time in minutes. For statistical analysis Graph pad InStat 3 demo software was used. The study results revealed average reduction of pain by 1.4 ± 1.126 in control and 5.3 ± 1.768 in experimental group and the average pain free sitting time in control group was 23 ± 13.351 minutes while as it was 47± 7.981in experimental groups. BMI in male subjects 31.8 ±2.7 and in female subjects it was 33.4±3.5.

Discussion

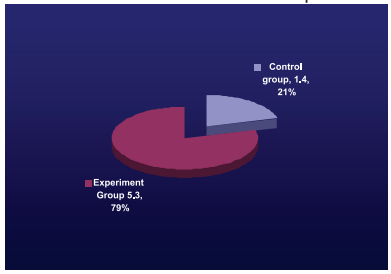
The results of this study show highly significant difference between experimental and control group. The experimental group subjects that were treated with coccygeal manipulation had better outcome in terms of pain relief on VAS score and increased pain free sitting time. This could be because of the mechanical or neurophysiological effects of

Table I: Analyses for differences between the groups for outcome measures

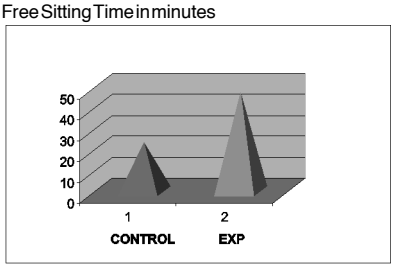
Statistic Analysis	Pain relief (VAS score)		Pain free sitting time (mins)	
	Control	Experimental	Control	Experimental
Mean	1.4	5.3	23	47
SD	1.126	1.768	11.351	7.981
N	18	18	18	18
SEM	0.3981	0.6251	4.013	2.822
Unpaired t test value (df,14)	5.263		4.892	
p value	0.0001*	0.0002*		

* = Statistically significant

Graph I: VAS score difference between Control and Experimental groups:



Graph II: Pain Free Sitting Time in minutes



coccygeal manipulation that could modulate the pain through the stimulation of articular receptors type I & II. Alternatively it could be because of correction of mal alignment of coocygeal vertebrae that could have been the cause of mechanical pain[22] and also due to the possibility of placebo effect. However, it was not possible to study the cause and the effect relationship. It was also noted that the BMI was slightly higher in all the subjects. These findings are in accordance with Maigne JY, Doursounian L, Chatellier G (2000)[6] who studied the role of body mass index and found that body mass index which represents the obesity as one of the risk factor in coccydynia as it (BMI) determines the way a subject sits down. However these findings are not in accordance with Wray CC, Easom S, Hoskinson J (1991)[10] who reported that Physiotherapy was of little help but found that manipulation and injection was more successful and cured about 85% of their subjects. But the details about their subjects are unknown and their intervention was combined with local anesthtc injection.

This study had few limitations like smaller sample size and there was no 100% follow up of these subjects after the study. However, it is recommended that similar study can be done with larger sample size with an added follow up for at least considerable period of time.

Conclusion

Idiopathic coccydynia is somewhat common in obese individuals as it determines the way a subject sits. Coccygeal manipulation could be of help and can be used as an addition to the conventional physiotherapy treatment.

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Efficacy of intensive neurodevelopment therapy versus conventional physiotherapy in children with spastic cerebral palsy

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Abstract

Cerebral palsy (CP) is a well-recognized neurodevelopmental condition beginning in early childhood and persisting through the lifespan. There are many systems of treatment for cerebral palsy. In a very effective method of treatment, NDT, the patient learns to control movement through the use of the development sequence using activities that promote "normal" selective movements. The main aim of this study is to prove the difference of effectiveness of intensive neurodevelopment therapy with conventional physiotherapy treatment.

There were two groups of subjects. Pre test values of Gross Motor Functions (lying & rolling, sitting, crawling & kneeling, standing, walking, running & jumping) and Spasticity were measured on GMFM-66 Scale (Gross Motor Function Measure-66 Scale), and The Ashworth Scale on the first day of the treatment. Both the groups received treatment for minimum 5 days/week, having each treatment session of 50 minutes per day. Total therapy was given for 8 weeks. After 4 weeks and 8 weeks post treatment measurements were again taken for quantitative analysis.

Major findings

There is non significant improvement of gross motor functions (F value = 0.199, P>0.05) in group A, while there is significant reduction of spasticity of Rt. (F value = 5.333, P<0.05) and Lf. (F value = 4.800, P<0.05) Elbow flexors and Rt. (F value = 6.706, P<0.05) knee extensors in group A, the reduction of spasticity in Lf. (F value = 3.083, P>0.05) knee extensors and Rt. (F value = 2.018, P>0.05) and Lf. (F value = 2.053, P>0.05)Ankle Plantar-flexors are statistically non significant.

There is significant improvement of the gross motor functions (F value = 0.144, P>0.05) in cerebral palsy children of group B, and there is significant reduction of spasticity of Rt. (F value = 6.882, P<0.05) and Lf. (F value = 11.294, P<0.05) Elbow flexors and Rt. (F value = 10.857, P<0.05) and Lf. (F value = 3.692, P<0.05) knee extensors and Rt. (F value = 23.786, P<0.05) and Lf. (F value = 5.229, P<0.05)Ankle Plantar-flexors.

Keywords

Spastic cerebral palsy, Intensive Neurodevelopment Therapy, Conventional Physiotherapy, GMFM- Gross motor function measures, GMFCS-Gross motor function classification system.

Introduction

Cerebral palsy is not a disease, but is, rather, a category of disability including patients with one kind of problem: chronic non-progressive disorders of movement or posture of early onset. The anatomic sites of involvement, degree of motor disability, associated dysfunctions and cause are heterogenous. (Nelson K., 1988). Cerebral Palsy is often associated with other neurologic difficulties including mental retardation. (Nelson K., 1989).

Cerebral palsy is the most common cause of severe physical disability in childhood. The worldwide prevalence and incidence of the disorder are not clearly known. The overall reported prevalence in children aged 3–10 years is 2·4 per 1000 children, with variability in the reported rates in girls and boys. During the past 20 years, there have been increases in the incidence and prevalence of cerebral palsy that may be related to improved documentation of cases by national registries, advances in neonatal care, or other factors. (L Andrew Koman, 2004). It is the most common childhood physical disability and affects 2 to 2.5 children per 1,000 born in the United States. (Karen W. Krigger, 2006). The statistics reveal that in India about 25 lakh children are affected by cerebral palsy. (Dr. Harsharan Singh Oberoi, 2004).

Cerebral palsy (CP) is a well-recognized neurodevelopmental condition beginning in early childhood and persisting through the lifespan. Originally reported by Little in 1861 (and originally called 'cerebral paresis'),

Several assessment instruments are available to quantify and monitor developmental milestones and skills and to assess the quality of life of patients and their caregivers. Functional scales such as the Gross Motor Function Classification System for Cerebral Palsy Standardize self-initiated movements and measure change in gross motor function over time and this particular scale is widely accepted and easy to administer in the primary care office. (Robert Palisano, 1997).

The GMFM is a clinical measure designed to evaluate change in gross motor function in children with cerebral palsy. Items on the GMFM-88 span the spectrum for activities in lying and rolling up to walking, running and jumping skills. The GMFM readings can be taken even in children with cerebral palsy who use an ambulatory aid or orthosis. (Dianne J Russell, 2005).

The Ashworth and Modified Ashworth scales, are used to grade muscle spasticity. (Bohannon RW, 1987). The Ashworth Scale is a simple five point Likert scale in which the observer's subjective opinion of the subject's resting muscle tone ranges from 'normal' at the lowest grade to 'rigid' at the highest. (Bohannon RW, 1987).

There are many systems of treatment for cerebral palsy. Although these therapeutic approaches were devised for the cerebral palsies, many of them are also for delay and for

Table 1: Comparison of mean values for GMFM-66 Scores at different sessions within Group A (experimental) and Group B (control)

GMFM-66	Group A		Group B	
	F Value	P value	F Value	P value
R1 Vs R2 Vs R3	0.199	P>0.05	0.144	P>0.05

adults with neurological defects. Motor education and braces, progressive pattern movements, synergistic movement patterns, proprioceptive neuromuscular facilitation, neuromotor development, neurodevelopment treatment with reflex inhibition, sensory stimulation for activation and inhibition, reflex creeping and other reflex reactions, conductive education are commonly used for cerebral palsy. (Sophie Levitt, 2001). The conventional physiotherapy methods include repetitive passive range of motion exercises to maintain and improve joint mobility. Passive, static, gentle stretches are performed on individual joints to decrease and prevent joint contractures. (Dilip R. Patel, 2005). A program of progressive resisted exercises is used to improve muscle strength. (Dodd K, 2002).

K. Bobath and B. Both developed a treatment approach designed to increase normal movement patterns in children with cerebral palsy and adults with acquired hemiplegia. NDT focuses on restoring normal movements and eliminating abnormal movements. It is a "living concept". It is a problem solving approach that involves the treatment and management of movement dysfunction in individuals with CNS pathophysiology. The person is addressed as a whole, and intervention is individualized to meet his / her specific goals. (Catherine A. Trombly, 2002).

Current NDT principles include the encouragement of normal movement patterns through therapeutic handling during functional motor activities. Active participation of the child is encouraged to allow for the gradual withdrawal of therapist feedback. (Suzann K. Campbell, 2006). Although there are several reviews about the effectiveness of intensive NDT, researches are also there which are contradicting its effectiveness. So there are still requirement of researches which may prove the difference of effectiveness of intensive neurodevelopment therapy with conventional physiotherapy treatment. (Charlene Butler, 2001).

1.2. Objective of study

To compare the effectiveness of intensive Neurodevelopment therapy versus conventional physiotherapy in improving gross motor functions and in reducing spasticity in children with spastic cerebral palsy.

1.3. Hypothesis

Alternate hypothesis: There is a significant difference between effects of intensive Neurodevelopment therapy with conventional physiotherapy in improving gross motor function and reducing spasticity in children with spastic cerebral palsy.

Null hypothesis: There is no significant difference between effects of intensive Neurodevelopment therapy with conventional physiotherapy in improving gross motor function and reducing spasticity in children with spastic cerebral palsy.

Materials and methods

Study design and methodology

3.1. Study design: Quasi Experimental design, comparative in nature.

3.2. Study setting: Department of Physiotherapy, Lovely Professional University, Chaheru, Phagwara, Saket Hospital for orthopedically handicapped, Sector-1, Panchkula and children orphanage home of Missionaries of charity-Mother Teresa, Kewal Bihar, Jalandhar.

3.3. Population and sampling

Population of study: Children of spastic cerebral palsy.

Sampling method: Convenient Sampling

Gender: Out of 14 subjects, 4 were males and 10 were females.

Sample size: Total 14 patients, out of which 10 were of Spastic Diplegic cerebral palsy and 4 were of Spastic Quadriplegic cerebral palsy type.

3.4. Sampling criteria

3.4.1. Inclusion criteria

- Children having Spastic cerebral palsy (Diplegic, Quadriplegic).
- Having the age group of 4-12 years.
- Child of both genders.
- Spasticity grading-from 1 to 4 (Acc. to The Ashworth Scale)
- GMFCS (Gross motor functional classification system) level- II to V.

3.4.2. Exclusion criteria

- Any orthopaedic remedial surgery as T.A. lengthening.
- Musculoskeletal Deformities as CTEV.

Table 2: Comparison of mean values of grades of spasticity for Right/Left Elbow Flexors at different sessions within Group A (experimental) and Group B (control)

Right/Left Elbow Flexors	Group A (Rt.)		Group B (Rt.)		Group A (Lf.)		Group B (Lf.)	
	F Value	P value	F Value	P value	F Value	P value	F Value	P value
R1 Vs R2 Vs R3	5.333	**P < 0.05**	6.882	**P < 0.05**	4.800	**P < 0.05**	11.294	**P < 0.05**

Table 2: Comparison of mean values of grades of spasticity for Right/Left Elbow Flexors at different sessions within Group A (experimental) and Group B (control)

Right/Left Knee Extensors	Group A (Rt.)		Group B (Rt.)		Group A (Lf.)		Group B (Lf.)	
	F Value	P value	F Value	P value	F Value	P value	F Value	P value
R1 Vs R2 Vs R3	6.706	**P < 0.05**	3.083	P>0.05	3.692	**P < 0.05**	10.857	**P < 0.05**

Table 3: Comparison of mean values of grades of spasticity for Right/Left Knee Extensors at different sessions within Group A (experimental) and Group B (control)

Right/Left Knee Extensors	Group A (Rt.)		Group B (Rt.)		Group A (Lf.)		Group B (Lf.)	
	F Value	P value	F Value	P value	F Value	P value	F Value	P value
R1 Vs R2 Vs R3	6.706	**P < 0.05**	3.083	P>0.05	3.692	**P < 0.05**	10.857	**P < 0.05**

Table 4: Comparison of mean values of grades of spasticity for Right/Left Ankle Plantar-flexors at different sessions within Group A (experimental) and Group B (control)

Right/Left Ankle Plantar-flexors	Group A (Rt.)		Group B (Rt.)		Group A (Lf.)		Group B (Lf.)	
	F Value	P value	F Value	P value	F Value	P value	F Value	P value
R1 Vs R2 Vs R3	2.018	P>0.05	2.053	P>0.05	5.229	**P < 0.05**	23.786	**P < 0.05**

Fig.1: Comparison of mean values for GMFM-66 Scores at different sessions between Group A (experimental) and Group B (control).

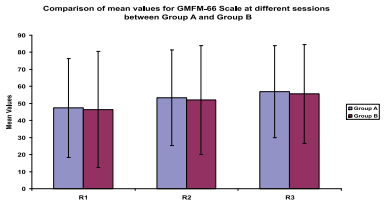


Fig.2: Comparison of mean values of grades of spasticity for Right Elbow Flexors at different sessions between Group A (experimental) and Group B (control).

Fig.3: Comparison of mean values of grades of spasticity for Left Elbow Flexors at different sessions between Group A (experimental) and Group B (control).

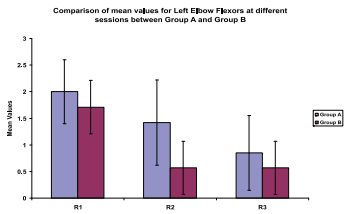
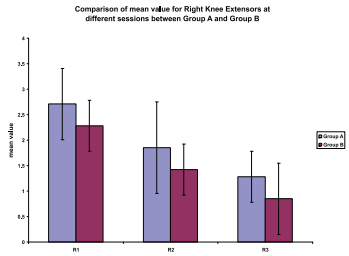


Fig.4: Comparison of mean values of grades of spasticity for right Knee Extensors at different sessions between group A (experimental) and group B (control).



- Botox therapy in the last 6 months.
- Presently taking any other medical treatment for spasticity.
- Present history of seizures.
- Participation in other therapeutic programs except for physical therapy.

3.5. Variables

Independent variables:
- Intensive Neurodevelopment therapy
- Conventional physiotherapy

Dependent variables:
- Gross Motor Functions
- Spasticity

3.6. Instrumentation and tool for data collection

Fig.5: Comparison of mean values of grades of spasticity for Left Knee Extensors at different sessions between Group A (experimental) and Group B (control).

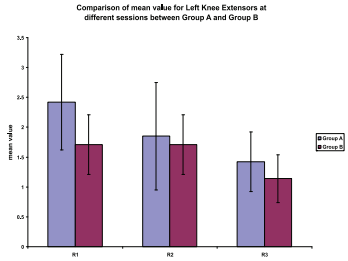


Fig.6: Comparison of mean values of grades of spasticity for Right Ankle Plantaflexors at different sessions between Group A (experimental) and Group B (control).

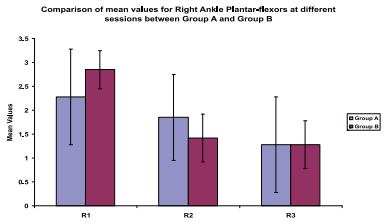
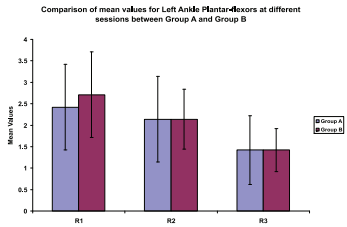


Fig.7: Comparison of mean values of grades of spasticity for Left Ankle Plantar-flexors at different sessions between Group A (experimental) and Group B (control).



Assessment tools

1. **GMFM (Gross Motor Function Measure) Scale-** The GMFM is a clinical measure designed to evaluate change in gross motor function in children with cerebral palsy. (Dianne J Russell, Lisa M Avery et al., 2000).
2. **GMFCS (Gross Motor Function Classification System)-** The Gross Motor Function Classification System for cerebral palsy is based on self initiated movement with particular emphasis on sitting (trunkal control) and walking. The description of the five levels represents the highest level of mobility that a child is expected to achieve between 6 to 12 years of age.
3. **The Ashworth scale-** The Ashworth Scale is a simple five point Likert scale in which the observer's subjective opinion of the subject's resting muscle tone ranges from 'normal' at the lowest grade to 'rigid' at the highest.

Instrument

Mat, Wedge, Thera Balls, Bolsters, Chairs, Stool, Standing Frames.

3.7. Technique of data collection procedure

The informed consent was taken from parents /caretakers/ guardians. Then the subjects were divided conveniently in to

two groups- Group – A and Group – B. Group – A was considered as the experimental group and Intensive Neurodevelopment Therapy was given. Group – B was considered as the control group and Conventional Physiotherapy was given.

All the subjects were assessed for parameters of Gross Motor Functions and Spasticity. Both the groups received treatment for minimum 5 days/week, having each treatment session of 50 minutes per day. Total treatment was given for 8 weeks. After 4 weeks and 8 weeks post treatment measurements were taken on The Ashworth Scale and Gross Motor Function Measure -66 scale for quantitative analysis.

3.8. Technique of data analysis and interpretation

Data collected were analyzed using Paired 't' test and ANOVA to measure the changes between the pre and post test values within and between the groups.

(a) Paired 't' test

(b) Analysis of Variance (ANOVA)

Data interpretation

Table-1. When comparing the effects of intensive neurodevelopment therapy with conventional physiotherapy in improving the gross motor functions, the difference between the two techniques is non significant with 't' value of 0.054, 0.085, 0.083 and -0.141 at 0.05 level.

Table-2. When comparing for the reduction of spasticity for the Right and left elbow flexors, the difference is non significant with 't' value of 0.866, 0.000, 0.522, 1.000 and 1.000, 0.0866 , 0.000 , except for the difference of R2 value, which is significant with a 't'-value of 2.384 at 0.05 level.

Table-3. On comparison for reduction of spasticity in the right and left knee extensors, the difference is non significant with 't' value of 1.260, 1.083, 1.342, 0.000 and 2.041, 0.369, 1.155, 1.441 at 0.05 level.

Table-4. When comparing for the reduction of spasticity in the right and left ankle plantar-flexors, the difference between the intensive neurodevelopment therapy with conventional physiotherapy is non significant with 't' value of -1.477, 1.083, 0.000, -1.549 and 0.555, 0.000, 0.000, 0.795 at 0.05 level.

Discussion

The present study done on the efficacy of intensive neurodevelopment therapy versus conventional physiotherapy in children with spastic cerebral palsy has shown the results that there is improvement of gross motor functions measured by GMFM-66 and the reduction in spasticity measured by the Ashworth scale in both the experimental and the control groups, but when we are comparing the effects of two techniques with each other, then there is no significant difference between the two.

Thus there is no significant effect of intensive Neurodevelopmental therapy in improving the gross motor functions, and in reduction of spasticity in children with cerebral palsy. The findings are in accordance with the work of Charlene Butler and Johanna Darrah who studied the Effects of Neurodevelopmental treatment (NDT) for cerebral palsy in a review. This review included studies in which the intervention (1) was stated to be exclusively NDT, (2) was stated to be NDT but combined with other Sensorimotor techniques, or (3) could be identified by the review authors as NDT-based therapy from the description of procedures that specified inhibition of primitive responses and pathological reflexes, facilitation of postural reactions, and normalization of muscle tone. The review is limited to studies in which all the participants were diagnosed with CP or studies in which there were specific data for those with CP. The participants may have also had additional impairments common in CP, such as mental retardation or related developmental disabilities.

5.1 limitations

- Very small sample size.
- Subjects were not assessed for their IQ and cognitive levels.
- The subjects were allowed to use any Orthosis and were not limited to the use of any single.
- Previous treatment undertaken medical or physiotherapy was not being considered.
- Children having a wide range of spasticity grading from 1-4 (According to The Ashworth Scale) were included.
- Children having a wide range of GMFCS (Gross motor functional classification system) level from 1-5 were included.
- Other activities in school, family and therapy schedule were not controlled.

5.2 Recommendations

Based on the outcome of the statistical analysis, it is suggested that the future studies can be modified to accommodate the following changes

- To use same form of treatment for other types of cerebral palsy.
- Other forms of motor function scales can be used for assessment.
- EMG can be used for assessment.
- Possible neural mechanism can be studied after Neurodevelopmental therapy.
- This study can be done for children with mental retardation also.

Summary and conclusion

On the basis of data analyzed, discussion and interpretation, the findings of this study can be concluded as follows.

Both the Intensive Neurodevelopment therapy and the conventional physiotherapy are equally effective in improving the gross motor functions in cerebral palsy children.

Both the Intensive Neurodevelopment therapy and the conventional physiotherapy are equally effective in reducing the spasticity, which is statistically significant for right and left elbow flexors and right and left knee extensors in cerebral palsy children.

The conventional physiotherapy is more effective than intensive neurodevelopment therapy in reducing the spasticity of right and left ankle plantar-flexors in cerebral palsy children.

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Effect of advanced techniques in improving upper limb functions in patients with stroke: A comparative study

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Abstract

Objective

To compare the effect of advanced techniques in improving upper limb functions in patients with stroke.

Design

Experimental design.

Study setting

The active treatment took place at a clinic within the physiotherapy outpatient unit at Prakash Hospital, Noida, PIPRAMS (Greater Noida)

Intervention

30 participants of either sex, fitting the inclusion criteria were assigned in two equal groups,Group I who recieved Motor Relearning Program(MRP) and Group II who received Propioceptive Neuromuscular Facilitation Technique(PNF). The baseline and outcome measures of ADL were taken on the Functional Independence Measure (FIM)using sub-sections on self-care before and after the treatment.

Result and conclusion

The results show that there is no significant differences (P>0.005) found in the distribution of age, sex and side involved between the groups. So these aspects can be considered to have no influence on the results of the present study. The conclusion of the present study is that no one technique is found to be more effective over the other Both the treatment techniques were found to improve the upper limb functions in one or the other aspect and therefore it is more beneficial if the techniques will be used in adjunct to each other for rehabilitation so that the overall all improvement could be achieved.

Key words

Stroke, MRP, PNF, FIM.

Introduction

Although the incidence of stroke is decreasing, its prevalence in the population is increasing because of enhanced survival and growing elderly population[1]. Broad discussion of disability suggests that about half of the patients die within the first few weeks and of the survivors, one – third will remain dependent and bedfast, another third will recover leaving a remaining third with some degree of residual functional incapacity[2]. Some of the impairments related to the stroke are motor and sensory dysfunction, aphasia or dysarthria, visual field defects and mental and intellectual impairments. Impairments that interfere with functional movement of the limbs are the changes in muscle strength, tone and activation. Impairment of upper limb functions contributes greatly to functional disability after stroke[4]. The incidence of dependence in ADL is highest immediately after stroke. Most stroke patients show considerable recovery of function over the first few months, although the exact extent and duration of this recovery is less certain[3]. In general neurological recovery occurs within the first 1-3 months following stroke[1,3,4,6]. Further motor and sensory recovery may continue to occur six months[5] to year later however these changes may not reach statistical or clinical significance[1]. Detailed knowledge of the time course of recovery is indispensable to rational planning of rehabilitation, discharge time, discharge placement and to informing patient and family about the prognosis and the possibility of further recovery[4]. Studies[7] analyzing the acute recovery patterns in stroke patients presents results concerning the critical factors, influencing functional outcome, like age, hemisphere involved, artery involved. Nowadays there are unlimited numbers of techniques in physiotherapy for treatment of the hemiplegia. The techniques differ in their basic concepts and the treatment effects. The Proprioceptive Neuromuscular Facilitation (PNF) technique is based on the neurophysiological aspect of the human body and promotes or hastens the response of the neuromuscular mechanism through stimulation of the proprioceptors. This technique helps in the movements of the extremities in patterns used in the daily activities and therefore facilitates movement. On the other hand Motor Relearning Programme (MRP) is the most widely used technique nowadays is based on the new concepts of motor control and motor learning and emphasizes in the correct and constant practice of tasks involving the extremities which are useful for the patient in their ADL and discourage the compensatory techniques which the patient tend to develop after stroke attack. The two techniques are quite different in their concepts but are considered to be effective in treating the same disorder.

Methods

Subjects: 30 patients of either sex with age 40-60 years was undertaken to determine whether the use of PNF or MRP is beneficial in upper limb functions of stroke patients. All patients were assessed by a neurologist confirming the diagnosis as 'stroke' within first 48 hours of onset. The subjects were randomly assigned on the basis of their order of recruitment in the study, for two protocols of treatment

consisting of MRP and PNF techniques and the initial detailed neurological assessment including the tonal assessment on Modified Ashworth Scale was done. The baseline and outcome measures of ADL were taken on the Functional Independence Measure (FIM) using sub-sections on self with following

Table:1 Showing the data of subjects

Character	Description	Group I(n=15)	Group II(n=15)
Age (in yrs.)	Mean(SD)	59.26(13.87)	61.53(14.46)
Sex	Male	6	10
Female	9	5	
Side involved	Right	8	11
Left	7	4	

Inclusion criteria:

1. First ever stroke involving an ischaemic infarct in the territory of the middle cerebral artery (MCA).
2. Impaired motor function of upper extremity.
3. Informed consent to participate.
4. Full-text, English-language publications.

Exclusion criteria were:

1. No complicated medical history such as cardiac, pulmonary, orthopedic or other neurological disorder unrelated to stroke.

Table 2: Reveals comparison between FIM Scores in Group A and Group B. Table also Reveals mean of differance of sub divisions of FIM scale between the Two Groups.

Sub-scale	Observation	Group I		Group II		t-value	p-value	Result
		Mean	SD	Mean	SD			
Feeding	**0**	1.06	.25	1	0	0.32	1.00	NS
	1	1.4	.50	1.53	.63	0.73	0.63	NS
	2	1.93	1.09	2.13	.99	0.69	0.52	NS
	3	2.46	1.30	2.86	1.06	0.81	0.92	NS
Grooming	**0**	1.06	.25	1	0	0.32	1.00	NS
	1	1.66	.89	1.8	.77	0.66	0.43	NS
	2	1.86	.99	2.33	.72	0.92	1.47	NS
	3	2.6	1.45	3.4	1.24	0.94	1.62	NS
Bathing	**0**	1.06	.25	1.2	.41	0.29	1.05	NS
	1	1.66	.89	1.93	1.16	0.75	0.70	NS
	2	2	1.19	2.46	1.06	0.86	1.13	NS
	3	2.73	1.53	3.46	1.64	0.89	1.26	NS
Dressing(u)	**0**	1.06	.25	1.46	.63	0.03	2.24	*
	1	1.8	.56	2.26	1.09	0.92	1.46	NS
	2	2.33	.61	2.86	.91	0.96	1.87	NS
	3	2.93	.59	3.8	1.14	0.99	2.60	NS
Dressing(L)	**0**	1.06	.25	1.4	.50	0.03	2.26	*
	1	1.6	.50	1.93	.88	0.89	1.26	NS
	2	2.06	.45	2.73	.88	0.99	2.59	NS
	3	3	.65	3.53	1.24	0.92	1.46	NS
Toileting	**0**	1.4	.50	1.6	.50	0.28	1.08	NS
	1	2.13	1.40	2.73	1.16	0.89	1.27	NS
	2	2.73	1.43	3.46	1.30	0.92	1.46	NS
	3	3.46	1.64	4.53	1.64	0.95	1.77	NS
Total	**0**	6.73	1.53	7.66	1.75	0.13	1.54	NS
	1	10.26	4.25	12.2	4.53	0.88	1.20	NS

* - Significant at <0.05, NS- non significant

Table 3: Reveals Scores of FIM Within Group I and Group II. Table also reveals mean of differance of sub divisions of FIM scale within the Two Groups.

Scale	Observation	Group I			Group II		
	f-value	p-value	Result	f-value	p-value	Result	
Feeding	**0-1**	0.333	0.11	NS	0.533	0.03	*
	1-2	0.533	0.08	NS	0.600	0.01	*
	2-3	0.533	0.00	*	0.733	0.00	*
	0-3	1.4	0.00	*	1.867	0.00	*
Grooming	**0-1**	0.600	0.08	NS	0.800	0.00	*
	1-2	0.200	0.49	NS	0.533	0.00	*
	2-3	0.733	0.00	*	1.067	0.00	*
	0-3	1.533	0.00	*	2.400	0.00	*
Bathing	**0-1**	0.600	0.08	NS	0.733	0.03	*
	1-2	0.333	0.57	NS	0.533	0.03	*
	2-3	0.733	0.00	*	1.000	0.00	*
	0-3	1.667	0.00	*	2.267	0.00	*
Dressing(U)	**0-1**	0.733	0.00	*	0.800	0.00	*
	1-2	0.533	0.00	*	0.600	0.00	*
	2-3	0.600	0.00	*	0.933	0.00	*
	0-3	1.867	0.00	*	2.333	0.00	*
Dressing(L)	**0-1**	0.733	0.00	*	0.867	0.00	*
	1-2	0.267	0.24	NS	0.467	0.08	NS
	2-3	0.867	0.00	*	1.067	0.00	*
	0-3	1.867	0.00	*	2.400	0.00	*
Toileting	**0-1**	0.733	0.06	NS	1.133	0.00	*
	1-2	0.600	0.01	*	0.733	0.00	*
	2-3	0.733	0.00	*	1.067	0.00	*
	0-3	2.067	0.00	*	2.933	0.00	*
Total	**0-1**	3.533	0.01	*	4.533	0.00	*
	1-2	0.444	0.00	*	3.800	0.00	*
	2-3	4.267	0.00	*	5.600	0.00	*
	0-3	10.467	0.00	*	13.933	0.00	*

* - Significant at <0.05, NS- non significant

2. No deficit in conscience, orientation, memory, understanding and no sensory aphasia.
3. Animal and cadaver studies Before initiation of the study, institutional review board approval was obtained.

Treatment protocol

Patients were divided by convenient sampling method into two groups A and B. After taking the baseline scores on FIM scales the treatment to groups I and II was given on basis of the techniques of MRP and PNF for the upper limb respectively. All the subjects were given the treatment for three consecutive weeks, five days a week making it 15 sessions in total. The time duration was variable according to the fatigue level of the patient and was seen to increase from an initial of 10 minutes to a maximum of 40 minutes for the upper limb. The researcher herself assessed all outcome variables weekly. The repeated measurements were taken on FIM scales. The final outcome was measured at the end of 3rd week after completion of the 15 sessions. The patient for the purpose of assessment performed all the activities FIM in presence of the researcher.

Data analysis

Data collected was analyzed using Un-Paired t- Test to measure the changes between the Pre and the Post test values within the group.The significance (Probability-P) was selected as 0.05. The repeated measure ANOVA with post-hoc analysis on Bonferroni was used to see the within group differences. The data were analyzed under the supervision of an experienced and qualified statistician using STATA (8.0 version) at the Biostatistical Department of AIIMS, New Delhi.

Results

Subject information

Age distribution

Group I contains 15 patients age 40-60 (in yrs.). The mean is 59.26 and SD= 13.87 Group II contains 15 patients 40-60 (in yrs.). The mean is 61.53 and SD= 14.46(Table: 1) There was no significant difference for age distribution between the two groups. (p = 0.6648)

Sex distribution: Group I contains 15 patients males = 6 and females = 9. Group II contains 15 patients males = 10 and females = 5. There was no significant difference for sex distribution between the two groups. (p = 0.143)

Side distribution (involved): Group I contains 15 patients left = 7 and right = 8. Group II contains 15 patients left = 4 and right = 11. There was no significant difference for involved side distribution between the two groups. (p = 0.256)

Discussion

The aim of the study was to investigate the effect of advance techniques in upper limb functions in Stroke patients. Total 30 patients were taken. Un-paired T-Test was used to analyse the results. Patient outcomes were measured on the FIM. In FIM total scores there was a significant improvement in both the groups with every week treatment. Considering the sub-sections of FIM it was found that scores for the first two weeks for feeding, grooming and bathing and also the score for first week of toileting there was significant improvement in group of subjects treated with the PNF but no such significant improvement was seen in the MRP group during the same time frame. Activities like feeding, grooming, bathing and toileting requires manipulation as well as transportation of the objects from one place to another so therefore PNF techniques have been shown to improve impairment range of motion, co-ordination, strength and even endurance. When the final scores were considered for these sub-sections it can be inferred that the PNF techniques are rightly more effective in the initial stage as it works on the impairment level. The summary effect size for outcome variables defined on the neuromuscular level is almost three times high as for functional outcome parameters. This finding may reflect the higher responsiveness of assessment instruments for neuromuscular functioning and supports the assumptions that improvements on an impairment level are not unequivocally related to improvements in disability [27]. We know that MRP deals with the upper limb tasks related to reaching, balancing, manipulation and dexterity. Our hands require placement at the appropriate place for manipulation in the working environment and to transport the objects from one place to another. The muscle forces produced and the timing and sequencing of joint movement involved in a specific action are a function of the task being performed, the object, the individual's position relative to the object and the constraints of the environment. Training is designed to help the patient regain the ability to harness the degrees of freedom available so the limb functions as a coordinated unit in functional actions with many different goals. Skilled motor actions are characterized by the patterns of segmental movement which best address the spatiotemporal demands of the action. PNF techniques have been shown to improve impairment range of motion, co-ordination, strength and even endurance since the technique incorporates the motion of the body segments in the full range at all the joints into patterns that are useful in daily activities. As the results show greater improvements with the PNF in the initial weeks therefore it can be used with MRP to work on the impairment level so that the patient will be able to improve on the impairment as well as functional limitation like feeding, grooming etc. Finally the results show that no technique could show 100% improvement but they work on different aspects of disability

Conclusion

The conclusion of the present study is that no one technique is found to be more effective over the other and the hypothesis that MRP is more effective in treatment of upper limb functions in stoke patients is found to be wrong. Both the treatment techniques were found to improve the upper limb functions in one or the other aspect and there fore it is more beneficial if the techniques will be used in adjunct to each other for rehabilitation so that the overall all improvement could be achieved.

Limitations

1. Small number of subjects
2. Duration of study was small
3. Area of population was small so can't be generalized.
4. The functional scales lack the focus on the muscle strength and endurance.

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Effects of physical therapy treatments with and without spinal mobilization in individuals with acute nonspecific low back pain: A randomized trial

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Abstract

Background

The benefits of spinal mobilization in low back pain were claimed in pain reduction and movement promotion.

Objective

This study aimed to investigate the effects of physical therapy treatments combined with spinal mobilization in individuals with acute nonspecific low back pain (LBP).

Material and method

Fifty subjects were randomized to a physical therapy treatments group (CON group) or a mobilization with physical therapy treatments group (MOB) group. The treatment program lasted 6 weeks maximum on a twice weekly basis. Pain, active range of motion (AROM), disability, and change at the beginning of treatment (except change), 1 week, after treatment, and 3-month follow-up were assessed.

Results

The subjects in each group had significant improvement in pain, AROM, disability, and change ($p<0.05$) but between-groups differences were not found.

Conclusion

The study showed the effects of treatments in both groups but there was no difference between the groups in any parameters. Further study, it is interesting to study the effects of spinal mobilization in individuals with LBP and obvious stiffness.

Keywords

Back pain, Physical therapy, Manipulative therapy, Manual therapy, Disability

Introduction

Low back pain (LBP) is one of the most prevalent problems, it was estimated that the lifetime prevalence of LBP is at least 60 to 70 percent[1,2]. According to the diagnostic triage, LBP could be divided into nonspecific LBP, radicular syndrome, and specific pathologic change[3]. Among LBP patients, most of them have the diagnosis of nonspecific LBP[4]. The recovery of LBP, it was estimated that 30-60 percent of LBP patients recover in one week, 60-90 percent in 6 weeks, and 95 percent in 12 weeks[4,5]. While, about 40 percent of LBP patients have recurrences within 6 months[6].

There are many options for LBP treatments such as spinal manipulative therapy (SMT), deep massage, therapeutic exercise, ultrasound therapy, and heat or cold modalities[7]. Among these modalities, they have their own specific therapeutic effects with different physiological explanations. Spinal manipulative therapy or SMT includes both manipulation and mobilization. Manipulation is a high velocity thrust of small amplitude performed at the limit of available movement, and mobilization is defined as low-velocity repetitive oscillations[8]. There are some good-quality systematic reviews indicating that SMT is beneficial in pain reduction over sham treatments[9,11], and in function improvement over sham treatments[9,11,12]. In addition, it was reported that mobilization has the effect of pain reduction in LBP patients[13,14]. However, SMT does not maintain the benefits in long term for acute LBP[9,10,12]. Besides SMT, other physical therapy modalities seem to be unclear in their therapeutic effect for acute LBP patients[15].

Practically, in a treatment session, more than one intervention are chosen for treating LBP patients after the relevant physical examination has been conducted by physical therapists[16]. It is interesting that the use of treatment combination may be more effective for LBP patients. Therefore, the objective of this study was to investigate spinal mobilization with physical therapy interventions in individuals with acute nonspecific LBP, and to compare this group with a control group treated with physical therapy interventions only. The hypothesis was that spinal mobilization with physical therapy interventions is more effective.

Methods

Subjects

Fifty individuals (33 females and 17 males) with acute nonspecific LBP seeking physical therapy treatment at Physical Therapy Clinic, Faculty of Physical Therapy, Mahidol University volunteered to participate in the study. They were explained about general information and objectives of the study.

Inclusion criteria

Men or women aged 30-50 years with acute LBP (pain < 1 month) without radiation below gluteal folds.

Exclusion criteria

Prior episode of LBP within previous 6 months, pregnancy, prior spinal surgery, known lumbar disc hernia, diagnosed

joint inflammatory disease, neurological involvement, cancer, or receiving other forms of treatment rather than physical therapy such as back pain injection, steroids use. The Ethics Committee, Faculty of Medicine Siriraj Hospital Mahidol University, approved the study.

Procedure

The patients were randomized into either of two treatment groups: a control group received physical therapy treatments (CON group) and an experimental group received physical therapy and spinal mobilization treatments (MOB group). Physical examinations were done by assigned physical therapists with more than 6 years of experience in musculoskeletal physical therapy and spinal mobilization. Baseline, 1-week, after the intervention and at 3-month follow-up, assessments were made.

Pain assessment: Visual analog scales (VAS) with 100-mm horizontal line anchored by 'no pain' and 'worst pain imaginable'[17] were used. The patient exposed the magnitude of pain with a mark on the line.

Active range of motion (AROM) tests: In this study, AROM assessments included flexion, extension, and right and left lateral flexion. Modified-modified Schober techniques, tape methods[18] were used and the assessments were performed by a research assistant. The training session for the assessments of all directions was given to the research assistant. In the study, the treating therapists were blinded to values measured. The starting position of measurement for all directions was in standing with hips and knees in neutral position; the distance between feet equals to shoulder's width. For flexion and extension, the tape was aligned from baseline landmark (at the middle of spine in line between both sides of PSIS) to 15 cm above the baseline landmark. The patients moved both hands down as far as possible while keeping knees extended. The research assistant recorded the difference of distance between the superior and the baseline landmarks by subtracting from 15 cm while the

Table 1: Subjects' characteristics (n = 50)

	CON-group (n=25)	MOB-group (n=25)
Age (years)	39.2 (6.1)	39.5 (6.0)
Weight (kg)	59.7 (11.0)	64.4 (11.5)
Height (cm)	159.6 (6.8)	162.6 (6.9)
BMI (kg/m^2)	23.4 (4.0)	24.4 (4.7)
Duration of symptoms (days)	11.6 (4.8)	10.8 (5.4)
VAS pain (mm)	44.9 (23.7)	52.4 (24.5)
AROM flexion (cm)	5.0 (1.4)	5.1 (1.3)
AROM extension (cm)	1.7 (1.2)	1.4 (1.0)
AROM right lateral flexion (cm)	18.6 (4.8)	20.0 (3.9)
AROM left lateral flexion (cm)	19.2 (3.6)	19.8 (3.8)
ODQ (%)	23.6 (17.0)	21.1 (17.5)

Data are means and (SD), BMI = Body mass index

Fig. 1: Pain intensity (VAS) at baseline, 1 week, after the treatment program, and at 3-month follow-up. CON group = control group receiving physical therapy treatments; MOB group = mobilization group with physical therapy treatments.

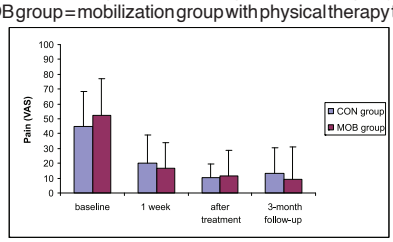

Fig. 2: Functional disability (ODQ) at baseline, 1 week, after the treatment program, and at 3-month follow-up. CON group = control group receiving physical therapy treatments; MOB group = mobilization group with physical therapy treatments.

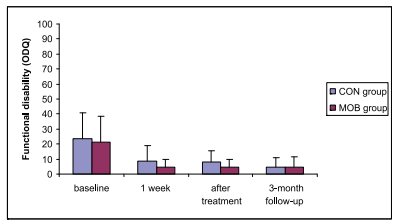

Fig. 3: Patient's perception of change (VAS) at baseline, 1 week, after the treatment program, and at 3-month follow-up. CON group = control group receiving physical therapy treatments; MOB group = mobilization group with physical therapy treatments.

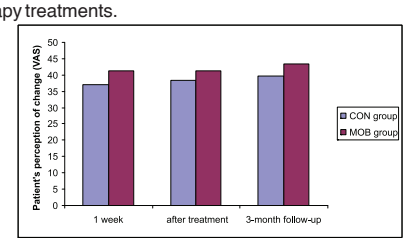

Table 2: Means and SDs for the CON and MOB groups (n = 25 of each)

	Baseline	1 week	After	3 months	p (within)	p (between)
VAS pain (mm)						
CON group	44.9 (23.7)	20.4 (18.9)	10.3 (9.3)	13.2 (17.4)	<0.001*	0.921
MOB group	52.4 (24.5)	16.7 (17.3)	11.3 (17.6)	9.4 (21.5)	<0.001*	
AROM (cm)						
Flexion						
CON group	5.0 (1.4)	5.3 (1.4)	5.5 (1.2)	5.7 (1.3)	0.079	0.712
MOB group	5.1 (1.3)	5.2 (1.2)	5.4 (1.2)	5.5 (1.4)	0.089	
Extension						
CON group	1.7 (1.2)	2.3 (1.4)	2.4 (1.3)	2.3 (1.3)	0.002*	0.719
MOB group	1.4 (1.0)	2.2 (1.1)	2.2 (1.0)	2.3 (1.2)	0.001*	
Right lateral flexion						
CON group	18.6 (4.8)	19.4 (4.5)	19.8 (4.5)	19.8 (4.2)	0.029*	0.153
MOB group	20.0 (3.9)	20.8 (4.4)	21.8 (4.2)	21.9 (4.1)	0.013*	
Left lateral flexion						
CON group	19.2 (3.6)	19.9 (3.5)	20.0 (3.9)	20.3 (3.3)	0.044*	0.132
MOB group	19.8 (3.8)	21.4 (3.7)	21.9 (3.6)	22.1 (3.4)	0.002*	
ODQ (%)						
CON group	23.6 (17.0)	8.8 (10.1)	7.8 (7.6)	4.7 (6.0)	<0.001*	0.236
MOB group	21.1 (17.5)	4.4 (5.1)	4.4 (5.1)	4.5 (7.2)	<0.001*	
PPC (mm)						
CON group	—	37.1 (10.4)	38.3 (8.6)	39.8 (12.1)	0.313	0.082
MOB group	—	41.4 (10.7)	41.4 (10.7)	43.4 (12.4)	0.439	

subject fully flexed or extended. For right and left lateral flexion, the research assistant marked the position of the tip of middle finger. Then the patients laterally flexed and moved hand down side of leg as far as possible. The difference between skin mark on thigh in erect standing and skin mark on thigh in full lateral flexion was recorded. The research assistant's intra-tester reliability of the AROM assessments in flexion, extension, right and left lateral flexion was high, with intraclass correlation coefficients [$ICC_{(3,1)}$] of 0.96, 0.97, 0.96, and 0.94 respectively.

Functional disability

Thai version modified Oswestry Disability Questionnaire (ODQ) was used to assess physical function. Thai modified ODQ is composed of 10 items: pain intensity, personal care, lifting, walking, sitting, standing, sleeping, social life, traveling, employment/ home making, which is categorized into 6 levels of each item starting from 0 (no disability) to 5 (highest disability). The ODQ is designed to provide a percentage score of disability and to assess how pain affects various activities of daily living[19,21].

One week, after the intervention, and at the 3-month follow-up, the patients expressed their change with a mark on patient's perception of change (PPC) line. The PPC is a three-point VAS horizontal line with 100-mm long (-50, 0, 50), which the left end anchored by 'worst change', the middle 'unchanged', and the right end 'completely recovered'. At the 3-month follow-ups, the patients were questioned about their treatments received additionally after the program. The patients lost in appointment at any time throughout the study, considered as drop-outs, would be replaced by new patients until the number of patients in each group reached accordingly to the sample size calculation, 25 patients per group.

The treatment program lasted 6 weeks maximally. The decision to finish the treatment program was made by the treating therapists together with the patients' recovery.

Intervention

CON group

Twenty–five CON-group patients completely underwent a physical therapy treatment program, individually meeting with a treating CON-group therapist twice a week for 60 minutes maximally. After physical examination, the CON-group patients were given a combination of interventions including hot pack, cold pack, ultrasound, massage, lumbar traction, and stretching exercise. Neither spinal mobilization nor manipulation was done. The patients were supervised basic ergonomics and were also suggested to continue their usual activities or prescribed exercises.

MOB group

Twenty–five MOB-group patients completely underwent a physical therapy treatment program, individually meeting with a treating MOB-group therapist twice a week for 60 minutes maximally. After physical examination, spinal mobilization was also given to all MOB-group patients based on findings from the physical examination and Maitland's selection of technique[8]. The mobilization technique included central posteroanterior (PA), unilateral PA, and transverse gliding with 100 repetitions per an area. The spinal mobilization treatment time lasted 5 minutes, no manipulation was given. The overall treatment session lasted 60 minutes maximally. If the MOB-group subjects needed other modalities for other therapeutic effects, hot pack, cold pack, ultrasound, deep friction, mechanical traction could be given. The patients were supervised basic ergonomics and were also suggested to continue their usual activities or prescribed exercises.

Data analysis

The statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS). The level of statistical significance was set at $p < 0.05$. The data in this study were normally distributed, the parametric statistics were used.

- Unpaired t-test was used to assess difference on baseline data between two groups.
- Two-way repeated measures Analysis of Variance (ANOVA) was used to assess difference in outcome measures within each group and between two groups during 1-week, after the treatment program, and at 3-month follow-up.
- Bonferroni post hoc was used for multiple comparisons to assess differences within each group and between two groups.

Results

Fifty patients, 25 of each group, completely received the treatment program. During the study, there were 5 and 3 subjects in the CON and MOB groups respectively lost follow-ups, or drop-outs. New subjects were then replaced fulfilling that group from the beginning to the end of the procedure until each group had 25 subjects totally. The data of baseline assessments showed no significant difference between the two groups regarding age, weight, height, BMI, pain, AROM, and ODQ (Table 1).

Within-group analysis

The analysis of difference within each group, the CON group showed significant improvements over time regarding pain ($p < 0.001$), AROM; extension ($p = 0.002$), right lateral flexion ($p = 0.029$), left lateral flexion ($p = 0.044$), and ODQ ($p < 0.001$) (Table 2). The MOB group also had significant improvements regarding pain ($p < 0.001$), AROM; extension ($p = 0.001$), right lateral flexion ($p = 0.013$), left lateral flexion ($p = 0.002$), and ODQ ($p < 0.001$) (Table 2). Anyhow, in AROM of flexion and PPC, there was no significant difference found in each group.

Between-groups analysis

Consideration of between-group difference, there was no significant difference between two groups with regard to pain ($p = 0.921$), AROM; flexion ($p = 0.712$), extension ($p = 0.719$), right lateral flexion ($p = 0.153$), left lateral flexion ($p = 0.132$), ODQ ($p = 0.236$), and PPC ($p = 0.082$) (Table 2).

Discussion

The results of this study indicate significant improvement regarding pain intensity, active range of motion, functional disability, and patient's perception of change in each group. Therefore, it can be implemented that either physical therapy treatments or physical therapy treatments with spinal mobilization can reduce pain and disability and improve AROM in individuals with acute LBP. However, it seems to be

that physical therapy treatments with spinal mobilization give no additional benefit over physical therapy treatments alone. The results of 3-month follow-up also showed the retention of therapeutic effects in both groups.

Previous clinical trials have proved that spinal mobilization is effective in pain reduction[13,14,22]. Also, this study has showed the significant improvement in mobilization group from time to time, the improvement still existed even at 3-month follow-up. Anyhow, this study cannot compare to the previous clinical mobilization trials because of the difference of intervention used in this study. Ideally, a nontreatment or placebo group should be used as a control group for the RCT study to be a reference of naturally spontaneous recovery of LBP patients. But this would be difficult for ethical and practical reasons. So, the use of an alternative treatment has been adopted in LBP studies[23].

The techniques of spinal mobilization used in this study included central posteroanterior (PA), unilateral PA, and transverse gliding, no manipulation was given. These techniques were selected in accordance with the recommendation from Maitland's mobilization[8] and similar to that used in a previous clinical trial[22].

The interventions used for both groups, besides spinal mobilization for the MOB group, were a combination of physical therapy treatments, mainly massage, ultrasound, and active exercise. However, the decisions on selecting modalities were made by the therapists after the appropriate individual physical examination has been done, and the treatment time per one session was within one hour maximum. The number of the use of these treatments was very similar between both groups. The disadvantage of the use of combination of treatments may be relevant to the difficulty in concluding therapeutic effect rather than selecting a credible modality. However, the rationales for using more than one modality was due to other therapeutic effects needed and to be comparable to practically clinical setting[16]. The combination or a package of treatment were also selected in recent previous studies[23,25].

Spinal mobilization is a treatment that the given forces directed to a patient's spine in order to minimizing pain and increasing spinal mobility[8]. While other modalities such as exercise or mechanical traction, the forces acting on the spine are indirect and need the involvement of surrounding structures. Therefore, the benefit of spinal manipulative therapy may be clearly beneficial in increasing mobility for LBP patients with obviously decreased spinal mobility, or spinal stiffness. So, for the future study, the effects of spinal mobilization on LBP patients with obvious spinal stiffness require further investigations.

Conclusion

The improvements regarding pain, AROM, functional disability can be detected in patients with acute nonspecific LBP after receiving either physical therapy or physical therapy combined with spinal mobilization. This study does not indicate the additional effect of adding spinal mobilization.

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Effects of task oriented balance training program with or without altered sensory input on balance and functional performance in community dwelling older adults

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Background and purpose

The adaptation of regular exercises with the use of surface and vision manipulation to challenge the balance could improve the process of somatosensory integration and have a positive effect on postural stability. This type of intervention has further shown to be effective at improving postural stability in neurologically intact elderly people. Exercise interventions in the form of task oriented exercise programs, are now recognized as a new strategy to improve to improve the balance and functional status of chronic stroke individuals. So the purpose of this study was to see the effect of task oriented balance training program with or without altered sensory input on Balance and functional performance in older adults.

Study design

A pre-post experimental design was used in this study.

Subjects

48 community dwelling elderly adults (> 65 yrs of age) participated in the study. These subjects were randomly allocated to one of the two groups: Group 1 (n=24) was administered with Task oriented balance training programme with altered sensory input and Group 2 (n=24) was administered with task oriented balance training programme without altered sensory input.

Methods

The balance performance of the subjects was evaluated on Berg Balance Scale, Modified clinical test of sensory interaction for balance and functional performance of subjects was evaluated on Ten meter walk test. Each group performed program of balance training exercises and then ended up the session with 10 minute cool down period.

Results

The subjects in both groups were benefited from balance training program with a significant improvement in post-intervention balance course on Berg Balance Scale, Modified clinical test of sensory interaction for balance and one functional performance measure – Ten meter walk test as compared to their pre–intervention scores. On comparison between the two groups, there was statistically significant difference between post intervention scores of Berg Balance Scale, Modified clinical test of sensory interaction for balance and Ten metre walk test.

Conclusion

This study thus concludes that both Task oriented balance training programme with altered sensory input and Task oriented balance training without altered sensory input were effective in improving balance and functional performance in older adults but it becomes more effective when multisensory training is incorporated to task oriented balance training program.

Keywords

Balance, Functional Performance, Altered Sensory Input, Community Dwelling Older Adults.

Introduction

Maintenance of posture and the ability to move about the environment depends on the orientation and balance[1]. Balance is a complex biologic function dependent upon sensory input through visual, tactile proprioceptive and vestibular systems[2]. Decrements in sensory functions (i.e., vestibular, visual and tactile proprioceptive) and strength have been reported with age which in turn frequently causes elderly to seek medical advice and admission to hospital and residential homes[2,3] Poor balance is initially detectable in sixth decade of life rather than exception by one's late eighties[4]. Balance and mobility disorders are single largest cause of disability in individuals of 60 years or older and is often manifested as falls and fall related injuries[5].

Effective preventive strategies require a better understanding of the causes of, and risk factors for falling among elderly persons[6,7,8]. The etiology of falls is a multifactorial and typically involves a dynamic interaction between intrinsic and extrinsic factors[9,10,11,12]. Intrinsic factors include age and disease related changes within individual that increases lability to falls(e.g., visual impairments, neurological and musculoskeletal disabilities, dementia etc.) where as extrinsic factors are environmental hazards that produces opportunity for a fall to occur (e.g., slippery surface, loose rugs, poor lighting, low bed, toilet seats)[12,13].

Exercises may play an important role in maintaining fitness and stability in older persons and may have special benefits for those at risk of falling[14]. Exercise intervention in form of task oriented exercise programme are now recognized as a new strategy to improve functional status of chronic stroke individuals and it was found that adaptations of regular exercises with the use of surface and vision manipulation to challenge balance could improve process of somatosensory integration and have a positive effect on postural stability in stroke patients[15,16,17]. This type of intervention has further shown to be effective at improving postural stability in neurologically intact elderly people[18.]. But none of the studies have investigated the effect of task oriented balance exercise with or without altered sensory inputs in elderly people.

Keeping this in view the study was designed to see the effects of task oriented balance training programme with or without altered sensory inputs on balance and functional performance in older adults. A second objective was to establish the feasibility of multisensory training in older adults.

Methods

Selection and description of participants:

Fourty eight community dwelling older adults took part in this study. The group 1 receiving Task oriented balance training program with altered sensory input consisted of 11 males and 13 females with a mean age of 71.95 ± 3.91 years while the Group 2 receiving Task oriented balance training program without altered sensory input consisted of 13 males and 11 females with a mean age of 71.79 ± 4.00 years. The two groups were comparable with respect to age, height, and weight. The subjects were gathered through a sample of convenience of fifty older adults took part in this study. The subjects were gathered through a geriatric camp organized at the community centre, Sarojini Nagar, New Delhi. Subjects who fulfilled the inclusion criteria and were ready to attend the exercise program regularly were selected. The inclusion criteria for the subjects included the following:-Subjects who had age 65 years or above Community dwelling older adults and not institutionalized or hospitalized. Mini mental state examination (MMSE) scores >24.

Subjects who were able to ambulate independently walk without assistive devices. Exclusion criteria for the subjects included: - Subject who had fallen recently within the previous year. An acute illness that may interfere in participation in the study. Unstable and limiting cardiac disease, history of cardiac surgery History of Neurological disease with residual impairments Permanent history of dizziness. Subjects who had any history of orthopedic illness. Subjects who had uncorrected hearing or visual impairment. Subjects who were not receiving physical therapy or any exercise programme at the same time. Irregular to attend the exercise programme. (Not guarantee to regular attendance).

Technical information:

A pre test and post test experimental design was used. The subjects were invited to participate in the study and were then randomly assigned to one of the two groups. A detailed explanation of the procedure was given after which subjects signed the informed consent. Subjects were then assessed on two balance scales – Berg Balance Scale (BBS)[19]., Modified clinical test of sensory interaction for balance(mCTSIB)[20,21] and one functional performance measure – Ten meter walking test (10 MWT)[22,28]. Group 2 performed all of the exercises such as stepping up and down, stepping backwards and sideways on the exercise step, stepping over blocks of various heights in normal conditions that is eyes open and hard regular surface .Group 1 performed exercises 1-5 under normal conditions that is eyes open and hard regular surface. As a part of multi sensory training Group 1 performed exercises 6 – 10 under the following conditions : (1) Eyes open, firm surface (2) Eyes open, soft surface (3) Eyes closed, firm surface and (4) Eyes closed, soft surface. The soft surface condition was performed with subjects standing on a 50 cm × 62 cm foam mat (foam, 2.5 cm thick)[16]. The number of repetitions given were 2 -3 sets of 8-10 repetitions[23]. Finally, both group of subjects completed their session with a 10 minute cool down period where flexibility and range of motion exercises were performed. These exercises focused on major muscle groups involved during the protocol (quadriceps, hamstrings, hips, lower and upper back and neck muscles). After an intervention of three weeks with five sessions per week, the subjects were again assessed on above mentioned scales.

Statistics

Statistics were performed using SPSS software version 10.5. A student's t-test was used to analyze the difference between the balance improvements in group 1 and group 2.Intra-group analysis between pre intervention scores and post intervention scores was also done for both the groups. A significance level of $p<0.05$ was fixed. A student's t test was used to compare the performance of subjects of group1 and 2 on Berg Balance Scale (BBS), Modified clinical Test of sensory interaction for balance (mCTSIB), and Ten meter walking test (10MWT).

Results

The analysis of pre intervention scores of Berg Balance Scale between group 1 (Mean=49.83, S.D=1.90) and group 2 (Mean=49.79, S.D=2.06) did not show significant difference (t value=0.07, p=0.94) indicating that both groups were matched in terms of Berg Balance Scores. The comparison of post intervention scores of Berg Balance Scale between group 1 (Mean=54.29, S.D=1.78) and group 2 (Mean=51.75, S.D=1.98) revealed significant difference with t value=4.67 and p value=0.000). The pre intervention scores of Modified clinical test of sensory interaction for balance also show no significant difference between both the groups. Group1 (Mean=113.66, S.D=2.18) Group2 (Mean=113.75, S.D=2.18) with t value = 0.14 and p =0.887). The comparison

Table 5.1: Demographic Data: Comparison between Group 1 and Group 2(Unpaired t-test)

Variable	Group 1(n=24)		Group 2(n=24)		t-value	p-value
	Mean	S.D	Mean	S.D		
Age (yr)	71.95	3.91	71.79	4.00	$0.04^{N.S}$	0.971
Weight (kg)	65.21	5.50	66.25	7.61	$0.48^{N.S}$	0.630
Height (cm)	155.70	4.02	156.91	4.93	$0.83^{N.S}$	0.412
Sex	Male=11 Female=13		Male=13 Female=11			

N.S= Not Significant.

Group 1: Task Oriented Balance Training Programme with altered Sensory Input.
Group 2: Task Oriented Balance Training Programme without altered Sensory Input

Variable		Pre-intervention Scores		Post intervention Scores		t-value	p-value
		Mean	S.D	Mean	S.D		
Group 1(n=24)	BBS	49.83	1.90	54.29	1.78	23.45*	0.000
	mCTSIB	113.66	2.19	118.78	1.55	17.78*	0.000
	10MWT	11.76	0.75	8.67	0.92	22.84*	0.000
Group 2(n=24)	BBS	49.79	2.06	51.75	1.98	7.78*	0.000
	mCTSIB	113.75	2.18	115.29	2.20	5.94*	0.000
	10MWT	11.74	0.91	10.26	0.96	11.29*	0.000

Table5.4: Within Group Comparison of Berg Balance Scale (BBS), 10 Meter Walk test (10MWT) and Modified Clinical Test of sensory Interaction for Balance (mCTSIB) scores. (Paired t-test)

* = Significant
BBS = Berg Balance Score
mCTSIB = Modified Clinical Test of Sensory Interaction for Balance
10MWT = Ten Meter Walk Test
Group 1: Task Oriented Balance Training Programme with altered Sensory Input.
Group 2: Task Oriented Balance Training Programme without altered Sensory Input

of post intervention scores of Modified clinical test of sensory interaction for balance, group 1 (Mean=118.78, S.D=1.54) group 2 (Mean=115.30, S.D=2.20 with t value=6.34 and p value=0.000) The pre intervention scores of Ten meter walking test also showed no significant difference between both the groups. Group 1 (Mean=11.76, S.D=0.746). Group 2 (Mean=11.74, S.D=0.912 with t value=0.08 and p=0.938). The comparison of post intervention scores of Ten Meter walking test between Group 1 (Mean=8.67, S.D=0.92) Group 2 (Mean=10.26, S.D=0.96) also revealed significant difference with t value=5.84 and p value=0.000).

Within group there was significant difference in pre intervention and post intervention scores of Berg Balance Scale for Group 1 (t value=23.45 and p value=0.000) and Group 2 (t value=7.78 and p=0.000) Pre intervention and Post intervention scores of Modified clinical test of sensory interaction for balance for Group 1 (t value=17.78 and p=0.000) and Group 2 (t value=5.94 and p value=0.000). Pre intervention and Post intervention scores of Ten meter walking test also showed significant difference for both Group 1 (t value=22.84 and p value=0.000) and Group 2 (t value=11.29 and p=0.000). Thus indicating that both groups showed improvement in balance scores and functional performance but experimental group 1 showed more improvement than group 2 in balance scores and functional performance.

Fig. 2: Comparison of pre and post intervention Berg Balance Scores (BBS) between group 1 and group 2

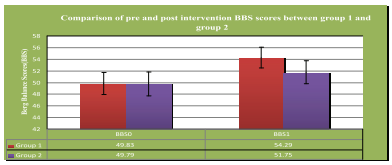


Fig. 3: Comparison between pre and post intervention Ten Meter Walk Test (10MWT) Scores between group 1 and group 2

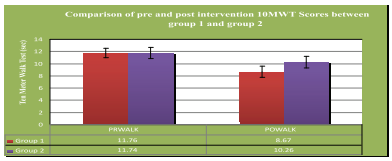


Fig. 4: Comparison of pre and post intervention modified clinical test of sensory interaction for balance (mCTSIB) Scores between group 1 and group 2

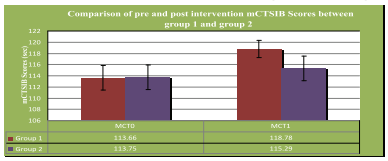
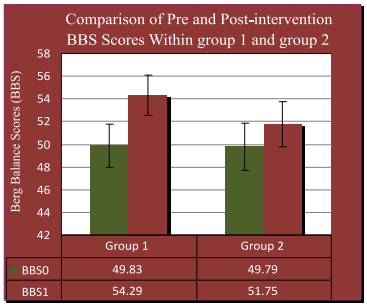


Fig. 2: Comparison between pre and post intervention Berg Balance Scores (BBS) within group 1 and group 2



Discussion

The study was designed to compare the effectiveness of task oriented balance training programme with altered sensory input (group 1) versus task oriented balance training programme without altered sensory input (group 2). The results obtained reveal that subjects in both groups benefited from balance training interventions with a significant improvement in post intervention balance scores on Berg balance scale, on modified clinical test of sensory interaction for balance and functional performance measure i.e. Ten meter walking test. Although post intervention scores were highly significant in both the groups but subjects in group 1 performed better than group 2.

Both group1 and group 2 subjects participated in task oriented balance training program. Components of training protocol included tasks like stepping up, down, backwards, forwards and tasks that encouraged participants to bend turn and reach to limits of stability. Stepping up and down exercises are also likely to train an individual's balance, since the movements involved present a threat to stability. In addition such exercises help the individual regain strength and control of lower limbs which may enable them to take more weight through weakened legs.[24.] Reduced muscle strength is often associated with advance age and is another important factor that contributes to falls. Therefore improvements in muscle strength may further reduce the risk of falls[25].

Stepping exercises were used in recent study (Sherrington and lord 1997) as part of an exercise programme for elderly individuals following hip fracture. As a result of the intervention subjects had improved weight bearing ability and reported fewer falls. Tasks that encouraged participant to bend turn and reach to limits of stability may have provided vestibular stimulation and contributed to improvements in

Fig. 3: Comparison between pre and post intervention Ten Meter Walk Test (10MWT) Scores within group 1 and group 2

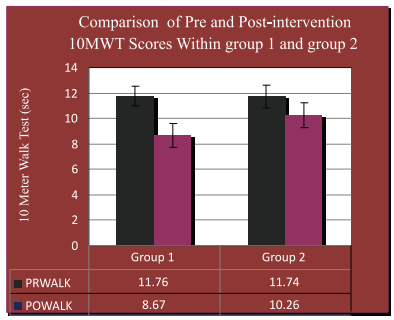
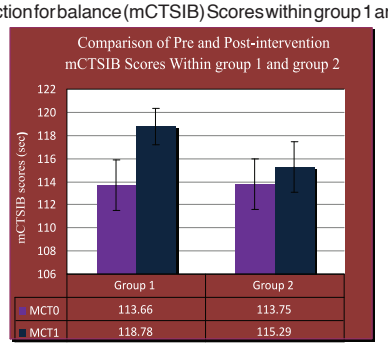


Fig. 4: Comparison between pre and post intervention modified clinical test of sensory interaction for balance (mCTSIB) Scores within group 1 and group 2



balance in both groups[26].

Sharp declines in static balance i.e. standing on one leg have also been shown to occur after the age of 70 years. Bohannon et al have reported that people aged 65 to 69 years could stand on one foot for approximately 10 seconds before losing their balance; while those aged 70 to 79 years could perform the same task for only 4 seconds[27]. An important outcome of the study done by Islam et al (2004) was that older adults can improve their balance by participating in exercises such as Single leg stance, Tandem stance and recommended that older adults should incorporate such exercises into their exercises routines. Single leg stance, tandem stance were also components of our training protocol[25]. Therefore repetitive practice of these tasks might have improved their static balance.

In group1 multisensory training was incorporated along with task oriented balance training programme. As a part of multisensory training exercises performed were based on manipulation of sensory input from visual i.e. closing the eyes and somatosensory i.e. standing on a foam surface as well as manipulation of musculoskeletal system i.e. standing on one leg, tandem stance for 10 seconds. The improvement may be the result of increased use of somatosensory, visual and vestibular information when performing exercises under sensory deprivation conditions. The sensory compensation might have improved sensorimotor integration of postural control in the central nervous system, thus serving to activate and coordinate motor processes i.e. action of proper muscle synergies. Previous studies by Hu and Woolacott (1994), Bonan et al (2004) using a static standing balance protocol involving sensory manipulation of visual, vestibular and somatosensory system, reported important changes in the muscle and movement characteristics of postural responses after 10 hour of training in healthy older adults. These changes were characterized by reduction in latency of muscle activation and kinematic patterns, and by a decrease of the response frequency of antagonist muscles in reaction to platform translation perturbation. Traditionally, balance has been conceptualized as a global function and training programs in elderly have been created without an identified target system such as specific muscle groups or sensory systems. More recently developed systems model of balance control acknowledges that multiple systems- including the vestibular, visual, somatosensory, motor and musculoskeletal systems- contribute to balance. This model suggests that training programs should be customized to the needs of individuals, and a specific target physiological system should be identified for training to be effective[28]. So addition of multisensory training would have led to more improvements in post- intervention balance scores in group 1 than group 2 ,hence showing that task oriented balance training program becomes more effective when multisensory training is incorporated to it. In relation to functional mobility, improvement was demonstrated by a reduction in time taken to complete Ten meter walking test in both group 1 and group 2 . These results are relevant since research shows compromised mobility increases the risk of dependency three to five fold ,in activities of daily life. Mobility is an important component of daily life activities, for example- Going to shopping mall, to the supermarket, to the doctor. Increased dependency could lead to institutionalization, and diminished quality of life. Good Balance is considered fundamental for improving mobility and preventing falls. Since both groups showed significant improvement on balance scores, in turn improved balance scores would have led to increase in functional performance in both groups with significantly better performance of subjects in group 1 than group 2[28].

Clinical implications:

This data suggest that task oriented balance training programme with altered sensory input is more effective in improving balance and functional performance in older adults than task oriented balance training program without altered sensory input. This helps us to choose a better training program for improving balance and reducing the risk of fall in elderly population. This type of intervention suggest that each system contributing to balance that is visual, vestibular and somatosensory should be targeted for improving balance and functional performance in older adults.

Limitations of the study

Small sample size and short duration are the measure limitations of the study. Also the participants were community dwelling older adults and were living an active lifestyle. Thus, results obtained cannot be generalized for all population type including frail and institutionalized.

Future research

This study was conducted for a short duration with a small sample of subjects. Future research involving longer time period should be done. The relevance of this study can be increased by talking a large sample of subjects from different sectors of society. The study only involved community dwelling older adults who were living an active life style and not institutionalized or hospitalized. Future research should be done to see the effect of this intervention in institutionalized or hospitalized older adults and frail elderly population should be also taken into consideration

Conclusion

This study thus concludes that although both task oriented Balance training program with altered sensory input and task oriented Balance training program without altered sensory input show significant improvement on Balance outcome scale and functional performance measure, the subjects who participated in task oriented Balance training program with altered sensory input showed a significantly better improvement in Balance and Functional performance as compared to group 2.

Thus concluding that task oriented Balance training program with altered sensory input is more superior to task oriented Balance training program without altered sensory input.

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Visual vestibular assessment – Tool construction

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Abstract

Objective

This study developed visual vestibular assessment.

Method

The visual vestibular assessment has 4 domains (Balance, Postura stability, bilateral coordination & visual motor integration) and consists of 17 activities and 29 items. Twenty five (n=25) typically developing children, aged 5-10 years (M = 7 years±1.443) were included.

Results

There is no statistically significant difference between the age groups in balance ,postural stability, bilateral integration and visual motor integration subtest of visual vestibular assessment

Conclusion

The present study developed visual vestibular assessment. Based on the results, final form visual vestibular assessment was refined which consists of 16 activities and 28 items. The visual vestibular assessment is a clinical tool to identifying children with visual vestibular dysfunction.

Introduction

Visual – vestibular integration focuses on four domains namely postural stability, balance, bilateral integration and visual-motor integration. Dysfunction in any one of these domains reflects on children performance areas like self care, play, academics. The occupational therapist uses sensory integrative approach for treating children who have problem in processing the sensory information, which may lead to difficulty in participation in daily life activities. The goal of intervention is to improve the ability to process and integrate sensory information and to provide a basis for improved independence and participation in daily life activities, play and school tasks[1]. About 75% of classroom learning occurs through visual pathways is estimated in the school and hence, learning is affected if a child has any visual impairment[2,3]. There are two components of vestibular system namely a)defensive /protective component which helps us discriminate visual stimuli and help us listen to the environment, maintain our balance and aids in the automatic reflex to protect our bodies b)discriminative component helps us to react to the environment with more mature motor responses[4]. The visual and vestibular system are functionally and neurologically connected to each other. The vestibular system and vision work closely together helping the body to maintain an upright posture and balance. Visual - vestibular integration is a basic for skilled and comfortable movement through space and time and is also important for intake of visual information for learning. A baby starts to link meaning to his visual environment through rechecking the vestibular system hence visual - vestibular integration is very important development. The end products of sensory integration such as space perception, visual perception and even linguistic concepts of prepositions depend upon good visual-vestibular integration. Martin , Guzman, Cerveron and Baydal[5] found that a pattern of visual dependence in normal and pathological group for postural control. Redfern, Yardley and Bronstein[6] identified that some patients with Space and Motion Discomfort may have an underlying balance disorder. Visual - vestibular inco-ordination also shows subjective autonomic symptoms and postural instability[7], motion sickness. The co-ordination between visual and vestibular systems is improved by certain activities such as kawar spinning protocol, infinity work[8].

Visual vestibular dysfunction impacts child performance components which reflect in their performance areas. Postural instability problem in bilateral integration, balance and visual motor integration leads to difficulties in self care includes eating, personal -hygiene, dressing[9], difficulties in academics includes inattention[10], reading difficulties, hand writing problems , drawing[11] and difficulties in play includes shooting a ball at a basket, passing a ball , hitting ball with a bat[12,13,14], building block, kick a ball , throw a ball.

Identification of visual – vestibular dysfunction has been based on a subjective process involving informal assessment and clinical observation of behaviors. Visual – vestibular domains are assessed by separate assessments but there is no standardized objective assessment for assessing visual – vestibular dysfunction as a whole. The purpose of this study was to develop visual – vestibular assessment.

Methodology

Research design:

Quantitative model – Methodological research

Development of visual vestibular assessment:

In developing a standardized assessment tool, Benson & Clark[15] four phases of instrument development are necessary before a valid instrument is produced.

1. Planning phase; 2. Construction phase; 3. Quantitative evaluation phase; 4. Validation phase

The current study consists of three of these four phases. The development of visual vestibular assessment was as follows:

1. Planning phase: Domain specification of Visual vestibular assessment was developed based on literature review[16,17]. The Operational definition of balance, postural stability, bilateral integration, visual motor integration was developed. Initially 27 activities were selected and 7 activities were eliminated due to practical difficulty and similarity in the activities. Preliminary test activities and scoring criteria and items format were developed.

2. Test construction phase: After initial test activities were selected and scoring criteria were finalized informal pretesting was conducted in ten children using 17activities by the examiner to determine standardized direction, order of task administration and refinement of scoring criteria. Based on this result preliminary form of visual vestibular assessment was developed. It includes 32 items and 4-point scoring system. The preliminary form of assessment was sent to experts in the field of pediatric occupational therapy (9 experts from India and one from United States) for their feedback to refine test items and scoring criteria.

3. Quantitative evaluation phase: This phase involved pilot testing of final form of visual vestibular assessment.

Samples: Twenty five typically developing children (n=25) aged 5-10 years (M=7, SD = 1.443; 13 boys, 12 girls) were selected through convenience sampling from mainstream school.

Screening criteria:

a. **Inclusion criteria:**
Subject with good comprehension skills, age ranging from 5 – 10 years,no language problems, no history of educational remediation, normal or corrected hearing & hearing, and no past or present occupational or physical therapy services based on parent and teacher reports

b. **Exclusion criteria:**
Children with Physical disabilities and Mental retardation

Equipments used: Skipping rope, Measuring tape, Stopwatch, 1 ball (small size), 1 ball (large size), Nine bowling pins and one ball, Scissor, Chair, Table, Clown, Dart board, and 5 Magnetic coins

Data collection procedures: The purpose of the study was explained to the appropriate authorities of the mainstream school at Potheri village, India and informed consent form was obtained from parents. Testing was conducted in twenty-five typically developing children of age group ranging from 5 – 10 years. The evaluation was conducted in the standardized format according to the protocol developed for the visual vestibular assessment. All subjects were oriented to the tasks. The directions were given for each task and children were requested to complete the task. Test is conducted individually in separate room, which is distraction free with good ventilation and lighting.

Results & discussion

Each one of the expert provided separate suggestions for each activity. In one leg standing, knee position is given 60 degrees, activity termination is changed as when child shows following criteria: a) when no longer child is able to maintain 60 degrees of flexion b) persistent sway c) looking down. It is decided based on the preliminary testing. In walking on a line, the steppage is in tandem fashion is included and folded hands in scoring criteria is excluded as it seems to be easier than abduction and adduction of the arms when observed in preliminary testing. In Ball juggling activity, one ball is taken in to consideration rather than two or three balls in performing the cycles which is decided based on the experts opinion and preliminary testing. Bolster swing activity is excluded due to practical difficulties such as the size of the bolster swing that has to be increased with advancement in age (5–10 years) which will be practically difficult to carry to the testing environment and absence of hook for hanging bolster swing in testing environment. Mirror

Table 1: The description of visual vestibular assessment

S.No.	Activities	Items	Domains
	OLS eyes open	1. No. of sec held-Dominant	Balance
1		2. No. of sec held-Non dominant	Balance
2	OLS eyes closed	3. No. of sec held-Dominant	Balance
		4. No. of sec held-Non dominant	Balance
	Hopping	5. Distance hopped-Dominant	Balance
3		6. Distance hopped-Non dominant	Balance
4	Walking on a line	7. Distance walked	Balance
5	Snow bowling	8. No. of bowling pins hitten	Visual motor integration
6	Scissoring	9. Ability to cut	Visual motor integration
7	Dart	10. Total No. of points	Visual motor integration
		11. No. of repetitions per 60 sec – Dominant	Visual motor integration
8	Ball dribbling	12. No. of repetitions per 60 sec–Non Dominant	Visual motor integration
		13. No. of repetitions per 60 sec – alternative	Bilateral integration
9	Prone extension	14. No. of sec held	Postural stability
10	Neck cocontraction	15. Amount of resistance Tolerated	Postural stability
11	UE cocontraction	16. Amount of resistance Tolerated	Postural stability
12	Donkey kicks	17. Ability to assume position	Postural stability
		18. No. of cycles	Bilateral integration
13	Skipping	19. No. of repetitions per 60 sec – Dominant	Bilateral integration
		20. No. of repetitions per 60 sec–Non Dominant	Bilateral integration
		21. No. of repetitions per 60 sec – both	Bilateral integration
14	Standing on toes and heels	22. No. of repetitions per 60 sec – both	Bilateral integration
15	Ball juggling	23. No. of cycles	Bilateral integration
16	Trunk rotation	24. Ability to rotate – right	Bilateral integration
		25. Ability to rotate – left	Bilateral integration
		26. No. of repetitions per 60 sec – Dominant	Bilateral integration
		27. No. of repetitions per 60 sec–Non Dominant	Bilateral integration
17	Extremity tapping	28. No. of repetitions per 60 sec – both	Bilateral integration
		29. No. of repetitions per 60 sec – both	Bilateral integration

imaging activity is removed as it assess visual perception instead of assessing visual motor integration. Holding wooden dowel and hitting the swinging ball by maintaining prone extension posture is changed as the ability of child to withheld prone extension posture as the level of difficulty is more when observed in children of preliminary testing.

The average mean performance of children in prone extension is 34.84 sec. In neck cocontraction and upper extremity cocontraction, the child is able to tolerate moderate to maximum resistance. In donkey kicks activity, most of the children were able to maintain consistent extension in push up position but few of the them were not able to maintain consistent extension. Child is able to maintain one leg standing position for 31.64 sec , 26. 54 sec (dominant and nondominant respectively) and 6.4 sec ,3.84 sec (dominant and nondominant respectively) with eyes closed. Children average performance in hopping is able to hop 162 inches and 150 inches for dominant and nondominant.

In walking on a line, average mean performance is M = 101.76, SD = 25.4. In skipping,average mean performance is 11.96 repetitions, 9.84 repetitions and 12.64 for dominant,non-dominant and both respectively. In standing on toes and heels, average mean performance is 27.68 repetitions. In trunk rotation – right and left side, all the children were able to cross three halves. In extremity tapping, average mean performance is M = 58.68 rep, 56.44 rep, 57.32 rep and 47.36 rep for dominant, non-dominant, both and alternatively. In donkey kicks, mean performance is 4.32cycles. In ball dribbling - alternative, average mean performance is 8 repetitions. In ball juggling, mean performance is 2.80 cycles. Child is able to hit 4 bowling pin averagely in snow bowling. Most of the children were able to cut in straight line and zig zag pattern without difficulty, but few of them were unable to cut in scissoring. In Dart, mean performance is 123.60 points. In ball dribbling – dominant, mean performance is 12.24 rep and 4.16 rep for dominant and non-dominant.

The items of visual vestibular assessment was refined based on the level of difficulties. The items which are too easy or too difficult are excluded. The present findings showed that the level of difficulty falls between 25 to 75 percent except trunk rotation activity items. The trunk rotation activity was too easy for all the age groups. Hence trunk rotation activity was excluded in the final form of assessment. Based on the performance of children on visual vestibular assessment, the scoring criteria was refined for each item.

The study was conducted in small sample size due to time constraint .It might influence the refinement of scoring criteria of each item. Some experts failed to reply even though three months time is given because of their work schedule.The visual vestibular assessment can be used to screen the children with visual vestibular dysfunction. It can be used as assessment tool as well as outcome measure. This study can be further carried with large sample size to improve validity of the tool. Reliability and validity studies can be done to strengthen the psychometric properties of visual vestibular assessment before it may be routinely used.

Conclusion

The present study developed visual vestibular assessment. Based on the results, final form visual vestibular assessment was refined which consists of 16 activities and 28 items.

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Effects of spray and stretch technique and post isometric relaxation technique in acute active central trigger point of upper trapezius

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Abstract

Purpose of the study

To find a better intervention for the treatment of acute active central trigger point of upper Tarpezius between Spray and Stretch technique and Post Isometric Relaxation technique.

Method

Patients with acute active central trigger point of upper trapezius muscle were recruited from Physical Medicine & Rehabilitation center. A total of 45 subjects were selected, these subjects were randomly allocated into three groups with 15 in each group, Group A received Spray and Stretch technique, Group B received Lewit Post Isometric Relaxation and Group C which served as a comparison group received ultrasonic therapy. The outcome measures were pain intensity, Active Pain free range of motion and disability.

Results

All the three groups showed significant difference ($P<0.05$) in all the outcome measures with group A, showing quicker and better improvement. However stastical analysis failed to show any significant difference between the three groups in all the outcome measures.

Conclusion

Therapies that incorporate stretch of myofascial Trigger point will produce better improvement. Spray and Stretch technique may be effective than Lewit Post Isometric Relaxation & Ultrasonic Therapy in treatment of acute active central trigger point of Upper Trapezius muscle.

Introduction

Skeletal muscle is the largest organ of the human body, which accounts for 50-55% of body weight[1]. This study concentrates on the major cause of pain and dysfunction of this largest organ of the body, the Myofascial Trigger Point (MTrP). A hyperirritable spot, usually within a taut band of skeletal muscle that is painful on compression and that can give rise to characteristic referred pain, tenderness and autonomic phenomena. MTrPs are extremely common and can become a distressing part of nearly everyone's life at one time or another[2]. Individuals in their mature years (30-50 yrs) of maximum activity are most likely to suffer from the pain syndrome of active MTrPs[3]. The severity of symptoms ranges from painless restriction of motion to agonizing incapacitating pain as severe as heart attack or fracture and the painfulness often devastates the quality of life and or causes severe disability. General practitioners frequently refer these patients to physiotherapy[4] and 61% of patients attended by physiotherapist with musculoskeletal pain suffer from myofascial pain syndrome[5]. Trapezius is found to be the muscle most often affected by MTrPs[6]. The aim of physiotherapy treatment in management of MTrP is to reduce the pain and restore normal function by deactivating the MTrPs. In treating trigger points Simons et al (1999) advocates Spray and Stretch technique as single most effective non invasive method to deactivate active trigger point, while Lewit (1999) recommends Post Isometric Relaxation (PIR), both methods are commonly successful[7].

There are large numbers of studies being conducted and published with outcome measures of pain characteristics of myofascial pain syndrome such as pain intensity & pressure pain threshold; only limited studies are available with outcome measures on range of motion (ROM) and disability which are also the important goals of physiotherapy. As indicated by Hou et al, pain reduction, improvement of MTrPs sensitivity and increased ROM after treatment may not be maintained for long term and cumulative effects of subsequent repeated therapies need to be studied[8]. While most of studies concentrated on identifying the immediate effects only. This study was put forwarded to find a better intervention for the treatment of acute active central trigger points between Spray and Stretch technique and Lewit Post Isometric Relaxation technique for Upper Trapezius muscle with outcome measures on range of motion & disability including Pain Intensity in immediate as well as cumulative effects of subsequent repeated treatment

Methodology

Subjects & design

Patients with acute active central trigger point of Upper Trapezius muscle were recruited from Physical Medicine and Rehabilitation Center, (PMRC) Puducherry, from September 2008 to June 2009. A total of 45 subjects were selected who meet the following criteria.

- Age between 30-50 years of either sex.
- Diagnosis of active central trigger point of Upper Trapezius muscle with identified spot tenderness in a taut band, clinically active trigger point.
- Recognition & reproduction of pain by subjects on palpation.
- Painful limitation of cervical lateral flexion Range to opposite side of the affected muscle.
- Unilateral neck pain at rest with pain intensity above 30mm measured by Visual Analog Scale Pain intensity scale.
- Duration of symptoms less than 2 weeks and not under

any additional treatment for their painful condition during the trial other than NSAIDs with ability to comply with the trial.
- No Myofascial Trigger Point injection within last 2 months.
- No cervical or shoulder surgery within last year.
- No fibromyalgia syndrome.
- No cervical radiculopathy, myelopathy with severe disc or skeletal lesion, not a pregnant & had no contraindication for administered therapy.

Informed written consent was obtained from the participants after explaining about the study intervention including its benefits and risks in brief. These subjects were randomly allocated into three groups with the use of software, Random Allocation Software (Version 1.0, May 2004). With 15 subjects in each group, Group A received Spray and Stretch technique (Procedure: A jet stream of vapocoolant spray applied over the entire length of the muscle in direction of referred pain pattern, followed by stretching of the muscle by side bending to opposite side shoulder, repeated three times per session), Group B received Lewit Post-Isometric Relaxation technique (Procedure: Isometric contraction with 10-20% of strength for 8-10 seconds against therapist resistance with inhalation, followed by relaxation with exhalation after which muscle was stretched, repeated three times per session) and Group C which was used as a comparison group, received Ultrasonic therapy (1.2 to 1.5 Watt/cm^2 at 3MHz for 5 minutes per session), with five full cycle's active range of motion for all three groups. Pre and post-intervention values were assessed for all the subjects with Visual Analogue Pain Intensity Scale (ICC 0.97)[9] and Cervical Lateral Flexion by Universal Goniometer (ICC 0.96)[10] for 10 treatment sessions and the intervention was stopped when the condition resolved as accepted by therapist and subjects, without continuing for ten treatment sessions. The functional disability is quantified with the use of Copenhagen Neck Functional Disability Scale (Cronbach's á 0.90)[11] before initiation of intervention and after completion of ten treatment session on consecutive days or early when condition is resolved before the study regimen.

Stastical method

All subject data were collated in Microsoft Excel 2007. Analysis was undertaken using Statistical Package of Social Sciences Windows version 15 (SPSS Inc., Chicago IL, USA) by a statistician who was blind to the identity of the three groups. Both parametric and non-parametric test such as Paired 't' test, one-way ANOVA and Chi Square test were used to analyze the data. Mean was used as the measure of central tendency and computed with 95% of Confidence Interval to express the true population mean. When P Value is less than 0.05 it took as significant. Comparison of treatment groups at baseline with respect to demographic characters such as age, gender & dominancy and outcome measures such as Pain Intensity score, Range of Motion & Disability score is carried out. Paired 't' test is used to find the significance of mean within group, while one-way ANOVA was used to find the significance of improvement between groups. Chi squared test is used to analyze the significant percentage improvement between three groups. Paired t test was also used to analyze correlation between pain intensity, range of motion and disability independently for the three groups. Analysis was carried out to identify both the immediate & cumulative effects i.e. after day one, at day five and at day 10.

Results

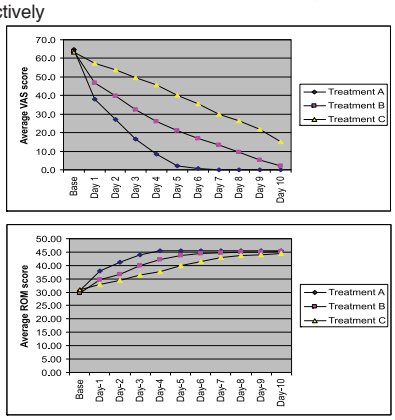
The baseline characteristics of the subjects, in three groups were highly comparable in terms of basic demography such as age, gender, dominancy & duration of illness and the Pretest scores of outcome measures such as Pain intensity, Cervical lateral flexion Range of Motion and Disability, Subject attendance was monitored and full attendance was obtained on all 3 groups. All the three groups showed no significant difference in the outcome measures between the characters age, gender, dominancy and duration of illness both within and between the three groups in pretest & post test values. The values obtained in Visual Analogue Pain Intensity Scale, Cervical Lateral Flexion & Disability Score for all the three groups before and after treatment with mean difference for all the three groups, Percentage of improvement in those means and their significance were tabulated in Table 1.

Table 1: Values obtained in three groups before & after intervention with their significance

Outcome measures	GroupA					GroupB					GroupC				
	Pre(S.D)	Post(S.D)	MD(S.D)	%	P-value	Pre(S.D)	Post(S.D)	MD(S.D)	%	P-svalue	Pre(S.D)	Post(S.D)	MD(S.D)	%	P-value
VAS*															
Day1	64.73 (10.8)	37.9 (8.4)	26.8 (3.5)	41.4	0.000	63.7 (17)	46.7 (13.2)	17.07 (14.5)	26.8	0.000	63.3 (15)	57.2 (14)	6.13 (3.7)	9.7	0.000
Day5	64.73 (10.8)	2.00 (0.4)	62.7 (.8)	96.9	0.000	63.7 (17)	21.1 (11)	42.66 (24.1)	66.8	0.000	63.3 (15)	39.9 (16.8)	23.40 (8.5)	36.9	0.000
Day10	64.73 (10.8)	0.00 (0.0)	64.7 (0.0)	100	0.000	63.7 (17)	2.3 (3)	61.47 (18)	96.4	0.000	63.3 (15)	15.1 (14.5)	48.20 (14.5)	76.1	0.000
ROM*															
Day1	30.60 (3.6)	37.93 (2.8)	7.33 (1.3)	15.7	0.000	29.6	34.67 (5)	5.07 (5)	10.7	0.000	30.93 (5.2)	32.87 (4.9)	1.93 (1.2)	4	0.000
Day5	30.60 (3.6)	45.47 (.8)	14.8 (1.8)	31.6	0.000	20.6	43.07 (2.8)	14.07 (4.7)	29.9	0.000	30.93 (5.2)	40.07 (4.2)	9.13 (2.9)	19.4	0.000
Day10	30.60 (3.6)	45.53 (.9)	14.93 (.92)	31.7	0.000	29.6	45.13 (.3)	15.53 (5.5)	33	0.000	30.93 (5.2)	44.47 (4.2)	13.53 (4.5)	28.8	0.000
Disability score*	19.80 (2.8)	1.07 (2.6)	18.73 (1.1)	94.6	0.000	19.33	3.53 (3.6)	15.80 (3.3)	81.7	0.000	19.5 (4.1)	7.53 (3.6)	12 (2.5)	61.4	0.000

* VAS-Visual analogue Pain intensity Scale, ROM- Cervical Lateral Flexion Range of Motion, pre- Baseline Scores, post- post intervention values, MD- Mean Difference, %-percentage improvement

Fig.1 & Fig: 2. Response to treatment in Pain Intensity & ROM over 10 days for groups respectively



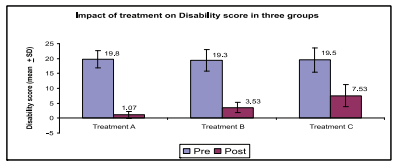
Treatment A – Spray and Stretch technique, Treatment B – Post Isometric Relaxation Treatment C – Ultrasonic Therapy.

From table 1 it could be observed that Group A showed significant difference with large difference between mean in VAS on immediate effects than the other two groups. This was observed on fifth day as well, but on tenth day percentage improvement of pain intensity for Group A was 100% & for Group B 96.9% which may not be considered as a significant clinical difference but, with the percentage of improvement, when compared with Group C both Group A & B showed greater difference. As observed in Table 2, Group A showed significant improvement of Range of Motion with 15.7% of improvement in day-1while Group B showed 10.7% of improvement and Group C showed only 4% improvement which indicates that there is significant difference clinically between the three groups, but on day 5 difference between Group A and B was negligible but significant when compared to Group C. On day 10 Group B showed 33% improvement while Group A showed 31.7% improvement which is lower than Group B, this difference may occur because pre-test score was lower for Group B than Group A. A point to be noted here is Group C also showed improvement in Range of Motion, which was comparable with other two groups on day 10. It could be inferred that Group A produced better improvement on Range of motion in 'immediate effects" but comparable results on day 5 and day10 with group B and all the three groups were clinically comparable on day 10. In disability score, Group A showed 94.6% improvement while Group B produced 81.6% improvement and 61.4% improvement in Group C, indicating that Group A subjects improved neck function to near normal.

The average number of treatment sessions required for the subjects to become pain free was five days for Group A & 8.4 days for Group B, while 9.4 days for Group C. It is should be noted that full active pain free ROM was obtained before total pain relief and group A demonstrated quicker improvement than Groups B & C. Figure 1 & 2 shows the three groups response to the treatment in pain intensity and range of motion in 10 treatment sessions respectively.

The figures 1 & 2 shows steady progression of improvement in all the three groups suggesting improvement with repeated therapies, and it can be observed that Group A demonstrated quicker improvement. Analysis of significance of percentage improvement between groups failed to demonstrate any statistical significance between three groups i.e. between (i) A and B, (ii) B and C and (iii) A and C on all the outcome measures namely Pain Intensity, ROM, and Disability Score.

Fig. 3: Response to treatment in Disability for three groups



Treatment A – Spray and Stretch technique, Treatment B – Post Isometric Relaxation Treatment C – Ultrasound.

The correlations between pain intensity, ROM and disability showed statistically significant with P-value < 0.05. It may be inferred that pain and limited ROM produced disability and function will improve with reduction in pain and improvement of ROM in MTrPs.

Discussion

Although significant improvements were found in all the three groups, intervention that incorporated stretching i.e. Spray and Stretch technique and Post Isometric Relaxation technique showed significantly better improvement in pain intensity, range of motion and functional disability. The remarkable effectiveness of almost any technique that elongated the muscle and restored it to full stretch length can be explained by integrated hypothesis. Integrated Hypotheses states that the contracture of the sarcomere in the contraction knots of the trigger points must be released in some way to deactivate a trigger point. Lengthening the contractured knots by gentle sustained stretch with augmentation technique apparently induces graded reduction in the overlap between actin and myosin molecules and releases the energy being consumed; when sarcomeres reach full stretch length there is minimal overlap and greatly reduced energy consumption. This breaks an essential link in the energy crisis viscous cycle by which trigger point is deactivated and eventually pain is relieved and ROM improves[12, 13].

Both Spray and Stretch technique and Post Isometric Relaxation targets to lengthen the contractured knots. The reason for the effectiveness of Spray and Stretch technique over PIR may be due to;

- The effects of spray on skin that inhibit the autonomic activation at spinal cord level, which significantly influences the intensity of activity of trigger point mechanism at the motor end plate[13].
- The improved effectiveness of stretch as irritated nocioceptor of the attachment trigger points is also desensitized which will reduce the sensory irritability[13].
- Its ability to affect the central sensitization of the referred pain[8].

Even though large difference in mean and quick improvement was obtained in Group A receiving Spray and Stretch technique, statistical analysis failed to show significance of improvement between groups this is may be because sample size is not large enough to more conclusively demonstrate the results. It is shown by the results that ROM seems to be improved before improvement in pain, suggesting restoration of full stretch length of muscle is required to relive pain and dysfunction of MTrP.

The limitation of the study is, it involved only Upper Trapezius muscle and variation in effect may be present when this intervention is given to another group of muscle. Long term

follow up was not done to show changes in condition with time. Sample size is limited which should be increased in the future studies.

Conclusion

The results of the study have shown that therapies that incorporated stretch of Myofascial Trigger Point produced quicker and better improvement. The Spray and Stretch technique is effective than Post Isometric Relaxation in treating active central trigger point of upper trapezius muscle in reducing Pain Intensity, and improving the Range of Motion & the Function. Spray and Stretch technique may produce quicker improvement than Post Isometric Relaxation and Ultrasonic therapy. The effects of interventions improved with subsequent therapy sessions and consistently showed improvement in pain, ROM and disability. Ultrasound may be used as an adjunct treatment in Myofascial trigger point. It should be remembered that trigger points are rarely an isolated phenomena and it is vital to address the precipitating and predisposing factors for each patient.

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Comparison of proprioceptive neuromuscular facilitation vs resistance training of respiratory muscles on respiratory rate of patients in ICU during weaning off period

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Abstract

Objectives

To compare the effect of Proprioceptive Neuromuscular Facilitation (PNF) and respiratory muscle resistance training on respiratory rate during weaning off phase of mechanical ventilation (MV).

Method

Thirty Patients are included in this study. Patients are divided into two groups of 15 each. Group A is treated with Proprioceptive Neuromuscular Facilitation technique. Proprioceptive Neuromuscular Facilitation techniques are used for diaphragm inter coastal muscles and pectorals. Readings were recorded before after the end of session from the chart. Group B was treated with abdominal weights placed over the upper abdomen. Muscle training consisted of breathing against an inspiratory resistance (abdominal weights) on upper abdomen for 15-minute session.

Results

PNF was successful in reducing respiratory rate in ICU patients when compared with patients treated with abdominal weights placed on their upper abdomen.(PNF: pretest respiratory rate = 27.000 ± 3.239 ; post test respiratory rate = 23.333 ± 2.619; abdominal weights = pretest respiratory rate = 28.87 ± 2.06 ; post test respiratory rate = 28.47 ± 2.77).

Conclusion

When both the groups were analysed statistically it was found that there was decrease in the respiratory rate of the patients who were treated with PNF and there was no change in the patients who were treated with abdominal weights placed on their upper abdomen.

Key words

Mechanical ventilation, Ventilators, Weaning off, Tidal volume, Respiratory rate, Abdominal weights, Proprioceptive neuromuscular facilitation

Introduction

Mechanical ventilation is a life-saving form of supportive therapy for respiratory failure. In addition to support of gas exchange, other potential benefits of mechanical ventilation include reversal of respiratory muscle fatigue, prevention of muscle fiber injury during sepsis, and restoration of blood flow to vital organs in shock state. Mechanical ventilation is also associated with major complications such as infection, barotraumas, cardiovascular compromise, tracheal injuries, oxygen toxicity, and ventilator-induced lung injury. Once stabilized, patients are usually taken off the ventilator within a few hours and are able to breathe with little effort. Some patients, however, have difficulty in breathing and become dependent on the ventilator. Risks associated with ventilator dependence include increased morbidity and mortality and high health care costs. Spontaneous breathing trials (SBTs), defined as regular periods of breathing off the ventilator, are initiated and lengthened in duration until the patients are weaned from MV. Rapid and shallow breathing is common in patients who fail to wean from mechanical ventilation. An index of rapid and shallow breathing is provided by the ratio of respiratory rate to tidal volume (RR/V_T). This ratio is normally less than 50 breaths /minute/L, and is often above 100 breaths/ minute/L in patients who do not wean from the ventilator. The respiratory rate /tidal volume ratio has a high predictive value for identifying patients who will and will not wean.

There are many PNF techniques which are used in neurological conditions and also for orthopedic conditions. In this study following techniques are used,

1. Diaphragmatic facilitation.
2. Segmental facilitation for pectorals and lateral intercostals.
3. Diaphragmatic inhibition.

Resistance training is given by placing abdominal weights on the upper abdomen for the 15 minutes and making sure that patient is not getting tired or starts deteriorating breathing pattern. If this starts to happen then treatment is given next day with reduced weight. Reading of respiratory rate is noted down from the vitals chart prepared by the staff in routine before and after the treatment.

PNF and resistance training of respiratory muscles are routinely used in ICU for weaning off. During weaning off there is increase respiratory rate which leads to increased cardiopulmonary overload and thus weaning off failure. PNF is known to decrease respiratory rate and increase tidal volume. Respiratory muscle resistance training is also commonly used in weaning off procedure but its effect on respiratory rate is not established. This study will evaluate the effect of theses two techniques on respiratory rate after single session of both the techniques. Single session is done in the study to eliminate the chances of spontaneous recovery, deterioration in the ICU, or effect of other factors in the condition of the patient.

Review of literature

Patients require mechanical ventilatory support when the ventilatory and/or gas exchange capabilities of their

respiratory system fail. This failure can be the result of processes both within the lung as well as in other organ systems, most notably the CNS and the cardiovascular system. Invasive ventilation can be successfully used to support patients with acute respiratory failure and other conditions which compromise respiratory system of the body. Although patients may be dependent on ventilatory support for brief periods of anaesthesia or neuromuscular blockade, the term "ventilator dependent" is usually reserved for patients with a need for mechanical ventilation beyond 24 h or by the fact that they have failed to respond during discontinuation attempts[1,2,4,5,6]. "Ventilator dependence" is associated with complications such as infection, barotraumas, cardiovascular compromise, tracheal injuries, oxygen toxicity, ventilator-induced lung injury, and ventilator induced diaphragmatic dysfunction as observed by Vassilakopoulous, Theodore et al[2]. It is estimated that as much as 42% of the time that a medical patient spends on a mechanical ventilator is during the weaning process. The weaning from mechanical ventilation was studied by Dr. Hemant H.R., Dr. Chacko J., and Dr. Singh M.K et al[3]. The balance between strength and load is crucial for weaning success and most often weaning failure is due to high level of load relative to the strength of the respiratory muscles[3]. Some parameters based on respiratory mechanics, gas exchange, and breathing pattern have been proposed as useful predictors of weaning outcome that could guide clinicians in determining the optimal time to discontinue mechanical ventilation[3]. The rapid shallow breathing index (f/V_T, where 'f' is the respiratory rate and 'V_T' is the tidal volume measured during the first minute of a T-piece trial) is superior to conventional parameters in predicting the outcome of weaning[1,7,8].

It is well documented feature that there is increase in respiratory rate and abdominal paradox during problem wean (i.e. patient is unable to successfully wean off from MV) as observed by Mier and Brophy et al[9] along with hypoxia, hypercapnia, Tidal volume and respiratory rate set the minute ventilation[7]. Proprioceptive neuromuscular facilitation technique is newly introduced technique in ICU based patients mainly who are ventilator dependent. Technique mainly relies on stimulating or inhibiting proprioceptors of muscles by voluntary effort, initiation of some reflex reactions or by interacting with antagonistic muscles. There are number of PNF techniques which can be used in facilitating respiratory muscles. Segmental facilitation which include pectoral and intercostal facilitation, diaphragmatic facilitation, diaphragmatic inhibition, are used. PNF techniques are helpful in increasing tidal volume and decreasing respiratory rate by mobilizing thorax and facilitating respiratory muscles[10,11].

PNF techniques are also known to decrease paradoxical pattern of breathing as cited in Physical Therapy and Pulmonary Rehabilitation Frownfelter, D in chapter Facilitating Ventilation Patterns and Breathing Strategies[10]. Role of PNF has also been explored and its importance in increasing chest expansion in ICU has been established by Nirali B Thakkar; in Role of PNF Techniques in chest Physiotherapy[11]. Leith and Bradley were the first researchers to demonstrate the respiratory muscle strength and endurance can be improved in healthy subjects. Strength may be increased by contracting the muscles against high loads, which can be achieved by inspiratory resistive training, static maximal inspiratory efforts, or application of weights directly on the muscles. Lane et al trained the diaphragm for strength through use of weights in 16 nonintubated patients with acute spinal cord injury. Random control trial was done comparing IMT and resistance training using abdominal weights by Derrickson et al. in 1992[12]. Their study has been quoted in chapter 8 of spinal cord injury rehabilitation evidence by A William Sheel, W Darlene Reid, Andrea F Townson, et al .Both the techniques were found equally effective in increasing forced vital capacity, maximum voluntary ventilation, peak expiratory flow rate and maximum inspiratory pressure ($p< 0.001$ to 0.05).

Objectives

Aim of syudy

To compare the effect of Proprioceptive Neuromuscular Facilitation (PNF) and respiratory muscle resistance training on respiratory rate during weaning off phase of mechanical ventilation (MV).

Need of study

Increase in Respiratory rate is the most common cause of failure of weaning process. Effects of PNF techniques and abdominal weights training of diaphragm on respiratory rate needs to be evaluated for their possible beneficial effects during weaning phase.

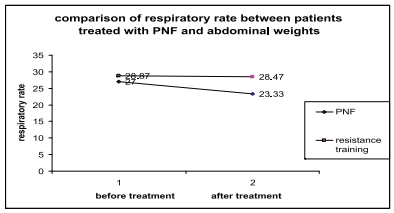
Methodology

Selection of The Subjects: ICU based 30 patients were included in the study. These patients were on mechanical ventilation and were undergoing spontaneous breathing trials as recommended by ICU in charge. All the parameters of the patients were with in the normal limits of the screening criteria. And respiratory rate was varying between 20 to 35. Patients were divided into two groups of 15 each randomly and were treated by PNF and abdominal weights

Table 1: Comparison of post treatment respiratory rate of patients treated with PNF with post treatment respiratory rate of patients treated with abdominal weights.

Readings	Mean ± SD	t. value	P- value *
post treatment respiratory rate of patients treated with PNF	23.333±2.619		
post treatment respiratory rate of patients treated with abdominal weights	28.47±2.77	5.52	0.001
* Significant at P>0.05			

Mean values of after treatment of PNF group was 23.333 ± 2.619 and that of resistance training was 28.47 ± 2.77. t-value of this group is 5.52 and P-value is 0.001, which is significant. It means that there is significant change in the respiratory rate after the patients were treated with PNF



X axis = before treatment and after treatment
Y Axis = respiratory rate
This graph compares the change in respiratory rate which occurred because of PNF and resistance training in the form of abdominal weights after single session.

respectively. Readings were noted after the single session of the treatment in both the groups from the vitals chart prepared by staff of the ICU. In PNF group session consisted of 3-6 minutes including average 20 to 40 repetitions.

Study design

Experimental

Sample

Convenient sampling and randomization

Inclusion criteria:

Patients on mechanical ventilator.
Patients undergoing unassisted breathing trials.
Patients having FiO_2 less than 0.5.
Patient's PEEP less than 5.
Patients having stable cardiovascular function i.e.
Heart rate < 140 /min
Blood pressure (systolic: <180mmHg)
Respiratory rate < 35/min and >20/min

Exclusion criteria:

Patients who develop any cardiac condition during the course of treatment. Patients who cannot tolerate unassisted breathing trial .
Patients whose respiratory rate is exceeding 35 breaths/min.
Patients who develop systolic blood pressure more than 180 mm of Hg or less than 90 mm of Hg.

Patients who have undergone cardiac surgery or abdominal surgery or gynaecological surgery.

Patients having respiratory rate less than 20 i.e. having normal Respiratory rate or bradypnea.

Instrumentation:

Ventilator
Abdominal weights

Procedure:

Thirty Patients are included in this study. Patients are divided into two groups of 15 each. Group A is treated with Proprioceptive Neuromuscular Facilitation technique. Proprioceptive Neuromuscular Facilitation techniques are used for diaphragm inter coastal muscles and pectorals. Readings were recorded before after the end of session from the chart.

Group B was treated with abdominal weights placed over the upper abdomen. Muscle training consisted of breathing against an inspiratory resistance (abdominal weights) on upper abdomen for 15-minute session. Weight was placed on the upper abdomen for 15 min. Weights ranging from half kilograms to two kilograms were used according to the tolerance of the patients. Those patients who were unable to tolerate the resistance for 15 min, it was reduced according to the patient's comfort and endurance. Readings were recorded before and after the end of session from the chart that was prepared by the staff of the ICU in the routine of the patient care.

Baseline readings were taken in terms of Respiratory rate.

Results

When the post treatment readings of respiratory rate of PNF were compared with post treatment readings of respiratory rate of abdominal weights group using paired sample t- test and it was found that there was significant change in the groups which suggests that PNF was successful in reducing respiratory rate in ICU patients when compared with patients treated with abdominal weights placed on their upper abdomen.

Discussion

As it is known phenomenon of rise in respiratory rate during failed weaning trials, reducing respiratory rate and increasing tidal volumes becomes necessary. Patients were included in the study when they were undergoing spontaneous breathing trial i.e. either they were on T-piece or on minimum pressure support and their cardiopulmonary status was stable except their respiratory rate was varying between 20 and 35 breaths per minute. Initial and final readings of respiratory rate were noted down after the end of the treatment session from the vitals chart prepared by the staff of the ICU. There was significant reduction in respiratory rate in first group. There was significant difference in the pre and post treatment readings of group treated with PNF[10,11] whereas second group which was treated with resistance training (abdominal weights) did not show any change in the respiratory rate.

Inmaculada Alía and Andrés Esteban have shown that rapid shallow breathing index is most predictive measure in finding whether patient can be weaned off from mechanical ventilation or not. Value of below 50 breaths / liter/ min predicts that patient can be weaned off easily whereas ratio of 100 breaths / liter/ min or above predicts that patient cannot be weaned off from the ventilator. So the technique which decreases respiratory rate can therefore decrease the rapid shallow breathing ratio thus helps the patient in weaning off from mechanical ventilation. Resistance training of respiratory muscles did not reduce the respiratory rate but PNF reduced respiratory rate to therapeutic range and is effective than resistance training

Reason for resistance training for not effective in reducing the respiratory rate could be that results were assessed after only one session of treatment. There are number of studies which advocate resistance training for weaning off from the mechanical ventilation. But these studies are of longer duration and are effective in weaning off from the mechanical ventilation.

To significantly increase strength, a resistance training program must be of at least 6 weeks in duration and 4 to 5 days per week as stated by Fox, E and Matthews, D. Whereas this study was of one session only which can't hypertrophy type II muscle fibers. PNF techniques stimulates or relaxes the muscles or golgi tendon organs in musco-tendinous junction thus produces results instantly where as resistance training takes time in producing same effect. Thus PNF can reduce the frequency-volume ratio in the ventilated patient when compared with resistance training of the respiratory muscles with abdominal weights.

Conclusion

This study indicates that PNF techniques in ICU are effective in reducing the respiratory rate than resistance training using abdominal weights.

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The effect of physiotherapy treatment on saliva decrease in children with cerebral palsy

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Abstract

The aim of this study was to investigate the effects of physiotherapeutic treatment consisting of electrical stimulation, exercises and proprioceptive neuromuscular facilitation (PNF) applied to orofacial area on drooling in children with spastic cerebral palsy. The study population consisted of 15 children with spastic cerebral palsy (mean age 9.9±3.6 year, mean weight 36.9±12 kg. and mean height 134±15 cm.) who were identified as having severe drooling. Salivary flow rate was measured in each session pre and post-treatment using drooling quotient (DQ) assessment method. Each patient received 8 therapy sessions with 2 sessions per week. There was statistically significant decrease in the rate of salivary flow rate in post-treatment period when comparing with pre-treatment observations ($p<0.01$). However, there was no permanent decreasing in the pre-treatment drooling levels throughout the therapy sessions ($p>0.05$). Children with cerebral palsy who drool appear to reduce saliva after physiotherapy treatment.

Key words

Cerebral Palsy, Saliva, Physiotherapy, Drooling

Introduction

Cerebral palsy is a neuromuscular dysfunction caused by non-progressive injury to the immature brain and resulting in various impairments of the ability to co-ordinate muscle action to maintain normal posture and movement[1]. It is classified in relation to predominant motor characteristics such as spastic, hypotonic, athetotic, dystonic, and ataxic, as well as to topographical pattern of limb involvement, such as monoplegia, diplegia, triplegia, hemiplegia, or quadriplegia[2]. In addition to other symptoms patients with cerebral palsy persist drooling which is an important clinical problem. Insufficient coordination of orofacial, palatolingual, head and neck musculature control, difficulties in swallowing and oral sensiorial problems results in excessive pooling of saliva in the anterior part of the oral cavity and uncontrolled saliva loss[3]. It has been estimated that 10% to 38% of patients with cerebral palsy persist abnormal drooling. When presents it is considered a serious disability affects negatively the patient social environment[4,5]. as well as the progress of various therapeutic procedures and keeps the patient away from learning skills. Clinicians and therapists dealing with such patients have tended to neglect this problem[6].

There is no sufficient emphasis on the management of this problem specially during the application of a routine physiotherapy and rehabilitation program of cerebral palsied children. However, children with cerebral palsy were treated for orofacial motor-sensory dysfunctions with stimulatory plates according to Castillo-Morales and with special oral and facial physiotherapy[7]. It was postulated that intraglandular injections into the submandibular glands with botulinum toxin A could reduce the secretion of saliva and consequently decrease drooling and promise technique to reduce salivary flow rate and probably an alternative in the treatment of drooling in children with cerebral palsy[8]. In this study we have evaluated the efficiency of the physiotherapeutic intervention on drooling.

Materials and methods

15 (10 female, 5 male with mean age 9.9±3.6 year, mean weight 36.9±12 kg. and mean height 134±15 cm.) children diagnosed with spastic cerebral palsy who were identified as having severe drooling by reporting that clothing and work surfaces were constant wet and didn't receive any medication for drooling treatment were included in this study. Each session consisted from 50 minutes divided to three periods. The first period included the assessment of drooling throughout 20 minutes without therapeutic intervention. In the second period we applied a 10 minute physiotherapeutic intervention which consisted of electrical stimulation lasted for 5 minutes. A low frequency interrupted current (frequency 35 pps, pulse duration 300 μs) held on orbicularis oris and masseter muscles by skin electrodes located on each side of the mouth using Danmeter Elpha E 80 tool, a hand-held battery-powered electrical stimulator with two dual channel. The current level was adjusted according to patient's tolerance.

Electrical stimulation was applied in addition to exercises and PNF technique which also lasted for another 5 minutes. PNF technique included a global stretching followed with resistance or assistance according to the muscles action level of the orofacial area. The actions which retrained are smiling with and without opening the mouth, pursing the lips, lifting the upper lip, lowering the lower lip, sticking out the tongue, sticking the tongue upward, downward, to the right and to the left and swallowing activity.

The drooling then assessed again during the last 20 minutes.

During each session the patient was supported in an erect position of upper trunk, neck and head by a frame.

Each patient received 8 therapy sessions with 2 sessions per week. The drooling quotient (DQ) was scored throughout pre and post-treatment periods. An episode of drooling was defined as new saliva presents on the lip margin or dropping from the chin[8,2]. Every 15 seconds, the presence or absence of drooling episode was recorded (80 observations in 20 minutes). To eliminate the discomfort of patients we cleaned

every episode after recording.

Statistical analysis

Descriptive statistics are presented as means ± SE (standart error). The differences between pre and post treatment drooling levels for each therapy sessions were analysed by Wilcoxon signed ranks test, and throughout all sessions by Friedman test, using SPSS for Windows 11.5. P-values< 0.05 were considered significant.

Results

Mean number of pre and post treatment drooling episodes are presented in Table I and Figure I. Results showed that the drooling levels decreased after each therapeutic intervention ($p<0.01$). There was no significant change in the pre treatment levels of the drooling episodes throughout the therapy sessions ($p>0,05$), while there was a significant decrease in the post treatment levels of drooling episodes ($p<0.001$) (Table, Figure)

Discussion

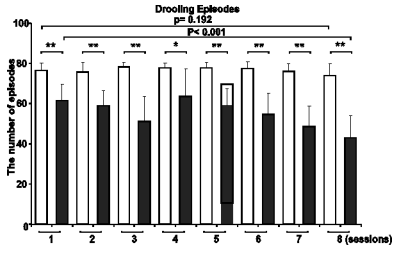
Many children with mental retardation and developmental disabilities such as cerebral palsy suffer from the consequences of chronic drooling which can be seen in 10% to 38% of people with cerebral palsy. This problem results in cosmetic effects, defect of masticatory function, peri-oral infections and dehydration[9,10].

Some of procedure such as behavior modification, biofeedback, oral motor therapy; speech therapy, drug therapy, radiotherapy, orofacial regulation therapy; and surgery have been suggested to treat drooling. In our research we applied a physiotherapy treatment combination consisting of electrical stimulation, exercises and PNF techniques to improve oral sensorimotor control. It was stated that using electromyographic biofeedback from the orbicularis oris and infrahyoid muscles to improve oral motor control and other specific training approaches to increase swallowing frequency using a timed auditory cue significantly decreased drooling in the children with cerebral palsy[11]. McCracken (1978) used sensorimotor techniques to decrease tongue thrust and applied Vibrations to the masseter, the anterior digastrics and the upper lip for 2–3 min in each area of a patient with cerebral palsy and a subjective improvement in drooling frequency was noted[12]. Ray, Bundy & Nelson (1983), reported that oral motor therapy for an 11-year-old child with a spastic form of cerebral palsy resulted in a reduction in drooling whilst the treatment sessions were in progress. However, on termination of the sessions, there was no evidence of sustained benefit from the program. Their intervention involved providing jaw control with intermittent tapping and jiggling, stroking the upper gum, and giving juice with jaw control[13]. In this research we applied the electrical stimulation as a facial neuromuscular reeducation program to orbicularis oris which acts to shape and control the size of the mouth opening and it is important for creating the lip positions and movements during speech, and masseter muscles whose action closes the jaw during chewing[14]. Facial neuromuscular reeducation is a process of facilitating the facial movement and eliminating unwanted patterns of facial movement and expression. This program provides the patients with disorders of facial movement control opportunity for the recovery of facial movement and function. It is demonstrated that application of electrotherapy modalities such as electrical stimulation and electromyography biofeedback improve motor control and increase sensory awareness. Although electrical stimulation often is used in facial conditions such as facial palsy to improve muscles functions[15,16,17], we didn't find studies related to its direct effects on drooling in literature. As an important role in supplying the nervous system we estimated that electrical stimulation of the orbicularis and masseter muscles will provide adequate sensation awareness, thus encouragement the normal motor movement of these muscle and playing a role in decreasing drooling. PNF is a type of motor control rehabilitation program in which therapist facilitates the voluntary contraction of the impaired muscle by applying a global stretching then resistance to the entire muscular section and motivates action by verbal input and manual contact techniques. PNF has been used in orthopaedic diseases of the bone and joints, sports-related trauma, and central nervous system diseases, such as stroke, and its usefulness has been reported in other medical fields[18,19,20,21]. In orofacial and dental treatment, it has been demonstrated that PNF techniques can improve aesthetics of facial expression[18]. When performing PNF to the orofacial region 3 different region are considered: the upper (forehead and eyes), intermediate (nose), and lower (mouth). We also estimated that the orofacial exercises and PNF facilitation techniques we used could have a significant affects on drooling decrease by encouragement the motor control of related muscles. The drooling episodes showed significantly decrease after each treatment and the physiotherapeutic intervention played important role in decreasing drooling. There was no significant change in the pre- treatment levels of the drooling episodes throughout the therapy sessions as the drooling episodes returned to its pre-treatment level and this may be due to non-intense with short duration therapy program and follow-up period. On other

Table 1: Pre and post treatment levels of drooling episodes by therapy sessions

	Number of drooling episodes			
Therapy sessions:	Pre treatment Mean ±SE	Post treatment Mean ±SE	Wilcoxon signed ranks test (z)	p
Session 1 (n=15)	76,40±1,01	61,60±2,09	3,239	<0.001
Session 2 (n=15)	75,66±1.25	58,86±1.98	3,409	<0.001
Session 3 (n=15)	78,26±0.56	51,20±3.21	3,409	<0.001
Session 4 (n=15)	77,80±0.65	63,60±3.53	2,867	<0.01
Session 5 (n=15)	7,60±0.76	59,00±2.14	3,411	<0.001
Session 6 (n=15)	77,40±0.86	54,60±2.76	3,409	<0.001
Session 7 (n=15)	76,00±1.00	48,66±2.60	3,410	<0.001
Session 8 (n=15)	74,00±1.52	42,93±2.82	3,352	<0.001
Friedman test	X^2=9.938 p=0.192	X^2=33.323 p<0.001		

Fig. 1: Drooling episodes before and after treatment. Drooling levels decreased after each therapeutic intervention. There was no significant change in the pre treatment levels of the drooling episodes throughout the therapy sessions, while there was a significant decrease in the post treatment levels of drooling episodes ($p<0.001$). * P-values< 0.01; ** P-values< 0.001.



hand there was a significant decrease in the post treatment levels of drooling episodes and when comparing the first and the last post treatment episodes we found that the efficiency of the last treatment was significantly more than the first one and this may be related to the adaptation of patient's participation and his responses to the therapy program. The result also gives a clue that drooling in cerebral palsied children is appear to be due to oro-motor dysfunctions rather than hypersalivation of the saliva glands because the interventions in this research was directed to the structures of the orofacial area not to the saliva glands. Finally we think that the physiotherapeutic interventions such as electrical stimulation and PNF may decrease the drooling level in patients with cerebral palsy and we suggest intense and long duration therapy program and follow-up period.

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Comparison of McConnell patellar taping versus mobilisation with movement in chronic knee osteoarthritis: A randomized clinical trial

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Abstract

Background

Knee osteoarthritis is a prevalent musculoskeletal condition affecting older people and is associated most commonly with symptoms of pain, inflammation, instability, decreased range of motion (ROM) as well as compromise in quality of life.

Objectives

To evaluate the effectiveness and compare the McConnell Patellar taping and Mulligan's Mobilisation with Movement in chronic knee osteoarthritis.

Materials and methods

60 subjects both male and female, referred to the physiotherapy department from April 2008 to December 2008 were recruited and randomly allocated into three groups, 20 each, after signing a written informed consent. All Groups, group A (McConnell Patellar taping and conventional treatment), group B (Mulligan's Mobilisation with movement and conventional treatment) and group C (McConnell Patellar taping, Mulligan's Mobilisation with movement and conventional treatment) were received the selected treatment for a period of two weeks. Conventional treatment included short wave diathermy and supervised exercises. Outcome parameters were pain on visual analogue Scale, knee flexion range of motion and disability index (by Western Ontario McMaster University Osteoarthritis Index)

Results

In present study combination of McConnell patellar taping and Mulligan's Mobilisation with Movement showed superior results ($p<0.0001$)

Conclusion

Combination regimen of McConnell patellar taping and Mulligan's Mobilisation with Movement is simple, inexpensive strategy in the conservative management of knee OA and can be used as an adjunct to drug and conventional therapies.

Key words

Knee; Osteoarthritis; McConnell patellar taping; Mulligan's Mobilisation with Movement; Isometric exercises.

Introduction

Osteoarthritis (OA) has been defined by the American College of Rheumatology (ACR) as a "heterogeneous group of conditions which lead to joint symptoms and signs associated with defective integrity of the underlying bone and joint margins." The peak onset for development of osteoarthritis is between 50 years to 60 years of age with prevalence rate of 22 % to 39 % in India and is the most common cause of locomotor disability in the elderly[1].

The exact mechanism of osteoarthritis is not known, but research has shown that it appears due to an imbalance between the synthesis and degradation of articular cartilage, its extracellular matrix, and subchondral bone resulting in loss of integrity. Knee osteoarthritis is associated most commonly with symptoms of pain, inflammation, instability, decreased range of motion (ROM) as well as compromise in quality of life[2].

The objectives of treatment of osteoarthritis are to maximize function and impede or remediate musculoskeletal impairment. Knee taping is one strategy recommended by American College of Rheumatology[3]. The use of tape as a technique in general rehabilitation was popularized in the 1980s by Jenny McConnell an Australian physiotherapist. Evidence suggests that taping may benefit individuals with knee osteoarthritis and researchers found a significant reduction of pain (78% by visual analogue scale), increased stride length during ramp ascent and improved loading response with knee flexion in taped patients and concluded that the pain reduction allowed increased quadriceps activity, and improved tolerance to patellofemoral joint reaction forces[4].

Techniques known as Mulligan's joint Mobilisation with Movement (MWM) have been proposed as novel manual therapy techniques to improve joint range of motion by combining physiological and accessory joint movements.[5] This technique is performed in symptom free range of motion, a factor that probably makes it safer than many other manual therapy approaches[6].

Short wave diathermy (SWD) is non-pharmacologic management approach that involves the application of deep heat and this treatment has been reported to have a measurable effect for patients with knee osteoarthritis. A variety of muscle conditioning programs can be effective in improving strength, endurance and function without exacerbation of pain or disease activity. Isometric quadriceps exercises are the one, which is somewhat frequently used in physiotherapy science to improve muscle tone, static endurance, and strength and to prepare joints for more vigorous activity.

Methodology

Source of data

The data was collected at K.L.E's Prabhakar Kore Hospital And Medical Research Centre, Belgaum, Karnataka, India.

Study design and research question

The present study is a prospective study designed as a pragmatic clinical trial aimed to evaluate the effectiveness and compare the McConnell Patellar taping and Mulligan's Mobilisation with Movement in chronic knee osteoarthritis. Ethical clearance was granted by the institutional ethical committee.

Sampling design

The sampling design was a random sampling method.
Inclusion criteria

1. Kellgren and Lawrence grade III radiographic evidence of osteoarthritis knee unilateral or bilateral.
2. Men and women e" 40 years with duration more than or equal to one year.
3. Average knee pain e" 3 cm on visual analogue scale.
4. Subjects with both unilateral & bilateral knee osteoarthritis.

Exclusion criteria

1. Acute exacerbation in or around knee joint.
2. Traumatic injury to the knee joint with in 6 months of study.
3. Any recent surgical intervention or intra-articular steroid injection to the knee joint with in three months..
4. Peripheral vascular diseases.

Procedure

The suitability of participant as per the inclusion and exclusion criteria was made before enrollment. A written informed consent after explaining the advantages and disadvantages of the study was taken from partcipants. Demographic data and baseline data of pain (in terms of VAS), knee active and passive flexion range of motion (by Universal Goniometer) and physical function level (by Western Ontario McMaster University Osteoarthritis Index) were assessed prior to the commencement of the intervention. Participants were then allocated in 3 groups viz. group 'A' (McConnell Patellar taping and conventional treatment), group 'B' (Mulligan's Mobilisation with movement and conventional treatment) and group 'C' (McConnell Patellar taping, Mulligan,s Mobilisation with movement and conventional treatment). All measurements were repeated on day 12th i.e. at the end of treatment session.

Participants in Group 'A' received conventional treatment and McConnell patellar taping which had three basic components glide, tilt and rotation. Medial glide is accomplished by 4 cm adhesive tape applied across the anterior aspect of the patella pulling from lateral to medial to shift the patella medially (photograph 1).

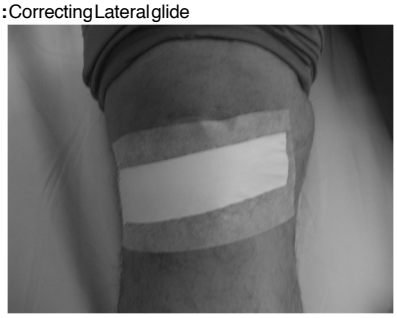
Lateral tilt was corrected by 4 cm leukotape applied across the middle of the patella to the medial border of the medial hamstring tendons (photograph 2).

Photograph 2: Correcting Lateral tilt
To correct external rotation component 4 cm leukotape was applied to the middle of the inferior border of the patella and tape was secured to the medial soft tissues in superior and medial direction while the manual correction was maintained and vice versa to correct internal rotation component.

Participants in Group 'B' received Mulligan's Mobilisation with Movement which included medial glide and medial rotational glide in weight bearing and non weight bearing positions of knee joint. All glides were given in three sets of ten repetitions.

Medial glide: The therapist stood on the contralateral side

Photograph 1: Correcting Lateral glide



Photograph 2: Correcting Lateral tilt

Photograph 3: Mulligan's Medial glide

Photograph 4: Mulligan's (a) NWB and (b) Weight bearing rotational glide

a

b

with the participant prone and Mulligan's belt was placed at therapist

waist and participant's tibial joint margin and the knee was glided medially with the help of belt and participant was asked to flex his knee in the painless range (photograph 3).

Rotational mobilisation with movement:

Non-weight bearing: The therapist stood on the affected side knee with the participant supine and grasped and rotated the tibia internally on the femur and the participant was instructed to perform flexion and extension within painless range. (Photograph 4a)

Weight bearing: The participant was asked to stand with the painful leg on a low stool. The therapist hand was kept proximally around the lower leg and the participant's tibia rotated medially and participants were instructed to bend forward to flex the knee provided there was no pain. (Photograph 4b)

Participant in group 'C' received the combination of McConnell patellar taping and Mulligan's Mobilisation with Movement as given in group A and group B.

All the three groups received conventional treatment in the form of short wave diathermy and supervised exercises. Short wave diathermy was applied for 20 minutes in contraplanar method with continuous mode.

Supervised exercises given in the form of static quadriceps where participants were asked to press the rolled towel by isometrically contracting the quadriceps with the hold time of six seconds and repeated for 10 times with ten seconds rest between each repetition. Strengthening of vastus medialis by making participant to sit on a chair comfortably with the knees bent and was instructed to straighten the knee slowly with hip adduction and internal rotation and asked to maintain the contraction for 1 minute. Repeat the exercise 10 times in a row with total duration of 10 minutes.

All the measurements were taken on day one before commencement of treatment, and on day12th at the end of the treatment period.

Results

The result of this study was analyzed in terms of reduction in pain, improvement in knee flexion range of motion and improvement in physical function.

Table 1: Age distribution

Groups	Mean Age (years)
Group A	56.22±5.15
Group B	56.40±6.81
Group C	56.70±8.08

Table 2 : Mean changes in VAS

Groups	Visual Analogue Scales (cms)	
	Pre Treatment	Post Treatment
Group A	7.45±1.71	2.54±1.01
Group B	6.50±1.14	3.10±0.94
Group C	6.79±1.56	1.30±0.56

Table 3 : Mean changes in Active ROM

Groups	Active ROM	
	Pre Treatment	Post treatment
Group A	99.39±22.99	105.50±20.14
Group B	99.40±11.60	111.95±8.71
Group C	105.15±9.19	119.70±5.66

Statistical analysis

Data was analyzed using "SPSS" 13.0 version. Mean and standard deviation were calculated for age, BMI, pain, range of motion (ROM) and disabillity on day 1 and day 12 i.e. at the end of treatment session.

Intra group comparison of the pre interventional and post interventional outcome measures was done by using student paired 't' test whereas one way ANOVA and multiple comparison Scheffe test was used to measure the inter group difference.

Pain

Intra group changes in the visual analogue scores revealed statistically significant reduction in pain post interventional for all the three groups. The inter group analysis for VAS showed statistically significant difference between group A versus group C ($p<0.0001$) and group B versus group C ($p<0.0001$), where as group A versus group B showed no significant difference ($p=0.14$). (Table No.-2)

Range of motion

Active ROM and passive ROM

On comparing pre-interventional versus post-interventional values; all the three groups had shown statistical significant difference ($p<0.0001$) in improving knee active and passive range of motion. The inter group analysis for active ROM showed statistically significant difference between group A versus group C ($p=0.005$). (Table No.-3 and 4)

Western Ontario McMaster University Osteoarthritis Index (WOMAC)

On comparing pre-interventional versus post-interventional values; there was statistically significant difference shown in all the three groups ($p<0.0001$). The inter group analysis for WOMAC showed statistically significant difference between group A versus group C ($p<0.0001$), and group B versus group C ($p<0.0001$), whereas group A versus group B ($p=0.64$) showed no statistical significant difference. (Table No.-5)

Discussion

The results from the statistical analysis of the present study supported alternative hypothesis which stated that there will be beneficial effect to the participants treated with McConnell patellar taping and Mobilisation with Movement. In the present study reduction in pain level, as quantified by the VAS, with the application of patellar taping is consistent with the findings of previous studies indicating that therapeutic tape reduced pain by up to 50% compared with the untaped condition[7].

Table 4 : Mean changes in Passive ROM

Groups	Passive ROM	
	Pre Treatment	Post treatment
Group A	104.94±20.24	110.00±18.99
Group B	105.00±11.44	116.15±7.98
Group C	110.45±7.39	123.3±5.36

Table 5 : Mean changes in WOMAC Index

Groups	WOMAC	
	Pre Treatment	Post Treatment
Group A	55.1±14.41	24.6±9.20
Group B	49.55±11.66	22.3±9.07
Group C	44.75±10.46	10.25±3.64

Study done by Hinman et al evaluated the effects of knee tape in a population with osteoarthritis, and 25% reduction in pain was observed in patients with patellofemoral joint disease by taping the patella medially for four days. Several mechanisms may explain the pain-relieving effects of therapeutic tape, given that patellofemoral joint osteoarthritis is correlated with patellar mal-alignment, and this in turn is associated with increased peak patellofemoral contact pressures and loading of the lateral facet, therapeutic tape may thus ease pain by improving patellar alignment[7].

Few of the authors suggested that this effect is not produced by medialization of the patella. Bockrath et al[8] also argued that patellar tape may elicit neural inhibition by facilitating large afferent fiber input.

Another possibility is that reduced pain was due to placebo effect of the patellar tape, regardless of the direction in which the tape was applied. However, previous authors have indicated that therapeutic taping had a greater effect on pain reduction and functional improvement than placebo taping or control conditions[9,10]. Alternately, several investigators[11,12] have reported no significant differences between therapeutic and placebo taping techniques on perceived pain and neuromuscular activity. Given these facts, few of the authors believe that the simple application of tape to the patella is a valid therapeutic option[11].

The present study demonstrated that the application of Mulligan Mobilisation with Movement had shown significant change in pain, range of motion as well as in physical functional outcome. However, these findings are consistent with studies conducted in other joints of the body that have shown similar effects with the Mobilisation with Movement techniques. It is pertinent to the application and effectiveness of an MWM that a reduction or an elimination of pain are achieved throughout the technique, with appropriate adaptation of the technique in relation to pain response. This also raises the importance of adaptation in response to pain behaviour during the MWM. Abbott et al also stated that four attempts of the glide direction are permitted; in order to determine which best eliminates the pain. If the pain was not eliminated or it returned during treatment, no further repetitions were performed[13] however, the pain relief mechanism was hypothesized to be due to changes in nociceptive and motor system dysfunction, possibly implying the role of hypoalgesia.

Mulligan's original theory for the effectiveness of an MWM is based on the concept related to a 'positional fault' that occur secondary to injury and lead to maltracking of the joint; resulting in symptoms such as pain, stiffness or weakness[14]. The cause of positional faults has been suggested to be due to changes in the shape of articular surfaces, thickness of cartilage, orientation of fibres of ligaments and capsules, or the direction and pull of muscles and tendons. MWM's correct this by repositioning the joint causing it to track normally[14,15,16]. Alternatively; it is equally plausible that no positional fault exists but, rather, there is purely a limitation of joint motion; the Mobilisation with Movement (MWM) have produced its effect through improving accessory joint motion, not a change in positional fault[17].

In the present study, group C had shown significant changes in pain, range of motion, and functional activities than group A and group B which indicated that the combination of McConnell patellar taping and Mobilisation with Movement was helpful in improving the physical function status of subjects with knee osteoarthritis. A study done by Chandana Saraswathi showed that a combination of Mobilisation with Movement with hot packs and supervised knee exercise is more effective than hot packs and supervised knee exercise alone in decreasing pain, dysfunction, stiffness and improving the functional capacity as assessed on WOMAC in patients with primary knee osteoarthritis[18].

Limitations

1. Subjects could not be followed up after the study.
2. Duration of the study was short with small sample size.
3. McConnell rotation component not assessed.

Recommendations

1. Conduct the study using different radiological grades of knee osteoarthritis.
2. The amount of force applied during an MWM is a parameter of limited research and documentation within studies.
3. Testing of the kinesiological models to explain the effect of mechanism of McConnell patellar taping in improving range of motion.

Conclusion

In conclusion, the present randomized clinical trial provided evidence to support the use of physical therapy regimen in the form of McConnell patellar taping and Mulligan's Mobilisation with Movement (MWM) in relieving pain, improving range of motion, functional well being in subjects with chronic knee osteoarthritis. In addition, results supported that combination therapy is of great value which can be useful in improving quality of life as knee osteoarthritis is a heterogeneous condition.

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Shoulder function and scapular positioning pattern in patients with shoulder impingement syndrome before and after strengthening & flexibility exercises

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Abstract

Shoulder impingement syndrome is a common condition and is often managed with an exercise program. The purpose of this study was to identify changes that might occur in scapular positioning patterns and shoulder function after exercise program in patients with impingement.

Methods

Thirty subjects were assessed before and after a four week rehabilitation program. Pain, satisfaction, and function were measured using the University of Pennsylvania Shoulder Scale. Scapular kinematic data also were collected using gravity inclinometer. Subjects were given a progressive exercise program that included resistive strengthening, stretching, and postural exercises. Each subject attended five physical therapy sessions per week for a four-week period. Pre-test and post-test scores were compared using pairedt tests.

Results

Improvements were found for pain, satisfaction, and shoulder function and for scapular upward rotation in saggital and scapular plane.

Discussion and conclusion

The use of this exercise protocol in the management of shoulder impingement syndrome may have a positive impact on patients' impairments, functional limitations and scapular positioning pattern.

Key words

Exercise, Shoulder impingement, Shoulder Function, Scapular Positioning Pattern

The Shoulder subacromial impingement syndrome (SAIS) refers to the mechanical compression of the rotator cuff, subacromial bursa, and biceps tendon against the anterior undersurface of the acromion and coracoacromial ligament, especially during elevation of the arm (Neer)[1]. Neer[2] stated that as many as 95% of all rotator cuff tears could be attributed to mechanical impingement.

Multiple factors have been proposed to contribute to the development of SAIS, these factors include abnormal acromial morphology[3,4,5], aberrant kinematic patterns associated with altered rotator cuff or scapular muscle function[6,9], capsular abnormalities[10,12] (including posterior capsular tightness as well as capsular laxity), poor posture[13,15] (flexed thoracic spine) and overuse secondary to repetitive eccentric loading[16,19] or sustained use of the arm above 90 degrees of elevation. Therefore rehabilitation should encourage strengthening & flexibility exercises of rotator cuff muscles & scapular stabilizers & postural awareness.

During dynamic arm movement, the scapula must move synchronously with the humerus to provide optimal congruence between the glenoid and the humeral head. This congruence is necessary for establishing adequate length-tension relationships for the muscles acting on the scapula and the humeral head[20,22] and for maintaining a stable base for transferring kinetic energy from proximal to distal segments[23,25].

During humeral movement, the scapula has been shown to rotate about three axes, anterior-posterior or horizontal (perpendicular to the scapular plane), superior-inferior or vertical, and medial-lateral (parallel to the scapular spine), thus producing three distinct motions, that is anterior-posterior tilting, upward-downward rotation, and internal-external rotation, respectively[26,28].

Upward rotation of the scapula is suggested to be important because the scapula must rotate adequately in an upward fashion to prevent the humeral head from compressing and shearing against the undersurface of the acromion process during humeral elevation[22,23,29,31]. The combination of shear (mechanical abrasion) and compression forces of the humeral head on the undersurface of the acromion and coracohumeral arch has been described as the main mechanism responsible for producing subacromial impingement[23,29,31].

Patients with rotator cuff impingement have less scapular upward rotation and reduced shoulder function as compared to normal subjects[11,30]. The restoration of shoulder function has been studied in all exercise based studies[11,13,32,33,34]. It is a corollary that persistent scapular positioning defect or dyskinesia is a precipitating factor for development of impingement related symptoms. Study addressing the scapular positioning patterns post rehabilitation has not been cited. Therefore, the study aims to address the effect of rehabilitation on scapular function (positioning) in patients with impingement before and after the exercise protocol.

Method

Subjects

Thirty subjects (26male & 4female) seeking care for shoulder pain and diagnosed with SAIS were recruited. The basic descriptive characteristics of the subjects are given in Table 1.

The diagnosis of SAIS was made initially by the referring physician[35] and was confirmed by the examination. To be

Table 1: Demographic Details of Subjects

Variable		Mean±SD
Age (years)		29.86±4.27
Height (cm)		166.7±8.16
Weight (kg)		64.66±6.50
Pain Duration		12.13± 5.79
Shoulder Function (measured on PSS)		52.7 ±12.07
Scapular Upward Rotation in Saggital Plane at humeral angle	30°	0.96±0.71
	60°	4.23±1.86
	90°	10.4±3.02
	120°	18.2±3.71
Scapular Upward Rotation in Scapular Plane at humeral angle	30°	1.5±1.008
	60°	5.7±2.15
	90°	12.56±2.63
	120°	20.86±3.10

S.D–Standard Deviation, PSS–Penn Shoulder Scale.

Pre-intervention and post-intervention comparison of shoulder function: There is a significant improvement in shoulder function after strengthening and flexibility exercises.

Pre Experimental	Post Experimental	t–Value
Mean±S.D	Mean±S.D	17.74**
52.70±12.07	74.03±8.204	

**value significant at 0.01 level

Pre-intervention and post-intervention comparison of scapular upward rotation in saggital Plane: There is a significant improvement in scapular upward rotation in saggital plane after strengthening and flexibility exercises.

	Pre Intervention	Post Intervention	t–Value
Humeral Elevation	Mean±S.D	Mean±S.D	
30°	0.96±0.71	1.46±0.97	4.78**
60°	4.23±1.8	5.76±2.63	6.56**
90°	10.4±3.02	12.76±3.48	7.23**
120°	18.2±3.71	23.0±5.24	8.14**

**value significant at 0.01 level

Pre-intervention and post-intervention comparison of scapular upward rotation in scapular plane: There is a significant improvement in scapular upward rotation in scapular plane after strengthening and flexibility exercises.

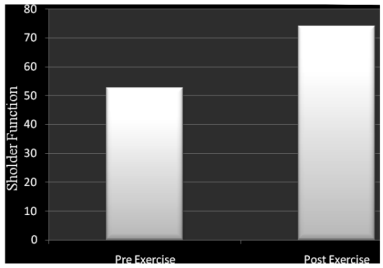
	Pre Intervention	Post Intervention	t–Value
Humeral Elevation	Mean±S.D	Mean±S.D	
30°	1.50±1.00	3.40±1.38	8.03**
60°	5.70±2.15	9.60±2.71	8.70**
90°	12.5±2.63	17.4±3.93	8.35**
120°	20.86±3.1	29.23±5.3	9.31**

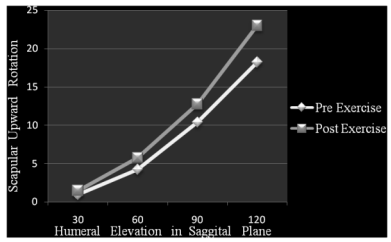
**value significant at 0.01 level

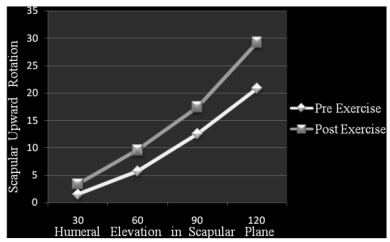
classified as having SAIS, subjects had to demonstrate at least 3 of the following: positive Neer[36] impingement test, positive Hawkins impingement test, pain with active shoulder elevation, pain with palpation of the rotator cuff tendons, & pain with isometric resisted abduction. Subjects were excluded if they demonstrated signs of a complete rotator cuff tear or acute inflammation. Signs of a complete tear were gross weakness in

abduction or lateral rotation, as evidenced by a 50% or greater deficit (relative to the uninvolved arm) , or positive magnetic resonance imaging findings for a full-thickness rotator cuff tear from a previous diagnostic evaluation. Signs of acute inflammation were severe resting pain or severe pain reported during either the Neer or the Hawkins impingement test or during isometric resisted abduction. Additionally, subjects who have cervical spine–related symptoms, glenohumeral instability (positive apprehension, anterior drawer, or sulcus test), or previous shoulder surgery were excluded. The study was explained to all subjects who met the criteria, and they were asked to read and sign the informed consent agreement.

Instrumentation and measurement procedures







Two types of measurement were collected: Shoulder Function and Scapular Positioning Pattern (scapular upward rotation).

Shoulder function

Shoulder function was assessed on Penn shoulder scale[37]. It has three subscales:

Pain subscale: Subjects were asked to rate their symptoms on a 10-point scale at rest, during light activities, and during strenuous activities. These ratings were combined for a possible score of 30, representing "no pain at all."

Satisfaction: was rated based on a single 10-point scale ranging from "completely unsatisfied" to "completely satisfied" in response to the question: "How satisfied are you with your current level of shoulder function?"

Function: was assessed based on 20 questions related to functional activities, each rated on a 4-level ordinal scale with 3 representing "no difficulty" and 0 representing "cannot do at all." The highest functional score possible is 60 points. The combined total of the subscale scores may be used to determine a composite score based on 100 points, with higher scores being better.

Scapular positioning pattern: In this upward rotation of scapula is measured in saggital and scapular planes at multiple angles of humeral elevation (30, 60, 90 &120 degrees).

All patients were assessed in a relaxed, balanced standing position with their feet positioned shoulder width apart. Scapular upward rotation was measured with full elbow extension, neutral wrist and with the thumb leading to control for humeral rotation. The guiding pole was placed at an angle of 40 degrees anterior from the frontal plane, ensuring

humeral elevation in the scapular plane, and 90 degree anterior from the frontal plane, ensuring elevation in the sagittal plane. The selected humeral elevation angles were determined using the goniometer and the subject's arm was moved to each angle and the position was marked on the guiding pole.

The inclinometer was placed along the spine of scapula and patient was instructed, to raises the arm slowly to the specified mark on the guiding pole, and the scapular position was measured at 4 angles of humeral elevation (30, 60, 90, 120 degrees) using gravity inclinometer[38].

Intervention

A standardized intervention regimen was applied to all patients[39]. Subjects were required to make 5 visits per week for 4-weeks. All patients initially began with:

i. Strengthening of the rotator cuff and scapular stabilizers using lightest grade theraband(yellow),
ii. Flexibility exercises for of the glenohumeral posterior capsule, pectoralis minor muscle, and upper thoracic spine,
iii. Upper-quarter postural awareness exercise, and
iv. Educating patient regarding environmental and workplace factors.

Strengthening exercises:

- Shoulder external rotation starting in approximately 45 degrees of internal rotation, with the arm by the side and the elbow flexed to 90 degrees.
- Shoulder internal rotation starting in approximately 45 degrees of external rotation, with the arm by the side and the elbow flexed to 90 degrees.
- Shoulder extension starting with the arm forward flexed approximately 45 degrees

The subjects were instructed to do two or three sets of 10 repetitions for each exercise, once per day.

Flexibility exercise: Flexibility exercises was done throughout the four week period and consisted of the following:

- Internal rotation towel stretch: Subjects was instructed to sit or stand while holding a towel with the affected arm behind the back and to use the other arm to pull the affected arm up the back.
- Cross-body stretch: Subjects was instructed to sit or stand and hold the affected elbow with the opposite hand in front of the body and slowly pull the elbow across the body until they felt a comfortable stretch.
- Upper thoracic extension stretch: Subjects was instructed to lie supine with (two or three inch) towel roll positioned between the shoulder blades and allow the shoulders to drop back to surface.

Subjects were instructed to hold an individual stretch for thirty seconds and to repeat each stretch three times. They were instructed to perform flexibility exercises at least once per day and twice if able.

Upper-quarter postural awareness:

To address upper-quarter posture, all subjects were instructed to do chin-tuck exercise, which was supposed to be performed at least three times every hour. Subjects were instructed to apply pressure to the chin with the fingers as the head was pulled back, holding it for three seconds. Emphasis was placed on keeping the motion horizontal, and to avoid tilting of the head back or to looking at the ceiling.

Enhancing patient understanding of environmental and workplace factors:

Simple strategies to reduce loads on the shoulder are explained to patients. This includes working with the arms below 60 degrees of elevation, keeping loads close to the body, use of armrests, and use of ergonomic aids or assistance from other people for heavy lifts. The concept is to avoid undue repetition and prolonged static work postures.

Once the patient was able to do three sets of ten repetitions without feeling substantial pain or fatigue, the next strongest elastic band (green) was used. Once they have progressed to using green (moderate resistance), new exercises were added, as follows:

- Shoulder abduction (scapular plane) through a 0- to 60-degree arc with the elbow flexed to 90 degrees and the shoulder in neutral rotation, holding the band in the hand with the band oriented horizontally across the body.
- Shoulder flexion (sagittal plane) through a 0- to 60-degree arc starting with the elbow flexed to 90 degrees and the shoulder in neutral rotation and punching forward, simultaneously extending the elbow and flexing the shoulder.
- Scapular retraction starting with elbows flexed to 90 degrees, the shoulder in neutral rotation, and the arms by the side, pinching the scapulae.
- Shoulder external rotation starting with the arm abducted to 45 degrees in the scapular plane with the elbows flexed to 90 degrees, moving through an arc from 30 degrees of internal rotation to 30 degrees of external rotation.

The subjects were instructed to do two or three sets of ten repetitions for each exercise, once per day.

Three more flexibility exercises were added, after taking goniometric measurements, if subject lacked normal flexibility for those motions.

- Doorway pectoral muscle stretch: Subjects was instructed to stand (one to two ft) to the side of a doorframe and grasp the doorframe at shoulder height and then rotate the upper body away from the door.
- Shoulder flexion stretch: Subjects was instructed to hold a stick or cane with both hands while lying supine and use the unaffected arm to raise both arms overhead until they felt a comfortable stretch.
- Shoulder external rotation stretch: Subjects was instructed to lie supine and rest the affected arm on a pillow (six inches) from the side with the elbow bent. Then, holding a stick or cane with both hands, they were instructed to apply downward pressure to the affected arm by rotating it back.

Data analysis

The variables available for analysis were Shoulder Function & Scapular Positioning Pattern. The data was managed on an excel spreadsheet and was analyzed using SPSS 12.0 Version software. Descriptive statistics (mean, standard deviation) were computed for the studied variables.

The statistical test used was paired student's t test for comparing Shoulder Function & Scapular Positioning Pattern before & after four weeks of strengthening & flexibility exercises. The statistical tests were considered significant at p d" 0.01 level.

Results

Dicussion

It has been identified from the literature that patients with rotator cuff impingement have reduced shoulder function & less scapular upward rotation as compared to normal subjects[11,30]. The background of the current study was to find out the effect of strengthening & flexibility exercise program on shoulder function and scapular positioning pattern in patients with shoulder impingement Syndrome. In the current study it was hypothesized that strengthening & flexibility exercise program have significant effect on shoulder function and scapular positioning pattern in patients with shoulder impingement syndrome.

On comparison, it is evident from the results that there is statistically significant improvement in shoulder function & Scapular positioning patterns. These findings are in support to previous studies.

Brox [33] et al compared a supervised exercise program with acromioplasty and placebo laser treatment. They found that both the acromioplasty and exercise groups had improvement in pain, muscle force, active range of motion and radiographic assessment.

Bang and Deyle[34] found that patients who received manual therapy and exercise demonstrated greater short-term improvements pain, muscle force and function than those who received exercise only. The limitation of their study was the use of combination therapy which cannot conclude whether the improvement was due to mobilization or exercise. The current study finds out the effect of supervised exercise only.

Ginn KA [40] et al documented improve shoulder function after physical therapy in patients with shoulder pain. A retrospective study by Morrison[74] et al also showed satisfactory results after supervised physical therapy regime. Wang C-H, McClure P & Pratt NE[41], evaluated the effect of stretching and strengthening exercises on three dimensional scapular kinematics. The results showed improvement in scapulohumeral rhythm, increased scapular stability, erect upper trunk posture and improved muscle strength.

Our study has shown improvement in shoulder function & scapular positioning patterns (p d" 0.01). The probable reasons for improvement in shoulder function is decrease in pain, avoiding elevation exercises until the glenohumeral rotators are strong enough perform an important depressor function that keeps the humeral head centered on the glenoid fossa during elevation.

Improvement in scapular upward rotation could be attributed to flexibility exercises (like cross body stretch & upper thoracic extension stretch) and strengthing of the scapular muscles that helps to stabilize the scapula on the thorax and facilitate upward rotation.

Moreover, scapular upward rotation was not measured under loaded conditions; this could be the reason for improved scapular poisoning pattern because some studies[9,29] have suggested that patients with impingement show greater deficits under loaded conditions.

No control group was used because pain associated with impingement does not resolve spontaneously and may even worsen slightly with no intervention or placebo resulting in declined shoulder function[32,40,42].

In our study, tester was not blinded, and therefore bias may have been a factor and use of non probability convenient sampling, small sample size and lack of supervised upper quarter postural exercise are the limitations of the study.

Our study is the first study that has assessed scapular upward rotation post rehabilitation. We cannot conclude that the improvement in shoulder function & scapular poisoning patterns is due to strengthening of rotator cuff and scapular stabilizers or due to flexibility exercises.

In future, a study with follow up period of 6 month or one year is recommended to analyze the long term effect of strengthening & flexibility exercises on shoulder function & scapular positioning pattern. Effect on strengthening & flexibility exercises should also be studied on anterior-posterior tilting and internal-external rotation of scapula.

Conclusion

A 4-week exercise program aimed at strengthening the rotator cuff, increasing the flexibility of the posterior glenohumeral capsule, and encouraging upper thoracic extension and a retracted head position have results in improved shoulder function and scapular positioning patterns in patients with shoulder impingement.

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Opinions about the roles of a good health sciences teacher

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Abstract

Background and objective

The teaching process is being developed in order to provide an environment favorable to the self-development and self-valuing of the student, representing a tendency of education for the beginning of the 21st century. The purpose of this study was to assess the opinions of students that completed the Physiotherapy course about the importance of the different roles of the teacher in health science.

Methods

A self-administered questionnaire consisting of 13 structured items was elaborated and distributed to a total of 71 physiotherapists divided into three groups. The first group consisted of postgraduate students from a private university, the second of postgraduate students from a state university, and the third of students of a public Specialization Course.

Results

The data for the three groups were compared by the nonparametric Kruskal-Wallis test (nonparametric ANOVA), with statistically significant differences being detected in six questions.

Conclusion

The roles of the teacher most appreciated by the groups were generator of new knowledge (researcher) and provider of practice information.

Key words

Health education; Teaching practice; Questionnaire.

Introduction

During the 1990's, studies and debates about education started to be considered again in Brazil and in other parts of the world[1]. The result was the creation and adoption of new and different roles for health sciences teachers.

In a traditional model, teaching actions used to be centered on the presentation of information by the teacher. The teacher had functions such as watching and counseling the students and teaching the subject matter. He was seen as the highest authority, an organizer of contents and strategies, and therefore as the only one responsible for and leading the educational process. There was a predominance of oral exposition of content following a predetermined and fixed sequence regardless of the school context[3].

The teacher used to transmit a content as a truth to be absorbed, without trying to establish a relation between the contents to be taught, the interest of the students, and the real problems that affect society[2,3]. Since the current trends regarding the teaching of Health Sciences are being modified, these concepts have also changed.

According to McMillan (2007)[4], a good teacher is the one who establishes a relation between teaching and learning and who contributes significantly to the academic success of the student in order to prepare a future member of the clinical profession. The teacher should also create opportunities for the student to develop skills such as independence and flexibility in his way of learning.

The renewed pedagogy includes several currents linked to the movement of non-directive pedagogy, mainly represented by the psychologist Carl Rogers and by the movement called New School or Active School[5]. These currents, although admitting divergences, are guided by the same principle of valuing the individual as a free, active and social being. The center of school activity is not the teacher or the content of the disciplines, but rather the student as an active and curious being[3,6]. The most important feature of this model is the learning process[3].

The teacher plays other roles in education aiming at facilitating the free and spontaneous development of the student, and pursuing the process of searching for knowledge, organization and coordination of learning situations, adapting his actions to the individual characteristics of the students in order to develop their individual abilities and intellectual skills. The teacher strongly stimulates the motivation of his students since he indirectly affects their interest in learning, raising their interest in the search for knowledge, in achieving their personal and learning goals, and in developing competence and skills. Thus, the teaching process is developed in order to provide an environment favoring student self-development and self-valuing, representing a tendency that started at the beginning of the 20th century[3,7,8].

The educator should know how to assess the performance of the student and should be aware of the social role he plays, always thinking about the best way to fit practice to the pedagogic needs of the institutions and to the health needs of the population[9,10]. He should stimulate leadership instead of training managers subordinate to the order emanating from those in power.

Problem-based learning (PBL) arose from this new educational model, leading to the necessity of a new role to be played by the teacher – that of a tutor. The ideal tutor should not remain silent but should know when to intervene and should be able to communicate with his students in an informal manner, being capable of expressive attitudes and

encouraging learning using creative methods. In addition to tutoring, there is another form of education – mentoring – in which the tutor exerts a parental function as a professional consultant, confidant, disciple, and mediator[6,11,12].

The greatest changes in the role of Professor of Health Sciences first occurred in universities of the Northern Hemisphere, followed by many others, including Brazilian schools. The purpose of this study was to assess the opinions of recently graduated Physiotherapists about the importance of the different roles of the professor of health sciences.

Methodology

A questionnaire with open questions directed at university professors and postgraduate students - in the medical area - was the base for elaboration of the instrument - a self-administered structured questionnaire. This questionnaire consisted of 13 items, with replies scored from 1 to 5 on a Likert scale. The questionnaires were distributed to a total of 71 physiotherapists divided into three groups. The first group consisted of 45 postgraduate students from a private university, the second consisted of 29 postgraduate students from a state university, and the third consisted of 15 students of the Physiotherapy Specialization Course from the same state institution.

The questionnaire contained questions aiming at assessing the importance of the roles of professors of health sciences according to the opinions of physiotherapists who had graduated less than five years before the study. The questions concerned the following roles and qualities of the professor: institutional administration, evaluation of students and courses, financial support and material obtained by the

Table I : Behavior of the mean and standard deviation obtained in the questionnaire applied to the first group

QUESTIONS	INDIVIDUALS	Note 1	Note 2	Note 3	Note 4	Note 5
Institutional administrator	45	4	4	9	9	19
Student evaluator	45	1	3	9	8	24
Course evaluator	45	1	1	4	12	27
Recipient of material resources for the institution	45	3	0	7	11	24
Generator of new knowledge	45	0	2	1	8	34
Professional skillful and competent	45	3	1	3	12	26
Active member of the university structure	45	3	2	6	14	20
Model of activities, values and beliefs	45	2	4	12	16	11
Planner of courses/curricula	45	0	1	9	13	22
Producer of teaching material	45	0	2	6	10	27
Provider of practice information	45	0	0	5	15	25
Provider of information for students in formal classes	45	0	1	2	12	30
Tutor/facilitator/consultant	45	1	1	7	10	26
Mean	45	1.38	1.69	6.15	11.54	24.23
Standard Deviation	**45**	**1.45**	**1.32**	**3.16**	**2.54**	**5.60**

In the second group, all replies obtained an equal predominance of a score of 5, except in eighth that was a predominance of a score of 3 (Table 2).

Table 2 : Behavior of the mean and standard deviation obtained in the questionnaire applied to the second group

QUESTIONS	INDIVHDUALS	Note 1	Note 2	Note 3	Note 4	Note5
Institutional administrator	29	6	9	14	9	22
Student evaluator	29	1	6	11	11	31
Course evaluator	29	3	5	6	17	29
Recipient of material resources for the institution	29	4	3	10	13	30
Generator of new knowledge	29	0	4	6	10	40
Professional skillful and competent	29	5	3	9	14	30
Active member of the university structure	29	3	3	12	18	25
Model of activities, values and beliefs	29	4	8	17	16	16
Planner of courses/curricula	29	0	2	12	17	29
Producer of teaching material	29	1	7	10	13	29
Provider of practice information	29	3	1	8	20	28
Provider of information for students in formal classes	29	0	2	4	16	38
Tutor/facilitator/consultant	29	3	2	11	10	34
Mean	29	2.54	4.23	10.00	14.15	29.31
Standard Deviation	**29**	**1.98**	**2.55**	**3.51**	**3.48**	**6.24**

In the third group there was a predominance of a score of 5 for all replies, except for the first and second in which there was a predominance of a score of 5 and 4 (Table 3).

Table 3: Behavior of the mean and standard deviation obtained in the questionnaire applied to the third group

QUESTIONS	INDIVHDUALS	Note 1	Note 2	Note 3	Note 4	Note 5
Institutional administrato	15	0	0	1	3	3
Student evaluator	15	0	0	1	3	3
Course evaluator	15	0	0	3	1	3
Recipient of material resources for the institution	15	0	0	1	2	4
Generator of new knowledge	15	1	0	0	1	6
Professional skillful and competent	15	0	0	0	2	4
Active member of the university structure	15	0	0	2	2	3
Model of activities, values and beliefs	15	0	0	0	3	4
Planner of courses/curricula	15	0	0	0	2	5
Producer of teaching material	15	0	0	1	2	4
Provider of practice information	15	0	0	1	2	4
Provider of information for students in formal classes	15	0	0	0	2	5
Tutor/facilitator/consultant	15	0	1	0	2	4
Mean	15	0.08	0.08	0.77	2.08	4.00
Standard Deviation	**15**	**0.28**	**0.28**	**0.93**	**0.64**	**0.91**

The general mean and standard deviation was calculated for each group, with a value of (4.29 ±0.28) for the first group, of (4.05 ±0.29) for the second group, and of (4.55 ±0.21) for the third. The mean was also calculated for each question and for each group, as illustrated in Figure 1.

professor for the institution, generation of new knowledge (researcher), professional skillful and competent, active member of the university structure, model of attitudes, values and beliefs, planner of courses and curricula, production of teaching material, provision of practical information and of information in the classroom, and tutor/facilitator/consultant, with the student being the manager of the learning process.

The Kruskal-Wallis test for independent sample was used for statistical analysis of the results, with the level of significance set at 5% (p d" 0.05).

Results

The 13 replies to the questionnaires given by the subjects in the three groups were analyzed. Regarding the replies of the first group, all replies obtained an equal predominance of a score of 5, except in eighth that was a predominance of a score of 4 (Table 1).

The nonparametric Kruskal-Wallis test (nonparametric ANOVA) was used for group comparison in the analysis of these variables. This test simultaneously compares the values of the 3 groups since the hypothesis of normality was rejected. When necessary, the post hoc Dunn test was used. The level of significance was set at p d" 0.05 in all analyses.

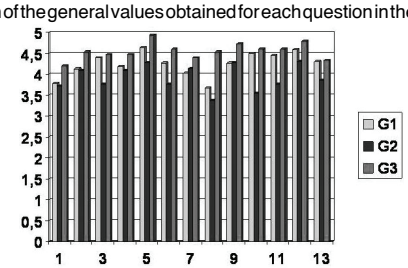
A statistically significant difference was detected only for questions 3,5,6,8,10 and 11. For question 3, the private school group presented significantly higher values than the state school group (p = 0.05). For questions 5 and 6, the trainee group presented significantly higher values than the state school group (p = 0.03 and p = 0.04, respectively).

For question 8, the trainee group presented significantly higher values than the private school and state school groups (p = 0.006). For questions 10 and 11, the private school and trainee groups presented significantly higher values than the state school group (p = 0.001 and p = 0.03, respectively).

Discussion

Education has become a subject of discussion at congresses, seminars and meetings of educators from the most different backgrounds, as well as in the press. Over the last few years, based on the dissemination of the results of large-scale exams applied to students of various educational levels, there has been an increase in the attention devoted to the performance and profile of Brazilian students. The analyses have shown that several factors influence the performance of the students, among them socioeconomic level, location of the university, and others, with these factors acquiring greater or lesser importance according to the type of investigation conducted and to the objectives to be fulfilled. Thus, in the present study a questionnaire was applied in order to assess the roles of the professor in a private university and in a public state university. Regarding the third question (course evaluator), a statistically significant difference was observed between the private and state school students, with the private school students presenting higher values. This difference may be explained by the fact that in the state school group the student is also a subject who consciously participates in activities of evaluation and intervenes in the social context. From this perspective, the evaluation interacts with topics such as acquisition of knowledge, learning strategies, self-evaluation, as well as interactive perspectives directed at surpassing traditional approaches of a static nature[13]. Thus, the state school group tends to favor the information obtained in the learning process, explaining the statistical difference detected, whereas the education of the private school group is more directed at their performance in exams, regardless of their learning.

Fig. 1: Mean of the general values obtained for each question in the three groups.



For questions 5 (generator of new knowledge), 6 (professional skillful and competent) and 8 (model of attitudes, values and beliefs) there was a statistically significant difference between the trainee and state school groups, with the former presenting higher values than the latter. For the students of a public Specialization Course, higher education requires cultivating scientific creativity, which is based on research. Thus, the quality of higher education depends on the ability of the professor to transmit the knowledge that he himself constructs by means of his research activities and to encourage his students to look for and to present practical solutions for specific problems of society[14]. According to this group, the professor is seen as a model of attitudes[15], whereas, according to the state school group, the professor, as an investigator, devotes more time to research[16], distancing himself more from teaching and learning. According to Almeida, Pinto and Piccoli (2007)[17], the integration between theory and practice and the integration between the disciplines of the course deserve greater attention on the part of managers and professors.

Questions 10 (producer of teaching material) and 11 (provider of information in medical practice) presented statistical difference between groups, with the private school and trainee groups having higher values than the state school group. For the state school group, the essential function of education is the training of autonomous subjects understood as a nucleus of social life[18], whereas the private school and trainee groups do not express this autonomy of self-knowledge, overvaluing the knowledge of the teachers. According to Castanheira and Ceroni (2007)[19], the role of the teacher is fundamental for the implantation of any process of change regarding the educational system. Without a process of awareness, adhesion and participation on the part of teachers, any attempt at different approaches will fail. It should be emphasized that, in addition to the figure of the teacher, the integration and participation of all those involved in the process is also important. The focus of the quality of teaching and of the success of learning is directly linked to the performance of the teacher in the classroom and in his academic activities. Also, goals need to be established for a successful enterprise.

Conclusion

The roles of the teacher most valued by the groups were “generator of new knowledge (researcher)” and “provider of

practice information". The group of students of a public Specialization Course also assigned a high value to the role of physician (professional skillful and competent)".

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A comparative study between Thera PEP and incentive spirometer in upper abdominal surgery patients

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Abstract

Purpose of study

To determine and compare the effects of TheraPEP (TP) and Incentive Spirometer (IS) devices on Heart Rate (HR) and Respiratory Rate (RR) and prevention of Post Operative Pulmonary Complications after Upper Abdominal Surgery (UAS) in patients.

Material and methods

30 Patients of UAS were randomly allocated into two groups. Group- A (N= 15) patients were treated with TP where as other Group-B (N=15) treated with IS for 10 minutes. Effects of TP and IS were investigated on HR and RR, immediate post intervention and 45 minutes of post intervention.

Results

Data was analyzed using SPSS-15 statistical software. HR is significant in both TP and IS groups where as RR is more significant in TP than IS intervention.

Conclusion

It concluded that both devices showed effectiveness in secretion clearance and improvement on HR and RR after UAS on patients. But TheraPEP more effective than IS. TP may choice of treatment for these patients and it is easy to use and also the choice of patient.

Key words

Incentive Spirometer, TheraPEP, Upper Abdominal Surgery.

Introduction

This research is being undertaken to find out the efficacy of new PEP device i.e. TheraPEP with post-operative pulmonary complication followed by Upper Abdominal Surgery (UAS) patients. The aim of these techniques is to secretion clearance and improves the alveolar ventilation. Clearing secretion may also decrease the frequency of infection[1,2].

Role of the Cardio-pulmonary Therapy (CPT) is well established and documented in prevention of Post Pulmonary Complications (PPC's) after UAS. The various mechanical devices like IS, ACAPELLA, TheraPEP, Flutter have been commonly used for prevention of PPCs (Thoran L, 1954)[3].

IS frequently used in hospitals after surgery but newer device like TheraPEP is now recently introduced for the prevention & treatment of PPC's after surgery (Regan K, 1990).[4] PEP therapy improves lung function and the removal of pulmonary secretion (Costantini D, 2001)[5] and has a greater advantage to standard CPT in patients after heart-lung surgery (Larsen KR, 1994)[6]

The following study helps us to identify which of the two devices more efficient in clearing and prevention of post operative pulmonary complication in UAS patients. Based on the findings we can advice patients to use the more effective and safe technique for prevention of post operative complication in UAS patients & thus enhance the patient's recovery.

Material and methods

Study design

Experimental study with a pretest-posttest design. The study design was approved by the research committee of Jamia Hamdard University. Study was done in GI-Surgery ward, G.B. Pant Hospital, New Delhi, India.

Subjects

30 UAS patients were selected on the basis of the inclusion and exclusion criteria. A written informed consent was obtained from all those subjects who fulfilled the inclusion and exclusion criteria.

Inclusion criteria

a) Aged between 30-55 years .
b) Post operative UAS patients.
c) Haemodynamically stable
d) Both genders.

Exclusion criteria

a) Unconscious Patient.
b) Need for surgical or endoscopic procedures during the study period.
c) Indication of ventillatory support.
d) Recent facial, skull surgery or trauma.

Materials

- DHD TheraPEP (CE-044, USA)
- Incentive Spirometer (Tri-Bal, Spain)
- ABG Analyzer (ABL- 610)
- Stethoscope
- Syringe, Heparinised

Procedure

The intervention was given to each patient according to the allocated group. In all the patients, post-operative pain was controlled with intravenous pethidine analgesia (25mg, 6

Fig. 1: Application of TheraPEP Device.

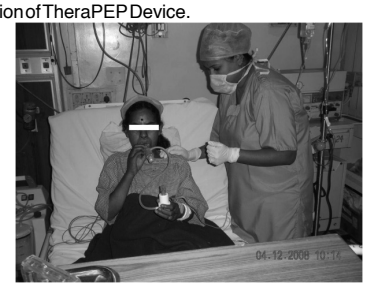
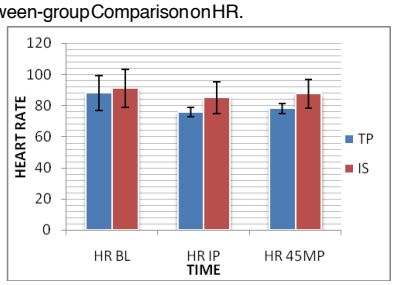


Fig. 2: Application of Incentive Spirometer.

Graph. 1: Between-group Comparison on HR.



hourly). Pre intervention i.e. baseline measurement of variables was recorded initially in both the groups A and B. post-intervention measurement of variables was performed and recorded, first immediately post-intervention and later 45 minutes of post-intervention.

Group-A (TheraPEP): Patient position: Semi Fowler, Encouraged the patient to relax, Adjusted the expiratory resistor (selector dial) to the setting, according to the patient need as it produced the desired inspiratory to expiratory ratio of approximately 1:3 &1:4 while maintaining the TheraPEP pressure indicator (10-20 cm Hg), Patients were instructed: (a) To place the TheraPEP mouthpiece in mouth & place his lips firmly around the mouthpiece & take breath through the mouth. (b) To inhale a volume of larger than a normal tidal volume through the PEP device and then hold the breath for 3 second. (c) Exhalation was done actively, but not forcibly, through the device to a normal level of exhalation. (d) Each patient performed a series of 10 breaths using the PEP device, followed by 2 to 3 Huffs and /or Coughs. (e) Each patient repeated the above cycle for 5 times. (Fig.1)

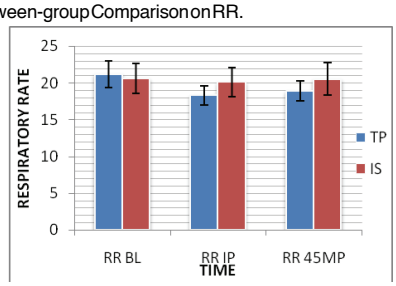
Huffing and coughing: The patients were instructed to perform huffing by first splinting the incision with a pillow or a towel. Patients were then instructed to open the mouth in an O-shape, keeping the cheeks stiff so as to keep the glottis open. Then a maximal inhalation was performed followed by a forced exhalation from mid to high lung volume. Whereas during coughing, patients were instructed to inhale maximally followed by a forceful exhalation (with incision supported) with the glottis closed[7,8]. Duration of the entire protocol was approximately 10 minutes

Table.1: Between-group comparison on HR & RR.

	Mean ± S.D.		
Variable	**Group-A**	**Group-B**	**Sig.(2-tailed)**
HRBL	88.0±11.0	91.2±12.2	0.45
HRIP	75.9±2.9	85.2±10.2	0.002*
HR45MP	78.2±3.2	87.5±9.4	0.001*
RRBL	21.2±1.89	20.6±2.02	0.410
RRIP	18.3±1.34	20.13±2.09	0.009*
RR45MP	18.9±1.43	20.53±2.23	0.027*

p=significance (level of significance set at p<0.05), *= Significant
BL= Pre intervention measurements
IP= Immediate post intervention measurements
45MP= 45 min post intervention measurements
HR= Heart Rate
RR= Respiratory Rate
Group-A= TheraPEP intervention
Group-B= Incentive Spirometer intervention

Graph. 2: Between-group Comparison on RR.



Group- B (Incentive Spirometer): Patient position: Semi Fowler, Patients were instructed to: (a) Hold the incentive Spirometer in an upright position. (b) Placed the lips firmly around the mouthpiece. (c) A normal exhalation was done actively and inhaled slowly through the mouthpiece, raising the ball then take a deep breath and holded it for 3 to 5 sec. (d) Removed mouthpiece & normal exhalation was done. (e) Each patient performed a series of 10 breaths using the incentive Spirometer. (f) Each patient repeated the above cycle for 5 times and after completing each cycle, patients were instructed to take deep breath & cough 2 to 3 times (with incision supported) and expectorate the secretion. (Fig.2) Duration of the entire protocol was approximately 10 minutes.

Results

The result of this study was analyzed in terms of Heart Rate (HR) and Respiratory Rate (RR) in both group-A and B subjects.

Data analysis

Statistical analysis was done by using SPSS-15 software. The results were found to be statistically significant with p<0.05.Between groups comparison was done by using independent-t test and within group comparison was analyzed by repeated measure ANOVA test.

Demographic profile

Data (Age and weight) of all subjects was recorded. The mean age of TheraPEP (TP) group was 38.6 years with S.D. ± 6.2, the mean age of Incentive Spirometer (IS) group was 38.0 years with S.D. ± 1.8. TP group subjects were having mean weight 53.6 kgs with S.D. ± 5.7 and IS group was 54.1 kgs with S.D. ± 6.0. There is no significant difference between groups in terms of demographic variables.

Between-group analysis

HR: Group-A and B shows significant difference with p value is 0.002 (lesser than 0.05). At post 45 MP: Group-A and B also shows significant difference with p value is .001 (lesser than .05).

RR: Group-A and B shows significant difference with p value is 0.009 (lesser than 0.05). At post 45 MP: Group-A and B also shows significant difference with p value is .027 (lesser than .05).

Discussion

Respiratory rate decreases significantly ($p<0.009$); immediate post intervention and 45 minute of post intervention ($p<0.002$) in between groups (TP & IS group). TheraPEP decreases Respiratory rate significantly by removing the secretion from peripheral to central airways and decreasing the work of breathing. It was also noted that respiratory rate was more significantly reduced in 45 minutes of post intervention than immediate post.

Heart rate also showed significant difference in between group comparison; immediate post intervention ($p<0.002$) and 45 minutes of post intervention ($p<0.001$). TheraPEP shows better improvement than IS it may be due to increases the collateral ventilation, encourages re-inflation of areas of atelectasis, increases FRC and aids the removal of secretion from the lung periphery to the central bronchi where they can be expectorated by huffing and coughing.

Although it has been indicated in AARC clinical practice guideline that IS is helpful in reducing incidence of atelectasis, therefore it has been a choice of treatment in post-operative abdominal surgery patients but on systemic review by Tom J. Overend et al, 2001[10] and Cochrane review by Guimaraes MF et al, 2007[11] showed that IS should not be used following abdominal surgery.

TheraPEP use to enhance the deposition of bronchodilator aerosol and in the treatment and prevention of pulmonary complications in who have undergone UAS (Regan K. et al, 1990). Thus TheraPEP can be acceptable and effective treatment regimen than IS in upper abdominal surgery patients to improve HR and RR values as well as PPC's.

Conclusion

It concluded that both devices showed effectiveness in secretion clearance and improvement on HR and RR after UAS on patients. But TheraPEP more effective than IS. TP may choice of treatment for these patients and it is easy to use and also the choice of patient.

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Joubert syndrome: A case report

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Introduction

Joubert syndrome is a rare autosomal recessive disorder typified by a set of cerebellar and brainstem abnormalities[1]. The condition presents with abnormal respiratory pattern and eye movements, hypotonia, ataxia and associated developmental retardation [2]. We report a case of child with developmental delay diagnosed to have Joubert's syndrome at the age of 10 months. The child is third in line with two elder siblings also being affected with Joubert's syndrome.

Case report

This child was born to parents with 1st degree consanguinity and was diagnosed to have Joubert's syndrome at the age of 10 months. The child was delivered normally at full term and had cried immediately after birth. She weighed around 3.25kg. The mother had an uneventful prenatal history with regular antenatal check up. Postnatal history was also uneventful. Delay in developmental milestones was noticed at the age of 4 months. MRI scanning done at 10 months of age revealed splitting of vermis along with elongated batwing appearance of 4th ventricle at the midbrain level. There was molar tooth appearance in the superior cerebellar peduncle and midbrain was smaller in size suggestive of Joubert's syndrome.

At 10 months of age medical examination reported that though the head control and rolling over was attained, there was no creeping and crawling. At 10 months, the baby was a stigmatoid child; mentally alert with fair eye contact, socialization was inadequate. Bio-chemistry lab tests revealed that ammonia, creatinine phosphor-kinase, lactate levels and thyroid hormones were within normal limits. The Visual Evoke Potential was within normal limits. Brainstem Auditory Evoke Response reports showed that interlatency was normal but amplitude was reduced on right side.

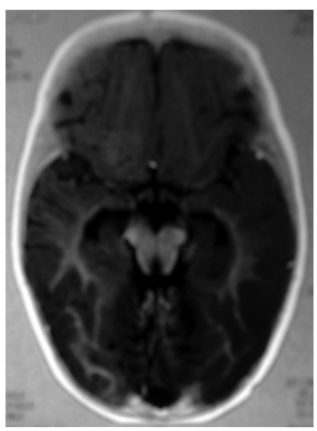
The child was referred for physiotherapy at the age of 1 year 2 months for complaints of developmental delay. The history revealed that, there was a mild delay in achieving head control and rolling over. On Physiotherapy assessment, the child was able to roll prone and back to supine. Prone lying with forearm support was possible. Head holding was good and child had just begun to initiate creeping. Strabismus was present bilaterally. With reference to developmental milestones, social smile had developed at 3 months, visual tracking at 6 months, head holding at 4 months and rolling over at 6 months.

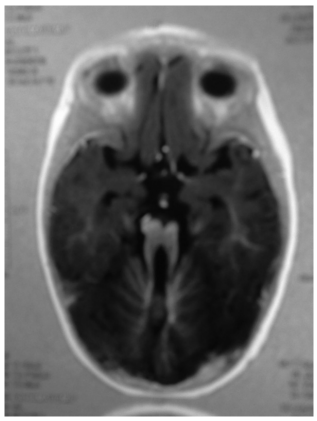
All the neonatal, spinal, and brainstem reflexes were integrated however, parachute reactions were absent. The midbrain reactions i.e. neck righting, body on body, optical and labyrinthine reactions were present, though slow.

The child presented with hypotonia in all 4 limbs and trunk. There was extensor plantar response and diminished tendon jerks. The pelvic control was poor. Child was unable to sit independently. Child had forward righting reaction, lateral righting was transient and backward righting was absent.

Infant neurological international battery (INFANIB) [3] when administered on the child showed that although the scarf sign was normal, the heel to ear, popliteal angle, hip abduction, dorsiflexion was not age-appropriate. There was average foot grasp, Tonic Labyrynthine Reflex and Asymmetrical Tonic Neck Reflex were integrated; body rotation and de-rotation was present on both sides, pull to sit was normal. In prone the child was able to come up on forearm only. On supported sitting the spine was extended and there was unequal weight bearing on standing. The total INFANIB score was abnormal for her age (60/100) with definite features of hypotonicity. The Gross Motor Function Measure (GMFM) revealed that the baby could complete most of the items in lying and rolling except prone on forearms with weight on both side and extension of the opposite arm. The total score in this item was 46. In the item of sitting, the child had a score of 20 and could not initiate any of the items in crawling, kneeling, standing and walking. The GMFM score was 8.3% and GMFCS level was Level III.

Physiotherapy was aimed at facilitating hip adductor control, pelvic girdle stability and concentric abdominal activity. The hip adductor control was gained by mermaid pant. The mermaid pants are modified trousers which prevent hip hyper-abduction. Pelvic girdle stability was facilitated through transition training from side sitting to prone kneeling, prone kneeling over bolster and through weight shifts in antero-posterior and medio-lateral direction. Abdominal activity was facilitated through exercises over bolster and physioball. Supramalleolar orthosis was given to prevent excessive eversion of foot.





Discussion

Dr. Maria Joubert first identified the disorder in 4 siblings of a French Canadian family in 1969.[4] In India, there have been 3 cases of Joubert syndrome that have been reported from Gujarat, Rajasthan and Srinagar. Out of these, 2 cases were females of age 16 and 18 years and both were born to consanguineously married couple. The 3rd case report was of a 20 month old boy product of non consanguineous marriage[5,6,2].

Joubert syndrome is a rare autosomal recessive neurodevelopmental disorder caused by a set of cerebellar and brainstem abnormalities termed the molar tooth sign due to their radiologic appearance. Other clinical features include hypotonia, ataxia and developmental delay. Additional symptoms may include breathing abnormalities (apnea & hyperpnea), problems with eyesight (retinal dystrophy) and visual tracking (ocular motor apraxia), kidney problems(renal cystic fibrosis) and a variety of associated difficulties[8]. Although diagnostic criteria for JS has not been established, the clinical features often cited as necessary for the diagnosis of classic JS include:-

- Cranial MRI findings demonstrating the Molar Tooth Sign on axial imaging with these three components: midline cerebellar vermis hypoplasia, deepened interpeduncular foison and thick elongated superior cerebellar peduncles (present in 100% of cases).
- Hypotonia in infancy (100%)
- Developmental delay /mental retardation of variable severity (100%)
- One or both of the following: (not absolutely required but supportive of the diagnosis): Irregular breathing pattern in infancy (episodic tachypnea and /or apnea) or abnormal eye movements (including nystagmus, jerky eye movements and Occulomotor Apraxia or difficulty with smooth visual pursuits)[7].

Cognitive abilities are variable, ranging from severe mental retardation to normal mentation. Retinal blindness is rarely present. The renal disease in Joubert Syndrome is variable, Progression to end-stage renal disease occurs by an average age of 13 years. Long term follow-up is essential to delay secondary complications which may lead to death[6].

Treatment for Joubert syndrome is symptomatic and supportive. Infant stimulation and physical, occupational and speech therapy may benefit some children. Infants with abnormal breathing pattern must be monitored. The prognosis for infants with Joubert syndrome depends on whether or not the cerebellar vermis is entirely absent or partially developed[8].

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Comparison of anterior versus posterior glide mobilisation techniques for improving internal rotation range of motion in shoulder adhesive capsulitis

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Abstract

Objective

With respect to physical therapy, a variety of interventions are used in which passive mobilization techniques are an important part of the intervention.Traditionally,Physical therapists have used anterior glide of humeral head on glenoid, as a technique to improve external rotation and posterior glide of humeral head to improve internal rotation,a choice based on convex- on- concave concept of joint surface motion. In Contrast, posterior directed glide manipulation is being used by many authors based on "capsular constraint mechanism" to restore external as well as internal rotation ranges.

Till date,there was no convincing studies comparing the effect of anteriorly/posteriorly directed glenohumeral joint mobilization techniques in improving internal rotation. Hence, the purpose of this study was to find out effectiveness of anterior and posterior glides techniques for improving internal rotation in shoulder adhesive capsulitis patients.

Methods

45 subjects were included for 3 weeks protocol and randomly assigned to three groups (Anterior glide;Posterior glide & Control).Outcome Measures includes Visual Analogue scale Score.(VAS),Active Internal & External rotation and abduction range of motion and. Shoulder Rating Questionnaire Score (SRQ).Data was analyzed using SPSS–15 software. One way ANOVA was applied to compare pain intensity using VAS and to compare Active Int.Rot, Active Ext.Rot, Active Abduction between the groups.Mann–Whitney test was used to analyse SRQ scores between the groups.

Results

At the end of the study, statistically significant improvement in active internal rotation range was found in anterior glide group as compared to other groups. Pain relief was seen in all the three groups but was more in anterior glide group and posterior glide group as compared to control.Final SRQ scores were found to be insignificant between Group A & Group B but was found to be significant when Group A & Group C as well as Group B & Group C were analyzed

Conclusion

Anterior glide techniques given with therapeutic ultrasound and conventional exercises were more efficient in improving internal rotation than posterior glide techniques given in combination with ultrasound and conventional exercises.

Keywords

Idiopathic Adhesive Capsulitis; Anterior & Posterior glide stretch mobilization; Capsular constraint mechanism; Concave-convex rule.

Idiopathic Adhesive capsulitis: is a self limiting regional skeletal problem whose etiology remains an enigma[1]. It is characterized by insidious and progressive pain with loss of active & passive mobility of glenohumeral joint[2]. It affects 2-3% of general population[3]. In diabetics, the incidence is between 10-20%[4]. Other factors such as depression, immunological factors, posture and occupation have been implicated in the etiology[4]. It is the main cause of shoulder pain and dysfunction in individuals aged 40-70 yrs[3]. The peak age is 56 years and the condition occurs slightly more often in women than men[5]. The non – dominant arm is more likely to be involved, although about 12% of people are affected bilaterally[4].

The clinical diagnosis of frozen shoulder is based on patient's subjective history and clinicians objective finding[6].Maximal abduction and maximal external rotation reported vary considerably. Rotational values has also been described as percentage of normal with maximal. External Rotation restriction ranging from 50-60%.and reported maximal Internal Rotation(IR) percentage ranges from 45-50%[6].

Treatment options documented in the literature include benign neglect,supervised physical rehabilitation, non steroidal anti-inflammatory medications,oral corticosteroid, intra-articular injections, distention arthrography, closed manipulations: open surgical release and more recently arthroscopic capsular release[7].

With respect to physical therapy, interventions includes heat or ice applications, ultrasound,IFT, TENS, active and passive range of motion exercises, propioceptive neuromuscular facilitation (PNF) techniques and mobilization technique[2].

Traditionally, physical therapists have used anterior glide of humeral head on glenoid, to improve external rotation range of motion and posterior glide of humeral head to improve internal rotation range of motion, a choice based on the convex –on— concave concept of joint surface motion[3]. In Contrast, Roubal[3,8] et al used a posterior directed glide manipulation based on "capsular constraint mechanism"[3,9] to restore external as well as internal rotation range of motion.

Harryman et al[10,11] studied the humeral head translation in cadaver specimens with a device that measured motion with a six degree of freedom.The glenohumeral motions studied were the following:-Flexion,extension,lateral & medial rotation and cross-body movement. All joints were tested under the following conditions:Capsule intact, Capsule

vented to the air with a needle, & tightening of the posterior capsule with a suturing technique. Both flexion & medial rotation resulted in anterior translation of the humeral head, whereas extension & lateral rotation both resulted in posterior translation of the humeral head.

Till date, there are no convincing studies comparing the effect of anteriorly directed glenohumeral joint mobilization techniques in improving internal rotation in patients with adhesive capsulitis.

Hence, aim of this study was to find out the exact relationship between the direction of movement and force application(anterior versus posterior) for glenohumeral joint mobilization that would result in the greatest improvement in shoulder internal rotation range of motion in primary adhesive capsulitis patients.

Methods and materials

A total of 45 (17 male & 28 female) patients with primary adhesive capsulitis were included in the study.The criteria for inclusion were male/female aged between 40-60 years[4]; Unilateral condition with duration of more than 3 months[12]; Idiopathic/primary adhesive capsulitis i.e. insidious onset with no history of major trauma[3]. Presence of shoulder pain with limitations of both active and passive movements of glenohumeral joint of more than 25% in at least 2 directions including Internal rotation.(Ext Rot,abduction,flexion) as compared with contralateral shoulder or with normal values[13,14]. Normal findings on the antero posterior/ axillary'lateral radiographs of glenohumeral joint[3].

Subjects were excluded if patients were having secondary adhesive capsulitis[12] shoulder girdle motor control defects associated with neurological disorders; Intrinsic glenohumeral pathology such as OA, RA, rotator-cuff pathology,biceps tendonitis, calcific tendonitis[2] former manipulations under anesthesia of affected shoulder[2]. patients taking NSAIDS and other Analgesics; injections with corticosteroid in affected shoulder in preceding 4 weeks[2] previous shoulder surgeries of affected shoulder[15].

Procedure

After screening for inclusion and exclusion criteria the subjects were randomly assigned into either of 3 groups with 15 subjects in each group and informed consent was obtained from the subjects.

Group A: Anterior glide mobilization (Grade-3)+ conventional therapy.

Group B: Posterior glide mobilization (Grade-3)+ conventional therapy.

Group C: Control group (No Mobilization) + conventional therapy.

The outcome measurements in this study were VAS score; active Internal rotation, external rotation & abduction range of motion and shoulder rating questionnaire(SRQ) scores.

Measurement of pain intensity :

Intensity of pain was measured by Visual Analog Scale.VAS[16] each subject marks a visual analogue scale (VAS) for pain on first session,6th session and after 12 th session.

Measurement of range of motion:

Range of motion[17] was measured with conventional goniometer in accordance with the guidelines of the American Academy of Orthopedic surgeons.Measurements for active range of motion of Internal rotation, external rotation and Abduction were taken on first treatment session,on 6th session and after 12 th session.

Measurement of functional index:

SRQ[26] was filled up by the patients on first treatment session (baseline reading),on 6th session and after the 12th session,& this reflected the improvement in functional status.

Intervention

Jont Mobilisation Procedure[3,19]. Joint mobilization procedures were followed after pulsed ultrasonic therapy was administered. (Frequency1Mhz[3]; Intensity1.0W/cm[2,8]; Duration: 8minutes[8]) Patients in posterior mobilization group were made to lie down in supine position.Before starting mobilization technique, relaxation of shoulder complex muscles was achieved by moving the shoulder twice or thrice complete range of motion passively.During treatment,reflex muscle activity was monitored and overcome by means of palpation & by changing the intensity & direction of mobilization force/technique.To minimize joint compression & possible periarticular soft-tissue damage,lateral traction of glenohumeral joint was performed before & during mobilization procedures.

Kaltenborn stretch mobilization was used which loads the restricting tissue at the end of the available range of motion.At this end range, a linear gliding movement was produced by bone translation.Kaltenborn grade 3 mobilization which apply force "after the slack of the joint has been taken up", to

Table 1.1: Comparison of VAS between the groups.

	GroupA N=15	GroupB N=15	GroupC N=15	ONE-WAY ANOVA. F	P
V_0 Mean±SD	5.24±1.29	5.46±1.37	5.72±0.98	0.558	0.576
V_6 Mean±SD	3.54±1.22	3.58±1.33	4.44±0.96	2.736	0.076
V_{12} Mean±SD	1.26±0.97	1.30±1.03	2.86±1.07	11.84	0.00

Table 1.2: Between Group Analysis of AIR ROM.

	GroupA N=15	GroupB N=15	GroupC N=15	ONE-WAY ANOVA. F	P
AIR_0 Mean±SD	45.87±6.36	45.27±6.67	47.33±6.32	0.407	0.668
AIR_6 Mean±SD	62.47±6.04	59.40±6.32	51.87±7.58	9.98	0.00
AIR_{12} Mean±SD	76.66±3.45	68.40±6.40	57.93±7.33	37.17	0.00

Table 1.3: Comparison of AIR between the groups.

	AIR_0 pvalue	AIR_6 pvalue	AIR_{12} pvalue
GrpA Vs GrpB	1.00	0.64	0.001
GrpB Vs GrpC	1.00	0.01	0.00
GrpA Vs GrpC	1.00	0.00	0.00

Table1.4: Comparison of AER between groups using p values

	AER_0 pvalue	AER_6 pvalue	AER_{12} pvalue
GroupA Vs GroupB	1.00	0.948	0.017
GroupB Vs GroupC	0.91	0.058	0.001
GroupA Vs GroupC	1.00	0.494	1.00

Table 1.5: Comparison of AAbd in between the groups

	$AAbd_0$ pvalue	$AAbd_6$ pvalue	$AAbd_{12}$ pvalue
GrpA Vs GrpB	0.932	1.00	1.00
GrpB Vs GrpC	1.00	0.007	0.00
GrpA Vs GrpC	0.473	0.01	0.001

stretch tissues crossing the joint is used in this study. The end range position of mobilization were held for atleast one minute.Fifteen minutes of sustained stretch was performed at each treatment session.

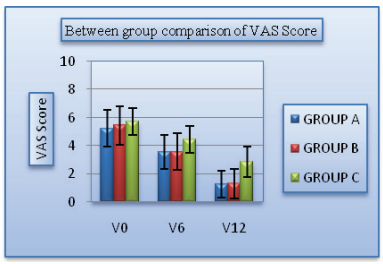
Patient was made prone and lateral humeral distraction was maintained in its midrange position, while the anterior stretch mobilization was performed to end range, at the end range of abduction and internal rotation.As the subject was able to tolerate a stronger stretching force, body weight and gravity was utilized to generate the mobilization force in a similar combined fashion of distraction to midrange & anterior glide to end range.

In posterior glide group, posterior glide to the shoulder joint was given in supine position. In this position, lateral humeral distraction is maintained in its midrange position while the posterior stretch mobilization was performed to the end range of abduction and internal rotation.The position chosen for the progression of the posterior mobilization takes the humerus into end range of newly gained ranges. In this position,the humerus taken into end range internal rotation and abduction.

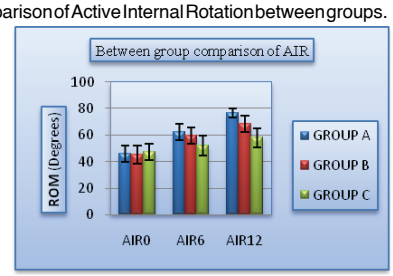
During the joint mobilization (anterior and posterior), the subjects were instructed to describe his/her sensation, so that the therapist could modify the force or position to maintain a moderate stretch on the targeted tissue.However, each subject was encouraged to tolerate the pain to allow a moderate stretch sensation.

Upon completion of the mobilization sessions at 6^{th} & 12^{th}, readings for internal & external rotation & abduction range of motion measurements were taken according to the protocol described earlier. After completion of mobilization procedure, Codman pendular exercises were performed for 2 minutes[20,3,4]. To reduce post mobilization soreness, each subject was given moist heat to the mobilized shoulder for 20 minutes[21]. Therapeutic Exercises Programme common to all groups were Codman's pendular exercises for 2 minutes[21,20]. Wall ladder in abduction & flexion (five reps x 3 times daily)[14]. Wand-assisted exercises for shoulder (five reps x 3 times daily)[7].

Graph: Comparison of VAS Scores between the groups.



Graph: Comparison of Active Internal Rotation between groups.



Statistical analysis

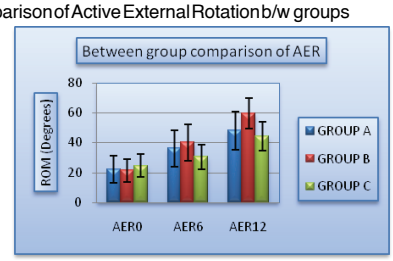
A Pre & Post experimental design was used.Data was analyzed using SPSS –15 software. Pain using VAS, Active internal rotation, active external rotation and active abduction range of motion using goniometer and functional \state of shoulder using SRQ were used. The baseline value for pain intensity, range of motion & functional state of shoulder(SRQ) were taken on first day designated as V_0,AIR_0, AER_0, $AAbd_0$ and SRQ_0 respectively. The second reading for all the variables was taken on session 6 (designated as V_6, AIR_6, AER_6, $AAbd_6$ and SRQ_6 respectively) and final reading was taken on session 12(designated as V_{12}, AIR_{12}, AER_{12}, $AAbd_{12}$ & SRQ_{12} respectively). Repeated measure ANOVA was applied for comparison of VAS within the group. One way ANOVA was applied to compare VAS between the group.One way ANOVA was applied to compare the AIR,AER,AAbd range of motion between the groups.

Shoulder Rating Questionnaire scores within the group were analyzed using Friedman test and the analysis between the groups was done using Mann–Whitney test. The values of all the 3 groups i,e Group A,B & C were compared for all the variables at the baseline on day 7 & final day. The test were applied at 95% confidence interval & p values set at 0.05. The results were taken to be significant if $p<0.05$.

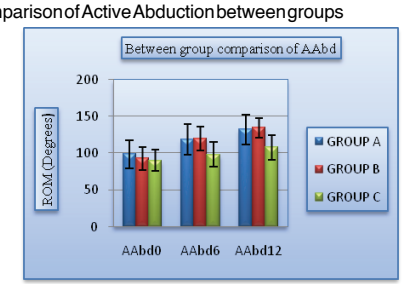
Results

The baseline reading(V_0) for all the three groups were statistically insignificant (p=0.576). On comparing V_6 between the three groups again an insignificant difference

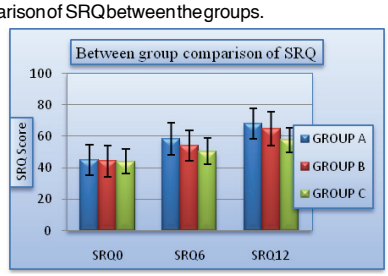
Graph: Comparison of Active External Rotation b/w groups



Graph: Comparison of Active Abduction between groups



Graph: Comparison of SRQ between the groups.



was obtained (p=0.07) but a significant difference was observed between the 3 groups at the final session i.e V_{12}(p=0.00) (refer table 1.1). Post hoc analysis revealed that on comparing group A & B for VAS scores on sessions 0,6 & 12 an insignificant difference between the two groups was found. Similarly, VAS scores for pain at V_0 & V_6 were insignificant when between group analysis was done between Group B & Group C and Group A & Group C, but at V_{12} clinically as well as statistically significant difference between group B & Group C & Group A & Group C were observed (p=0.02).

Active internal rotation analysis:

Clinically & statistically significant improvement in active internal rotation was found when between group analyses was done.Group A & Group B did not show any significant difference at AIR_0 & AIR_6 but showed clinically & statistically significant difference at AIR_{12} (P=0.001).Between group analysis of B & C revealed no significant difference at AIR_0 but the level of significance increased from AIR_6(P=0.01) to AIR_{12}. (P=0.00). Between group A & C a significant difference at session 6^{th} (AIR_6),12^{th}(AIR_{12}) was found with significant level p=0.00 . (refer table1.2 & 1.3).

The p value at session 0 in all the three groups did not show any significant difference indicating homogenicity at the baseline among the three groups.Within group analysis revealed clinically as well as statistically significant difference in all groups with p=0.00.

Active external rotation analysis:

A significant improvement in active external rotation range of motion was found when between group analysis was done. GroupA & GroupB did not show any significant difference at AER_0 & AER_6 but showed clinically & statistically significant difference at AER_{12} (p=0.017) (refer table 1.4). Between group analysis of B & C revealed no significant difference at AER_0 (p= 0.91)and AER_6 (p=0.05) but significant improvement was noticed at AIR_{12}.(p=0.001).Between group A & C an insignificant difference was found at AER_0, AER_6andAER_{12}.

Active abduction range analysis:

Group A & Group B did not show any significant difference at any session. Between group analysis of B & C revealed no significant difference at $AAbd_0$ (p= 1.00) but significant improvement was noticed at $AAbd_6$ (p=0.007). and $AAbd_{12}$. (p=0.00). Between group A & C an insignificant difference at $AAbd_0$ (p= 0.473) was found but significant results was found at $AAbd_6$ (p=0.01).and$AAbd_{12}$ (p=0.001) (refer table 1.5)

SRQ scores result.

The baseline value i,e SRQ_0 was found to be statistically insignicant when groupwise comparison was done i,e Group A Vs Group B, Group A Vs Group C & Group B Vs Group C. The readings of SRQ_6 was found to be insignificant when Group A Vs Group B & Group B Vs Group C were compared. However SRQ_6 score between GroupA Vs Group C was statistically significant (p=0.04).Finally SRQ_{12} score was found to be insignificant between GroupA & Group B but found to be significant when Group A & Group C as well as Group B & Group C were analyzed (refer 1.6)

Discussion

The primary purpose of this study was to compare the effectiveness of anterior glide and posterior glide mobilization techniques in improving internal rotation range of motion in patients with adhesive capsulitis. The hypothesis that the experimental group would gain more active mobility in internal rotation range of motion than the control group was fully accepted on the basis of the findings in this investigation. This result is consistent with the finding of Harryman[10] et al who found that anterior translation of the head of the humerus is associated with internal rotation range of motion although the displacements were small of the order of 2mm. He studied the translation of humeral head in the glenoid in fresh cadavers and examined the movements of flexion, extension, internal rotation, external rotation, horizontal adduction with the use of a six degrees of freedom position sensor and a six axis force and torque transducer. When examining internal rotation and external rotation along the vertical axis parallel to the humeral shaft, anterior glide was associated with internal rotation and posterior glide was associated with external rotation. These glides were abolished with the excision of the joint capsule. The authors proposed that glenohumeral gliding during active and passive movements is primarily due to capsular tension rather than joint geometry[8].

The findings of this study also concluded that there was some improvement in internal rotation range of motion with posterior glide mobilizationtechnique. This improvement is less as compared to the marked improvement in internal rotation with anterior glide mobilization technique. This conclusion of the study is consistent with the findings of Roubal[18] et al and Placzek[38]. et al who with a posterior gliding manipulation found increase in external as well as internal rotation range of motion.

However,several studies[8] suggests that adhesions are not particularly prominent posteriorly, but, rather adhesive capsulitis results in global reduction in capsular size, in particular, abolishment of the anterior and inferior axillary fold. This suggest that anterior structures may be the primary cause of restriction of range of motion, hence anterior adhesions may draw the humeral head to its anterior most excursion thus limiting anterior glide and subsequently internal rotation range of motion. Hence the improvement gained in range of motion is due to breaking of the anterior adhesions or stretching of these anterior structures by anterior glide mobilization techniques. The results of this study are not at odds with the concave convex rule. The results, however,support the concept that the capsule plays an important role in dictating the humeral head translation ,possibly in the opposite direction to the expected effect of joint geometry if restricted.

Reduction of pain intensity:

On comparing the values of VAS score in all the three groups the results revealed clinically as well as statistically significant differences at V_6 and V_{12}. In all the three groups p value was 0.00 indicating that pain relief was seen in all the three groups but the improvement in pain relief was more in anterior mobilization group and posterior mobilization group as compared to control group. The result supports the findings of Johnson et al who studied the effect of anterior versus posterior glide joint mobilization on external rotation range of motion in patients with shoulder adhesive capsulitis and found that both the anterior mobilization group and posterior mobilization group had a significant decrease in pain.

Active external rotation range of motion:

The result of the study indicate that posterior glide stretch mobilization was effective in treating external rotation defecits commonly found in adhesive capsulitis than anterior glide stretch mobilization and control group. The improvement in external rotation range with posterior mobilization is in agreement with the studies done by Johnson et al[3] who also concluded that a posteriorly directed joint mobilization technique was more effective than anteriorly directed mobilization technique for improving external rotation range of motion in subjects with adhesive capsuilitis.

Active abduction range of motion:

The results of the study demonstrate that when anterior and posterior mobilization groups where compared with each other, there was insignificant difference between the two groups in improving Active abduction Range of motion which implies that both anterior and posterior glides were equally effective in improving active abduction range of motion The above finding supports the finding of Artyan whose studied the changes in abduction and rotational range of motion in response to simulated dorsal and ventral translational mobilization of the glenohumeral joint and suggests that both dorsal and ventral translational mobilizations of the glenohumeral joint are effective in improving glenohumeral abduction range of motion if they are applied at the end range of gleno humeral abduction[23].

Functional index (SRQ Scores):

Shoulder disability was measured by shoulder rating questionnaire. The total score ranges from minimum of 17 points indicating worst functional status to a maximum of 100 points indicating best functional status.The reduction in shoulder disability as measured with SRQ was insignificant when anterior mobilization group was compared to posterior mobilization group. This concludes that there was insignificant improvement in mobilization groups i.e both anterior and posterior mobilization group patients show some clinically functional improvement within the group but when compared to each other the improvement was not statistically significant. The reason behind this may be shorter duration of the study(3 weeks only). On the other hand,when anterior mobilization group and posterior mobilization group were compared to control group, significant improvement was found.There was marked improvement in functional status in mobilization groups as compared to control or from baseline value(SRQ_0). Hence, this finding of the study promotes the intervention of mobilization technique in physical therapy to reduce disability and improve activity of daily living and functions in patients with adhesive capsulitis. The results of this study supports the findings of Vermuelen et al who compared high grade and low grade mobilization techniques in the management of adhesive capsulitis of the shoulder and suggests that high grade mobilization techniques appear to be more effective in improving glenohumeral joint mobility and reducing disability than low grade mobilization technique[2].

Conclusion

The results of the study showed that anterior glide mobilization technique given with therapeutic ultrasound and conventional exercises was more efficient in improving internal rotation range of motion than posterior glide mobilization given in combination with therapeutic ultrasound and conventional exercises. This study has highlighted that anterior glide mobilization provides immediate increase in internal rotation range of motion and enhances shoulder function while decreasing pain and promotes early return to work, avoiding prolonged undue discomfort associated with natural, often incomplete self resolution process.

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Cognitive, perceptual, gross motor dysfunction and academic performance in childhood epilepsy: A prospective study

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Abstract

Background

Epilepsy is one of the common chronic neurological disorders in childhood. It is frequently associated with behavioral, attentional, perceptual, psychiatric problems and learning disabilities. Antiepileptic drugs have side effects mainly impaired cognition. Neuropsychological impairments also interfere with normal cognition and academic achievements. Significant dysfunction in gross as well as fine motor function exist which overall affects physical, psychological health and the social relationship.

Objectives

1: To assess and compare cognition, visual and spatial perception, visuo-motor organization and gross motor function i.e. balance between children with epilepsy of age group 6-12 years and age matched normal children. 2: To correlate gross motor function i.e. balance with visual and spatial perception in children with epilepsy and age matched normal children. 3. To understand academic performance in childhood epilepsy based on cognitive dysfunction.

Design

Prospective, parallel design study

Methodology

Study consisted of total 60 children of age group 6-12 years. Group I (Control group) – Normal school going children (Healthy controls) n=30 and group II (Experimental group) - Children diagnosed with epilepsy and under medications n=30.

Main outcome measures

Loewenstein Occupational Therapy Cognitive Assessment Scale (LOTCA), Bruninkis Osertsky Test of Motor Proficiency (BOMPT)

Results

There were statistically significant differences ($p<0.00001$) in cognition, perception, visuo-motor organization and balance between children with epilepsy and the age matched normal children. There is a positive correlation between perception and gross motor dysfunctions i.e. balance.

Conclusion

Cognitive, visuo-motor, perceptual dysfunction along with gross motor dysfunction exist in children with epilepsy. Cognitive dysfunction interferes with school performance and academic achievements in children with epilepsy whereas perceptual dysfunction interferes with balance which may lead to difficulty in participating in sports and recreational activities.

Key words

Epilepsy, cognition, perception, balance and Anti epileptic drugs (AEDs')

Introduction

Epilepsy is heterogeneous condition characterized by recurrent seizures that are not provoked by metabolic, toxic disturbances or an acute CNS insult[1]. Epilepsy is one of the common chronic neurological disorders in childhood with a prevalence of about 4-6 cases/1000 children[2,5]. Epilepsy in children is a developmental and not a static disorder[6,7] and affects the maturation of central mechanism integrating sensory information for motor coordination.

Based on available information on age specific incidence, it can be estimated that worldwide 3.5 million people annually develop epilepsy. About 40% of these are under the age of 15 years and more than 80% of them live in less developed countries[8,9].

Epilepsy is not a specific disease or even a single syndrome but rather a broad category of symptom results from dysfunction of a localized area of cerebral cortex. Frisch & Hitziq 1870 and Ferrier 1873 has established the cortical excitability as the most likely underlying cause[1].

Childhood epilepsy is heterogeneous condition with various neural deficits occurring in one-third children[10,11]. It is frequently associated with behavioral, attentional, perceptual, psychiatric problems and learning disabilities[12,13]. Studies have shown that seizures alter behavior[14,15,16]. Cognitive changes in epilepsy are well documented and results from a combination of structural lesions, interictal epileptiform discharges, effect of frequent generalized tonic-clonic seizures, AED'S and social factor which can reduce self- esteem, limit education, mobility and independence[17]. Most of the antiepileptic drugs have side effects[18,19] including impaired cognition, behavior, depression, sedation, movement disorder etc[20]. Neuro-psychological disturbances such as memory disturbances; visuo-spatial deficit occurs and interferes with normal cognitive development and academic achievements. It leads to increased frequency of underachievement, reading difficulties and behavioral problem. Hence epilepsy affects overall physical, psychological health and social relationship[21,22]. Therefore there is a need to assess the

cognitive, visuo-motor and perceptual dysfunction in these children so as to understand from their assessment result whether child suffering from epilepsy along with cognitive, visuo-motor and perceptual dysfunction would be able to have normal school performance and academic achievements.

About 30% children with epilepsy but no other major neural deficits have been found to have significant dysfunction in gross as well as fine motor function[23]. The most obvious deviation from normal is noted in gross motor function such as running speed, balance and bilateral coordination. Gross motor dysfunction i.e. loss of balance leads to frequent fall which results in decreased participation in sports and recreational activities.

Although motor and sensory dysfunction coexist but are often neglected and rarely investigated in detail[24]. However till date there is no study that correlates cognitive and sensory dysfunction (perceptual and visuo-motor dysfunction) with gross motor dysfunction (balance). Hence the aim of current study is also to see whether perceptual dysfunction is associated with poor gross motor score i.e. poor balance.

Table 1: show that there were statistically no significant differences in the demographic variables of epilepsy and normal groups.

Table 1: Demographic features of study groups

	Epilepsy	Normal	p value
n	30	30	
Age (years)	8.66	9.46	>0.05
Gender			
Male	54%	49%	>0.05
Female	46%	51%	>0.05

Table 2: show demographic variables in epilepsy group. Although detail demographic variables were taken but impact of individual variable on cognition, perception and academic performance was not considered.

Table 2: Demographic variables of epilepsy group

Type of epilepsy	n=24 (Generalized tonic clonic seizures) n=4 (Complex partial seizures) n=2 (Absence seizures)
Age of onset	4.15 years
No. of episodes	73% = 2-10 episodes per year 27%= > 10 episodes per year
Type of medications	76%= on polytherapy 24%= on monotherapy

Methodology

Study design

Prospective, parallel design study

Study Setting: Consecutive patients were selected from Epilepsy clinic, Department of Pediatrics, T. N. M. C. and B. Y. L. Nair Hospital, Mumbai.

Patient selection criteria: 60 children of age group 6-12 years were selected for the study based on the selection criteria. Group I- Control group: 30 normal school going children and Group II- Experimental group: 30 children with epilepsy were included.

Inclusion criteria:

1. Children with diagnosed epilepsy minimum before one year, of age group 6-12 years who were undergoing medical treatment and attending mainstream school.
2. Normal school going children of same age group.

Exclusion criteria:

1. Children with any other CNS disorder other than epilepsy.
2. Children with epilepsy with developmental delay & mental retardation or IQ < 50.
3. Children with extremely less attention span.
4. Hyperactive / Irritable children.
5. Children with known learning disorder and Attention Deficit Hyperactive Disorder.

Study variables:

These factors are not considered in the study-

1. Age of onset
2. No. of episodes
3. Type of medications
4. Type of seizures

Outcome measures:

1: LOTCA (Loewenstien Occupational Therapy Cognitive Assessment Scale)[25,26,27]

LOTCA was developed by occupational therapy department

Table 3 : Mean scores of Orientation, Visual and Spatial perception, Motor praxis, Visuo - motor organization, Time for visuo -motor organization, Thinking operation, Attention and concentration, Running speed and agility and Balance

	Epilepsy Group		Control Group		p value
	Mean	Variance	Mean	Variance	
Orientation	10.26	14.26	15.1	1.33	<0.0001
Visual perception	14.16	2.35	15.46	0.32	<0.0001
Spatial perception	9.83	7.38	11.3	1.80	<0.0001
Motor praxis	8.33	2.71	11.66	0.60	<0.0001
Visuo-motor organization	17.2	30.71	24.26	7.99	<0.0001
Time for Visuo - motor organization in seconds	723	3330	421.8	9582	<0.0001
Thinking operation	19.8	39.26	28.1	93.12	<0.0001
Attention and concentration	3.16	0.62	3.73	0.20	<0.0001
Running speed and agility	4.4	1.35	8.53	5.96	<0.0001
Balance	19.23	29.63	28.56	1.63	<0.0001

of Lowenstein Rehabilitation hospital for the purpose of evaluating basic cognitive abilities in brain damage patients. LOTCA was established in 1990. The evaluation provides a profile of clients' cognitive status that is useful for establishing a baseline for treatment, planning treatment and monitoring changes during treatment.

Reliability and validity of LOTCA in epilepsy was determined. The measurement properties of the LOTCA were found to be reliable for all subtests in the agreement between rates and internal consistency of the three major areas perception, visuo-motor organization & thinking operation. Hence this scale was used for cognitive assessment of epilepsy children. It consists of 26 subtests and is divided into six areas i.e. orientation, visual and spatial perception, motor praxis, visuo-motor organization, thinking operation & attention and concentration.

2. Bruninkis Oseretsky Test of Motor Proficiency [BOTMP] [28]

BOMPT was also administered to evaluate gross motor proficiency in the following areas-

1. Running speed & agility
2. Balance

B1 - Standing on preferred leg on floor.
B2 - Standing on preferred leg on balance beam.
B3 - Standing on preferred leg on balance beam-eyes closed.
B4 - Walking forward on walking line.
B5 - Walking forward on balance beam.
B6 - Walking forward heel to toe on walking line.
B7 - Walking forward heel to toe on balance beam.
B8 - Stepping over an obstacle on balance beam.

Procedure

30 children with epilepsy were selected based on the inclusion and exclusion criteria from Epilepsy Clinic of T.N.M.C. and B.Y.L. Nair Hospital, Mumbai during 2006-07. Written informed consent and assent were obtained from parents and children respectively who were willing to get screened. Detail history of academic performance through semi-structured interview with parent was obtained. The categories of academic performance were based on actual academic performance i.e. below average academic performance and repeating a grade. Detail neurological examination was done prior to the application of LOTCA and BOMPT. Then LOTCA and BOMPT was applied and scores were taken for cognition, visual and spatial perception and balance. Same procedure was executed for normal children and the scores were compared and the correlation of perception with balance was found.

Data analysis

Kolmogorov Smirnv test used to see whether data is normally distributed. Test results showed that data was normally distributed hence Unpaired t- test used to compare the mean scores of orientation, visual and spatial perception, visuo-motor organization, thinking operation, attention & concentration, running speed & agility & balance in children with epilepsy with that of age matched normal children. Visual and spatial perception is correlated with balance by Pearson's coefficient of correlation

Results and interpritations

Study included 30 children with diagnosed epilepsy (Experimental group) and 30 age matched healthy controls (Control group).

Table 3 and Graph 1 shows the comparison of mean scores of orientation, visual and spatial perception, motor praxis, thinking operation, visuo-motor organization, attention and concentration, running speed and agility and balance between two groups. Unpaired't' test was used to compare the mean scores between two groups. Statistically significant difference $p<0.0001$ was found in all the components in epilepsy group compared to controls which suggest that cognition, visuo-motor organization and perception is grossly affected in children with epilepsy.

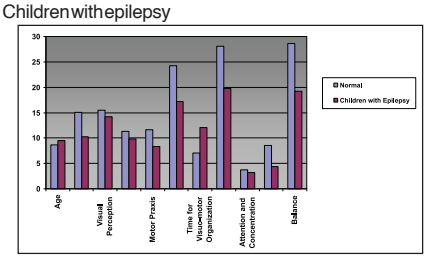
Graph 2 shows moderate correlation of perception with balance (r=0.6) Moderate correlation (r=0.6) was found between visuo-spatial perception and balance in children with epilepsy which suggest that visual and spatial perceptual dysfunction could be one of the contributory factor for gross motor dysfunction in children with epilepsy.

Graph 3 shows that in epilepsy group, n=26 had below average academic performance, n=7 repeated school grade and n=had average academic performance which suggest poor academic performance in children with epilepsy.

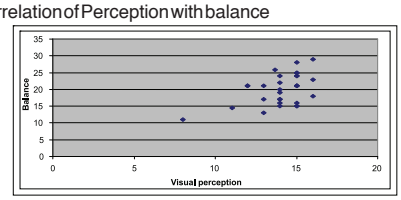
Discussion

Results of current study show that cognitive, visuo-motor and perceptual deficits along with gross motor dysfunction i.e. running speed, agility and balance is significantly affected in

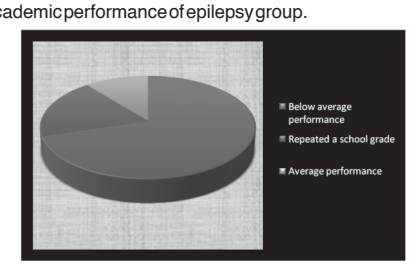
Graph 1: Comparison of mean scores of all subsets of LOTCA and BOMPT in Normal and Children with epilepsy



Graph 2: Correlation of Perception with balance



Graph 3: Academic performance of epilepsy group.



children with epilepsy. There is moderate correlation between balance and perception. It also confirms the incidence of poor academic performance in this group. Findings of prior studies (Rochelle Caplan et al 2008, Bruce P. Hermann et al 2008, Dunn and Austin 1999,Pavone P 2001, Rodenburg R et al 2005, Williams J et al 1996, Berg et al 2007, Dodrill 2004,Oostrom 2003, Seidenberg 2006, Jacqueline R. Farwell 1985) also show high incidence of cognitive and academic difficulties. When assessed on seven subtests of LOTCA i.e. orientation, visual perception, spatial perception, motor praxis, thinking operations, visuo-motor organization and attention and concentration, children with epilepsy showed marked dysfunction and poor performance compared to normal children. Likewise when assessed for gross motor dysfunction i.e. running speed, agility and balance, they showed poor performance on BOMPT scale. Graph 1 show that children with epilepsy have lower performance level in cognitive, visuomotor and perceptual areas. Cognitive deficit may result from-

1. Structural lesion
2. Interictal epileptiform discharges
3. Effect of frequent GTC seizures
4. AED's etc

Result of our study shows dysfunction in Orientation, attention and concentration in epilepsy group. Attention is ability to select and attend to specific stimulus while suppressing extraneous stimuli and attention deficit could be combined effect of AED's and the structural lesion of prefrontal cortex, anterior cingulate gyrus and right hemisphere which are major areas for divided attention. Structural involvement of these areas may lead to divided attention dysfunction in children with epilepsy (Gregory Stores 1973).

Visual and spatial dysfunction is evident in our study results. Studies by Anna Maria et al 2006 and Linda M. et al 2007 showed that Visuo-perceptual difficulties exist in occipital lobe epilepsies and memory impairment in temporal lobe epilepsy respectively. Process of perception includes sensory detection, sensory analysis, hypothesis formation and decision response (Klatzy 1980). Visual-spatial perception is a function of prefrontal cortex and dorsal stream. Structural lesion of prefrontal cortex and dorsal stream is probable reason for perceptual dysfunction in epilepsy group.

Motor praxis is an ability to perform purposeful movements. Motor praxis is affected in epilepsy group in our study which could be because of structural lesion of left frontal cortex and parietal lobe. Visuo-motor organization which is affected in epileptic group is a combined effect of spatial abilities processed by dorsal stream and cognitive abilities which may include attention and concentration. Epilepsy with parietal lesion which disrupts dorsal processing stream shows marked inability in understanding spatial relationship needed for construction and probable reason for visuo-motor organization dysfunction in epilepsy group. Time taken (seconds) for visuo-motor organization is considerably more in epilepsy group compared to normal which shows decreased performance speed in children with epilepsy. Thinking operation comes under executive function and is a function of frontal and prefrontal cortex, structural lesion of it could lead to poor thinking operation in childhood epilepsy.

Our study result also shows poor academic performance and repeating grade in children with epilepsy. Overall effect of cognitive dysfunction and attention deficit explains the academic underachievement in epilepsy group in spite having normal IQ. Study by F William Black 1996 and Pratibha Singh et al 1992, Whitmore and Holdsworth 1971 supports our findings.

Sensory and motor perceptual abilities are integral for balance. Deficits in motor speed, delayed reaction time and loss of dexterity are important reasons for gross motor dysfunction and hence leads to loss of balance in these children. Studies by Eva Becking and Paul Livebrand 1993 and Beckung E 1993 showed motor and sensory impairment in intractable epilepsy along with fine and gross motor dysfunction and impairment in sensorimotor function independent of major disabilities respectively. Efficient movement requires coordination between visuo-spatial processing and other sensory motor system. Sensory perceptual deficits i.e. visual and spatial perceptual dysfunction correlates moderately with the balance dysfunction. (r=0.6) in our study results.

Conclusion

From the study it can be concluded that

1. Children with epilepsy show cognitive, visuo-motor and perceptual dysfunctions.
2. Children with epilepsy also show gross motor dysfunction in the areas such as running speed & agility, balance.
3. There is positive correlation between visuo – spatial perception and balance. So visuo-spatial perception is one of the contributory factor for gross motor dysfunction i.e. balance in children with epilepsy.

Limitations of the study

1. Variables such as age of onset, duration, frequency, type of medications were not considered in the study.
2. Patients on monotherapy and polytherapy were not assessed separately which could have varied impact on balance.
3. Whether the cognitive and gross motor dysfunctions were because of epilepsy or secondary to the AED'S couldn't be commented because separate assessment for children on monotherapy and polytherapy was not done.

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The effect of manual hyperinflation on total static compliance of the lung in mechanically ventilated cardiac surgery patients

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Abstract

Objective

To determine the effect of Manual Hyperinflation on total Static compliance of Lung in Mechanically Ventilated Cardiac Surgery Patients.
Study design
Experimental Control group design.

Settings

ICU CTVS Department, All India Institute of Medical Science, New Delhi.

Background and purpose

Many studies on the efficacy of Manual hyperinflation and different chest physiotherapy maneuvers carried out till date. However in most studies the effects of these procedures on respiratory functions were assessed by spirometric measurement only. In some studies report the effects on respiratory mechanics as such. This study attempt to define how a specific chest physiotherapy maneuver (MH) affect the mechanics of the respiratory system and relevance importance in intensive care units for cardiac surgery patients.

Methods and materials

The measurement of compliance before the application of any physiotherapy maneuvers. Then for group A 30 subject are given five manually hyperinflated breaths with 100% O_2, pressure gauge 30 to 40 cm H_2O followed in a period of 30 secs ET suctioning 3 consequent session of manually hyperinflation and suctioning were done. Then immediately after the treatment session the second set of reading of variables was taken. Subsequent readings were taken after every half an hour till 2 hours post treatment. The similar procedure was carried out for group B 30 subjects provided hyperinflation was replaced by hyperoxygenation given as inspiratory hold for 2 sec. with FiO_2 100% from ventilator.

Results

The result does not show any significant difference in the benefits of hyperinflation over controls. Although an early benefit on static lung compliance was measured in mechanical ventilated patients of experimental group as compared to control group.

Conclusion

The effect of manual hyperinflation on total static compliance of lung was improved better than the hyperoxygenation but the study results were statistically insignificant.

Keywords

Manual Hyper inflation (MH), Lung Compliance, Hyperoxygenation(HO), Chest Physiotherapy, Endotracheal suctioning.

Introduction

The efficacy of chest physiotherapy which is routinely administered to mechanically ventilated patient undergone cardiac surgery to for improving pulmonary function and chest complication[1,2]. The chest physical therapy procedures of percussion, vibration postural drainage, hyperinflation and endotracheal suction are regularly administered after a careful assessment of vitals and clinical examination of the patients.[3] Manual hyperinflation as a chest physiotherapy maneuver is well established in most intensive care units[4].

Hyperinflation that is procedure of manually inflating the patients lungs with tidal volumes 50% greater than those delivered through the ventilator, is advocated to mobilize the secretions in peripheral bronchi towards central all ways, to prevent and treat atelectasis, and to improve oxygenation[5,6].

Yet to our knowledge, no scientific validation if exact dosimetry and pressure standization has been reported. Hyperinflation at 100% oxygen followed by 10 to 15 seconds of suction, can be used safely in patients postcardiac surgery[7,15].

There are many isolated reports on the efficacy of manual hyperinflation and different chest physiotherapy maneuvers[8]. However in most studies the effect of these procedures were assessed by spirometric measurements. Reports in the literature about effect of specific procedures in chest physiotherapy maneuvers as such on respiratory mechanics are scantyx[9].

C. Hodgson et al 2000 states that significant improvements in compliance and removal of secretions occurred in mechanically ventilated patients with the use of MH without an increase in the FiO_2 delivered. There were no adverse effects on parameters of cardiovascular stability or gas exchange when MH was used to a pressure of 40 cm H_2O with an inspiratory pause of two second[10].

Alice YM Jones et al 1992 reports manual inflation and percussion are common techniques used by respiratory physiotherapists in the management of patients requiring mechanical ventilation the effect of bagging and percussion on total static compliance of the respiratory system (CT) and arterial blood oxygenation (SaO_2) was investigated in 20 patients requiring full mechanical ventilatory support. This

Fig .1: Comparison of Variable Compliance between Group A & B

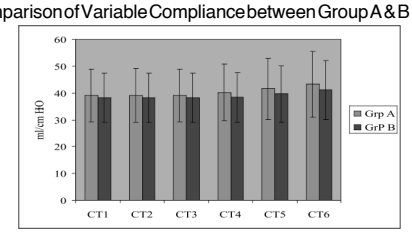
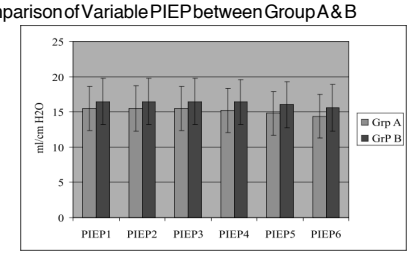


Fig. 2: Comparison of Variable PIEP between Group A & B



study showed that the static compliance of the total respiratory system and arterial oxygen saturation was significantly improved after bagging, for 75 minutes in patients with lung pathology. The improvement remained significant for at least two hours in patients with no pulmonary problems[9].

Methods and materials

Sample

Sixty subjects including males and females with age group of 30-60 yrs Group A 30 subjects (mean ± SD 45.23±9.15) Group B 30 subjects (mean ± SD 45.60±8.9) fulfilling inclusion and exclusion criteria were enrolled.

The Subjects are Randomly Divided into two Groups

Group A: Manual hyperinflation and suctioning.
Group B: Hyper oxygenation with 100% FiO_2 from the ventilator and suctioning.

Inclusion Criteria

- Postoperative cardiac surgery patients electively ventilated in pressure regulated volume control mode (PRVC).
- Age group 30 to 60 yrs (both sex).
- Hemodynamically stable.
- Patients with midsternal incision.
- Sedated and paralysed with sedatives and relaxant as per the protocol used.

Exclusion criteria

- Previous H/O obstructive/ restrictive lung disease.
- Cardiac arrhythmia.
- Postoperative pulmonary complications like, atelectasis, lung collapse/ consolidation/ pulmonary oedema, Pneumo, hemopneumothorax.
- Structural deformity of rib cage.
- Any previous scars (chest region) reducing chest/ thoracic compliance.
- Mechanically ventilated patients for > 24 hrs on PRVC mode.

Design

Experimental control group design.

Instrumentation

Equipments

- Mechanical ventilator (Servo 300 ventilator) Siemen Elema AB medical system corporation.
- Stethoscope.
- Manual hyperinflation bag/ Ambu bag with pressure gauge/ manometer (Siemens).
- E.T. suction will suction through manifold within negative auction pressure between 80-120 mmHg.

Protocol

After the patients met the inclusion criteria they are randomly divided into two groups. Group A and Group B matching age/ sex and surgical procedure maximally. The treatment protocol as below:

For Group A

- Five (05) manual hyperinflation with 1.5 liter hyperinflation bag within the inflation pressure of 30 to 40 cm H_2O.
- Followed by E.T. suctioning (using 80-120 mmHg neg. Pressure) with aseptic technique total suction time 10-15 seconds (from insertion to withdrawal) with close monitoring of all vitals, through continuous monitoring.

For Group B

- Hyper oxygenation with 100% oxygen given as inspiratory hold for 2 sec each through the ventilator (5 breaths).
- Followed by E.T. suctioning (80-120 mmHg) with aseptic technique, total suction time 10-15 seconds (from insertion to withdrawal) with close monitoring of all vitals, through continuous monitoring.

Dependent variables

- ÄV- inspired tidal volume.
- Positive inspiratory end pressure (PIEP).
- Positive end expiratory pressure (PEEP).
- Static compliance = ÄV /PIEP- PEEP

Procedures

The procedures started with the measurement of compliance before the application of any physiotherapy maneuvers. Then for group A patients, the cases are given five manually hyper inflated breaths with 100% O2 pressure followed by gauge 30 to 40cm H_2O in a period of 30 sec followed by aseptically performed E.T. suctioning. 03-Consequent sessions of manually hyperinflation followed by E.T. suctioning were done. Then immediately after the treatment session the second set of reading of variables was taken. Subsequent readings were taken after every half an hour till 2 hours post treatment. Initial baseline reading CT1, Immediately after treatment CT2, Half an hour after treatment CT3, One hour after treatment CT4, 1½ hours after treatment CT5 and Two hours after treatment CT6. (CT- Compliance)

The similar procedure was carried out for group B patients provided hyperinflation was replaced by hyper oxygenation given as inspiratory holds for 2 sec with FiO_2 100% from ventilator. It was assured that all patients in both groups were mechanically controlled with pressure regulated volume control mode (PRVC) and had cuffed endotracheal tube. All the patients had midsternotomy incision. Then total lung/ thorax compliance was calculated from the relationship CT= DV/ (PIEP-PEEP)

Data analysis

Data analysis was done using the software package SPSS V.10 and stata 7.0 stata are used to find mean and standard deviation of age of patients and of all the variables.

Results

Subject information

The subjects are grouped into two groups Group A and Group B. In group A 30 subjects receiving mechanical ventilation (M=20, F=10) in age group 30 to 60 years (45.23±9.11). In group B 30 subjects receiving mechanical ventilation (M=19, F=11) in age group 30 to 60 years (45.60±8.96) who underwent cardiac surgery were included in the study.

Within the groups compliance measurements

Fig. 1.illustrated that in group A there is significant difference in compliance over the period of study. There is a main effect for time. Graph clearly demonstrating a gradual change in compliance from initial baseline reading (CT1) up to 2 hours after MH (CT6) in Group A.

Pairwise comparison revealed that the compliance is significant between initial baseline reading (CT1) (39.08±9.99) and 1 hour after MH (CT4) (40.22±10.6) in group A with a p value of <0.06.

Figure 1 illustrates that in group B also there is significant change in compliance over the period of study. There is a main effect for time. Graph clearly demonstrating a gradual change in compliance from initial baseline reading (CT1) to 2 hrs after H0 (CT6) in Group B

Pairwise comparisons revealed that the compliance is significant between initial baseline reading (CT1) (38.18±9.24) and 1½ hrs after HO (CT5) (39.67±10.64) in group B with a p value of <0.001.

Between the groups compliance measurements

Figure 1 illustrates that there is no statistically significant difference in compliance over the period of study in both the groups from initial baseline reading (CT1) up to 2 hours after treatment (CT6) but there is a clinical significant difference in compliance of group A after 1 hour whereas the same difference was there in group B after 11/2 hours only. The T-test revealed that the change in compliance is not significant between the two groups.

Within the groups PIEP measurements

Figure 2 illustrates that significant difference in PIEP over the period of study in group A. There is a main effect for time. Graph clearly demonstrates a gradual change in PIEP from PIEP1 to PIEP6 in group A.

Pairwise comparison revealed that the PIEP is significant between PIEP1 (15.50±3.14) to PIEP4 (15.20±3.19) in group A with a p value of <0.005.

Figure 2 illustrates that significant difference in PIEP over the period of study in group B. There is a main effect for time Graph clearly demonstrates a gradual change in PIEP from PIEP1 to PIEP6 in group B.

Pairwise comparisons revealed that the PIEP is significant between PIEP1 (16.47±3.31) to PIEP 5 (16.03±3.33) in group B with a p value of <0.00.

Between the groups PIEP measurements

Figure 2 illustrates there is no statistical significant difference in PIEP over the period of study in both the groups from PIEP1 up to PIEP6 but there is a clinical significant difference in group A after 1 hr where as same difference was there in group B after 11/2 hours only. T-test revealed that the change in PIEP is not significant between the two groups.

Discussion

This study illustrates that manual hyperinflation with in (30 to 40cm H_2O) PIP, produces an early and significant improvement in total static lung compliance. When calibrates against the technique of hyperoxygenation. Though the data shown both the groups significant improvement but the MH showed early effect as compared to HO.

The role of MH in the clearance of secretion was described in studies published as early as 1968[11]. As to answer what actually causes an improvement in compliance with MH, there have been many hypothesis for possible mechanisms. Hodgson and colleagues in 2000[10] quoted that improved clearance of secretions during MH may be due to increased expiratory flow rates achieved causing secretion to be swept proximally in the airway towards the carina from where they can be removed with ET suctioning[10]. Another possible explanation may be that by restoring lung volume using MH expiratory flow rate may be greater due to stronger passive elastic recoil of the lungs[6]. Thirdly according to the two phase gas liquid flow the greater the difference in flow between expiration and inspiration the better is the mechanisms of sputum clearance. It is well known that if expiratory flow rate is greater than inspiratory flow rate alveolar secretions may be moved proximally by either mist or anular flow in airways. Therefore the increase in thoracic compliance was probably secondary to the recruitment of more functioning alveoli units as a result of mobilization and clearance of secretions. Not only this, the study by Allice et al in 1992[9] demonstrates that the mechanical ventilation at normal tidal volumes may cause progressive alveolar collapse associated with decreased lung volume and decreased pulmonary compliance. It was further suggested that occasional hyperinflation may prevent and partially reverse lung function deterioration (Balsys et al, 1980)[12]. Theoretically, bagging should improve the time dependent elastic behaviour of the lungs and allow more even gas distribution in the alveoli, improve surfactant activity and minimize the splinting and engorgement effect of pulmonary blood vessels (Nunn, 1987)[13].

Therefore the increase in thoracic compliance was probably secondary to the recruitment of more functioning alveoli units as the result of mobilization of secretions from the smaller airways. The recruitment is progressive and gradual which may account for our statistical values increasing significantly after 1 hour.

Over the years an effective technique like hyper inflation has not been judiciously used for the fear of over distention of lung with the possible consequences of increased pulmonary vascular resistance in ventilated regions and of pulmonary rupture resulting in decreased compliance. Moreover till date no dosimetry has been standardized for MH. It was only Chulay and Graebar who showed the effectiveness of 5 hyperinflation breaths.[14] But as in this study the use of manual inflation pressure of 30 to 40 cm H_2O and 5 breaths resulted in statistically significant increase in static lung compliance.

As the technique of hyperoxygenation is concerned there are very minimal documentation which could clear the mechanism of its working on total compliance. Lynne M and colleagues 1986[16] quoted that the effect of inspiratory hold was basically to increase intrathoracic pressure during inflation. It is possibly, sustained inflation pressure given like an inspiratory hold, actually causes redistribution of ventilation and functional recruitment of alveoli. Clement et al 1968[11] in their study very well explained the does and don't of inflation technique. It was explained that the inflation should not be too quick and the maximum pressure and inflation volume should be held at a plateau for a few seconds to allow time for poorly ventilated alveoli to fill short inspiration without plateau only gives preferential ventilation to normal alveoli. Though the exact physiological basis of improved compliance with inspiratory hold is uncertain still the above explanation holds true for recruitment of more functioning alveoli. Since the redistribution of ventilation is the time dependent phenomenon, this possibly explained our statistically significant improvement in compliance with MH within 1 hour and hyperoxygenation only after 1½ hours.

Conclusion

The compliance as such was better improved in both the groups as compared to baseline data except the time of appearance of the benefit.

Although an early benefit on static lung compliance was measured in mechanical ventilated patients of experimental group as compared to control, but the study does not show any significant difference in the benefits of hyperinflation over controls.

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Patellofemoral pain syndrome- A common condition among young adults

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Abstract

Patellofemoral pain is a common symptom and managing it is a challenge, in part because of lack of consensus regarding its cause and treatment. Contributing factors include overuse, overload, biomechanical problems or muscular dysfunction. The initial treatment plan is to control pain, activity modification, and quadriceps strengthening exercises. Additional exercises may be dictated by the findings of the physical examination. Footwear should be closely evaluated for quality and fit, and use of arch supports should be considered.

Key words

patellofemoral pain syndrome, biomechanics, malalignment, conservative treatment, quadriceps strengthening, taping

The knee joint was the centre of orthopedic attention during the 1980s. It consist of a Joint between femur and tibia is a synovial joint of hinge variety (but some degree of rotation is possible) and the joint between patella and femur is a synovial joint of plain gliding variety. The patellofemoral (PF) joint is a part of knee joint. The Patellofemoral joint has often been described as the most researched small joint in the body, producing pain & disability, far out of proportion to its size. The patella articulates with the femoral trochlea during knee flexion & extension. The patella is a sesamoid bone located within the patellar ligament. PF joint pain is common in all ages of the general population, but even more so among athletes. Hording (1983) reported that 10% of Swedish children sought medical advice for patellar pain. Devereaux & lachman (1984) found that patellofemoral arthalgia was the complaint in 6% of all patients attending a sports injury clinic, particularly those engaged in sports like running, cycling, swimming & other racquet sports. Abnormalities of the PF joint generally amount to 10% of knees assessed by arthroscopy.

In PF joint, quadriceps muscle force increases with knee flexion. During relaxed upright standing minimal quadriceps muscle is required to counter balance small flexion moments about the PF joint because COG of the body above the knee is almost directing above the centre of rotation of PF joint. As knee angle of flexion increases, the COG shifts away from the centre of rotation, thereby greatly increasing the flexion movement to be counter balanced by the quadriceps muscle force. Knee flexion also influences PF JRF, because of the angulation between patella tendon force and the quadriceps tendon force. Angle of the two components becomes more acute with knee flexion, hence increases the magnitude of PF JRF. The JRF is much greater during activities that require greater flexion. E.g. During knee bending to 90 degree JRF reaches 2.5 to 3 times the body weight with knee flexed at 90 degrees.

The PF JRF remains higher than the quadriceps muscle force throughout the knee bending. E.g. during stair climbing and getting down from the stairs, when the knee flexion is reached approximately 60 degrees, the peak value equals 3.3 times the body weight. (The physiology of joints- I A Kapanji, volume 2,5th edition)

When the knee is extended lower part of tibia is against femur while when the knee is flexed to 90 degree. The contact surface between patella and femur shifts cranially. The quadriceps muscle force and the torque around the PF joint can be extremely high when particularly the knee is flexed instantly. E.g. Basket ball players may suffer a patellar fracture due to the indirect forces from the eccentric contraction of quadriceps, in Weight lifting – there can be rupture of patellar tendon when the subject lifts the heavy weight due to creation of external torque on patella. Therefore an effective mechanism is required for reducing these external forces to limit the amount of or percentage or injuries.

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The term "PATELLOFEMORAL PAIN SYNDROME" (PFPS) can be used to describe the clinical entity of activity in dues pain, pain on physical examination of the PF Joint and on at least two of the following – stair climbing, squatting, pseudo locking and pain or stiffness after prolong sitting. "CHONDROMALACIA PATELLA" was an all embracing term used in the early literature. It is now restricted to those instances where articular cartilaginous degeneration has been shown to present. Mclatchie and Lennon said chondromalacia patella occurs in adolescents between 13 and 19 years with the characteristics of anterior knee pain and crepitus aggravated by prolonged sitting or holding the knee in flexon. Approximately 7% of schoolboys and 19% of school girls complain of such symptoms (mac-Kechnie-Jarvis and Boobbyer, 1984). These authors also noted an association between chodromalacia patellae and persistent femoral anteversion which was not confirmed by Fairbank et a, (1984), who found only that those with chondromalacia patella enjoyed sport more than asymptomatic children.

Various causative factors have been attributed to PFPS-

Biomechanical fault

Although a direct blow or a traumatic dislocation of patella may precipitate PF pain, mal alignment of the patella from the biomechanical faults is increasingly believed to be the major contributory factor. These faults can be STRUCTURAL or NON STRUCTUAL

Structural causes of mal alignment may be divided into INTRINSIC AND EXTRINSIC FACTOR. Later are more common and magnify the affect of the non structural faults.

Others include poor alignment of the extensor mechanism, poor alignment of the entire lower extremity and the patellar instability. Prat and Hungerford (1977) described the "EXCESSIVE LATERAL PRESSURE SYNDROME" (ELPS) i.e. a patellar tracking abnormality associated with a tight lateral PF retinaculum. This may be the result of the action of the malalignment factors listed above, or to the anatomy of the complex and extensive lateral structures of the knee. Merchant (1988) in a detailed classification of PF disorders, places secondary chondromalacia patella (i.e. not caused by trauma) under the heading of PF dysplasias indicating etiology of related malalignment of lower extremity

Q-angle

Although some investigators believe that a "large" Q angle is a predisposing factor for patellofemoral pain, others question this claim. One study found similar Q angles in symptomatic and non symptomatic patients. Another study compared the symptomatic and asymptomatic legs in 40 patients with unilateral symptoms and found similar Q angles in each leg. Furthermore, "normal" Q angles vary from 10 to 22 degrees, depending on the study, and measurements of the Q angle in the same patient vary from physician to physician. Therefore, the physician should be wary of placing too much emphasis on such biomechanical "variants," as this can lead patients to believe that nothing can be done about their pain.

Pain may be felt on the outside of patella and femur because of increased pressure on these contact areas. The Q angle of growing female athletes and largest as the pelvis widens during the process of maturation, increasing the risk of PF pain

PFPS described anterior or retro patellar pain in the absence of other knee pathology. It occurs commonly with prospective cohort studies reporting incidents rate of 7 to 15% in sporting and general population. (The soft tissues- trauma and sports injuries-edited by Gr Mc Latchie and Cme Lennox 1996) In addition of PFPS is one of the most common conditions presenting to clinicians involved in the management of sports injuries, amounting to 2-30% of all presentations. Various predisposing factors have been proposed.

Signs and symptoms of PFPS have been summarized in the following table.

Examination involves thorough History taking, observation and examination. Special tests form the major part of the assessment and help to rule out differential diagnosis of PFPS.

Special tests

PF dysfunction implies there is some pathology that is interfering with the normal mechanics of the movement of patella over the femoral condyles during knee flexion and extension. Commonly, patients with PF problems complain of pain when climbing or descending stairs, stepping up or down, with prolonged sitting

(Movie sign), squatting, or getting up from chair. In some cases, the pain may cause reflex inhibition causing buckling or giving way of the knees. (Orthopedic physical assessment, David J. Magee, 4th edition)

Clarke's sign- First the leg is fully extended and the patient relaxes. The patella is then pressed down and distally, into the patellofemoral grove. The patient contracts the quadriceps. Pain is felt with the movement, indicates positive sign. The patient should be warned to contract the quadriceps gently.

Mc connell test for chondromalacia patellae- The patient is sitting with the femur laterally rotated. The patient performs isometric quadriceps contractions at 120,90, 60, and 0 degrees, with each contraction held for 10 seconds. If pain is produced during any of the contractions, the patient's leg is passively returned to full extension by the examiner. The patient's leg is then fully supported on the examiner's knee, and the examiner pushes the patella medially. The medial glide is maintained while the knee is returned to the painful angle, and the patient performs an isometric contraction, again with the patella held medially. If the pain is decreased, the pain is patellofemoral in origin. Each angle is tested in same fashion.

Zohler's sign- The patient lies supine with the knees extended. The examiner pulls the patella distally and holds in the position. The patient is asked to contract the quadriceps. Pain is indicative of a positive test for chondromalacia patellae.

Other tests

- Active patellar grind test

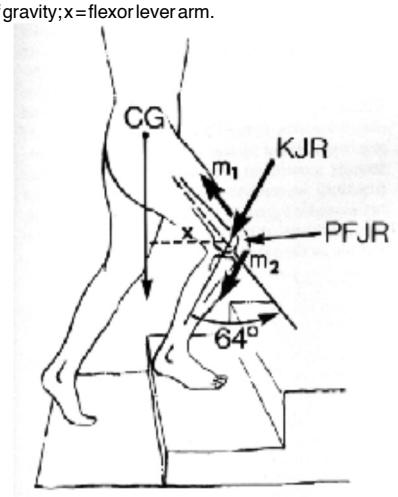
Predisposing factors for patellofemoral pain	
Factors	Cause
Abnormal biomechanics	femoral anteversion; Increased Q angle; patella alta, patella Baja; excessive pronation; genuvalgus, varus, recurvatum.
Soft tissue tightness	Lateral retinaculum; iliotibial band; rectus femoris; hamstrings: gastrocnemius.
Muscle imbalance	Vastus medialis obliquus; hip abductors, external Rotators (gluteus medius posterior fibers)
Training	Sudden increase in mileage; increase in hill work, Stairs; Change of training surface; change of Footwear.

(Sports physiotherapy applied science and practice- maria zulugua, 1995)

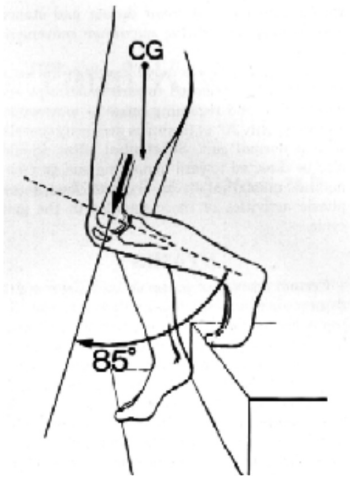
Clinical Signs of PFPS	
Onset	Running, Stair/Step Activity Particularly Eccentric Component
Pain	Peripatellar And/Or Posterior, Hard To Describe
Tenderness	Peripatellar And Inferior Pole, May Not Be Palpable
Crepitus	Often Present in Severe Cases
Giving Way	Due To Quadriceps Weakness or Pain
Effusion	Occasional But Small
Click/Clunk	Often in Older Athletes
Range of Knee	Decreased in Severe Case
Patellar Mobility	Decreased Medial Glide Due To Tight Lateral Retinaculum.
Vmo	Wasting, Vmo/Vl Imbalance and Altered Timing
Effect of Activity	Pain Increases with Increasing Activity
Retest	Stairs, Squats, Duck Waddle Sign

(Sports injuries- diagnosis and management- norrus, 2nd edition)

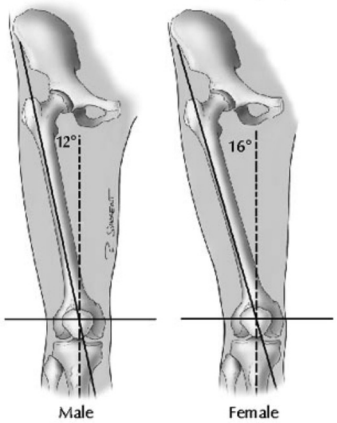
Free body diagram of a patient
Ascending a step, m_1 = quadriceps force;
M_2 = patellar tendon tension;
Kjr = knee joint reaction;
Pfjr = patellofemoral joint reaction;
Cg = center of gravity; x = flexor lever arm.



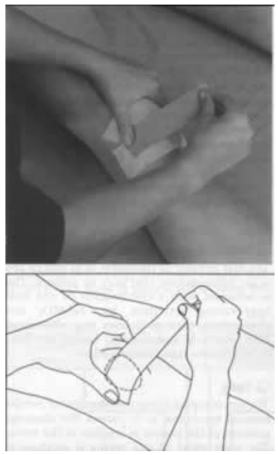
A free body diagram of an individual descending a step, note the significant increase in knee flexion required
And also the change in orientation of the tibial shaft to the vertical, cg = center of gravity; *arrow* indicates
Anteriorsubluxation thrust of the femur



Comparison of male and female Q angles



(a) Knee taped in medial glide. Tape is applied to the lateral aspect of the patella. The patella is glided medially and the tape anchored to the skin over the medial aspect of the knee. When taping is completed, skin creases should be evident on the inside of the knee indicating adequate tension on the patella.



(b) Knee taped showing correction of lateral tilt. Tape is applied to the medial aspect of the patella and secured to the soft tissue on the inner aspect of the knee

(c) Knee taped showing correction of rotation. Tape is applied to the inferior pole of the patella and taken medially and superiorly to rotate the patella

(d) Knee taped showing correction of inferior tilt. Tape is applied across the superior pole of the patella with sufficient firmness to elevate the inferior pole

- Waldron test
- Lateral pull test
- Step up test
- Patellar tilt test

Differential diagnosis

1. Patellar tendinitis or periostitis.
2. Bursitis. I
3. Plica syndrome.
4. Fat pad syndrome.
5. Meniscal lesions.
6. Ligamentous lesions.
7. Osteochondritis disiccans.
8. Chondromalacia and arthrosis.
9. Systemic joint disease.
10. Reflex sympathetic dystrophy. .
11. Slipped femoral epiphysis.
12. ELPS(excessive lateral pressure syndrome)
13. GPPS(global patellar pressure syndrome)
14. Osgood-Schlatter syndrome.
15. Jumper's knee.
16. Patellofemoral arthritis.
17. Contusion injury.
18. Acute patellar dislocation.
19. Patellar subluxation.
20. IT band friction syndrome.

Treatment

It is now well accepted that the conservative treatment of PF pain, malalignment and instability besides being successful should be fully exhausted before any operative procedure are performed. (Mark S. Juhn, 1999)

Conservative management

1. Relative rest

2. Ice and anti inflammatory drugs

3. Taping- A taping technique used to relieve pain as develop by Mc. Connell, 2002 has been described and has been shown to be effective in more than 85% of cases. (WHITTINGHAM M, PALMER S, MACMILLAN F., 2004)

4. Knee sleeve, brace and footwear modification.

5. Exercise and physical therapy- A rehabilitative approach using isometric, concentric and eccentric exercises should be employed with special emphasis on VMO strengthening. According to Witrow.Bellermans (2000), there is almost no difference between open and closed chain exercise in terms of pain and function and best program would probably be combining both open and closed chain exercises in rehabilitation. Physical therapy with a rehabilitative exercise routine is the mainstay of treatment. Physical modalities like Ultrasound (US) or Phonophoresis (US plus topical analgesics) may decrease pain symptoms. Other modalities that can be used are Paraffin wax bath (PWB), Transcutaneous electrical nerve stimulation (TENS), Interferential therapy (IFT), PULSED Short wave diathermy (SWD), High voltage pulsed galvanic stimulation (HVPGS), Electrical muscle stimulation (EMS), etc. But these have a temporary effect. These are not of much help in the PFPS, other than decreasing symptoms. (Mark S. Juhn, 1999)

Activity modification, correction of forefoot abnormalities, biofeedback, flexibility, external support (brace, taping) may be appropriate in selected patients. (Christopher M. Powers, 2003) According to unityhealth. com, Patellofemoral pain can be hard to treat and knees don't get better overnight. Some people are lucky and get better quickly. But it might take 6 weeks or longer for your knee to get better. One would be less likely to get this pain again if he/she stays in good shape, but don't make sudden changes in your workouts.

Here are some exercises to help knee pain. These should be done for both legs so that both knees get the benefit of stretching.

a. Quadriceps strengthening
b. Iliotibial band and buttock stretch
c. Hamstring stretch
d. Hip adductor strengthening
e. Hip abductor strengthening
f. Calf stretch
g. Static cycling
h. Closed chain exercises- mini squats, squats, squat sled leg press
i. Open chain exercises- exercise in which foot is free.

Surgical intervention

Surgery may be useful for patients who have been compliant and were unsuccessful with a 12-month trial of conservative therapy. Surgery may completely resolve symptomatology, partially resolve symptomatology, or may not change symptomatology; rarely is symptomology exacerbated iatrogenically. Surgery is more successful when a specific diagnosis has been established and when clear surgical goals can be defined. (James, 1996)

Surgical intervention includes arthroscopy for articular cartilage shaving with or without lateral release of the retinaculum. Surgery also may include proximal or distal realignment. Open surgical procedures include patellar tendon transfer, or rarely, patellectomy.

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