COMPARISON OF POSTOPERATIVE PAIN AFTER PROTAPER ROTARY AND MANUAL STEP-BACK ROOT CANAL PREPARATION TECHNIQUES IN SINGLE VISIT ENDODONTICS

Muhammad Adeel Ahmed[1] BDS, MFDSRCS
Abdul Qadir Dall[2] BDS, MSc
Noor Ahmed Khoso[3] BDS, MDS
Rizwan Jouhar[4] BDS, FCPS

OBJECTIVES: To compare the frequency of postoperative pain after ProTaper (NiTi) rotary and manual step-back root canal preparation techniques in single visit endodontics.
METHODOLOGY: Randomized control trial was conducted at Out Patient Department of Operative Dentistry, Altamash Institute of Dental Medicine, Karachi From Sep 2009 to March 2010, according to the inclusion criteria. Exclusion criteria were strictly maintained and confounding variables were taken care by random allocation. Patients after selection were randomly divided in to two groups by lottery method. Group A: Root canals prepared by ProTaper (NiTi) rotary (Dentsply, Maillefer, Ballaigues, Switzerland). Group B: Were prepared by manual step-back technique. The Visual Analogue Scale (VAS) was explained to patients and instructions were given that, if patients experience pain then they ought to mark the severity of pain on VAS and then take Paracetamol (1gm). The dose could then be repeated every 6 hours if necessary. All patients were appointed after 48 hours and evaluated for postoperative pain during 48 hours by Visual Analogue Scale.
RESULTS: Frequency of postoperative pain noted after 48 hours was 13.3% (7/51) in Group A while 15.7% (8/51) in Group B.
CONCLUSION: No statistically significant difference (P=0.78) was noted in the frequency of postoperative pain between patients treated by ProTaper (NiTi) rotary and manual step-back root canal preparation technique in single visit endodontics.
KEYWORDS: Postoperative Pain, ProTaper (NiTi) Rotary, Manual Step-Back Technique, Single Visit Endodontics.
How to cite this article:
Ahmed M A, Dall A Q, Khoso N A, Jouhar R. Comparison of postoperative pain after protaper rotary and manual step-back root canal preparation techniques in single visit endodontics. J Pak Dent Assoc. 2012; 21: 103 -107

INTRODUCTION

The crux of the endodontic treatment is to treat infected vital and necrotic dental pulps so that patients can maintain their natural teeth in form & function. For the successful endodontic therapy the most important step in any root canal treatment is canal preparation. This is very essential step because preparation decides the effectiveness of remaining procedures such as mechanical debridement, space creation for inter-appointment medicament and widening of canal geometries for adequate obturation. But during cleaning and shaping methods, dentine chips, pulp tissue remnants, necrotic tissues, microorganisms and irrigation solutions may be extruded from the main canal to the periradicular tissues. It is stipulated that extrusion of the material or debris to the periapical tissues is directly related to postoperative pain and flare up.[1]

Almost all root canal preparation techniques have been identified to be associated with extrusion of infected remnants, even when preparation is terminated short of the apical foramen.[2,3] However, some techniques extrude

1 Senior Registrar, Department of Operative Dentistry, DOW International Medical College, Dental Section, DUHS, Karachi.
2 Assistant Professor, Department of Operative Dentistry, Faculty of Dentistry, LUMHS, Jamshoro.
3 Associate Professor, Department of Oral Pathology, Faculty of Dentistry, LUMHS, Jamshoro.
4 Assistant Professor, Operative Dentistry, Altamash Institute of Dental Medicine, Karachi.
Correspondence: Muhammad Adeel Ahmed <sarmad415@yahoo.com>

less amount of debris than the other. Such differences in the quantity of extruded debris are very essential for the development of postoperative pain, as techniques that extrude more debris supposedly amplify the risk for exacerbation to arise. Motor-driven instruments such as ProTaper (NiTi) rotary are related with less extrusion of the debris apically in comparison to manual step-back root canal preparation methods.[4] Therefore, the quantitative factor could possibly be under the control of the operator. In contrast, the qualitative aspect is more complicated to be proscribed such as if infectious clonal species of pathogenic microbial types are occupying the root canal system and are forced beyond root apex at some stage during canal preparation, even a little quantity of infected remnants will have the ability to initiate or accelerate peri-radicular inflammation.

Numerous in-vitro studies have shown that traditional manual step-back technique is associated with more extrusion of the debris as compared to newer ProTaper (NiTi) rotary technique.[5, 6] However, in this regard in-vivo studies are few[7, 8]; therefore, it is worthwhile to conduct a study that can clinically evaluate the results of these two root canal preparation techniques in terms of postoperative pain.

The objective of this study is to compare the frequency of postoperative pain after ProTaper (NiTi) rotary and manual step-back root canal preparation techniques in single visit endodontics and we hypothesize that rotary preparation caused less postoperative pain as compared to manual preparation.

METHODOLOGY

This study was conducted at Out Patient Department of Operative Dentistry, Altamash Institute of Dental Medicine Karachi from Sep 2009 to March 2010. The sample size was calculated by using WHO recommended sample size determination software for health studies and also by considering the results of the previous international study as a reference 8 and total of 102 patients, divided in to two groups, 51 patients in each group. The inclusion criteria were, single rooted tooth requiring root canal treatment due to irreversible pulpitis and/or acute apical periodontitis presented with moderate pain (VAS 4-6) and patients between age group 14- 60 years, while the exclusion criteria were teeth with open apices (immature root formation), teeth with aggressive periodontitis and grade III mobility, severe labially or lingually mal- positioned teeth in which obtaining straight line access were difficult and patients requiring root canal treatment of two or more teeth ipsilaterally were excluded because the pain caused by any to these teeth can result in false positive reading. The Patients were selected according to the inclusion criteria. Exclusion criteria were strictly maintained and confounding variables were taken care by random allocation. Patients after selection were randomly divided in to two groups by lottery method (i.e. a bowl having equal number of slips marked as Group A and B were given to patient and asked to pick one).

Group A: Root canals prepared by ProTaper (NiTi) rotary (Dentsply, Maillefer, Ballaigues, Switzerland).

Group B: Were prepared by manual step-back technique.

After obtaining written consent by the patient (Annexed I), Local anesthesia (2% lignocaine 1:80,000 adrenaline) was administered and rubber dam applied on tooth for isolation. Adequate coronal access was made into the pulp chamber by round diamond bur and estimated working length was measured by ISO K#15 file (Mani, Stainless Steel) on pre-operative periapical radiograph.

Group A (ProTaper (NiTi) Rotary Group): ProTaper (NiTi) rotary (Dentsply, Maillefer, Ballaigues, Switzerland) was used in a crown down manner according to the manufacturer's instructions as follow:

A gliding path was formed by inserting a manual file size ISO # 10 to the working length.

Shaping file (S1) was introduced with a brushing movement into the canal, 3 mm short of the estimated working length.

- Shaping file (SX) was introduced into the canal with a brushing movement 2/3 of its blade length.
- The ISO # 15 file was used to ascertain the working length.
- Shaping file (SI) was used to the working length.
- Shaping file (S2) was used to the working length.
- Finishing file (F1) was used to the working length for one second, and the canal was then assessed with an ISO # 20 file. If it fits snuggly at the apex, the preparation was

completed.

- When the ISO # 20 file did not fit properly at the apex, instrumentation was continued with the Finishing file (F2) and the canal assessed with ISO # 25 file. Once again, if it fits snuggly at the apex, instrumentation was completed; otherwise, it was continued with Finishing file (F3).
- ISO K# 15 file (Mani, Stainless Steel) was used at the working length amid each Shaping and Finishing file in order to avoid apical blockage.

Group B (Manual Step Back Group): After obtaining working length on periapical radiograph by ISO #15 file, further ISO K- file instruments (Mani, Stainless Steel) was used in a step back manner, firstly with a quarter clockwise rotational motion followed by a pull-back motion. The apical region was shaped by using initial binding files to a final master apical file size 35 or 45; each consequentially larger instrument was introduced 1.0 mm less into the canal to form a taper. In between placing each larger instrument, the master apical file was introduced to the working length for recapitulation.

In both groups, 2.5% sodium hypochlorite was used as an irrigant between each file. Finally, canal was dried by ProTaper (Group A) / ISO standardized (Group B) paper points and obturated with ProTaper (Group A) / ISO standardized (Group B) gutta-percha points using sealapex sealer (SybronEndo) and cold lateral compaction filling technique followed by glass ionomer cement (Fuji I, GC Corporation) as a liner and light cured composite (Filtek Supreme, 3M, ESPE) as a coronal restoration.

Visual Analogue Scale (VAS) was explained to patients and instructions were given that, if patients experience pain then they ought to mark the severity of pain on VAS and then take Paracetamol (1gm). The dose could then be repeated every 6 hours if necessary. All patients were appointed after 48 hours and evaluated for postoperative pain during 48 hours by Visual Analogue Scale.

The data collected was entered and analyzed in SPSS version 14. Chi- Square test was applied to compare proportion of patients with postoperative pain between groups. A p-value of ≤ 0.05 was considered as significant.

RESULTS

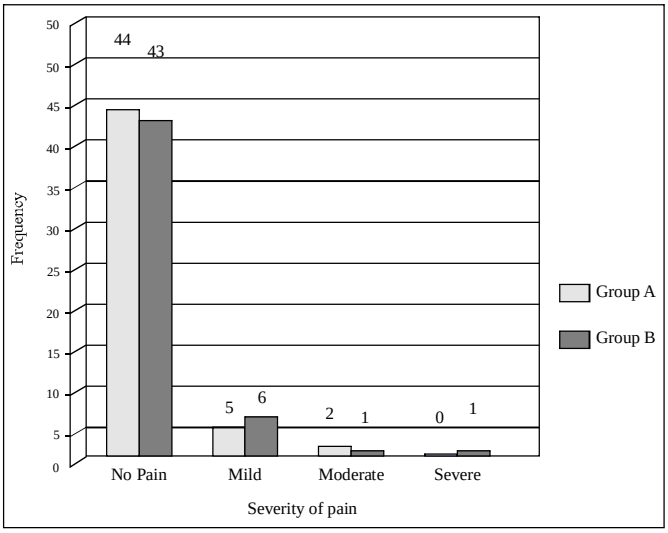
Comparison of frequency of postoperative pain between groups is presented in Table I. Out of 102 patients, 15(14.7%) patients reported pain while 85(85.3%) had no pain (VAS=0). In this study mild pain was noted in 11 cases in which 5 were in Group A and 6 cases were Group B. Moderate pain was noted in 3 cases in which 2 cases were in Group A and 1 in Group B. Severe pain was noted in only one case that was in Group B as presented in Graph 1.

Frequency of postoperative pain noted after 48 hours

Pain	***Group A n=51***	***Group B n=51***	***Total n=102***
Yes (Mild, Moderate and Severe)	*7(13.7%)*	*8(15.7%)*	***15(14.7%)***
NO (No Pain)	*44(86.3%)*	*43(84.3%)*	***85(85.3%)***

Table I: Comparison of frequency of post operative pain between groups after 48 hours

Chi-Square value= 0.078 df= 1 p-value=0.78
Chi-Square test applied after merging of mild, moderate and severe cells due to low frequency and expected value in a cells.
VAS Score 1-3 mild pain,
VAS Score 4-6 moderate pain
VAS Score 7-10 severe pain.



Graph 1: Postoperative pain with respect to severity

In case of pain,
VAS Score 1-3 mild pain,
VAS Score 4-6 moderate pain
VAS Score 7-10 severe pain.

was 13.3% (7/51) in Group A while 15.7% (8/51) in Group B. There was no significant difference in frequency of postoperative pain between both groups (P=0.78).

DISCUSSION

The present study was undertaken to compare the frequency of postoperative pain after ProTaper (NiTi) rotary and manual step-back root canal preparation technique in single visit endodontics. The result of this clinical study indicated that there was no statistically significant difference (P=0.78) in the expression of postoperative pain between the patients treated by these two different root canal preparation techniques.

In our study, root canal treatments of all cases were performed in single visit because success for single-visit endodontic treatment appears in the high end of the ranges studied by majority of authors.[9-11]Eleazer et al. (1998) recognized high success rate related with single visit RCT.[11]Recent systematic reviews found no difference in postoperative pain between single and multiple visits endodontic treatment.[12,13]

The findings of our study are similar to the results obtained by Aqrabawi J et al.[7]They reported no statistically significant difference in evaluation of postoperative pain between patients treated by ProTaper (NiTi) rotary and step-back root canal preparation technique. However, Wei X et al. found relatively high incidence of postoperative pain with stainless steel hand file preparation as compared to NiTi rotary[14], but this study was done on multi-rooted teeth in contrast to our study on single rooted tooth. In addition, Al-Jabreen also reported results contrary to our study i.e. higher incidence of postoperative pain after step-back root canal preparation technique (11.4%) as compared to nickel titanium rotary profile(0%).[8] The reason for this difference could possibly be the inclusion of teeth with necrotic pulp in their study.

Several in-vitro studies showed that rotary files during rotation engage the dentinal debris in to the flutes of the file and directed them towards the orifice whereas in manual step-back technique, the rationale for more apical extrusion of debris is that file movement in the apical one third serves as a piston that tends to drive the debris through the foramen and hence reduced space is available to flush it out coronally. However, the results of in-vitro studies should not be directly applied to the clinical situation because in clinical circumstances periapical tissues may act as a natural barrier and hamper debris extrusion. If the quantities of debris extruded in these in-vitro studies were extruded regularly in clinical practice, a higher incidence of postoperative pain might be expected. Other factors may also influence the outcome of in-vivo study such as positive and negative pressure at the apex, normal or pathological periapical tissues and immature root development or open apices. The results of our study are in disagreement with the numerous in-vitro studies possibly because of the involvement of these multiple confounding factor in clinical (in-vivo) study.

It is imperative to note that we have strictly followed the inclusion criteria, randomly selected and divided the patients in to two groups, properly isolated the tooth by rubber dam and carefully used the manual and engine driven root canal instrumentation techniques according to manufacturer instructions. This strict adherence to protocol could perhaps be the reason why we have not found statistically significant difference in postoperative pain between the two techniques.

CONCLUSION

As no statistically significant difference noted in the frequency of postoperative pain between patients treated by ProTaper (NiTi) rotary and manual Step-back root canal preparation technique in single visit endodontics therefore; it is concluded that both root canal preparation techniques are equally effective in relation to postoperative pain.

LIMITATIONS:

We had following limitation in our study; Postoperative pain after 48 hours (short term success) was evaluated. Therefore one limitation of our study is that long term outcome was not evaluated due to limited study period.

Other limitations are the difference in the sampling technique, methodology and / or study design of other studies and our study; therefore, it was difficult to exactly compare our results with other studies

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