ORIGINAL RESEARCH

Influence of Abutment Evaluation on Designing of Fixed Partial Denture: A Clinical Study

Ranjdar Mahmood Talabani

Lecturer at Conservative Department, School of Dentistry - Faculty of Medical Sciences/ University of Sulaimani (Kurdistan Region/Iraq) (Corresponding Address). Contact Us: www.ijohmr.com

ABSTRACT

Objective: The purpose of the current study was to evaluate clinical, radiographic and mounted study cast assessment of the abutment on designing of fixed partial denture. **Patient & method:** The present study was limited to patients who treated by postgraduate students of Conservative Department, School of Dentistry/Faculty of Medical Sciences between January 2014 to February 2015. A total number of 104 case sheets of patient's age ranged from 16 years to 60 years and above with mean age 41 years and 48 male and 56 females. The evaluation performed on patients with at least 3 units fixed partial denture or a single crown with the presence of natural contra-lateral tooth/teeth. The assessment included a complete clinical and radiographic examination of abutment in terms of studying design of fixed partial denture, periodontium, caries, pulpal status and periapical area and mounted study cast made for the determination of the span length, abutment length, and position. **Results:** Out of the 104 patients who participated in this study, replacement of missing one tooth represent the most common type of fixed partial denture configuration (47.12 %) and complex missing one tooth represent least among all types of fixed partial denture design about (1.92%). The clinical evaluation of the (237) abutments (88.6 %) has revealed normal periodontium, (83.9 %) without any pulpal involvement, and (43.03 %) of the abutments has intact sound tooth structure with no any caries lesion. Radiographic assessment of the abutments (43.8%) has shown 1:2 crown to root ratio. On the mounted study cast evaluation, (83%) of the cases has adequate span length, (76.7 %) of the abutments has adequate length and (63.71 %) of the abutments has the normal status position. **Conclusion:** Evaluation of the abutment selection considered integral part of diagnosis and treatment planning in fixed partial denture.

KEYWORDS: Fixed Partial Dentures, Abutments

INTRODUCTION

Replacement of missing teeth represents the largest category among patients in clinics who are looking for better esthetic and/or functional teeth. Optional managements include replacing a single missing tooth; removable partial denture, fixed partial denture or dental implant.[1]

Treatment with removable partial dentures (RPDs) is the most common of these options because it is noninvasive and inexpensive. However, treatment with RPDs has a high 'biological cost' with high caries incidence and periodontal breakdown of abutment teeth.[2]

The esthetic and functional rehabilitation of a missing tooth or teeth regards one of the complex procedures for most of dentists. In some cases, the replacement of the missing tooth or teeth is difficult to replace by an implant-supported prosthesis. The possible underlying reasons for this procedure might be due to a local bony defect, an inadequate volume of bone in the edentulous area, occlusal function, systemic disorders, or the socioeconomic status or unwillingness of the patient to experience invasive implant surgery.[3]

Fixed prosthodontics treatment regards an exceptional achievement for both regarding both patient and the dentist.[4] The fixed partial denture is one of the most commonly preferred definitive treatment options for a single missing tooth. For many years, FPDs were considered to be the best treatment choice for replacing a single missing tooth. Survival rates of these FPDs were 77.8-89.2% after ten years. The primary reasons for suggesting FPDs are its clinical ease and reduced treatment time and costs.[5]

The replacement of the missing teeth in the posterior region is equally important as in the anterior segment of the mouth. It is significant to determine the absolute need to fill a space and to perform a cost-benefit analysis for any designed restoration – not only in commercial terms but also in biological value to tooth structure and the surrounding tissues.[6]

The maximum number of posterior teeth that allows to replace with a fixed partial denture is usually two. In rare circumstances, three can be replaced, but that should be attempted only under ideal conditions. An edentulous

How to cite this article:
Talabani RM. Influence of Abutment Evaluation on Designing of Fixed Partial Denture: A Clinical Study. Int J Oral Health Med Res 2016;3(2):1-7.

space established by the lack of four adjacent teeth, other than four incisors, is best restored with implant-supported crowns or a removable partial denture. If more than one edentulous space exist in the same arch, even though each might individually restore with a fixed partial denture or implants.[7]

Fixed partial dentures conduct forces via the abutments to the periodontium. Failures are largely due to improper engineering, the use of inappropriate materials, inadequate tooth preparation, and defective fabrication. Of significant importance to dentists is the selection of teeth for abutments. They must identify the underlying forces created by the oral mechanism, and the resistance of the tooth and its supporting structures to them. Successful selection of abutments for fixed partial denture needs sensitive diagnostic skill. Detailed knowledge of anatomy, ceramics, the chemistry and physics of dental materials, metallurgy, periodontics, phonetics, physiology, radiology, and the mechanics of oral function is essential.[8]

Periapical and bite-wing films are most important in the selection of abutment teeth. The major reason of roentgenograms is to display hidden spaces and structures such as the root morphology, pulp outline, the periodontal ligament space, the alveolar bone, infrabony defects, residual roots, impacted or supernumerary teeth, and the extent of exist or former caries. Definite rules for treatment planning impossible to formulate. However, an understanding of the favorable indications and reasonable limitations of abutments for fixed partial dentures is essential.

The accurate diagnostic cast must adequately orient to the transverse hinge axis and the plane of occlusion on an articulator to pass eccentric movements similar to those that happen in the mouth. This technique permits a simple assessment of the occlusal relationships of the dental arches and the abutment teeth.[9]

Selecting an abutment that will lead to success of tooth supported prosthesis needs receptive, sensitive and insightful diagnostic ability. A detailed knowledge of dental anatomy, dental ceramics, the chemistry and physics of dental materials, metallurgy, periodontics, phonetics, physiology, radiology and the mechanics of oral function is essential to perform the definite rules of treatment planning.[10]

In the present study, clinical, radiographic and study cast of the abutments teeth was evaluated and assess its influence on the design of fixed partial denture configuration.

MATERIALS AND METHODS

The present study was limited to patients who treated by postgraduate students of Conservative Department, School of Dentistry/ Faculty of Medical Sciences/ University of Sulaimani between January 2014 to February 2015. A total number of 104 fixed partial denture case sheets selected of patient's age ranged from 19 years to 60 years above with (48 male and 56 females).

The study performed on patients with at least three units fixed partial denture or a single crown with the presence of natural contra-lateral tooth/teeth.

A complete clinical and radiographic examination of abutment was assessed regarding to presence of any of the following:

- Classification of the fixed partial denture configuration designs depending on the number of the missing tooth (teeth) into simple (missing any one tooth or any two teeth except canine missing) and complex (missing canine, missing two teeth with including canine, missing more than two teeth and pier abutments)(7)
- The periodontal disease evaluated by measuring probing depths and clinical attachment loss on six sites per each tooth. The existance of 5 mm or more of clinical attachment indicated as the cutoff point.
- Gingival bleeding assessed by walking a periodontal probe ≥ 4mm into sulci of the abutment teeth.
- The presence of caries was assessed clinically by penetration of sharp dental explore or radiographically, as the presence of radiolucent area on bitewing or periapical X-ray films for posterior and anterior abutments, respectively.
- Periapical conditions of the abutment tooth assessed by radiograph.
- The mobility of the abutment tooth was assessed clinically by applying pressure to the ends of 2 metal instruments (e.g. dental mirrors) and trying to rock a tooth gently in a buccolingual direction (towards the tongue and outwards again).
- Pulpal involvements of the abutment tooth assessed by radiograph for any root canal treatment.
- Crown to root ratio of the abutment tooth assessed by radiograph estimating the length of tooth occlusal to the alveolar crest of bone compared with the length of root impacted in the bone.

Primary impressions made, and study casts designed and mounted and the following criteria were assessed:

- Span length assessed on mounted study cast.
- The length of the abutment tooth assessed.
- Malposition, mesiodistal drifting, rotation, faciolingual displacement, and over-eruption of the abutment tooth assessed.

Data were analyzed using SPSS version 12.0. Frequency and percentage calculated for the study variables.

RESULTS

Information collected on 104 patients on specified proformas. Out of the104 patients majority of the patients 56 (54%) were female while the rest 48 (46%) were male figure1. The distribution of the age of the patients ranged from 19 years to 60 years and above with mean age 41 years in which about (32%) of the patients below to (30-39) group age as shown in figure 2.

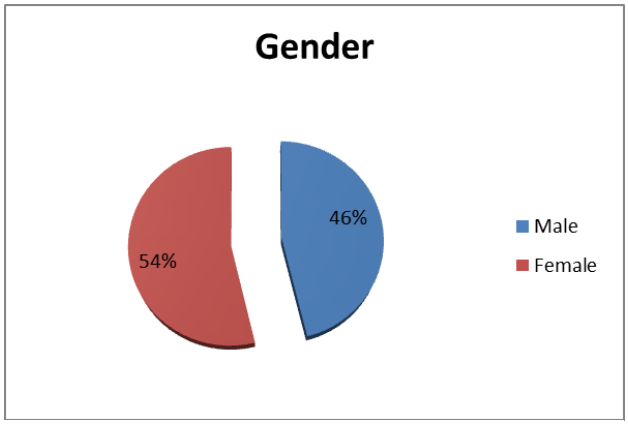

Fig. 1: Gender distribution

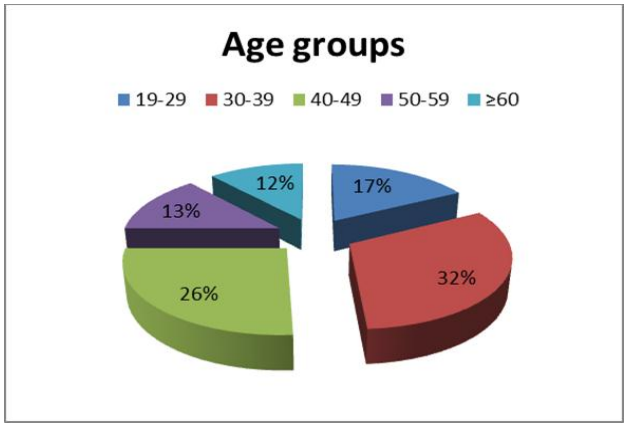

Fig. 2: Percentage of age group distributions among the total 104 cases

Fixed partial denture configuration designs depending on the number of the missing tooth (teeth) classified into simple (one tooth & two teeth) and complex design configuration (one tooth, two teeth, more than two teeth and pier abutment) as shown in Table 1.

Simple one tooth missing represent 49 (47.12%) of the total cases followed by simple missing two teeth 27 (25.96%) and complex missing one tooth represent least among all types of fixed partial denture design about 2 (1.92%).

The design of fixed partial denture configuration of 104 patients has (237 abutments and 183 pontics).

The numbers of abutments and pontic distribution among fixed partial denture design divided into (one abutment and one pontic), (two abutments with either one or two or three pontics) and (three abutments with either one or two or three pontics) table 2.

Most of the fixed partial design including two abutments with one pontic 45 (43.27%) and three abutments with one pontic represent least among design distribution.

Clinical evaluation of (237) abutments, 210 (88.6 %) cases has shown to have normal periodontium and 27 (11.3 %) cases represent with periodontal pocket ≥ 4 mm. On the other hand, 103 (43.4 %) of the cases has grade (0) mobility, 40 (16.8 %) grade I mobility, 38 (16.03 %) grade II mobility and 11 (4.6 %) show grade III mobility (figure 3).

Of total (237) abutments, 199 (83.9 %) has no any pulpal involvement and 38 (16.03 %) show pulp involvement with either root canal treatment or need any other modalities of pulpal treatment. Regarding caries and degree of extensive, 102 (43.03 %) of the abutments has intact sound tooth structure with no any caries lesion, 82 (34.5 %) has initial or simple decay and 53 (22.3 %) with extensive carious lesion (see figure 3).

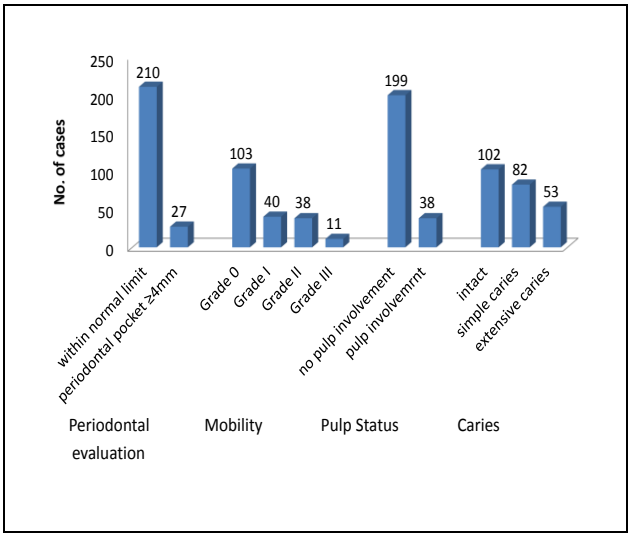

Fig 3: Clinical evaluation of the total 237 abutments

Radiographic crown to root ratio assessed on (237) abutments, 104 (43.8%) has 1:2 crown to root ratio, 115 (48.5 %) show 2:3 crown to root ratio and the remaining 18 (7.5 %) abutments has 1:1 crown to root ratio.

Regarding caries detected radiographically, 160 (67.51 %) diagnosed without decay and 77 (32.48) has mild or moderate or severe carious lesion radiographically figure 4.

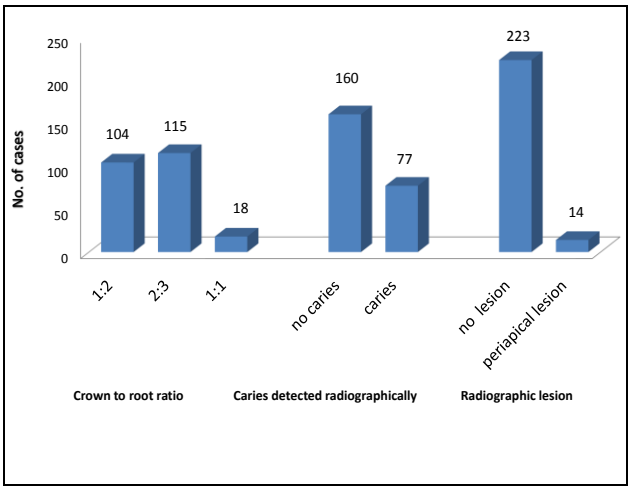

Fig 4: Radiographic assessment of the total 237 abutments

Design	Simple		Complex				Totals No. (%)
No. Of tooth missing	One Toothno. (%)	Two Teethno. (%)	One Tooth No. (%)	Two Teethno. (%)	More Than Two Teethno. (%)	Pier Abutment No. (%)	
No. of cases	49 (47.12)	27 (25.96)	2 (1.92)	4 (3.85)	14 (13.46)	8 (7.69)	104 (100)
Totals	76 (73.08)		28 (26.92)				

Table 1: Fixed partial denture configuration design

Abutments And Pontics								Totals No. (%)
No. Of Abutments	One Abutment	Two Abutments			Three Abutments			
No. of pontics	1 pontic No. (%)	1 Pontic No. (%)	2 pontics No. (%)	3 pontics No. (%)	1 pontic No. (%)	2 pontics No. (%)	3 Pontics No. (%)	
No. of cases	4 (3.85)	45 (43.27)	27 (25.96)	14 (13.46)	2 (1.92)	4 (3.85)	8 (7.69)	104 (100)

Table 2: Distribution of abutments and pontic in fixed partial denture design

The presence of periapical lesion assessed radiographically, 223 (94.09 %) has no periapical lesion and 14 (5.9 %) show periapical lesion (figure 4).

Span length assessed on mounted study cast that revealed 86 (83 %) cases among 104 patients to have adequate span length and 18 (17 %) show inadequate span length as shown in figure 5.

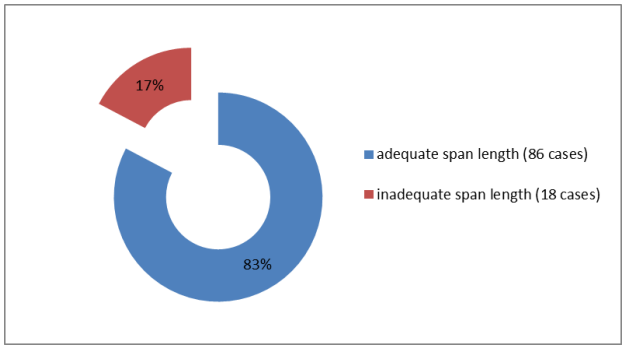

Fig 5: Evaluation of the span length on mounted diagnostic casts

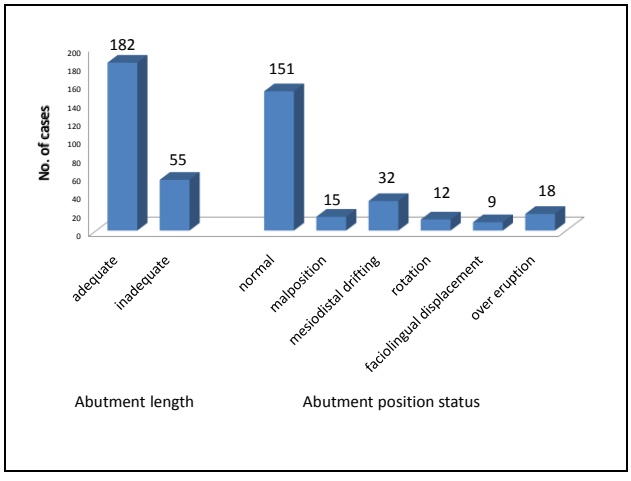

Fig 6: Evaluation of the abutment length and position status on mounted study cast

Abutment length and abutment position status on mounted study cast evaluated, 182 (76.7 %) of the abutments has adequate length and 55 (23.2 %) has inadequate length. In addition, 151 (63.71 %) of the abutments has normal status position, 32 (13.5 %) of the abutments show mesio-distal drifting, 18 (7.59 %) of the abutments over-erupted with 15 (6.3 %) show malposed abutments, 12 (5.06 %) of the abutments has rotation and 9 (3.7 %) has facio-lingual displacement (figure 6).

DISCUSSION

This study has provided useful information on designing fixed partial denture configuration; clinical, radiographic, mounted study cast evaluation of the abutments as an integral part of the treatment planning of fixed prosthodontics.

There is no significant gender correlation with the occurrence of partial edentulism and type of restorative treatment however in this study female more prone to replace missing teeth than male, and this may be due to women have more awareness to restore the same than men. This tendency in women might attribute to their consciousness about their appearance and had a better health seeking behavior.[11]

In the current study, most of the cases that needed fixed partial denture treatment fall into group (30-39) (32 %) and (40-49) (26 %) with mean age 41 years and this agree with Ozkurt & Kazazoglu observation.[12] They recognized that the mean ages were 45 years for fixed partial dentures, 42.43 years for implants, and 37.87 years for no restoration. This may be due to that fixed partial denture prosthesis is usually achieved in a relatively short time and the costs may increase, as even further surgical interventions such as lifting and grafting are indicated when bone and soft tissues are insufficient. Thus, the higher cost of implant treatment may explain why patients select to fixed partial dentures.

The design of fixed partial denture configuration assessed. It shows that the replacement of missing one tooth with two abutments using a three unit FPD having one mesial and one distal abutment tooth represent the most common type of restorative treatment by (49 (47.12 %)). The success rate of this type of treatment is very high because Ante in 1926 proposed his law for bridge design that "the total periodontal membrane area of

abutment teeth should equal or surpass that of the teeth to be replaced".[13,14]

In this study, replacement of missing one tooth with one abutment was the least of fixed partial denture design configuration. This finding is due the high number of failures as a result of the accident. Frequent number of roots and crowns fractured of the abutment teeth adjoining the free-end pontic. Furthermore, some of the gold crowns that covered these terminal abutment teeth loosened without the crowns covering the remaining portion of the splint. This defect delays to notice until caries had caused acute dental pain which involved the pulp and destroyed the crown of the tooth next to the cantilevered pontic.[15]

Periodontal tissues play an important role in proper esthetics, function, and comfort of the dentition. Healthy periodontium requires for all prosthetic and restorative therapies as a prerequisite for successful outcome.[16] Abutment teeth with periodontal and bone support provide a suitable biomechanical factor in designing fixed partial denture. This is due to the mobility of natural teeth which may increase during the defect of supporting periodontium. Thus, it is important to reduce the deteriorating effects of the poor supporting tissues under physiologic loads in periodontally rehabilitating compromised dentition.[17]

In the present study clinical evaluation of periodontium of the abutments evaluated and among (237) abutments 210 (88.6 %)) has normal periodontium. This finding is due to the knowledge of the responses of periodontal tissues to fixed partial dentures that is crucial in the development of treatment plan with predictable prognosis. It considers that the replacement of missing teeth with fixed partial dentures is largely dependent upon the health and stability of the surrounding periodontal structures.[18]

In the present study, only (4.6 %) of the participants showed grade (III) mobility. Similar observations were also reported by Al-Sinaidi and Preethanath[18] Kourkouta et al.[19]. Both studies stated that the indications and contra-indications for extensive tooth-supported fixed prosthodontic treatment in periodontally compromised patients are highly dependent on the mobility of the remaining teeth, affecting patient comfort and/or chewing ability.

Assessing the longevity of dental restoration is very difficult due to the various confusing factors that arise. For example, individual oral hygiene, appropriate design and quality of the initial restorations, quality of occlusion, parafunctions, and dental recalls attended, associated general diseases may influence the periodontal support, and/or the salivary flow and caries risk.[20]

In this study, dental caries of existing abutments was assessed both clinically and radiographically. It observed that (34.5 %) of the abutments has initial or simple decay and (22.3 %) with extensive carious lesion and this observation is comparable with Goodacre et al. finding.[21] They performed fifteen studies to evaluate the incidence of caries, but in 2 different ways. Some studies indicated the caries incidence in relation to the number of abutments affected and it determined that 602 of 3360 abutments become carious for a mean incidence of 18% and range from 0% to 27%. Other studies evaluated caries according to the number of prostheses affected and it determined that 8% of the prostheses be affected (113 of 1354 prostheses). Its caries incidence ranged from 0.7% to 26%.

Dental caries and periodontal diseases considered the most common causes of the tooth loss and the most apparent reason for re-treatment and replacement in restorative failures is recurrent caries under restorations. The 10-year probability of survival of fixed plate denture (FPD) systems is between 89.1% and 92%, and the most common reason for failure is caries. To avoid this, radiographic techniques such as peri-apical, bitewing, occlusal and panoramic imagings are being used together with clinical examination to detect problems.[22]

In this study, crown to root ratio of the abutments assessed radiographically. It shown that (43.8%) of the abutments has 1:2 crown to root ratio and (48.5 %) display 2:3 ratio. It considered a primary variable in the diagnosis of a tooth as an abutment for the various types of prosthetic restorations, such as fixed dental prostheses (FDPs) or removable partial dentures (RPDs) or overdentures.

Yun et al.[23] stated that crown to root ratio of 1.5 is acceptable for abutment teeth. Moreover, teeth with a lower ratio may also be acceptable abutments when the periodontium is healthy and the occlusion is under control. Shillingburg et al.[7] suggested that crown to root ratio of 1.5 is ideal for FPD abutments and a ratio of 1:1 is the minimum ratio for abutments under normal circumstances.

In the present study, abutment length and position status assessed on the mounted study cast. It is necessary that accurate verified diagnostic study casts needs to implant on an articulator to permit the clinician to closely duplicate the dynamic movements of the mandible outside of the clinical environment. Furthermore, when a tooth losses, the structural integrity of the dental arch disruptes, and there is a subsequent realignment of teeth as a new state of equilibrium is achieved. Teeth adjacent to or opposing the edentulous space frequently moves into it. Adjacent teeth, especially those distal to the space, may drift bodily although a tilting movement is a far more common occurrence. If an opposing tooth intrudes severely into the edentulous space, it is not enough just to replace the missing tooth. To restore the mouth to complete function, free of interferences, it is often necessary to restore the tooth opposing the edentulous space. In severe cases, this may necessitate the devitalization of the super-erupted opposing tooth to permit enough shortening to correct the plane of occlusion. Additionally, in extreme cases, extraction of the opposing tooth may require. Hence, the evaluation of

the mentioned parameters on the study cast represents the important aspect of diagnosis and treatment planning in fixed partial denture.[7,24]

Usually, when abutments are misaligned, orthodontic treatment is often an integral component of multidisciplinary therapy, frequently enhancing the esthetics of the final restorations. However, sometimes this treatment option is impossible by the patient who refuses any long-lasting treatment.[25] It reported by Goodacre, et al.[21] in 2003 that two of three needing endodontic treatment occurred in conjunction with tooth preparation and one after restoration. Stavropoulou, et al.[26] showed in 2007 that root canal treated teeth restored with crowns show an acceptable long-term survival of 10 years. The quality of root canal preparation and filling and coronal sealing are essential factors to achieve high rates of success.

The length of the span was the most significant factor to determine the biomechanical aspects of the fixed partial denture design.[27] In the present study, (83 %) of the cases has adequate span length evaluated on the diagnostic study casts. It is essential that selected cases have adequate span length because with long span bridge more load pressure placed on the periodontal ligament which effect on prosthesis rigidity and retention.[28]

CONCLUSION

It can be concluded that the proper selection of abutments influences the prognosis of the treatment. Successful selection abutments would require prompt diagnosis and meticulous treatment planning.

REFERENCES

1. Al-Quran FA, Al-Ghalayini RF, Al-Zu'bi BN. Single-tooth replacement: factors affecting different prosthetic treatment modalities. BMC Oral Health. 2011; 11: 34.
2. Fueki K, Yoshida E, Igarashi Y. A systematic review of prosthetic restoration in patients with shortened dental arches. Jap Dent Sci Rev. 2011; 47: 167-174.
3. Singh K, Gupta N, Unnikrishnan N, Kapoor V, Arora D, Khinnavar PK. A conservative treatment approach to replacing a missing anterior tooth. Case Rep Dent. 2014; 2014: 625784.
4. Raza M, Mullah F, Fayyaz M, Akram S. Complication and their severity in patients of conventional metal ceramic fixed dental prosthesis: A clinical study. Pak Oral & Dental Journal. 2015; 35 (1): 155-158.
5. Tomruk CO, Kayahan ZO, Sencift K. Patients' knowledge and awareness of dental implants in a Turkish subpopulation. J Adv Prosthodont. 2014 Apr; 6(2): 133–137.
6. Hemmings K, Harrington Z. Replacement of missing teeth with fixed prostheses. Dent Update 2004; 31 (3): 137–141.
7. Shillingburg HT, Sather DA, Wilson EL, Cain JR, Mitchel DL, Blanco LJ, Kessler JC. Fundamental of Fixed Prosthodontics, ed. 4, Quintessence Publishing Co, Inc.2012.
8. Kalra D, Kalra A, Goel S. Selecting abutments in fixed prosthodontics - A Review. IJERMDC. 2015; 2(1): 21-23.
9. Sumeet S, Rajesh S, Harvinder S, Sarbjeet S, Nikhil WD. Abutment Evaluation – A Boon to success of fixed partial denture. Journal of Dental Herald. 2014; 2 (1): 38-42.
10. Khurshid Mattoo, Anchal Brar, and Roma Goswami, ""Elucidating the Problem of Pier Abutment through the Use of a Fixed Movable Prosthesis – A Clinical Case Report"." International Journal of Dental Sciences and Research. 2014; 2 (6): 154-157.
11. Jeyapalan V, Krishnan CS. Partial edentulism and its correlation to age, Gender, socio-economic status and incidence of various Kennedy's classes– A literature review. J Clin Diagn Res. 2015 Jun; 9(6): 14–17.
12. Ozkurt Z, Kazazoglu E. Treatment modalities for single missing teeth in a Turkish subpopulation: an implant, fixed partial denture, or no restoration. J Dent Sci. 2010; 5:183-188.
13. Tipton PA. Bridge design, part three: fixed-fixed bridgework. Restorative and esthetic practice. 2000; 2(7): 78-86.
14. Singh S, Singh N. Treatment Planning for Fixed Partial Dentures. Int J Oral Health Med Res 2015; 2(2):99-101.
15. Sharma A, Rahul GR, Poduval ST, Shetty K. Assessment of various factors for feasibility of fixed cantilever bridge: A review study. ISRN Dent. 2012; 2012: 259891.
16. Sirajuddin S, Narasappa KM, Gundapaneni V, Chungkham S, Walikar AS. Iatrogenic damage to periodontium by restorative treatment procedures: An Overview. Open Dent J. 2015; 9: 217–222.
17. Chitumalla R, Munaga S, Khare A, Agarwal S, Bhoyar A, Parlani S. Stress distribution among periodontally compromised abutments: A comparative study using three-dimensional finite element analysis. Contemp Clin Dent. 2012 Oct-Dec; 3(4): 452–458.
18. Al-Sinaidi A, Preethanath RS. The effect of fixed partial dentures on periodontal status of abutment teeth. Saudi J Dent Res. 2014; 5: 104–108.
19. Kourkouta S, Hemmings KW, Laurell L. Restoration of periodontally compromised dentitions using cross-arch bridges. Principles of perio-prosthetic patient management. British Dental Journal. 2007; 203: 189 – 195.
20. Chifor I, Mitrea AI, Badea IC, Chifor R, Badea ME, Mitrea P, Popa S, Crisan M, Avram R. Mathematical methods for assessing the prognostic of fixed partial dentures resulting from evaluating a group of dental patients in Romania. Comput Math Methods Med. 2014; 2014:984901.
21. Goodacre CJ, Bernal G, Rungcharassaeng K, Kan JY. Clinical complications in fixed prosthodontics. J Prosthet Dent. 2003; 90: 31-41.
22. Aglarci OS, Bilgin MS, Erdem A, Ertas ET. Is it possible to diagnose caries under fixed partial dentures with cone beam computed tomography? Oral Surg Oral Med Oral Pathol Oral Radiol. 2015 May; 119(5):579-83.
23. Yun HJ, Jeong JS, Pang NS, Kwon IK, Jung BY. Radiographic assessment of clinical root-crown ratios of permanent teeth in a healthy Korean population. J Adv Prosthodont. 2014 Jun; 6(3): 171–176.
24. Patel M, Alani A. Clinical issues in occlusion - Part II. Singapore Dent J. 2015 Dec; 36:2-11.
25. Khiari A, Hadyaoui D, Saâfi J, Harzallah H, Cherif M. Clinical attitude for failed fixed restorations: an overview. Dent Open J. 2015; 2(4): 100-104.
26. Stavropoulou A, Koidis P. A systematic review of single crowns on endodontically treated teeth. J Dent. 2007; 35: 761- 767.

27. Lin CL, Chen. Numerical investigation of span lengths affecting mechanical responses in anterior resin-bonded fixed partial denture. Biomed. Eng. Appl. Basis Commun. 2005; 17 (3): 121.
28. Narula S, Punia V, Khandelwal M, Sharma V, Pamecha S. Retention in conventional fixed partial dentures: A Review. J Clin Diagn Res. 2011; 5(5): 1128-1133.

Source of Support: Nil
Conflict of Interest: Nil