

Evaluation of the Most Common Failures and Complaints of Patients Treated with Fixed Partial Denture Prostheses in A University Clinic in Qassim, KSA

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ABSTRACT

Background: The purpose of this study was to evaluate the most common complaints of patients and the related failures associated with fixed partial denture prostheses treatment given by undergraduate students. The evaluation was done during the follow up visits of the patients.

Materials and methods: The study population comprised of Saudi adult males selected from those who received fixed partial dentures (FPD), made by undergraduate students at the male campus of College of Dentistry, Qassim University, Saudi Arabia. 75 abutment teeth were selected for evaluation of fixed partial denture prostheses which included metal, porcelain fused to metal and all ceramic crowns, bridges and veneers.

Results: Fixed partial denture prosthesis treated in dental clinics included all ceramic crowns 27% (20), Veneers 32.4 % (24), PFM crowns 21.06 % (16), PFM bridges 9.5% (7), onlays 1.4% (1) and full metal crowns 8.1% (6). On examination for contact with the adjacent tooth it was found that 93.2% (69) of the abutments had normal contacts, In 5.4% (4) of the abutments there were open contacts and in 1.4% (1) the contacts were tight. On examination for occlusion and interferences, 95.9 % (71) showed good occlusal contact with no high points or interferences whereas 2.7% (2) had high points and 1.4% (1) was out of occlusion. On examination of finish lines, 45.9% (34) had equi- gingival finish lines, 40.5% (30) had sub gingiva finish lines, 9.5% (7) had supra gingiva finish lines and in 4.1% (3) there was overhang.

Conclusion: This research came up with the factors that have direct impact on the success of a fixed prosthesis. The factors that determine the success of a fixed prosthesis include a good preparation, a qualified lab technician and good oral hygiene habits for the patients. Moreover, any defect in these factors will lead to failure of the prosthesis.

Keywords: Fixed partial denture, Fixed prosthesis and Abutment.

INTRODUCTION

Fixed partial denture prosthesis is one of the most common and accepted treatment modality for treatment of edentulous spaces in the dental arch. Patient acceptability is very high due to the fact that it is a fixed option and also because the latest dental ceramics and porcelains give a very natural and esthetic appearance.

The success of fixed partial denture prostheses depend on a number of factors, which includes adherence to sterilization protocols, proper patient selection, ideal abutment selection, good mouth preparations, accurate impressions and excellent communication with the lab through a well-documented work authorization form.

The causes of failures in fixed partial denture can be attributed to numerous factors, basically depending

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on the stage at which it occurs like before preparation, during preparation, during fabrication, during cementation and after cementation. Failures can also be classified based on the mechanism of failure like biologic failure, mechanical failure, esthetic failure and maintenance failure. Fixed partial denture failure can also be in the form of patient complaints, which can be either immediate or delayed.

Biological failures can be due to caries, pulpal injuries, pain or sensitivity associated with these factors, periodontal breakdown, occlusal problems, tooth perforations and tooth fractures. Caries can develop due to an open or short margin, over extended margin, incomplete removal of caries and poor oral hygiene. Pain, sensitivity and discomfort can be due to caries and pulpal injury, traumatic occlusion, excessive torque on abutments, excessive pressure on soft tissues and retention of food on occlusal surface and cervical hypersensitivity of the abutment. Periodontal breakdown leads to mobility of abutment, periodontal pocket formation, periodontal abscess, bad odor and taste. This may be due to over or under contoured axial walls, poor marginal adaptation, periodontically affected abutment, inadequate abutment teeth in long span bridges and pontics with large contact area on the edentulous ridges. Occlusal problems arise due to premature contact in centric and eccentric occlusion leading to excessive tooth mobility. Tooth perforations can be due to faulty preparation and tooth fractures can be either coronal tooth fracture due to over reduction or recurrent caries and root fractures due to trauma, caries extending to root surface and excessive widening of root canal during endodontic treatment. Mechanical failures can be due to cementation failure because of cement failure, retention failure or occlusal problems. It can also be due to retainer, pontic or connector failure and also perforations because of occlusal wear. Esthetic failures occur mainly because of improper shade matching, inadequate tooth reduction and improper masking of metal by esthetic material.

Maintenance failure occurs mainly due to poor oral hygiene and maintenance. Patient education about the importance of these factors and his responsibility in the success or failure of the restoration should be emphasized. It is very important to note that patient should be recalled for

periodic clinical and radiographic examination to detect any harmful changes.

In this study, patients who have been treated with fixed partial dentures were recalled for follow up evaluation within a one year time period. Patient complaints were recorded, clinical evaluation done and radiographic examination if necessary done.

MATERIALS AND METHODS

The present study was carried out in the Dental Clinics, College of Dentistry, Qassim University, Buraidah, Saudi Arabia. The study was conducted to evaluate the most common complaints of patients and related failures associated with fixed partial denture prostheses treatment given in the clinics by undergraduate students during the short term follow up period.

METHODOLOGY

The methodology used in the study has been described in the following order:

1. Selection of patients
2. Follow up protocol
3. Evaluation of complaints and failures if any.
4. Comparative evaluation of complaints and failures if any.

1. Selection of patients:

The study population comprised of Saudi adult males selected from those who received fixed partial dentures (FPD), made by undergraduate students at the male campus of College of Dentistry, Qassim University, Saudi Arabia.

The inclusion criteria:

- (A) Adult males who were systemically healthy.
- (B) Adult male patients who had their FPDs fabricated in the College of Dentistry, QU by the undergraduate students in the past one year and were called for follow up appointments.

The exclusion criteria:

- (A) Patients who had their FPDs fabricated before the stipulated time period.

75 abutment teeth were selected for evaluation of fixed partial denture prostheses which included metal, porcelain fused to metal and all ceramic crowns, bridges and veneers.

2. Follow up protocol:

The study subjects were examined and the abutments were evaluated on the basis of the following variables:

- Open contact / tight contact.
- Over hang.
- Occlusal interferences.
- Finish line and margins.
- Periodontal health and plaque accumulation.
- Pain.

3. Evaluation of complaints and failures if any:

- Open contact / tight contact:
This can be assessed clinically by using dental floss to check for the contact with adjacent tooth.
- Over hang:
This can be assessed clinically by using a dental explorer or radiographic examination.
- Occlusal interferences:
This can be assessed clinically in centric relation by using articulating paper.
- Finish lines and margins:
This can be assessed clinically by tactile examination using sharp dental explorer.
- Periodontal health and plaque accumulation:
This can be assessed by measuring the probing depths and clinical attachments on six sites per tooth.

Table 1: Variables Related to Prosthesis and its design.

Variables Related to Prosthesis and its design							
S. No	Variable	Responses - Frequency Expressed in number (%)					
1	Type of Prosthesis	Bridge	Crown	Veneer	PFM	Onlay	Full Metal
		7 (9.5)	20 (27)	24 (32.4)	16 (21.6)	1 (1.4)	6 (8.1)
2.	Type of Contact	No	Open			High	
		69 (93.2)	4 (5.4)			1 (1.4)	
3.	Occlusion	No High Point	Out of Occlusion			High Point	
		71 (95.9)	1 (1.4)			2 (2.7)	
4.	Finish Line	Equal	Sub Gingival	Supra Gingival		Overhanging	
		34 (45.9)	30 (40.5)	7 (9.5)		3 (4.1)	

f. Pain:

This can be assessed by checking for recurrent marginal decay or caries by using a dental explorer or radiographic examination for radiolucent areas.

4. Comparative evaluation of complaints and failures if any:

Statistical analysis was done using Statistical Package for Social Science (SPSS, version 16). The descriptive statistics as well as mean and standard deviations were calculated for different variables. Pearson's chi-square test was done to examine the prevalence of different complications.

RESULTS

Fixed partial denture prosthesis treated in dental clinics included all ceramic crowns 27% (20), Veneers 32.4 % (24), PFM crowns 21.06 % (16), PFM bridges 9.5% (7), on lays 1.4% (1) and full metal crowns 8.1%(6). On examination for contact with the adjacent tooth it was found that 93.2% (69) of the abutments had normal contacts, In 5.4% (4) of the abutments there were open contacts and in 1.4%(1) the contacts were tight. On examination for occlusion and interferences, 95.9 % (71) showed good occlusal contact with no high points or interferences whereas 2.7% (2) had high points and 1.4% (1) was out of occlusion. On examination of finish lines, 45.9% (34) had equi gingival finish lines, 40.5%(30) had sub gingiva finish lines, 9.5%(7) had supra gingiva finish lines and in 4.1% (3) there was overhang.

Table 2: Type of responses related to the Patient's complaint.

Variables Related to Patient's Complaint			
S. No	Variable	Responses - Frequency Expressed in number (%)	
5.	Patient Complaint	No	Yes
		63 (85.1)	11 (14.9)
6.	Pain	No	Yes
		74 (100)	0 (0)

Table 3: Description of Oral hygiene standard and complaints reported on Follow up .

Variables Related to Periodontal Status & Oral Hygiene						
S. No	Variable	Responses - Frequency Expressed in number (%)				
7.	Method of Cleaning	Brush	Brush with Floss	Miswak	Sometime	None
		5 (6.8)	21 (28.4)	16 (21.6)	16 (21.6)	16 (21.6)
8.	Plaque Accumulation	No		Yes		
		38 (51.4)		36 (48.6)		
9.	Periodontal Health	No		Yes		
		38 (51.4)		36 (48.6)		

As far as patient complaints were concerned, 85.1% (63) had no complaints and 14.9% (11) had different complaints. None of them had complaints of pain. The method of cleaning employed by the patients included brushing 6.8%(5), brushing with

flossing 28.4%(21), Miswak 21.6%(16), brushing irregularly 21.6%(16) and none brushing 21.6% (16). In 48.6% (36) there was plaque accumulation and 51.4% (38) the periodontal health was poor.

Table 4: Description about the need for retreatment.

Variables Related to Periodontal Final outcome			
S. No	Variable	Responses - Frequency Expressed in number (%)	
10.	Replacement of Prosthesis	No Need	Yes, Needed
		56 (75.7)	18 (24.3)

The need for replacement of prosthesis was seen in 24.3% (18) of the cases.

DISCUSSION

Clinical complications and failures in fixed partial denture prosthodontics are very common. The types of failures and patient complaints can be classified into different categories depending on the level at which the prosthesis fails.

Charles J. Goodacre³in the study "Clinical complications in fixed prosthodontics" concluded

that conventional fixed partial dentures had the greatest complications incidence (27%), with resin bonded prostheses having a comparable incidence (26%). Single crowns (11%) and posts and cores (10%) had comparable complication incidences. All-ceramic crowns had the lowest incidence (8%) of complications. The most common complications associated with conventional fixed partial dentures were caries (18% of abutments and 8% of

prostheses), need for endodontic treatment (11% of abutments and 8% of prostheses), loss of retention (7% of prostheses), esthetics (6% of prostheses), periodontal disease (4% of prostheses), tooth fracture (3% of prostheses), and prosthesis/porcelain fracture (2% of prostheses). With resin bonded prostheses, the most common complications were de-bonding (21% of prostheses), tooth discoloration (18% of prostheses), caries (7% of prostheses), and porcelain fracture (3% of prostheses). The most common complications associated with conventional single crowns were need for endodontic treatment (3%), porcelain fracture (3%), loss of retention (2%), periodontal disease (0.6%), and caries (0.4%). The most common post and core complications were post loosening (5%), root fracture (3%), caries (2%), and periodontal disease (2%). With all-ceramic crowns, the most common complications were crown fracture (7%), loss of retention (2%), need for endodontic treatment (1%), and caries (0.8%).

Allan Padbury² et al in their study "Interactions between the gingiva and the margin of restorations" found that the health of the periodontal tissues is dependent on properly designed restorative materials. Overhanging restorations and open inter proximal contacts should be addressed and remedied during the disease control phase of periodontal therapy. Regarding restorative margins, undoubtedly it is preferable if margins can remain coronal to the free gingival margin. Obviously, sub gingival margin placement is often unavoidable. However, care must be taken to involve as little of the sulcus as possible. Evidence suggests that even minimal encroachment on the sub gingival tissue can lead to deleterious effects on the periodontia. Further more, deep margin placement risks invading the soft tissue attachment of the gingiva to the tooth, often leading to a more pronounced plaque-induced inflammatory response. If restorative margins need to be placed near the alveolar crest, crown-lengthening surgery or orthodontic extrusion should be considered to provide adequate tooth structure while simultaneously assuring the integrity of the biologic width. Although individual variations exist in the soft tissue attachment around teeth, there is general agreement that a minimum of 3mm should exist from the restorative margin to the alveolar bone,

allowing for 2mm of biologic width space and 1mm for sulcus depth.

Suzely Adas Saliba Moimaz⁴ et al in the study "Association between dental prosthesis and periodontal disease in a rural Brazilian community" concluded that

partial denture prosthesis was associated with periodontal disease and a significant percentage of cases might have been prevented if plaque control interventions had been implemented. The results suggest a need for population based plaque control programs in an attempt to reduce the incidence of development of periodontal disease in the population.

Sladana Milardovc Ortolan⁶ et al in the study "Oral hygiene and gingival health in patients with fixed prosthodontic appliances – A 12-month follow-up" concluded that although most studies on this topic indicate that prosthodontics appliances have a negative impact on the oral hygiene level and gingival condition, appropriate educational and motivational measures can lead to improved oral hygiene, even after the application of fixed dentures or single crowns. Patients with single crowns showed better oral hygiene levels than patients with FPDs or C+FPDs. The results revealed no significant difference in oral hygiene status among patients with fixed appliances made of different materials. The worst hygiene levels were found in patients with fixed appliances in both jaws. Younger patients showed better hygiene levels than the older ones. Fixed prosthodontic work should be checked regularly and regular check-ups contribute to a healthy periodontium and longer life span of fixed prosthodontics.

Aljoharah Al-Sinaid⁷ et al in the study "The effect of fixed partial dentures on periodontal status of abutment teeth" concluded that in subjects with FPDs, the abutment teeth are more prone to plaque accumulation, gingival inflammation and development of periodontal pockets than the non-abutment teeth. It also states that

the individual's age and duration of insertion of the FPD can affect the periodontal conditions of the abutment teeth. The abutment teeth with sub-gingivally placed crown margins are likely to have higher scores of plaque and gingival indices and

greater probing pocket depth than abutments with supra-gingival crown margins

Mayo Clinic⁹ et al in the study "Practice-based clinical evaluation of

ceramic single crowns after at least five years" concluded that replacement-free survival rates of ceramic single crowns were 95.1% at 5 years and 92.8% at 10 years. Fractures to the core of layered ceramic crowns for posterior teeth (7.4% at a mean 3.3 years) comprised the most common complication that prompted replacement of the ceramic crowns.

In this follow up study, the number of fixed partial denture prosthesis (abutments) treated in the dental clinics included all ceramic crowns 27% (20), Veneers 32.4 % (24), PFM crowns 21.06 % (16), PFM bridges 9.5% (7), on lays 1.4% (1) and full metal crowns 8.1%(6).

The proximal contact of the teeth in the dental arch and their inter digitation through occlusal contact with the opposing teeth stabilizes and maintains the integrity of the dental arches. Properly located contact area allows normal healthy interdental papilla to fill the interproximal space. It also prevents food from packing in between the teeth and thereby preventing the impingement to the gingival tissues. On examination for proximal contact with the adjacent tooth it was found that 93.2% (69) of the abutments had normal contacts. In 5.4% (4) of the abutments there were open contacts and in 1.4% (1) the contacts were tight.

Biologic failures of fixed partial dentures include complications due to occlusal problems and interferences. This can be a result of premature contacts on the occlusal surface in centric and eccentric occlusion leading to interferences and finally excessive tooth mobility. On examination of occlusion for interferences, 95.9 % (71) showed good occlusal contact with no high points or interferences whereas 2.7% (2) had high points and 1.4% (1) was out of occlusion.

The placement of margins can be supra gingival in case of non-esthetic areas which has the least impact on the periodontium or equi-gingival margins at the crest of the marginal gingiva, which has more impact on the periodontium and is more

plaque retentive and sub-gingival margins which are placed below the gingiva, posing the greatest biologic risk. On examination of finish lines, 45.9% (34) had equi gingival finish lines, 40.5%(30) had sub gingiva finish lines, 9.5%(7) had supra gingiva finish lines and in 4.1% (3) there was overhang.

Margins are the most important and weakest links in the success of FPD restorations. A successful prosthesis depends on a healthy periodontal environment and periodontal health depends on the continued integrity of the prosthodontic restoration. An over contoured restoration can also lead to plaque accumulation and gingival inflammation. When the margin of the restoration intrudes into the biologic width, inflammation sets in leading to bone resorption. The method of cleaning employed by the patients included brushing 6.8%(5), brushing with flossing 28.4%(21), Miswak 21.6%(16), brushing irregularly 21.6%(16) and none brushing 21.6% (16). In 48.6% (36) there was plaque accumulation and 51.4% (38) the periodontal health was poor. The need for replacement of prosthesis was seen in 24.3% (18) of the cases.

CONCLUSION

In this study conducted in the Dental Clinics, College of Dentistry, QU on failures in FPD done by the students and evaluated during the follow up recall visit, it can be seen that :

- 1.93.2% had normal contacts with 5.4% open contacts and 1.4% tight contacts. Hence it can be concluded that the failure rate was comparatively minimal.
- In terms of occlusal interferences, 95.9% had no occlusal interferences with no high points, 2.7% had high points and 1.4% were out of occlusal contacts. So it can be concluded that the failure rate was minimal.
- 45.9% had equi gingival finish lines, 40.5% had sub gingival finish lines and only 9.5% had the ideal supra gingival finish line.
- Plaque accumulation was seen in 48.6%, poor periodontal health in 51.4% and the need for replacement of prosthesis in 24.3% which can be considered a significant value.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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