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Research Article

A SURVEY TO ASSESS THE FAILURES IN FIXED PARTIAL DENTURES

Krishna Prasad D[1]., Chethan Hegde[2] and Harsh Desai[3]*

[1,2,3]Department of Prosthodontics, A.B. Shetty Memorial Institute of Dental Sciences, NITTE University, Mangalore

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ABSTRACT

Fixed dental prosthesis restores teeth which are missing or endodontically treated. It is considered as one of the best methods to replace the lost tooth or teeth and restore their functions because of retention and patient comfort. As the demand of fixed prostheses have increased the prevalence of failures of such prostheses have also increased. This study was done to assess the mean life span of such prostheses as well as the reasons of failures in order to help the clinician render better and successful treatment. In this study 103 subjects were evaluated and examined. It was concluded that Mean length of service of a fixed prosthesis was 7.33 years. Loss of retention was found to be the most common cause of failure followed by caries. The failure rate of dental bridge was more compared to any other types of prostheses. Porcelain fused to metal crowns showed more failure percentage than other types of prostheses.

INTRODUCTION

GPT 9 defines the Fixed Partial Dentures as 'Any dental prosthesis that is luted, screwed, or mechanically attached or otherwise securely retained to natural teeth, tooth roots, and/or dental implants/abutments that furnish the primary support for the dental prosthesis and restoring teeth in a partially edentulous arch; it cannot be removed by the patient.' Although dental implants are gathering popularity due to its advantages over tooth supported restorations, in developing countries like India tooth supported dental prostheses are still much in demand to replace the missing teeth. Single crown as well as post and core restorations are also part of fixed partial dentures. Various options are available for the fabrication of the prosthesis such as metal, porcelain, porcelain fussed to metal etc. The aim of all these restorations is to make them as durable as possible, but the longevity has always been of great concern for both patients as well as clinicians. Being one of the most widely used treatment modalities in dentistry, it is essential to assess the reasons of failure in order to render efficient treatment. Henry Ford once said 'The only real mistake is the one from which we learn nothing.' In order to ensure true professional service to the patients, understanding various reasons of failures or complications will help in improving prognosis for FPDs service.

Any crown or fixed partial denture that requires either repair or replacement is deemed as failure. It is very important to know the types of failures, the reason behind each to help the dental surgeons as well as lab technicians avoid all possible mistakes while treating the patient and achieve a predictable prognosis.

In order to assess the longevity of the restoration as well as identify the reason of failures various studies has been conducted. Walton p[1]in a survey of 270 patients found that caries was the most common cause of failures with mean length of all fixed restorations observed in the study being 8.3years.They also found out that no apparent relationship was present between the span of prosthesis and its length of service. Schwartz *et al*[2] in their study assessed 406 patients with "unserviceable" fixed partial dentures (in which "unserviceable" was defined as any crown or fixed partial denture that required either repair or replacement), the mean life span for all restorations was found to be 10.3 years, with caries accounting for the largest number of failures.

Gursharan Singh[3]*et al* in their study found dental caries as the most common cause of failures. Mean length of service of all fixed restoration was found to be 7.5 years. Whereas Sudhir *et al* [4]concluded lack of retention as the most common failure. Being one of the most common treatments done in prosthodontics not enough literature is available on the failure of FPDs. Hence this study was undertaken to find the longevity

Corresponding author:* **Krishna Prasad D
Department of Prosthodontics, A.B. Shetty Memorial Institute of Dental Sciences, NITTE University, Mangalore

of prostheses, prevalence of failures as well as evaluate the reasons behind the failures.

MATERIALS AND METHODS

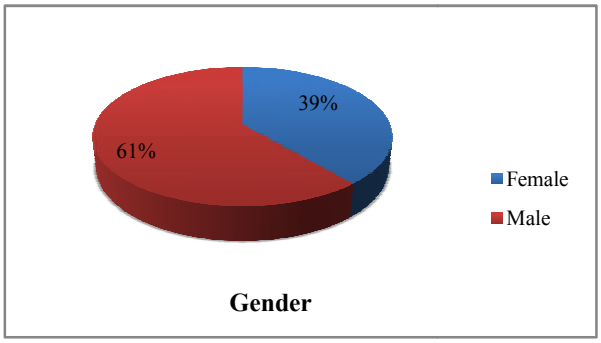
Sample selection: 103 dentulous subjects (63 men and 40 women) were selected for this study. Subjects selected were patients who reported to the outpatient Department of Prosthodontics, A.B.Shetty Memorial Institute of Dental Sciences, Mangaluru, Karnataka. Prior to data collection informed consent was taken from all the subjects.

METHODOLOGY

The subjects with any form of fixed dental prostheses were involved in the study. Any fixed dental prosthesis that required repair or replacement was considered a failed prosthesis in the study. Various types of restorations were evaluated and data were collected including the data assessing the reasons of failures. The aim was to find out the average life span of the prostheses and the root cause of the failure. The classification of the failures were based upon the classifications given by. Bernard G.N. Smith, John F. Johnston, Schwartz *et al*[2], Walton *et al*[1] in their study Because failure of a single unit in multi-unit FPD demands the replacement of the whole prosthesismulti-unit FPD was considered as a single prosthesis irrespective of their span and of the multiple reasons of failures seen in the same unit, the main cause of failure was selected in the study. The results were analyzed according to the individual unit which had failed even though it being a part of the multi-unit FPD.

RESULTS

1. Among 103 subjects 63 subjects were male and 40 subjects were female.



Graph 1 Gender distribution

2. Among 106 failed prostheses 32 were single crowns, 66 were teeth supported dental bridges, 3 post and core & 2 were implant supported prostheses. The failure of teeth supported dental bridge being the highest followed by single crown.(Table 1)

Table 1 Failure percentage according to the types of prostheses

	Type of prosthesis	Frequency	Percent
	Single crown	32	31.1
1.	Dental bridge	66	64.1
2.	Post and core	3	2.9
3.	Implant supported	2	1.9
4.	Prosthesis		
	Total	103	100.0

3. Mean length of service of a fixed prosthesis is 7.33 years.
4. Among the sample size Porcelain fused to metal crown were 68, followed by all metal crown 33.(Table 2)

Table 2 Failure percentage according to the types of materials used for fabrication

	Type Of Material	Frequency	Percent
	All Metal	33	32.0
1.	All Ceramic	2	1.9
2.	Porcelain	68	66.0
3.	fused to metal		
	Total	103	100.0

5. Mean length of service of various types of prostheses are listed in the table 3.

Table 3 Mean length of service according to types of prostheses

Types of prostheses	N	Mean (SD)
Single crown	32	8.89 (2.80)
Tooth supported dental bridge	66	7.46 (4.88)
Post and core	3	7 (3.61)
Implant supported prosthesis	2	4.5 (0.71)

6. Causes of failures are listed in the Table 4. Loss of retention was the highest among the causes. Reasons of failures were further divided into two groups, Biological failure and mechanical failure. The oral diseases such as dental caries, pulp pathology, periapical lesions, and periodontal diseases consisted of biological failures were accounted for 48.08% failures. The mechanical problems accounted for marginal defects, aesthetics, loss of retention, tooth fracture, porcelain fracture were accounted for 51.92% failures. Overall loss of retention accounted for highest number of failures consisting of 27.2 % followed by caries which was 23.3 %.

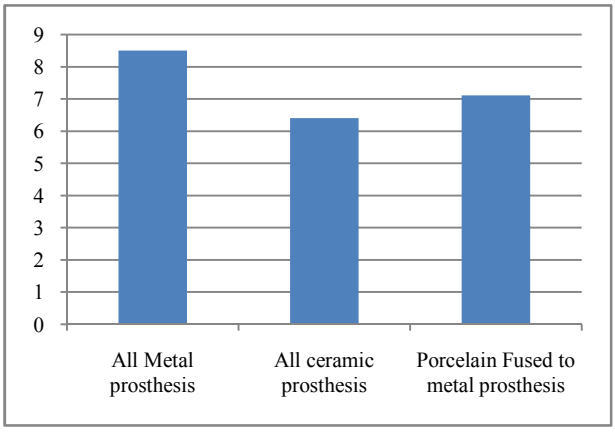
Table 4 Common cause of failure: Mechanical failure versus Biological failure

Reasons for replacements	Frequency	Percent
Mechanical Failure		
Aesthetics	8	7.8
Loss of retention	28	27.2
Fracture of prosthesis	1	1.0
Occlusion discrepancy	6	5.8
Defective margins	2	1.9
Porcelain failure	3	2.9
Tooth fracture	5	4.9
Total	53	51.92
Biological Failure		
Caries	24	23.3
Periodontal failure	18	17.5
Pulp pathology	8	7.8
Total	50	48.08

7. Length of service and most common reasons for replacements according to the types of materials used in the fabrication of the prostheses is listed in the Table 5.

Table 5 Lifespan according to the types of materials with common reasons for failures

Type of material	N	Mean (SD)	Reasons for common failures
All Metal prosthesis	33	8.50 (4.51)	Caries, Periodontal failure, loss of retention
All ceramic prosthesis	2	6.40 (2.12)	Aesthetics, pulp pathology
Porcelain Fused to metal prosthesis	68	7.11 (4.11)	Loss of retention, caries, periodontal failure



Graph 2 Types of prostheses and lifespan in years

DISCUSSION

The most common cause of failure in crown and fixed partial dentures was the lack of retention amounting to 27.2 %, which can be attributed to various causes like improper preparation of tooth with too much taper of proximal walls, one of the proximal walls being too short, and lack of resistance form[5,6]. It can also be attributed to improper cementation and lack of adjustment of occlusion during eccentric mandibular movements[7].

The average lifespan of prosthesis was found to be 7.33 years in the survey. Walton *et al*[1] (1986) in their study observed the lifespan to be 8.3 years of the prosthesis. Similar recent study[3] (2013) has observed the lifespan of the fixed restorations to be 7.5 years. So, it can be interpreted as the average lifespan of fixed restoration is around 8 years. Thus any prosthesis which lasts more than 8 years should not be considered a failure.

Porcelain fused to metal crown showed more failures (Table 2) than any other types of prostheses. Reason for it could be the increase in the usage of aesthetic restorations in recent years and it should not be interpreted as all metal prosthesis is better than porcelain fused to metal restorations. Single crowns showed less failure rates then the dental bridges (Table 3) which might be due to the fact that dental bridge takes support of adjacent teeth for the abutment purpose and failure of even a single abutment might lead to failure of entire dental bridge. In this study failure of one unit in a long span FPD was seen as failure of the entire FPD.

Coming to the reason of failures for individual type of restorations most of the failures in all metal prostheses were due to the caries which amounted to 23.3 %. Study done in 1986[1] suggested that 22.0 % of prostheses were lost due to the caries. In the same study mechanical problems amounted for 69.5% of the failures. In a study conducted in India (2013)[4] 24.2% of the failures were due to the caries which supports the result found in this study. Since caries proved to be the major reason of failure amongst the various reasons, it becomes necessary to lay emphasis on the relevant factors promoting caries and find measures to rectify the same in order to minimize loss of prostheses.[4] Oral hygiene practices by the patient and creation of accurately fitting margins of the restoration/ prostheses definitely are going to reduce this failure factor. Caries underneath old fillings must be evaluated/ treated in order to prolong the life of the tooth /teeth supporting the crown / prosthesis.[8]

Mechanical failures amounted for 59.9% in the same study which also supports the result found in this study where prosthesis loss due to mechanical problem consisted of 51.92 %. Mechanical failures accounted for a large percentage failure; it is wise to put emphasis on principles for tooth preparation as well as fabrication of FPD.

Periodontal failure also consisted of about 17% failure. The abutment tooth must be evaluated beforehand in order to prevent excess loading thereby leading to mobility and periodontal complications. Any disease process found active in the oral cavity must be treated before initiating restorative therapy. Factors promoting healthy adaptation of the artificial restorations in the mouth such as margins, contours, occlusal surfaces, embrasures, correct pontic design, correct connectors must be taken into consideration to ensure durability of the prostheses.[9] Tissues supporting the restorations must be maintained in a healthy state to ensure long life of the prostheses. Periodontal disease must be treated before fabrication of the prostheses.

SUMMARY AND CONCLUSION

The result of this study showed similar trends with the contemporary studies and identified factors which can be improved upon by the clinician while providing treatment to the patient and thus ensuring good prognosis. Mean length of service of a fixed prosthesis is 7.33 years. The most common cause of failure was loss of retention followed by dental caries. The failure rate of dental bridge was more compared to any other type of prosthesis. Porcelain fused to metal crowns showed more failure percentage than other types of prostheses.

The result has put emphasis on careful diagnosis and case selection, treatment planning, sound tooth preparation and effective communication to dental laboratory for successful treatment. The prosthesis should be made such as that it maintains health of surrounding biological tissues which will ensure the longevity of not only the prosthesis but the surrounding teeth also. Regular follow-up as well as good oral hygiene practices will decrease the chance of failure of the prosthesis.

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