

Research Article

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Failures in Fixed Dental Prostheses: A Clinical Survey on Causes and Longevity

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Crown and bridge failures are considered one of the most frequent challenges that dentists deal with on a daily basis. The aim of the current study was to assess the causes of failures in fixed dental prostheses in patients reporting to the dental clinics at Ahrum Canadian University, Cairo, Egypt. Using a comprehensive clinical survey, causes of failures and serviceability patterns of the fixed dental prostheses (FDP) were explored in a sample of 80 patients (mean age 39.7±11) visiting the clinic for complications related to FDP. Patients were clinically and radiographically examined, and all symptoms related to their complaints were recorded. Descriptive analysis was performed, and SPSS version 22 was used for statistics. Results indicated that most of the failures were mechanical in nature (30%), followed by biological failures (20%), and then aesthetics reasons (11%). 45.7 % of the FDP served for 1-5 years, 28.6 % served for 6-12 months, 14.30% served for more than 5 years, while the least numbers of prostheses (11.4%) served for less than 6 months. Proper patient selection, diagnosis, and treatment planning is essential to maintain and increase the longevity of FDP. It is also crucial to educate patients about good dental hygiene and prosthesis maintenance as well as for the dentist to fully recognize the disadvantages of each dental material to prevent the problems they induce and be able to make the best decision.

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Received: February 09, 2024; **Accepted:** February 13, 2024; **Published:** February 20, 2024**Introduction**

Fixed dental prostheses (FDP) constitute an essential part of dental restorations since they provide a convenient solution for a range of dental issues and many patients. A fixed partial denture is defined as a fixed restoration which replaces one or more missing teeth and is attached to natural teeth or an implant. There has been a noticeable rise in the frequency of FDP failures in tandem with the increased demand for fixed prostheses. The success and survival of a dental restoration is defined as its demonstrated ability to perform as expected. Restoration failures are defined as any conditions that leads to replacement of a prosthesis. The most common reported causes for restoration failures are secondary caries, irreversible pulpitis, excessive wear of opposing tooth surfaces, excessive erosion and roughening of the ceramic surface, ditching of the cement margin, unacceptable esthetics, cracking, chipping fracture, and bulk fracture [1-3].

FDP failures can be complex in terms of both diagnosis and treatment. Understanding the potential clinical complications associated with FDPs helps the clinicians make more accurate diagnoses, create the best possible treatment plan, and meet the patient's expectations. The FDP may be fabricated in a wide variety of materials ranging from full metal, all ceramic, or the traditional metal-ceramic FDP [4]. The choice of the right material depends on many factors related to both the dentist and the patient and it greatly affect the function and longevity of the restoration. The survival rate of a restoration is often used an indicator of

clinical performance [5, 6]. The aim of the current study was to evaluate the causes of failures and longevity patterns in FDP in patients reporting to the dental clinics at Ahrum Canadian University, Cairo, Egypt.

Materials and Methods

The study included a sample of 80 adult patients attending the undergraduate dental clinics at Ahrum Canadian University, Cairo, Egypt for reasons related to complaints of FDP. An interview-based questionnaire was used to collect the information needed from the patients. Questions included demographic data, medical and dental history, oral hygiene practices, the place of provision of the prosthesis, duration of using the prosthesis and details of the complaint related to the prosthesis.

All patients were subjected to comprehensive clinical and radiographic examination carried out by two calibrated examiners who followed the same sequence of exam and filled the diagnostic chart and questionnaire form for each patient. The soft tissues (gingiva, tongue and palate) were checked for any abnormalities including calculus, bleeding, or swelling. Periapical and bitewing radiographs were taken for each patient to evaluate the peri-apical area, detect any recurrent or root caries, and assess the margins of the restoration. The type of prosthesis (crown or bridge), material used (metal, porcelain fused to metal (PFM), or all ceramic), location (anterior or posterior), and the complication or complaint were recorded.

Reasons of FDP failure was classified according to previous literature [7-9]. Biological failures included dental caries, coronal or radicular abutment fracture, root canal treatment failure, peri-apical lesions, and periodontal complications. Mechanical failures included occlusal interference, no occlusal contact, and de-cementation of the prosthesis. Esthetic failures included over contour, color mismatches or porcelain and metal fractures (Figures 1-3).



Figure 1: Biological failure due to root caries



Figure 2: Mechanical failure due to porcelain fracture



Figure 3: Esthetic failure due to color mismatch and metal display

The data was entered into an excel sheet for descriptive analysis of FDP failure and complication rates. The analysis involved categorization of the data according to key variables including type of failure (biological, mechanical and esthetics), and longevity (less than 6 months, 6 months to one year, one year to five year and more than five years), in addition to the type of restoration, age and gender of the patient. Numerical data were summarized using means and standard deviations and categorical data were

summarized as percentages. Comparisons between the variables were analyzed with the Chi squared test. Data management and statistical analysis were performed using the Statistical Package for Social Science (SPSS) version 22 and a P-value ≤ 0.05 was considered significant.

Results

The sample consisted of 80 subjects (56.3% males, 43.8% females, mean age 39.7 ± 11 years). 11.3% of the participants had been using the FDP for less than 6 months while 31.3% reported using them from 6 months to 1 year, followed by 42.5% from 1-5 years and 14.9% who had been using FDP for more than 5 years (Table 1). A total of 34 patients had crown failures while 46 had bridges failures. Majority of participants had porcelain fused to metal prostheses (82.5%), 12(15%) had all metal prostheses, and only 2(2.5%) had all ceramic prostheses. 67.5% of the prostheses were posterior while 32.5% were anteriorly located (Table 2).

Table 1: Demographic characteristics of the included sample and duration of survival of the restorations

Gender	Male	Count	45
		%	56.30%
Female	Female	Count	35
		%	43.80%
Age		Mean	39.7
		SD	11.00
Duration of restoration	less than 6m	Count	9
		%	11.30%
	6-12 m	Count	25
		%	31.30%
	1-5 y	Count	34
		%	42.50%
	more than 5 y	Count	12
		%	14.9%

Table 2: The type of restoration, material used, and location

Type of Prosthesis		Materials used			Location	
Crown	FDPs	All Metal	All Ceramic	Metal ceramic	Anterior	Posterior
34	46	12	2	66	26	54

The highest value recorded for the FDPs failure was the mechanical failure (40%), followed by the biological failure (20%), while the aesthetic failure recorded the lowest value (11%). The same pattern was reported for crown failures with mechanical failures constituting (34.3%), followed by biological failure (20%), and 11.4% aesthetic failures (Figure 4). The association between type of the prosthesis and the time of service (longevity) is presented in table 3. 45.70% of the failed crowns served for 1-5 years, 28.60% served for 6-12 months, 14.3% served for more than 5 years, while 11.4% served for only less than 6 months. The same pattern was reported for failed bridges where 40% served for 1-5 years, 33.3% served for 6-12 months, 15.6% served for more than 5 years, while 11.1% of bridges served for only less than 6 months. No statistically significant differences were reported between single crown and bridge failures ($p=0.94$) (Table 3).

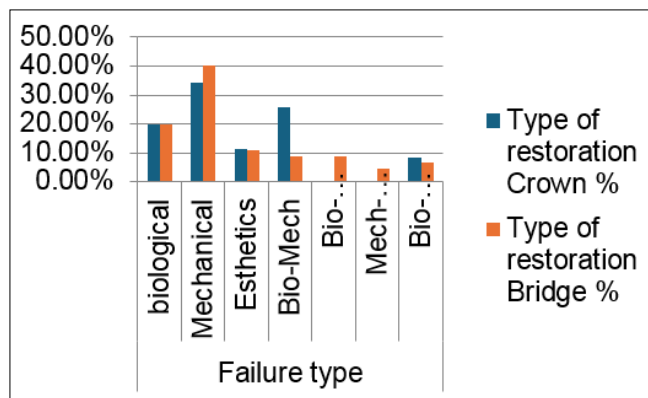


Figure 4: Percentages and types of restoration failures in crowns and bridges

Table 3: Relationship between the type of restoration type and longevity

		Type of restoration		P value
		Crown	Bridge	
Longevity		%	%	
	less than 6m	11.40%	11.10%	
	6-12 m	28.60%	33.30%	0.94 NS
	1-5 y	45.70%	40.00%	
	more than 5 y	14.30%	15.60%	

Complications related to mechanical failures were more significantly associated with patients who had acquired FDPs for a period of 1-5 years of service. The same observation was reported for the biological failures. On the contrary, the highest percentage of aesthetic failures (33.3%) was recorded in patients having the restoration for a period of less than 6 months (Figure 5).

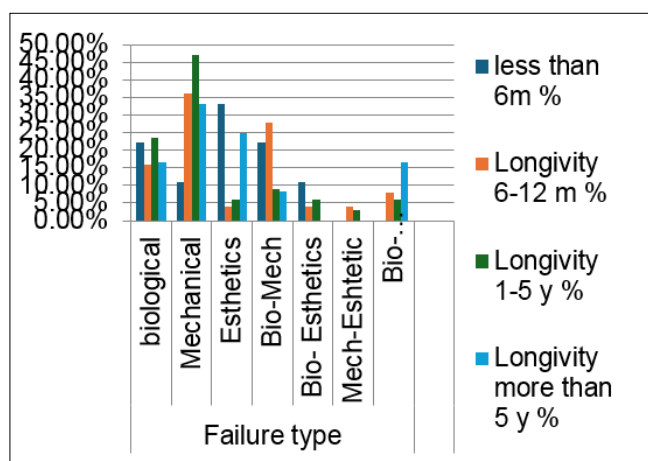


Figure 5: Relationship between type of restorations failure and duration of survival (longevity).

Discussion

This cross-sectional study evaluated the failure of FDPs (type and longevity) in patients attending the undergraduate dental clinic of Faculty of Dentistry, Ahran Canadian University, Cairo, Egypt. The sample consisted of patients presenting to the clinic with a main chief complaint of failed FDP and requesting repair or replacement for their existing restorations. A detailed questionnaire

and a full clinical and radiographic examination were performed for each patient. The collected data was organized and tabulated for analysis including types of failure (biological, mechanical, or esthetic), and the length of serviceability of the restorations (less than 6 months, from 6-12 months, 1-5 years, or more than 5 years).

The results showed that the most common type of complication in FDPs was mechanical failures which was also significantly associated with having the restorations (crowns or bridges) for a period of 1-5 years of service. We have observed that these failures were mostly due to insufficient tooth preparation, presence of prematurity, high functional habits i.e. bruxism, clenching or stresses, and fatigue of the materials used either metal alloys or porcelain. A study carried out by Leempoel et al. assessed the survival rate of FDPs and the influence of several factors on the lifetime of restorations and concluded that the 12-year survival rate of the bridges was 87% and that a weak significant difference existed between the FDPs with vital vs. non-vital abutment teeth [10]. Gender and age of the patient, length of the bridge, presence of a post and core build-up, or the construction of the bridge (conventional fixed vs. cantilever pontic) had no influence on the survival rate of the bridges in their sample. According to a recent systematic analysis, FDPs had cumulative 5-year survival rates of 93.5% and a 27.6% complication rate [11]. Bjarni et al., also reported a survival rate of 89.1% for fixed partial dentures after 10 years in service [12].

In the current study, aesthetic failures were the least reported and was greatly related to a service period of less than 6 months which was considered immediate failure. Esthetic deficiencies were mainly related to incorrect proportioning in size and shape of teeth, particularly in anterior FDPs, eruption profiles of pontics, colour mismatch, insufficient porcelain thickness or metal display. Similarly, Johar evaluated types of FDPs failures and indicated that the most common complication was shade mismatch 64%, over-contoured 59.9%, open margins 49.8% and caries 40.1% [13]. The number of units and duration of service were found to influence most of the assessed complications. In addition, aesthetic failure, in his study, had the highest values after 15 years of serviceability. These results contradict the findings of the present study however, differences could be contributed to the different age range and race of both study samples.

Conclusion

In summary, the current study showed that the most common cause of failures related to fixed prostheses was mechanical failures. The highest length of service recorded for mechanical failures was for a period of 1-5 years, followed by biological failures for the same period of service. The esthetic failures of the observed cases recorded the highest values in a period of less than 6 months of service. Proper case selection, careful diagnosis, and effective communication with the dental laboratory regarding the material and techniques used for fabricating are essential to achieve success and longevity of the restoration.

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