

Research Article**Fixed Prosthodontics Failure in Students' Patients at King Saud University**Dr Abdulaziz Ahmed Alghafees¹, Prof. Khalid Awazzan², Dr Omar Alqarawi³, Dr Moqri⁴

King Saud University - collage of dentistry

INTRODUCTION

Anticipating longevity as well as causes and trends of failure of dental fixed prosthesis (FP) are frequent demand by both clinicians and patients. Understanding such complications should help dentists plan the treatment of patients with a more reliable prognosis.

Several researchers tried to investigate the reason for FP failure, and their length of service. Schwartz et al 1970[[1]] analysed the life span of restorations as well as causes of failure of unserviceable FP. They defined unserviceable FP as "any crown or fixed partial denture that required either repair or replacement". They found that caries accounted for the largest number of failure. Likewise, Walton et al 1986[[2]] concluded that caries was the common cause of failure. Furthermore, Libby et al 1997[[3]] study supports the same conclusion.

The prevalence of failure of Fixed Partial Denture (FPD) fabricated at the College of Dentistry, King Saud University (CDKSU) was investigated by Fayyad and Al-Rafee 1996[[4]]. They concluded that the rate of bridge failure was 35.5%. They also concluded that the failure rate of bridges constructed at KSU was 15.7% and the major reasons for bridge failure were periodontal disease followed by caries. Moreover, they found that the duration of service of the failed bridges was 6.1 years.

Understanding such complications associated with FP delivered by dental students may provide educators with information that assists in curriculum revision to graduate more competent dentist.

The aims of this study are (1) to investigate the failure rate related to the length of service of FP fabricated on natural teeth prepared by CDKSU dental students between 2010 and 2013; and (2) to determine the causes of failure in these FP.

MATERIALS AND METHODS

This cross-sectional study was designed to analyze data obtained from clinical evaluation of FP fabricated for patients treated by dental students at CDKSU.

The clinical evaluation was carried out for patients with FP cemented between 1/1/ 2010 and 12/31/2013(Table 1). Dental

records of student patients' were reviewed and patients with FP cemented in this period were called for recall visits. Patients were not self-selected which means that the failure is not reported to clinic by the patient. In addition, external traumatic failures were excluded.

At $\alpha=0.05$ with the estimated failure around 60% and power of 0.9 or 90%, the minimum required sample size in each year was 23 FP. The sample size in the year 2010 did not reach the appropriate statistic size, due to patient noncooperation, geographic remoteness, or contact complications such as the lack of number documentation, false, changed, or locked phone number.

Table 1. Years of Service

Years of Service	Prosthesis
5 years(2010)	9(9.6%)
4 years(2011)	24(25.5%)
3 years(2012)	34(36.2%)
2 years(2013)	27(28.7%)
Total	94(100.0%)

A form was designed to record the data obtained from the clinical examination. The prosthesis type, area, years of service, retainer/crown and pontic type, and cause of failure, if any, were recorded. Clinical examination was conducted by one trained dentist. Criteria of failure classification reported by Schwartz et al 1970 [[1]] were followed to allow comparison with previous reports. Restorations requiring replacement or repair, associated with soft tissue pathosis, pocket formation, excessive mobility, poor esthetics, restoration fracture, defective margins, cementation failure, recurrent caries were considered as a failure.

Clinical evaluation was carried out by using a mouth mirror, explorer and a periodontal probe. No Radiographic examination was performed. If there was more than one cause of failure, the most damaging cause was only to be recorded. FPD failure was per bridge not per unit, except for pontic design. The data obtained was analyzed statistically.

RESULTS

Ninety four FP (Table 2) with 84 crowns (89.4%) and 10 FPDs (10.6%) cemented for 54 patients between January 2010 and December 2013 were clinically examined. The age of the patients ranged between 18-80 years with a mean age of 41.4 ± 14.4.

Table 2. Restoration Type

Restoration	Frequency	Percentage
Crown	84	89.4%
FPD	10	10.6%
Total	94	100%

Regarding the material of crowns, the metal ceramic were 73 (86.9%), all ceramic were 10 (11.9%), and only one all metal (1.2%). All 10 FPDs were fabricated with metal ceramic material (100%) (Table 3). Furthermore, 47 (50%) of all prosthesis had posts.

Table 3. Material Type

Material	Crown	FPD
All Metal	1 (1.2%)	0 (0%)
Metal Ceramic	73 (86.9%)	10 (100%)
All Ceramic	10 (11.9%)	0 (0%)
Total	84 (100%)	10 (100%)

Thirty eight (40.4%) of all prosthesis encountered a failure. Four types of failure were recorded. Defective margin was the highest and number one cause failure 28 (73.7%), followed by cementation failure (unstable or no restoration) of 6 (15.8%) prosthesis, 2 (5.3%) prosthesis failed due to recurrent caries and lastly 2 (5.3%) failed due to pocket formation (Table 4). Other cause of failures such as restoration fracture, poor shade match, poor anatomy, mobility, and soft tissue pathosis were not found in the examined sample.

Table 4. Cause of Failure

Failure	Frequency	Percentage
Recurrent Caries	2	5.3%
Defective Margin	28	73.7%
Restoration fracture	0	0%
Cementation Failure	6	15.8%
Poor shade match	0	0%
Poor anatomy	0	0%
Mobility	0	0%
Pocket Formation	2	5.3%
Soft tissue pathosis	0	0%
Total	38	100%

Thirty five (41.7%) crowns from the total 84 crowns encountered at least one of the four types of failures mentioned earlier. The highest cause was defective margin affecting 26 (74.3%) crown, followed by 5 (14.3%) crowns with cementation failures, and an equal failure of 2 (5.7%) crowns due to recurrent caries and 2 (5.7%) due to pocket formation (Table 5). On the other hand, 3 (30%) FPDs from the total 10 FPDs encountered only two types of failures, with defected margins found in 2 (66.7%) bridges, and cementation

failure in only 1 (33.3%) (Table 5).

Table 5. Cause of Failure

Cause of Failure	Crown	FPD
Recurrent Caries	2(5.7%)	0(0%)
Defective Margin	26(74.3%)	2(66.7%)
Cementation Failure	5(14.3%)	1(33.3%)
Pocket Formation	2(5.7%)	0(0%)
Total	35(100%)	3(100%)

Defective margin was encountered with metal ceramic restoration, 31 out of 73 (42.5%), more than all ceramic restoration, 3 out of 10 (30%). Failure due to recurrent caries was only found in 2 prosthesis with the service of 4 and 5 years. All pontic design for the examined bridges showed success, with the modified ridge lap design as the one and only choice for the 10 bridges.

No correlation was found between type of failure and Patient's age, hygiene habits, post presence, abutment tooth area (location), years of service, or FPD type.

DISCUSSION

Defective margin was the primary cause of failure in this study, accounting for 29.7% of all prosthesis failures. However, Schwartz et al [[1]], Walton et al [[2]], and Libby et al [[3]] concluded that caries were the primary cause with the percentage of 36.8%, 22%, and 38% respectively. This can be attributed to the period of FP service of the examined sample. The mean period of service for Schwartz et al sample was 11.1 years, 10.9 years for Walton et al sample, and 16 years for Libby et al sample. However, in this study's the period from the cementation to the date of examination does not exceed 5 years.

Fayyad and Al-rafee,[[4]] stated that the primary cause of failure in bridges was periodontal diseases accounting for 36.6% of failure. This can be explained by the differences in the study design. Only FPDs were included in their study and patient sample was selected from CDKSU as well as general dental practice.

Oginni [[5]] reported that poor shade match (poor esthetics) was the highest cause of failure (40.5%) for crowns and restoration fracture was the highest cause of failure (40.9%) for FPDs,. This is due to the use of acrylic resin provisional crowns and resin bonded FPDs because of the economic status of the patients who paid for the treatment. However, economic factor does not have the same effect for the CDKSU patients.

The defective margin is usually a failure caused by a non-ideal fabrication and can be noticed directly prior to cementation. This may be explained by the fact that the dental students are under training and not experienced to notice such a problem, but this is preferably excluded since cementation is only done after the approval of the supervising faculty who is usually experienced. This indicates that the supervisor approved the cementation of FP with defected margins. This may be

referred to the nature of the open clinic course where prosthodontic phase for most of the patient reached at the end of the school year. Approval of such conditions may be compelled on the faculty due to high course requirements with lack of time, in order to help the students to finish the required cases on time to pass the course. Defective margin failure found in these prosthesis have not developed to a more destructive failure like recurrent caries. Only two cases of recurrent caries were recorded. This indicate that the defective margins were minor defect, which encourage faculty to approve them. However, short period of service (2-5 years) should be considered and may be more recurrent caries will be developed with time.

Metal ceramic and all ceramic prosthesis have a significant difference in the defective margin failure percentage, with 26.6% defective margin failure in the metal ceramic material and only 3.2% in the all ceramic material, which may be due to the fabrication process. Metal ceramic restoration required more procedures with greater chance of distortion.

FPD cases in this study were very low compared to the number of crowns, which may be due to considering implants as treatment modality for single tooth replacement for student cases. This was applied by the CDKSU 7 years ago.

CONCLUSIONS

- 1- Failure accounted for 38 (40.4%) prosthesis, 35 (37.2%) crowns and 3 (3.19%) FPDs.
- 2- The main reason of failure was the defective margin of 28 (29.78%) prosthesis, 26 (27.6%) crowns and 2 (2.12%) FPDs, followed by cementation failure of 6 (6.38%) prosthesis, 5 (5.3%) crowns and 1 (1.06%) FPDs.
- 3- The most commonly used prosthesis was 83 (88.29%) metal-ceramic prosthesis.
- 4- Modified ridge lap design was the only FPD design found in this study.
- 5- No correlation was found between type of failure and Patient's age, hygiene habits, post presence, abutment tooth area (location), years of service, or FPD type.
- 6- All ceramic prosthesis have a less probability to have a defective margin compared with metal ceramic prosthesis.

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