

Complications of porcelain fused to metal crowns after five years of cementation at a tertiary care center in Kaski

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ABSTRACT

Introduction: Porcelain fused to metal (PFM) crowns are given to restore badly broken down teeth, to reinforce root canal treated teeth. The common complications are chipped-off porcelain, open contact, dental caries of an abutment, dental caries of adjacent teeth, fracture of an abutment, dislodged crowns, and periodontal problems. **Methods:** This was a hospital-based cross-sectional study conducted at the outpatient department of Prosthodontics, College of Dental Surgery, Gandaki Medical College. The patients of age group 25 to 50 years who had undergone PFM crowns minimum of five years back in the Department of Prosthodontics were examined for complications of chipped-off porcelain, open contact, periodontal pocket, dislodged crowns, fracture of abutment tooth, caries in abutment and caries in adjacent teeth. **Results:** The average age was 40.85±8.74 years. The average duration post-cementation of porcelain fused to metal crowns was 6.15±1.52 years. The complications were open contacts 23(28.8%), chipped off porcelain crowns 10(12.5%), periodontitis 4(5.0%), dislodged crown 7(8.8%), fractured abutment 2(2.5%), dental caries in abutment teeth 2(2.5%) and dental caries in adjacent teeth 3(3.8%). **Conclusions:** The most common complication in porcelain fused to metal crowns post five years of cementation was open contact followed by chipped-off crowns and periodontitis.

Keywords: Chipped off porcelain, complications, open contact, porcelain fused to metal crown.

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INTRODUCTION

Porcelain fused to metal (PFM) crowns are given to restore badly broken down teeth, to reinforce root canal treated teeth. It strengthens the tooth and prevents further breakdown. PFM crowns maintain occlusal anatomy, and occlusion and restore esthetics.¹ PFM consists of an inner metal substructure that provides strength and an outer layer of dental glass porcelain which provides esthetics. The PFM crown is fixed to the tooth with adhesive cement.²

Many authors have done studies to find out complications post-PFM crowns. The common complications are chipped-off porcelain, open contact, dental caries of an abutment, dental caries of adjacent teeth, fracture of the abutment, dislodged crowns, and periodontal problems.^{3,4} This study collected the cases treated with PFM crowns five years back. Many studies have shown the survival rate of PFM crowns to be 94% after ten years.⁵

Such studies have not been done in our setup to find out the complications post-PFM cementation. This study aimed to find out the common complications seen in PFM cases done at the College of Dental Surgery, Gandaki Medical College.

METHODS

This was a hospital-based cross-sectional study conducted at the

outpatient department of Prosthodontics, College of Dental Surgery, Gandaki Medical College after receiving ethical approval from the Institution Review Committee (Ref. No. 97/080/081-F) conducted from April 2024 to May 2024. The patients visiting the outpatient department at Prosthodontics meeting the inclusion criteria were included in the study after obtaining informed consent. Sample size calculation was based on considering 0.08 as the maximum tolerable error rate and prevalence of 15.3% $N = Z^2 p(1-p) / d^2 = 1.96 \times 1.96 \times 0.153(1-0.153) / 0.080 \times 0.080 = 77.78$

Where $Z=1.96$ at 95% confidence interval, N =Sample size. The calculated sample size was 77.78. Hence, 80 samples were taken in the study. The inclusion criteria were the patients of the age group 25 to 50 years who had undergone PFM crowns a minimum of five years back in the Department of Prosthodontics, CODS-GMC. Considering the passive eruption of permanent teeth till teenage and post-cementation of five years the lower age limit was taken 25 years and considering the higher prevalence of periodontal diseases above the age of 50 years the upper limit of age was taken 50 years.^{7,8} The crowns must be fabricated by the same laboratory. The exclusion criteria were patients who have done PFM crowns outside GMC, patients with all ceramic crowns, and metal crowns, and patients with incomplete data of treatment.

Clinical intra-oral examination of subjects was done on a dental chair with a mouth mirror, explorer, and periodontal probe with adequate illumination. The subjects meeting the inclusion criteria were noted for the duration of a crown and were asked for habits of brushing, flossing, betel nut, and bruxism. They were examined for chipped-off porcelain crowns, open contact, periodontal pocket, dislodged crowns, fracture of abutment tooth, and caries in abutment and adjacent teeth. The open contact was assessed by passing dental floss between the tooth contacts. If the floss passed without resistance it was marked as open contact. If the dental floss snapped with some resistance it was marked as optimal contact. A pocket depth of more than 4 mm was considered a periodontal pocket. The dental caries in the abutment tooth and adjacent teeth were assessed with intraoral peri-apical radiographs. The patients were examined by one researcher. In cases of confusion, it was verified by a second researcher. The data management was performed using Statistical Package for the Social Sciences software (version 20.0; SPSS Inc., Chicago, IL, USA). The percentage of the distribution of patients based on sex and age were calculated and the percentage of complications were tabulated.

RESULTS

Out of 80 patients 30(37.5%) were male and 50(62.5%) were females. The average age was 40.85 ± 8.75 years ranging from 25 to 50 years. The average duration post-cementation of PFM crowns was 6.15 ± 1.52 years. The maximum number of teeth with PFM crowns were examined in the mandibular arch 43(53.8%) with 78(97.5%) having opposing natural teeth (Table 1).

Table 1: Characteristics of the patients (N=80)

Variables	n(%)
Male	30(37.5%)
Female	50(62.5%)
Crown in Maxillary arch	37(46.2%)
Crown in Mandibular arch	43(53.8%)
Opposing natural teeth	78(97.5%)
Opposing artificial teeth	2(2.5%)

Slightly less than half of the participants brushed their teeth twice daily. Only 25.5% floss their teeth. Bruxism was present in 5% (Table 2).

Table 2: Distribution of habits in patients with PFM crowns (N=80)

Variables	n(%)
Brushing habits	
Once	41(51.3%)
Twice	39(48.8%)
Flossing habit	
Yes	20(25.5%)
No	60(75.00%)
Betel nut habits	
Yes	5(6.3%)
No	75(93.8%)
Bruxism	
Yes	4(5.0%)
No	76(95.0%)

The complications were open contact 23(28.8%), chipped-off porcelain crowns 10(12.5%), periodontitis 4(5.0%), dislodged crown 7(8.8%), fractured abutment 2(2.5%), dental caries in abutment teeth 2(2.5%) and dental caries in adjacent teeth 3(3.8%) (Table 3).

Table 3: Distribution of complications in patients with PFM crowns (N=80)

Complications	Yes n(%)	No n(%)
Chipped-off porcelain	10(12.5%)	70(87.5%)
Open contact	23(28.8%)	57(71.3%)
Periodontal pocket	4(5.0%)	76(95.0%)
Dislodged crown	7(8.8%)	73(91.3%)
Fractured abutment	2(2.5%)	78(97.5%)
Dental caries in abutment tooth	2(2.5%)	78(97.5%)
Dental caries in adjacent teeth	3(3.8%)	77(96.3%)

DISCUSSION

The most common complication encountered in this study was open contact 23(28.8%) which was much more as compared to the study done by Jamal et al.⁶ The open contact

could be attributed to laboratory errors in maintaining tight contact during crown cementation or drifting of the teeth due to occlusal interferences or missing adjacent teeth in the same arch or opposing arch or due to improper hygiene maintenance leading to periodontal problems. This complication can be reduced by cross-checking the laboratory work with clinical trials of crowns verifying the proximal contacts and maintaining proper hygiene because only 39(48.75%) of the patients in the study brushed twice and 20(25.50%) of the patients did flossing.

The second common complication in this study was chipped-off porcelain. The study done by Walton et al.⁴ showed that the service period of PFM crowns was 6.5 years requiring replacement, the cause for which was primarily chipped-off porcelain. Similarly, Jamal et al.⁶ reported that 6% of the samples had the complications of porcelain chipping off. Behr et al.⁹ also showed only 1.7% of the PFM crowns being chipped off. The differences could be due to the differences in laboratory setup, laboratory techniques and the materials used. Amongst our patients, 5(6.3%) had a habit of bruxism and 4(5%) had a habit of betel nut chewing. Kinsel et al.¹⁰ found out seven times higher probability of porcelain chipping off in patients with bruxism.

The fracture of the abutment tooth in this study was 2(2.5%) which was comparable to the finding found by Jamal et al.⁶ which was 1%. The prevalence of dislodged crowns was 7(8.8%). This is in unison with the findings of Behr et al.⁹ and Jamal et al.⁶ Dislodged crowns is the third major complication in this study while it was the second major complication in the study by Behr et al.⁹ In this study 4(5%) of the patients showed periodontal pockets. This is relatively less as compared to the study done by Behr et al.⁹ who found 14.4% of cases with periodontitis. Behr et al. have emphasized the increase in periodontitis with the length of oral service and the age of the patient. The prevalence of dental caries in abutment teeth was reported to be 2(2.5%) and adjacent teeth were 3(3.8%) in this study. Sjorgen et al.¹¹ had similar findings of prevalence of 2.7% of dental caries in abutment teeth. Durr et al.¹² in their studies found a bit higher incidence of caries in abutment tooth which was 1% in mesial margin and 14% in distal margins. The prevalence of caries could be attributed to the discrepancies in the crown and abutment margin and dissolution of luting cements.

Intraoral peri-apical radiographs before crown cementation and post-cementation could help minimize various complications like caries to abutment teeth, caries to adjacent teeth, and periodontal pockets. The use of

dental floss to assess the contact point will minimize the prevalence the open contact. The occlusion should be checked thoroughly after cementation of PFM crowns to avoid undesirable forces and drifting of the tooth which might lead to open contacts. The authors recommend to do further study with a large sample size, recording the parameters at the time of crown cementation and compare it with five years post-cementation.

The limitations of this study could be that we did not record the parameters of PFM crowns and adjacent structures at the time of cementation so a comparison of parameters at the time of cementation and five years post-cementation could not be done.

CONCLUSIONS

The most common complications in PFM crowns post five years of cementation were open contacts followed by chipped-off crowns and periodontitis.

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AUTHORS' CONTRIBUTION

SLT participated in selecting the research title, literature search, and data collection, conducted statistical analysis, contributed to the study design, and drafted the manuscript. PM and NT participated in data collection. UP and DP participated in the literature search and study design. All authors reviewed and approved the final manuscript.

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