Longevity of a Maxillary 2-Unit Cantilever Fixed Partial Denture: Clinical Report

Usama Nassar, *DDS, MS;* ***Shawn Russett,*** *BSc, DDS*

Contact Author

Dr. Nassar
Email: *unassar@ualberta.ca*

ABSTRACT

In this clinical report, we discuss the length of service and subsequent replacement of a maxillary anterior 2-unit cantilever fixed partial denture (FPD). The FPD provided 53 years of service to the patient and was finally replaced with a 2-unit porcelain-fused-to-metal (PFM) FPD. The original prosthesis replaced a missing maxillary lateral incisor using a partial coverage metal retainer, whereas the new FPD was designed with a complete coverage PFM retainer.

MeSH Key Words: biomechanics; dental abutments; dental restoration failure; denture, partial, fixed

Cantilever fixed partial dentures (FPDs) are considered a viable choice in restorative dentistry when treatment is planned carefully and the prosthesis is designed appropriately under favourable intraoral conditions. Several publications have discussed the designs, indications, success factors, advantages and disadvantages of the various types of cantilever FPDs.[1–6] Stelzel and others[7] investigated the influence of cantilever FPDs on periodontal health and concluded that they are not different from conventional FPDs when oral hygiene is maintained and closely monitored.

The use of a 2-unit cantilever FPD to replace the maxillary lateral incisors using the canine as a single abutment is recommended.[2,3] The design considerations of this specific FPD are described by Goldfogel and Lambert.[8]

The longevity of anterior 2-unit cantilever prostheses is not widely covered in the dental literature. In investigating the failure of fixed prosthodontics, a few studies have briefly mentioned the lifespan or years of service of cantilever FPDs[9] without describing their design or location in the oral cavity.[10–12] Roberts[13] elaborates on the failure of cantilever retainers in a study of 2,000 retainers. One review paper[14] discusses cantilever FPDs thoroughly and a second[15] discusses FPDs as part of a review of failure in fixed prosthodontics. The purpose of this clinical report is to present the years of service and replacement of a maxillary anterior cantilever FPD.

Clinical Report

A 75-year-old patient had a cantilever FPD that had replaced a left maxillary lateral incisor using the left canine as a partly covered abutment. The FPD, which had been in service for an amazing period of 53 years, required replacement due to formation of mesial marginal caries (**Fig. 1**). The patient was examined and treated in the department of dentistry at the University of Alberta. Clinical examination was carried out and resulted in treatment plan options that included the replacement of the existing cantilever prosthesis with a 2-unit or 3-unit complete coverage prosthesis.

Figure 2 shows a palatal view of the original FPD. The design had 2 classical features of the era: enlarged connector size and decreased labio-palatal dimension of the gold–resin pontic.

Figure 1: Recurrent caries in the mesial abutment area of the 2-unit cantilever restoration.

Figure 2: Palatal view of the 53-year-old fixed partial denture.

Figure 3: The new 2-unit complete-coverage porcelain-fused-to-metal fixed partial denture.

A 2-unit porcelain-fused-to-metal (PFM) FPD using a complete-coverage retainer was made as a replacement (**Fig. 3**) with a retentive groove placed along the mesial surface of the canine.

Discussion

Years of Service of the Original Prosthesis

The interesting part of this clinical report is the lifespan of the original cantilever prosthesis. A prosthesis that has become unserviceable after 53 years cannot truly be considered a failure.[10,15]

There are no longitudinal data in the dental literature that deal specifically with the longevity of 2-unit maxillary anterior cantilever restorations. However, as part of studies of restorative failure or years of service, a few report the longevity of 2-unit cantilever FPDs without information on their location or design. In a study that involved 406 patients with unserviceable FPDs during a 3-year period, Schwartz and others[10] report that 20 2-unit cantilever prostheses had a mean service period of 14.9 years, which was longer than the mean of all FPDs (11.2 years) and 32 2-unit splint cantilever prostheses (13 years). This indicates that splinting retainers in cantilever prostheses may not necessarily increase their longevity. Antonoff[2] suggests adding the premolar as a splinted retainer to replace a missing incisor, even though the canine can be used as a single retainer in ideal situations.

In a study similar to that of Schwartz and others, in 1986 Walton and others[11] reported that 9 2-unit FPDs had a mean length of service of only 3.7 years — the shortest period among all restorations examined. It was pointed out, however, that the small sample size prevented further extrapolation of these figures. The mean length of service for all FPDs in that study was 7.7 years. In another study, Cheung and others[9] recalled and examined 143 patients with 169 FPDs of which 15 were the cantilever type. Of these 15, 11 were anterior prostheses and 3 replaced the canine. Two out of the 3 cantilever FPDs that replaced maxillary canines failed technically (fractured porcelain and fractured abutment tooth). The authors, therefore, concluded that replacement of canines, particularly in the upper arch, with a cantilever bridge was contraindicated. Finally, Roberts[13] indicated an acceptable failure rate where anterior three-quarter crowns (retainers) were used in fixed removable and cantilever bridges. The failure rate of 1.63% a year was lower than the failure rate of all types of anterior retainers at 3.49% a year.

Reasons for Failure

Recurrent caries that formed at the mesial margin of the retainer was the reason for failure of the FPD reported here. The caries was not extensive, but large enough to justify removal of the prosthesis rather than repair. This is particularly interesting as loss of retention or gingival irritation beneath the pontic was not the cause of failure as one would expect in such restorations, especially when a partial coverage retainer was used.

Caries and loss of retention have been among the major causes of failure in fixed prosthodontic treatment. Although marginal caries account for failure rates ranging from 14.9% to 36.8%, loss of retention (or loose retainer) account for 12.1% to 27% of the failures studied.[10–12,16]

The original FPD was solid despite the recent caries. The patient was happy to have it replaced with a similar prosthesis; however, the patient chose complete coverage this time to enhance the esthetics. Additional design features included subgingival labial margins and a mesial retentive groove.

The Role of Occlusion and Periodontal Health

Because the success of the cantilever FPD depends largely on proper occlusion and the health of the supporting periodontium and abutment teeth,[2,5,6,14] the clinical assessment was consistent with these recommendations. The vital abutment tooth had healthy periodontal and alveolar supporting tissues, favourable

root length and morphology, favourable crown-to-root ratio and sufficient clinical crown length.

The occlusion of the new cantilever prosthesis excluded any contacts on the pontics in protrusion and lateral excursion.[3,14]

Conclusion

The longevity and replacement of a maxillary 2-unit cantilever FPD is presented in this clinical report. The length of service of the prosthesis was 53 years. The original retainer consisted of partial palatal coverage, whereas the replacement prosthesis was designed with complete coverage PFM material.

THE AUTHORS

***Dr. Nassar** is an associate professor and is the coordinator of the division of fixed prosthodontics, department of dentistry, faculty of medicine and dentistry, University of Alberta, Edmonton, Alberta.*

***Dr. Russett** is a graduate student in the orthodontic program, department of dentistry, University of Alberta, Edmonton, Alberta.*

***Correspondence to:** Dr. Usama Nassar, 4038 Dentistry/Pharmacy Centre, University of Alberta, Edmonton, AB T6G 2N8.*

The authors have no declared financial interests.

References

1. Wright WE. Success with the cantilever fixed partial denture. *J Prosthet Dent* 1986; 55(5):537–9.

2. Antonoff SJ. The status of cantilever bridges. *Oral Health* 1973; 63(1):8–14.

3. Crothers AJ, Wassell RW, Jepson N, Thomason JM. The use of cantilever bridges. *Dent Update* 1995; 22(5):190–8.

4. Nyman S, Lindhe J. Considerations on the design of occlusion in prosthetic rehabilitation of patients with advanced periodontal disease. *J Clin Periodontol* 1977; 4(1):1–15.

5. Ewing JE. Re-evaluation of the cantilever principle. *J Prosthet Dent* 1957; 7(1):78–92.

6. Stockton LW. Cantilever fixed partial denture — a literature review. *J Can Dent Assoc* 1997; 63(2):118–21.

7. Stelzel M, Flores-de-Jacoby L, Ciancio S. The influence of end abutment and cantilever fixed partial dentures on periodontal health. *Int J Periodontics Restorative Dent* 1997; 17(4):368–77.

8. Goldfogel MH, Lambert RL. Cantilever fixed prosthesis replacing the maxillary lateral incisor: design consideration. *J Prosthet Dent* 1985; 54(4):477–8.

9. Cheung GS, Dimmer A, Mellor R, Gale M. A clinical evaluation of conventional bridgework. *J Oral Rehabil* 1990; 17(2):131–6.

10. Schwartz NL, Whitsett LD, Berry TG, Stewart JL. Unserviceable crowns and fixed partial dentures: life-span and causes for loss of serviceability. *J Am Dent Assoc* 1970; 81(6):1395–401.

11. Walton JN, Gardner FM, Agar JR. A survey of crown and fixed partial denture failures: length of service and reasons for failure. *J Prosthet Dent* 1986; 56(4):416–21.

12. Karlsson S. A clinical evaluation of fixed bridges, 10 years following insertion. *J Oral Rehabil* 1986; 13(5):423–32.

13. Roberts DH. The failure of retainers in bridge prostheses. An analysis of 2,000 retainers. *Br Dent J* 1970; 128(3):117–24.

14. Himmel R, Pilo R, Assif D, Aviv I. The cantilever fixed partial denture — a literature review. *J Prosthet Dent* 1992; 67(4):484–7.

15. Selby A. Fixed prosthodontic failure. A review and discussion of important aspects. *Aust Dent J* 1994; 39(3):150–6.

16. Valderhaug J. A 15-year clinical evaluation of fixed prosthodontics. *Acta Odontol Scand* 1991; 49(1):35–40.