Surgical Periodontal Interventions: Long-Term Outcomes

Ignace Naert
Chairman, Department of Prosthetic Dentistry
Catholic University Leuven, Belgium
E-mail: Ignace.Naert@med.kuleuven.ac.be

Marc Quirynen
Professor, Department of Periodontology
Catholic University Leuven, Belgium

Fig 1 A 47-year-old female with a 13-unit FPD in the maxilla, supported by a few remaining teeth with very reduced but healthy periodontium.

The history of a 47-year-old female patient, referred 30 years ago to the Department of Prosthetic Dentistry of Catholic University Leuven, Belgium, illustrates the problems regarding long-term treatment outcomes of periodontally involved patients. In 1977, this patient was treated at the Department of Periodontology of the Free University, The Netherlands, by means of a periodontal 13-unit fixed partial denture (FPD) (Fig 1). Note the limited but healthy periodontium in the maxilla (Fig 2) and its stability over time (Fig 3). In 1990, the FPD framework fractured at the maxillary right lateral incisor and canine positions, along with fracture of the right first premolar. After extraction of the premolar, 2 implants were inserted at the right premolar sites, and a 3-unit FPD was delivered, linked with a custom-made nonrigid connector to the remaining teeth. This stabilized the mobile anterior teeth. Also, furcation involvement at the mandibular right second molar was treated by root separation and restored with a cast gold crown. In 1994, root fracture of the maxillary left second premolar occurred, leading to discomfort of the mobile anterior teeth. A 3-unit implant-supported FPD with custom nonrigid connectors was made to stabilize the remaining anterior teeth. Figure 4 shows the radiographs taken in 2005, 28 years after initial periodontal therapy. At the end of 2005, the maxillary right central incisor fractured, and high mobility was observed at the maxillary left incisors and canine. After extraction of the left incisors and canine, a removable partial denture (RPD) was selected as the treatment because of the patient's financial limitations (Fig 5).

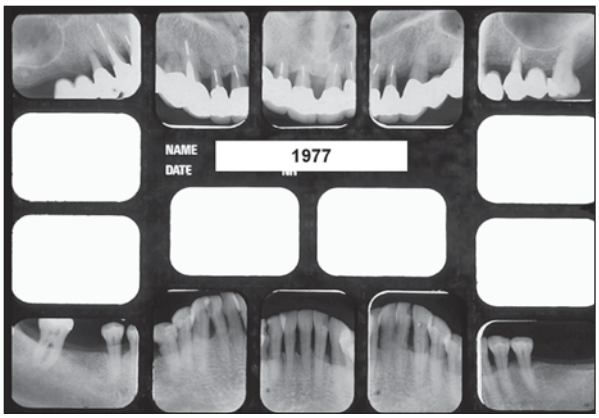

Fig 2 Radiographs taken in 1977 at the FPD delivery. Note the reduced periodontal attachment, double extension pontic (upper right), large post at the maxillary left second premolar, and furcation involvement at the mandibular right second molar.

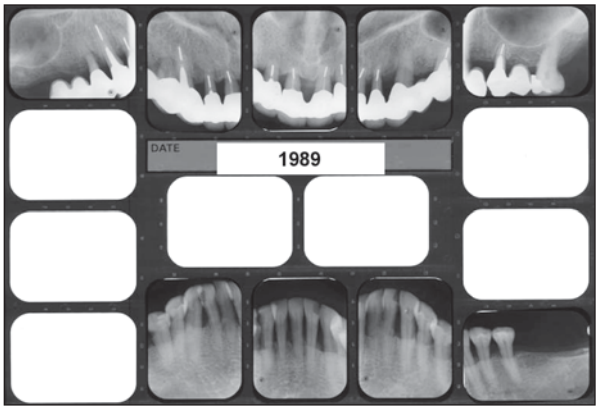

Fig 3 Radiographs taken in 1989 at the yearly control appointment. Note the stable bone level.

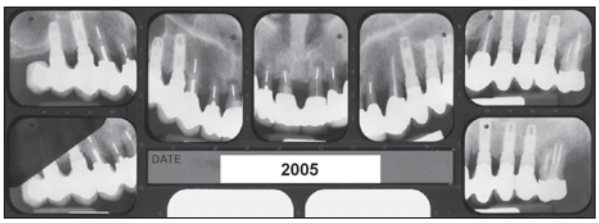

Fig 4 Radiographs taken in 2005. Implants had been inserted in 1990 and 1994. Note the stable bone level around the turned implants.

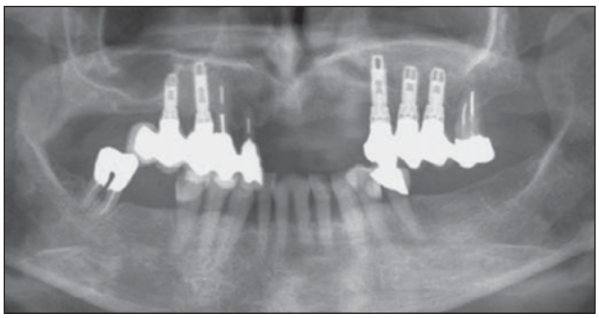

Fig 5 Panoramic radiograph taken in 2007. An RPD was inserted after fracture of the maxillary right central incisor and extraction of the left incisors and canine.

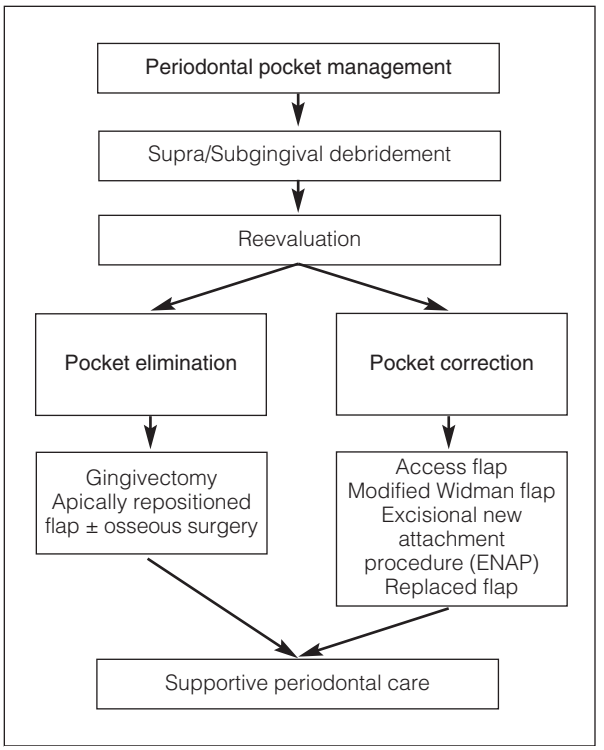

Fig 6 Schematic overview of periodontal pocket management.

Several aspects are worth considering. In 1977, the patient was horrified by the diagnosis of "full extraction." To fulfill the patient's demands, the limited periodontium was maintained, and has provided her with a fixed solution over the years. Of course, some problems with mechanical origins occurred over time. Indeed, the limitations for FPDs in patients with few abutments and reduced periodontium are related to technical and biomechanical problems, rather than to the biologic capacity of the remaining periodontium.[1] The use of some implants in patients susceptible to periodontitis, irrespective of turned or rough implant surfaces, has been shown to have a good 5-year prognosis.[2] The case shown here illustrates the great potential of the periodontium as long as it is kept infection free.

Over the years, 2 different strategies to treat periodontitis with intrabony pockets have been established—namely, pocket elimination and pocket correction (Fig 6).[3] The aim of this paper is to address the effectiveness of surgical versus nonsurgical therapy based on the highest level of evidence available in the literature.

Pocket Elimination

It is evident from the literature that tooth mortality is higher in molars with furcation involvement than in those without furcation involvement. Moreover, the failure rates in non-root removal versus root resection are 30% (12% to 57%) and 15% (0% to 38%), respectively.[4] Table 1 shows the relevant literature related to root separation/resection therapy and its long-term outcome. The periodontal treatment decisions for molars with deep furcations may show a high long-term success rate, provided maintenance care is offered.[5] Indeed, the long-term success of root-resected molars seems to rest with the technical aspects of the restoration, rather than with the periodontal support.

Pocket Correction

Pocket reduction is used to regenerate the intrabony defect. Cortellini and Tonetti[6] studied long-term tooth survival following regenerative treatment (GTR) of intrabony defects. One hundred seventy-five patients with 1 deep intrabony defect treated with GTR were followed from 2 to 16 years (mean: 8 years). The clinical attachment level (CAL) gain after GTR therapy was 4.6 mm, and 96% of the treated teeth survived after 10 years. The CAL after 15 years was 38% compared to the 1-year data.

Heden and Wennström[7] followed 82 patients with 103 angular bone defects treated with enamel matrix derivative (Emdogain, Straumann) in a 5-year follow-up study. The CAL gain after therapy was 5.4 mm, while 61% of the defects showed a bone gain of 3 mm compared to the baseline. After 5 years, 11% of teeth required extraction. On the other hand, Sanz and Giovannoli[8] are more restrictive, concluding in their review that GTR procedures are effective in mandibular Class II furcations, but not in mandibular Class III or in maxillary Class II furcations.

In a systematic review, Murphy and Gunsolley[9] focused on the effect of physical barriers compared with surgical controls on the clinical, radiographic, adverse, and patient-centered outcomes in patients with periodontal osseous defects. For the primary outcome variables, GTR was favored over open flap debridement therapies in studies of both intrabony and furcation defects ($P < .0001$). No differences were detected among barrier types, but barrier types could explain some heterogeneity in the results. Augmentation of the GTR barrier with a particulate graft enhanced probing pocket depths ($P < .05$) and CAL, but none of the intrabony outcomes.

In a systematic review of guided tissue regeneration for periodontal infrabony defects, Needleman et al[10] came to the following conclusions: GTR has a greater

Table 1 Long-Term Outcome of Root Separation/Resection Therapy

Study	Follow-up (y)	No. of teeth	Lost (%)	Causes of tooth loss (%)			
				Fracture	Periodontal	Endodontic	Caries
Bergenholtz, 1972	2–10	45	6	–	4	2	–
Klavan, 1975	3	34	3	–	3	–	–
Hamp et al, 1992	7	87	8	–	–	–	–
Langer et al, 1981	10	100	38	18	10	7	3
Erpenstein, 1983	4–7	34	9	–	3	6	–
Bühler, 1988	10	28	32	3.5	7	18	3.5
Carnavale, 1991	3–11	488	4	2	0.5	1	1
Basten et al, 1996	2–23	49	8	–	–	2	4
Carnavale, 1998*	10	175	7	1	2	2.5	2
Svärdström et al, 2000	8–12	47	11	9	2	–	–

*Prospective.

effect on periodontal outcome than open flap debridement. However, large variability exists between studies, making it difficult to draw general conclusions about the benefit of GTR. The factors affecting outcomes are unclear.

The actual clinical advantages of using enamel matrix derivative for periodontal tissue regeneration in infrabony defects are unknown.[11] With the exception of significantly more postoperative complications in the GTR group, there was no evidence of clinically important differences between GTR and enamel matrix derivative.

Periodontal Infection Control

Based on the aforementioned data, current clinical concepts in periodontal infection control can be formulated.[12] A key factor in the treatment of a patient with periodontitis is the prevention of bacterial plaque accumulations by oral hygiene methods. The long-term success of treatments of periodontitis-susceptible subjects is therefore dependent on the measures provided to support the patient in his or her own efforts to control the periodontal infection. Regular visits for diagnostic monitoring and supportive care should be integral parts of the treatment protocol. Obviously, there is a threshold level of bacterial load, below which the individual host can cope with the infection. Besides the quantity and quality of the biofilm, host-related and modifiable environmental factors should be recognized, eg, diabetes, stress, and smoking. While most of the current research is focused on developing means for improving self-performed plaque control, considerable efforts are also directed toward identifying subject- and tooth/site-associated factors that can predict outcomes of treatment approaches to periodontal infection control. This is of particular importance regarding the use of adjunctive antibiotic therapy for infection control, considering the general desire to avoid unnecessary use of antibiotics. Moreover, various devices and biologic mediators used to support attachment gain in the surgical treatment of periodontal defects may help reduce the oral exposure of the roots and thereby facilitate future self-performed infection control.

Conclusions

The main objective remains adequate infection control. Nonsurgical scaling and root planing combined with self-performed supragingival plaque control using ultrasonic devices—which are favored over hand instrumentation for pocket/root debridement—is the superior choice. Intentional removal of tooth structures by extensive root planing during pocket/root instrumentation is no longer considered a necessary prerequisite for periodontal healing, as demonstrated in both animal and human studies. Remaining probing pocket depths ≥ 6 mm at re-examination (3 months) following initial scaling and root planing should be surgically removed in the posterior area or regenerated in the anterior area, on the condition that the patient shows proper oral hygiene. When there is no patient cooperation, or cooperation is not expected, full-mouth tooth extractions are the most effective therapy to treat severe periodontitis. Indeed, full-mouth tooth extraction lowers systemic inflammatory and thrombotic markers of cardiovascular risk.[13] It should be clear that the choice of therapy may depend not only on the outcome measures of probing pocket depth and CAL, but also on other variables, such as patient discomfort and apprehension, root sensitivity, and esthetic and phonetic considerations.

References

1. Nyman S, Ericsson I. The capacity of reduced periodontal tissues to support fixed bridgework. J Clin Periodontol 1982;9:409–414.
2. Wennström J, Ekestubbe A, Grondahl K, Karlsson S, Lindhe J. Oral rehabilitation with implant-supported FPD in periodontitis-susceptible subjects. A 5-year prospective study. Clin Periodontol 2004;31:713–724.
3. Claffey N, Polyzois I, Ziaka P. An overview of non-surgical and surgical therapy. Periodontol 2000 2004;36:35–44.
4. DeSanctis M, Murphy KG. The role of resective periodontal surgery in the treatment of furcation defects. Periodontol 2000 2000;22:154–168.
5. Svärdström G, Wennström JL. Periodontal treatment decisions for molars: An analysis of influencing factors and long-term outcome. J Periodontol 2000;71:579–585.
6. Cortellini P, Tonetti MS. Long-term tooth survival following regenerative treatment of intra-bony defects. J Periodontol 2004;75:672–678.
7. Heden G, Wennström JL. Five-year follow-up of regenerative periodontal therapy with enamel matrix derivative at sites with angular bone defects. J Periodontol 2006;77:295–301.
8. Sanz M, Giovannoli JL. Focus on furcation defects: Guided tissue regeneration. Periodontol 2000 2000;22:169–189.
9. Murphy KG, Gunsolley JC. Guided tissue regeneration for the treatment of periodontal intrabony and furcation defects. A systematic review. Ann Periodontol 2003;8:266–302.
10. Needleman IG, Worthington HV, Giedrys-Leeper E, Tucker RJ. Guided tissue regeneration for periodontal infra-bony defects. Cochrane Database Syst Rev 2006;(2):CD001724.
11. Esposito M, Grusovin MG, Coulthard P, Worthington HV. The efficacy of various bone augmentation procedures for dental implants: A Cochrane systematic review of randomized controlled clinical trials. Int J Oral Maxillofac Implants 2006;21:696–710.
12. Wennström JL, Tomasi C. Periodontal infection control: Current clinical concepts. Endodontic Topics 2006;13:3–12.
13. Taylor BA, Tofler GH, Carey HMR, et al. Full-mouth tooth extraction lowers systemic inflammatory and thrombotic markers of cardio vascular risk. J Dent Res 2006;85:74–78.

Tooth Wear and Occlusion: Friends or Foes?

Nico H.J. Creugers
Professor and Chair
Department of Oral Function and Prosthetic Dentistry
College of Dental Science
Radboud University Nijmegen Medical Centre
Nijmegen, The Netherlands
Fax: +31 24 36541971
E-mail: n.creugers@dent.umcn.nl

Arie van't Spijker
PhD Student, Department of Oral Function and Prosthetic Dentistry
College of Dental Science, Radboud University Nijmegen Medical Centre, Nijmegen, The Netherlands

It is believed that extensive tooth wear is a potential threat to the functional dentition. From a prosthodontic point of view, attrition is of particular concern because it interacts directly with a central issue: occlusion. In a 1976 paper, attrition was considered to be part of a normal aging process in which depositioning of secondary dentin, alveolar growth, and muscle adaptation compensate for the loss of tooth substance.[1] The authors state that "attrition, whatever its extent, can never be excessive." Nevertheless, attrition may affect dental occlusion, and it is still disputed whether a changing occlusion should be ignored. It has been advised by some authors that tooth wear should be diagnosed early and treated quickly.[2] Others advise careful monitoring above early treatment because the progress of tooth wear can fluctuate.[3]

The interrelationship between occlusion and (the management of) tooth wear has been considered in the dental literature in 2 ways. First, it has been suggested that certain occlusal schemas may influence the development of tooth wear. Second, occlusal concepts may be considered useful to compass the treatment of worn teeth and dentitions. This paper aims to combine existing knowledge regarding the role of occlusal factors and concepts with (the management of) tooth wear, based on a systematic review by our research group on this topic.

Evidence of the Relationship Between Tooth Wear and Occlusion

The systematic review found 33 eligible articles describing the relationships between attrition and occlusal factors and/or oral (dys)function.[4]

Only a few studies reported correlations between attrition and occlusal parameters. Several studies reported no correlation between anterior attrition and absent posterior teeth, though 1 study found that lower numbers of teeth resulted in a higher tooth wear index of the remaining teeth. Associations between attrition and anterior (spatial) relationships were reported in several studies. As could be expected, anterior guidance seems to reduce the risk for posterior attrition, but increases the risk for anterior attrition. Whether the occurrence of anterior tooth wear is more or less a threat to the dentition or its function than posterior tooth wear remains a subjective issue.