MetLife
Quality Resource Guide

MetLife designates this activity for 1.0 continuing education credit
for the review of this Quality Resource Guide and successful completion of the post test.

Periodontal Osseous Surgery

Educational Objectives

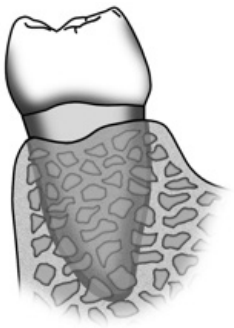
Following this unit of instruction, the practitioner should be able to:

1. Understand the rationale for Periodontal Osseous Surgery;
   a. to treat moderate and severe periodontitis.
   b. to lengthen clinical crowns prior to restoration of a tooth.
2. Delineate the advantages and disadvantages of closed subgingival scaling and root planing compared to periodontal surgery.
3. Understand the relationship of disease severity to the decision to recommend Periodontal Osseous Surgery.
4. Identify patients who would benefit from Periodontal Osseous Surgery.
5. Understand the concept of biologic width and how it relates to crown lengthening.
6. Understand the role of maintenance care and personal oral hygiene following Periodontal Osseous Surgery.

Introduction

Periodontal Osseous Surgery can be defined as the removal of bone surrounding the teeth in order to reestablish normal bony contours at a more apical level. The two primary applications for this type of surgery are treating periodontitis and lengthening the clinical crown of a tooth (crown lengthening) prior to restoring that tooth. Other forms of periodontal therapy, including closed subgingival scaling and root planing, and surgical therapy designed to achieve regeneration of the periodontium for patients with periodontitis, have been covered in other Quality Resource Guides.[1,2] This Guide will focus on the intentional removal of bone supporting the tooth (ostectomy) and contouring of non-supporting alveolar bone (osteoplasty), together known as "Periodontal Osseous Surgery", as part of therapy for periodontitis and for lengthening clinical crowns.

Figure 1



Moderate periodontitis is usually seen first in the molar regions and causes bone loss under the contact area. This figure demonstrates a typical two wall (one to the lingual, one to the facial) bony crater. Two to three millimeters deep interdental bony defects are optimal candidates for definitive osseous surgery. This is seen clinically as an increased interproximal probing depth and may or may not be visible on radiographs. The configuration of this defect reduces the efficacy of interproximal personal oral hygiene measures such as the use of dental floss.

THIRD EDITION

Author Acknowledgements

Thomas G. Wilson Jr., DDS

Dr. Wilson is a Board Certified periodontist with a private practice in Dallas, Texas.

Dr. Wilson has no relevant relationships to disclose.

The following commentary highlights fundamental and commonly accepted practices on the subject matter. The information is intended as a general overview and is for educational purposes only. This information does not constitute legal advice, which can only be provided by an attorney.

Originally published August 2010. Updated and revised December 2013 and December 2016. Expiration date: December 2019. The content of this Guide is subject to change as new scientific information becomes available.

ADA C·E·R·P® Continuing Education Recognition Program

MetLife is an ADA CERP Recognized Provider.

ADA CERP is a service of the American Dental Association to assist dental professionals in identifying quality providers of continuing dental education. ADA CERP does not approve or endorse individual courses or instructors, nor does it imply acceptance of credit hours by boards of dentistry.

Concerns or complaints about a CE provider may be directed to the provider or to ADA CERP at www.ada.org/goto/cerp.

Accepted Program Provider FAGD/MAGD Credit 11/01/16 - 12/31/20.

Address comments to:
dentalquality@MetLife.com
MetLife Dental
Quality Initiatives Program
501 US Highway 22
Bridgewater, NJ 08807

Surgery for Periodontitis

Periodontitis, usually in its chronic form, is seen in a large percentage of the adult population and is responsible for the majority of tooth loss in these individuals.[3] Periodontitis is an inflammatory process defined histologically by a loss of periodontal attachment apparatus (cementum, periodontal ligament, and alveolar bone) resulting in an apical shift of the junctional epithelium and connective tissue attachment.[4] Probing depths greater than 3 mm, assuming that the margins of the gingival tissues are at their normal level (slightly coronal to the cementoenamel junction), accompanied by signs of inflammation (bleeding and/ or suppuration following probing, and probing depths increasing over time) indicate that active periodontitis is present.

The primary extrinsic etiologic factor for inflammatory periodontitis is bacteria, usually present as a biofilm attached to the tooth surface. Subgingival calculus, formed by the calcification of mature bacterial masses within the biofilm, is usually deposited on the root surfaces as the disease progresses apically. This often results in inter-proximal bone loss under the contact area, limiting access for personal oral hygiene (Figure 1).

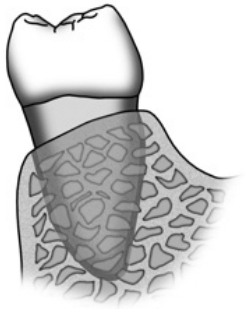
Probing depths greater than 3 mm have been shown to retain biofilm in spite of judicious personal oral hygiene.[5] If left undisturbed, this biofilm evolves into a biomass that has been associated with periodontitis. In general, the deeper the probing depth and the longer the bacteria within it is left undisturbed, the more the disease will progress. Calculus deposits covered with biofilm have been shown to be closely associated with periodontitis.[6] It is believed that these calculus accretions concentrate the noxious materials contained in the biofilm. One study[7] showed an apparent cause and effect relationship between inflammation in the pocket wall and subgingival calculus covered with biofilm. The same relationship was not routinely present for biofilm alone. In a separate study, calculus and biofilm were removed from human teeth affected by severe chronic periodontitis. When the teeth and surrounding tissues were examined histologically six months later, there were no signs of inflammation.[8]

It has been shown that professional removal of subgingival biofilm and calculus becomes less likely as probing depths increase.[9] Removal of these accretions without surgical access becomes even more difficult when a tooth has a variation in its subgingival anatomy such as a bifurcation, groove, and/or deep, narrow, periodontal pocket. Residual deposits of biofilm and calculus, typically left behind following closed subgingival scaling and root planing, allow rapid repopulation of subgingival bacteria and reintroduction of the inflammatory process. More of these deposits can be removed after a surgical flap has been reflected than when closed scaling and root planing is performed without surgical access.[10]

The traditional rationale for employing surgical therapy to treat inflammatory periodontal diseases has been to increase the probability of retaining the teeth in health and function by removing bacteria and calculus. Periodontal Osseous Surgery also reduces probing depths by apically repositioning the soft tissues and reestablishing normal gingival architecture at a more apical level (Figure 2). This allows the patient better access for personal oral hygiene to disrupt developing biofilm. A second rationale for periodontal surgery has recently been added because chronic inflammatory processes, including periodontitis, have been positively associated with ischemic cerebrovascular and cardiovascular disease, diabetes mellitus, low birth weight babies and multiple other systemic problems.[11,12,13] Thus, successful treatment of inflammatory periodontitis may not only help a patient to retain their natural teeth, it may also reduce their risk for certain systemic problems. Assuming normal root length, bony craters deeper than 3mm will usually respond optimally to regeneration. Osseous surgery and regeneration procedures can be combined in deeper lesions.

Surgery for periodontitis is not a monotherapy; rather, it is part of comprehensive treatment sequence. Proper therapy for patients with periodontitis usually includes: evaluation and modification of personal oral hygiene; closed subgingival scaling and root planing; and appropriate occlusal therapy. According to a recent study, malocclusion can be a secondary risk factor for the progression of inflammatory periodontal diseases.[14] Regenerative and/or periodontal osseous surgery may be indicated in regions that continue to show signs of active disease (bleeding upon probing, and increasing probing depth) at the reevaluation following non-surgical therapy.

Figure 2



Periodontal Osseous Surgery for the bony lesion seen in Figure 1 flattens the walls of the bony crater primarily from the lingual aspect, establishing normal architecture at a more apical level. This should result in reduced interproximal probing depths when compared to open flap surgery without bone removal.

Active treatment is followed by maintenance (supportive periodontal therapy). It has been demonstrated that individuals who practice effective personal oral hygiene tend to have less recurrence of disease than those who do not.[15] Similarly, patients who present regularly for periodontal maintenance have been shown to lose fewer teeth than those who do not keep prescribed maintenance appointments.[16] Modifying a patient's personal oral hygiene is a constant challenge and timely maintenance care helps to reinforce positive behavior. Factors that negatively affect periodontal health, such as smoking, diabetes mellitus, and bad dietary habits must also be controlled to achieve optimal treatment outcomes.[17]

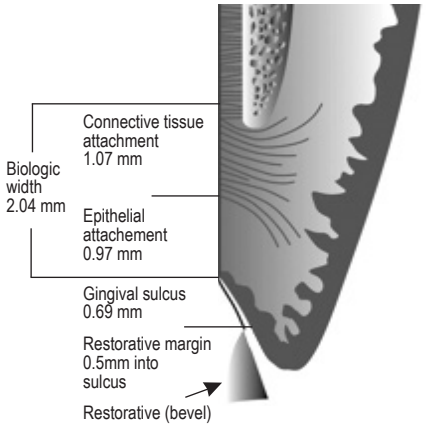
Crown Lengthening Surgery

Crown lengthening typically involves removal of bone and soft tissues to increase the length of tooth structure coronal to the bony crest and/or gingival margin. This procedure may be used to expose margins of carious lesions, cracks or other defects prior to restorative procedures, or to treat

altered passive eruption. Crown lengthening is often necessary to increase the mechanical retention of a dental restoration for a tooth affected by fracture, excessive wear, external root resorption, or advanced dental caries. Before crown lengthening is planned, the clinician must carefully assess the region and determine that the surgery will not compromise esthetics, undermine the stability of the tooth or adjacent teeth, and will not limit the possibility of placing an implant in the site at a later date.

One of the strongest rationales for crown lengthening is to avoid impingement of restorative margins on the biologic width. The biologic width is defined as those gingival tissues that attach to the tooth coronal to the alveolar bone (Figure 3). The biologic width usually consists of approximately 1mm of junctional epithelium and approximately 1mm of connective tissue attachment, and is relatively constant.[18] Approximately 1mm of tooth structure coronal to the biologic width is necessary to accommodate the gingival sulcus. Impingement on the biologic width by restorative margins (placing the margin of the restoration within 2-3 mm of the alveolar bone crest) has been shown to lead to accumulation of bacteria associated with initiation and progression of inflammatory periodontal diseases.

Figure 3



The biologic width is the zone of connective and epithelial tissue found attached to the tooth coronal to the alveolar bone. The normal corono-apical dimension of this attachment is 2-3 mm. Restorative margins should be placed in the gingival sulcus coronal to the biologic width.

With rare exceptions, crown lengthening procedures require elevation of a full-thickness mucoperiosteal flap to facilitate removal of bone. In cases where final restorations would encroach upon the biologic width, sufficient bone must be removed to allow the 3 mm of healthy tooth structure needed for soft tissue attachment and allow the final restorative margin to be placed coronal to the biologic width on healthy tooth surfaces. It should be noted that areas needing crown lengthening generally do not have pathologic probing depths or radiographically demonstrable bone loss.

The Surgical Procedure

The initial steps for Periodontal Osseous Surgery used to treat chronic periodontitis and for crown lengthening are the same. The clinician must make a diagnosis, formulate a treatment plan, go over the treatment plan with the patient, and obtain informed consent for therapy. This is followed by: initial non-surgical therapy, including oral hygiene evaluation and appropriate behavior modification; closed subgingival scaling and root planing; and appropriate occlusal therapy. When signs of active disease (bleeding upon probing, increases in probing depth) associated with probing depths of greater than 3 mm are seen at re-evaluation of initial therapy, surgery should be considered. This assumes that the patient's oral hygiene effectiveness is adequate, and their general health and mental status allow them to be a candidate for surgery. In general, probing depths of greater than 3 and less than 7 mm respond well to Periodontal Osseous Surgery alone. This procedure may be combined with periodontal regeneration procedures in regions with deeper probing depths.

The surgical process should be conducted in an environment that controls asepsis and is capable of monitoring the patient's vital signs. Surgery begins with delivery of adequate anesthesia (local alone or in combination with oral, parenteral, or intravenous medications). A mucoperiosteal flap is raised to adequately expose the surgical site. This involves extension of the flaps to the mesial and distal of the affected areas and may require vertical releasing incisions. The flap is elevated sufficiently to allow visualization of the surgical area. This usually involves elevating the flap past the mucogingival junction. Remaining adherent soft tissue is then removed. The root surfaces are inspected and any biofilm or calculus removed.

It is often necessary to remove supporting bone from both the tooth in question and contiguous teeth to allow reformation of the gingival tissue at a more apical level with normal probing depths. As previously stated, the immediate goals of the surgery for patients with periodontitis are to remove biofilm and calculus from the root surface and to increase access for personal oral hygiene by reducing probing depth. Periodontal Osseous Surgery accomplishes these goals by re-establishing normal bony architecture at a more apical level. Postoperative bony contours should follow the cementoenamel junction (scalloped on the facial and lingual [palatal], flat in the interdental region of the posterior teeth, and becoming more scalloped interdentally toward the incisor area).

Most early disease occurs in the interproximal areas of posterior teeth resulting in a shallow interproximal bony crater (Figure 1). Periodontal Osseous Surgery flattens the walls of a bony crater, usually from the lingual aspect, creating normal architecture at a more apical level (Figure 2). The surgical region is irrigated using sterile water or sterile saline before the flap is apically positioned and secured using either interdental or horizontal mattress sutures. The above description represents the approach when Periodontal Osseous Surgery is used as the primary periodontal treatment modality; if it is a part of a regenerative procedure, modifications may be necessary to maximize regeneration of periodontal tissues.

The patient is seen at short-term follow-up appointments (at 7-10 days following surgery for suture removal, and then approximately once a month until the tissues have matured. During this time, they are normally placed on chlorhexidine rinses (0.12% twice a day for four to six weeks) and instructed to avoid mechanical oral hygiene and mastication of hard foods in the surgical areas for three to four weeks. Following initial healing, the patient is placed in supportive periodontal therapy (maintenance). For the average patient, professional maintenance is needed for as long as the dentition survives. The maintenance interval varies according to the clinical signs of disease, but is typically every

three months. In general, the more severe the disease the greater the chance the patient will need the services of a specialist's office for supportive periodontal therapy.

Initial preparation (closed instrumentation and occlusal adjustment) is not necessary when performing Periodontal Osseous Surgery for crown lengthening, if there is no evidence of inflammation or occlusal trauma in the region. After the flap is reflected for a crown lengthening procedure, the distance from the apical portion of the tooth lesion (crack, caries, etc.) to the bony crest is carefully measured. Sufficient bone is then removed to allow 2-3 mm of healthy tooth surface coronal to the bony crest for reattachment of gingival soft tissues (reestablishing the biologic width). Additional bone usually needs to be removed to expose enough healthy tooth structure apical to any lesion to allow placement of a restorative margin that will not violate the biologic width (Figure 3). Best long-term results are achieved when the facial and lingual (palatal aspects of the marginal bone are located apical to the interproximal bone (positive osseous architecture). It takes approximately 3 months following surgery for the periodontium to mature sufficiently to allow final restorative procedures to be initiated. Follow-up for these cases is similar to that described for treatment of periodontitis.

In Summary

Surgical therapy with bone removal (Periodontal Osseous Surgery) is appropriate in several clinical situations. It may be used as an important component of therapy for periodontitis. It may also be used to expose tooth structure to increase mechanical retention before final placement of dental restorations, to expose healthy tooth structure when cracks or dental caries approach the alveolar bone, and in cases of altered passive eruption.

References

1. Oates T. Non-Surgical Periodontal Treatment. MetLife Quality Resource Guide. 2007.
2. Reynolds MA, Aichelmann-Reidy ME. Periodontal Regeneration. MetLife Quality Resource Guide. 2009.
3. Oliver RC, Loe H. Periodontal diseases in the U.S. in 1981: Prevalence, severity, extent and role in tooth mor¬tality. J Periodontol 1989; 60:363.
4. Page RC, Schroeder HE. Pathogenesis of inflammatory periodontal disease: A summary of current work. Lab Invest 1976; 34:235-249.
5. Waerhaug J. Healing of the dento-epithelial junction following subgingival plaque control. II. As observed on extracted teeth. J Periodontol 1978;49:119-134.
6. Patters MR, Landesberg RL, Johansson LA, et al. Bacteroides gingivalis antigens and bone resorbing activity in root surface fractions of periodontally involved teeth. J Periodontal Res 1982;17:122-130.
7. Wilson TG Jr., Harrel SK, Nunn ME, Francis B, Webb K. The Relationship Between the Presence of Tooth-Borne Subgingival Deposits and Inflammation Found With a Dental Endoscope. J Periodontol 2008;79:2029-2035.
8. Wilson TG Jr., Carnio J, Schenk R, Myers G. Absence of Histologic Signs of Chronic Inflammation Following Closed Subgingival Scaling and Root Planing Using the Dental Endoscope: Human Biopsies – A Pilot Study. J Periodontol 2008;79:2036-2041.
9. Stambaugh RV, Dragoo M, Smith DM, Carasal L. The limits of subgingival scaling. Int J Periodontics Restorative Dent 1981;1(5):30-41.
10. Caffesse RG, Sweeney PL, Smith BA. Scaling and root planing with and without periodontal flap surgery. J Clin Periodontol 1986;13:205.
11. Fridewald VE, et al. The American Journal of Cardiology and Journal of Periodontology Editors' Consensus: Periodontitis and Atherosclerotic Cardiovascular Disease. J Periodontal 2009;80:1021-1032.
12. Taylor CW, Burt BA, Becker MP. Severe periodontitis and risk for poor glycemic control in patients with non-insulin-dependent diabetes mellitus. J Periodontol 1996;67:1085-1093.
13. Offenbacher S, Katz V, Fertik G, et al. Periodontal infection as a possible risk factor for preterm low birth weight. J Periodontol 1996;67:1103-1113.
14. Harrel SK, Nunn ME. The association of occlusal contacts with the presence of increased periodontal probing depth. J Clin Periodontol 2009;36(12):1035-1042.
15. Suomi JD, Greene JC, Vermillion JR, Doyle J, Chang JJ and Leatherwood EC. The effect of controlled oral hygiene procedures on the progression of periodontal disease in adults: Results after third and final year. J Periodontol 1971;42:152.
16. Wilson TG, Glover ME, Malik AK, et al. Tooth loss in maintenance patients in a private periodontal practice. J Periodontol 1987;58:231-235.
17. Yoshihara A, Watanabe R, Hanada N, Miyazaki H. A longitudinal study of the relationship between diet and take and dental care ease and periodontal disease and elderly Japanese subjects. Gerodontology 2009;26:130.
18. Gargiulo WW, Wentz F, Orban B. Dimensions of the denotogingival junction in humans. J Periodontol 1961;32:261-267

Acknowledgements

Permission was given for the figures in this article to be used. These figures were originally published by Quintessence International in Fundamentals of Periodontics, Edition 2, Wilson TG, Kornman KS, 2003.

POST-TEST

Internet Users: This page is intended to assist you in fast and accurate testing when completing the "Online Exam." We suggest reviewing the questions and then circling your answers on this page prior to completing the online exam.

(1.0 CE Credit Contact Hour) Please circle the correct answer. 70% equals passing grade.

1. **Osseous surgery is normally preferred surgical treatment for which forms of periodontitis?**
   a. Probing depths of 2-3mm
   b. Probing depths of 4-7mm
   c. Probing depths of 8+mm

2. **Occlusal forces can cause loss of periodontal attachment.**
   a. True
   b. False

3. **Definitive osseous surgery can be performed without raising a flap.**
   a. True
   b. False

4. **Systemic factors that can negatively affect the long-term outlook for patients with periodontal diseases include all the following except:**
   a. Smoking
   b. Diabetes mellitus
   c. Dental malocclusion
   d. Poor oral hygiene habits

5. **Osseous surgery is most effective for which of the following?**
   a. One wall interdental bony defects
   b. 2-3mm two wall interdental bony defects
   c. 2-3 wall facial bony defects
   d. 4+ two wall interdental bony defects

6. **The biologic width is made up of the following components:**
   a. alveolar bone, the periodontal ligament, cementum
   b. sulcular epithelium, supra-bony connective tissue
   c. alveolar bone, supra-bony connective tissue, sulcular epithelium
   d. alveolar bone, periodontal ligament, cementum, supra-bony connective tissue

7. **The normal corona-apical dimension of the biologic width is:**
   a. 1-2mm
   b. 2-3mm
   c. 3-4mm
   d. 4-5mm

8. **Invasion of the biological width by the margin of a restoration will always result in inflammation and subsequent bone loss.**
   a. True
   b. False

9. **When using osseous surgery to correct a 2 mm deep two-wall bony crater found interproximally between the maxillary first and second molars, the bone is always treated by:**
   a. Removing facial and lingual bone
   b. Removing only facial bone
   c. Bone is not removed, regeneration is employed
   d. Ramping the bone toward the palate

10. **Crown lengthening surgery is similar to osseous surgery performed on patients with chronic inflammatory periodontitis with the exception of:**
    a. No personal oral hygiene instructions are given
    b. Closed subgingival scaling and root planing is rarely necessary
    c. There is no concern for the biologic width
    d. Flaps are not raised with crown lengthening

REGISTRATION/CERTIFICATION INFORMATION (Necessary for proper certification)

Name (Last, First, Middle Initial): _____

PLEASE PRINT CLEARLY

Street Address: _____ Suite/Apt. Number _____

City: _____ State: _____ Zip: _____

Telephone: _____ Fax: _____

Date of Birth: _____ Email: _____

State(s) of Licensure: _____ License Number(s): _____

Preferred Dentist Program ID Number: _____ ☐ Check Box If Not A PDP Member

AGD Mastership: ☐ Yes ☐ No

AGD Fellowship: ☐ Yes ☐ No Date: _____

Please Check One: ☐ General Practitioner ☐ Specialist ☐ Dental Hygienist ☐ Other

FOR OFFICE USE ONLY

Quality Resource Guide - Periodontal Osseous Surgery 3rd Edition

Providing dentists with the opportunity for continuing dental education is an essential part of MetLife's commitment to helping dentists improve the oral health of their patients through education. You can help in this effort by providing feedback regarding the continuing education offering you have just completed.

Please respond to the statements below by checking the appropriate box, using the scale on the right.	1 = POOR				5 = Excellent	
	1	2	3	4	5	
1. How well did this course meet its stated educational objectives?	☐	☐	☐	☐	☐	
2. How would you rate the quality of the content?	☐	☐	☐	☐	☐	
3. Please rate the effectiveness of the author.	☐	☐	☐	☐	☐	
4. Please rate the written materials and visual aids used.	☐	☐	☐	☐	☐	
5. The use of evidence-based dentistry on the topic when applicable.	☐	☐	☐	☐	☐	☐ N/A
6. How relevant was the course material to your practice?	☐	☐	☐	☐	☐	
7. The extent to which the course enhanced your current knowledge or skill?	☐	☐	☐	☐	☐	
8. The level to which your personal objectives were satisfied.	☐	☐	☐	☐	☐	
9. Please rate the administrative arrangements for this course.	☐	☐	☐	☐	☐	

10. How likely are you to recommend MetLife's CE program to a friend or colleague? *(please circle one number below:)*

10 9 8 7 6 5 4 3 2 1 0

extremely likely neutral not likely at all

What is the primary reason for your 0-10 recommendation rating above?

_____

11. Please identify future topics that you would like to see:

_____

Thank you for your time and feedback.

To Complete Program Traditionally, Please Mail Your Post Test and Evaluation Forms To:

MetLife Dental Quality Initiatives Program
501 US Highway 22
Bridgewater, NJ 08807