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Understanding the role of resective osseous surgical procedure in chronic periodontitis patients: A review article

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***Abstract*---**Variety of treatment approaches have been developed and used to treat periodontal diseases associated with attachment loss. While the goal of periodontal surgical treatments is to access the root surfaces for proper debridement, the decision to remove or reshape the supporting bone has been controversial. Osseous resective surgery necessitates following the use of strict guidelines for proper recontouring of the alveolar bone and proper management and positioning of the gingival tissues so that the results from osseous resective surgery are highly predictable.

***Keywords*---**osseous, resective surgery, recontouring.

Introduction

In the past the terms osseous resection and osteoplasty were used inter-changeably but it was Friedman who gave a more appropriate description to these terms. The term osteoplasty now is used when the bone is reshaped in order to achieve physiologic contour of the bone and the gingiva overlying it. In this operation the bone that is reshaped in order to achieve physiologic contour is not part of the attachment apparatus, thus no bony support of the tooth or teeth is lost. Osteoectomy is an operative procedure in which bone that is part of the attachment apparatus is removed in order to eliminate a periodontal pocket and establish gingival contour that will be maintained. Osteoectomy, then, will require

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the loss of some bony support of the tooth or teeth, and the amount involved will be an important criterion for its use.

Bone defects

Chronic inflammatory periodontal disease leads to changes in the normal architecture of the alveolar process. These changes vary in degree, form and distribution within the same mouth as well as between individuals. Where overall resorption has been uneven the overall bone form becomes irregular resulting in marginal bony inconsistencies. Bony defects are deemed to be present where bony craters are encountered about the periodontally involved roots. Glickman described the following specific types of bone deformities produced by periodontal disease.

- Osseous craters: these are concavities in the crest of the inter-dental bone confined within the facial and lingual walls. Craters are the most commonly encountered bone defects.
- Infra-bony defects: these are hollowed out troughs in the bone along one or more denuded root surfaces, enclosed with one, two, three, or four bony walls.
- Bulbous bone contours: bony enlargements caused by exostoses, adaptation to function, or buttressing bone formation.
- Hemisepta: the remaining portion of an inter-dental septum, after the mesial or distal portion has been destroyed by periodontal disease.
- Inconsistent margins: these are angular or U-shaped defects produced by resorption of the facial or lingual margins and the height of the inter-dental septa.
- Ledges: these are plateau like bone margins caused by resorption of thickened bony plates.

Bone topography

The gingival margin has an innate tendency to follow a scalloped or “wave – like” configuration regardless of the topography of the underlying bone. In other words the tips of the inter-dental papilla are situated more coronally than the facial or lingual/palatal height of the marginal gingiva. In health the alveolar crest also follows a similar wave-like pattern approximately 2 mm apical to the cemento-enamel junction. This scalloped configuration is called Positive Architecture. It is more extreme in the anterior regions of the jawbones than the posterior where it sometimes assumes an almost Flat Architecture. When either the gingiva or the bone is destroyed in the inter-proximal regions resulting in inter-dental areas being apical to the level of the adjacent facial or lingual / palatal gingiva or bone respectively it results in a Negative or Reverse Architecture. It is a common finding in bone in periodontitis.

Indications and contraindications

Goldman and Cohen gave the indications and contra-indications for bone removal:

- Indications:
  - When pocket is shallow and not too much support is lost.
  - When broad infra-bony pockets exist on the proximal surface where there is no adjacent tooth present.
  - Occasionally an osteoectomy can be performed on the buccal crestal bone in the mandibular molar region where an infra-bony pocket extends into the inter-radicular area that allows for the elimination of the pocket with resultant acceptable architecture.
- Contra-indications:
  - Excessive weakening of the support of an adjacent tooth may contra-indicate bone removal.
  - Creation of a gingival form not conducive to self-cleansing or difficulty in maintaining cleanliness by oral physiotherapy.

Objectives and rationale

The goal of osseous resection is to achieve an ideal form free of bony discrepancies that predispose to recurrence of pocket depth.
In osseous surgery, the alveolar bone is resculpted to establish an ideal architecture with the following characteristics:

- A positive osseous architecture (scalloping)
- An alveolar crest parallel to the adjacent cementoenamel junction.
- A thin alveolar margin.
- The bone is festooned in buccolingual contour.
- The contour in the level and shape of the bone is made harmonious gradually.
- Since thick fibrotic gingiva prevents compatibility between gingiva and bone, dense connective tissue in the tuberosity and palatal regions is thinned.

Armamentarium

- High speed handpiece with fibre-optics and surgical burs, which come with longer shanks (nos. 8,6, and 4 carbide); flame shaped and spear shaped
- Bone files: Schluger, Buck, and/or Sugarman
- Chisels: Wedelstaedt (assorted sizes), back action, Rhodes and Ochsenbein.
- Ultrasonic Scaler

Metal and coarse diamond burs in high speed hand pieces, chisels, files and rongeurs have been advocated to perform osseous resective surgery.

The technique for resective osseous surgery

Carranza described the technique of osseous resective surgery under four sequential steps:

- Vertical grooving
- Radicular blending
- Flattening of inter-proximal bone

- Gradualizing marginal bone

Not all steps are necessary in every case, but the sequencing of the steps in the order given is necessary to expedite the reshaping procedure, as well as to minimize the removal of bone.

Vertical grooving

Vertical grooving is designed to reduce the thickness of the alveolar housing and to provide relative prominence to the radicular aspects of the teeth. It also provides continuity from the inter-proximal surface onto the radicular surface. It is the first step of the resective process, because it can define the general thickness and subsequent form of the alveolar housing. This step is usually performed by rotary instruments such as round carbide burs or diamonds. The advantages of vertical grooving are almost apparent with thick, bony margins; shallow crater formations, or other areas that require maximal osteoplasty and minimal osteoectomy. Vertical grooving is contraindicated in areas with close root proximity or thin alveolar housing.

Radicular blending

It is an extension of vertical grooving. Conceptually, it is an attempt to gradualize the bone over the entire radicular surface to provide the best results from vertical grooving. This provides a smooth, blended surface for good flap adaptation. The indications are the same as for vertical grooving (i.e. thick ledges of bone on the radicular surface, where selective surgical resection is desired). Naturally, this step is not necessary if vertical grooving is very minor or if the radicular bone is thin or fenestrated. Both vertical grooving and radicular blending are purely osteoplastic techniques that do not remove supporting bone. In most cases they compose the bulk of osseous resective surgery. Classically, crater formations, thick osseous ledges of bone on the radicular surfaces, and Class I and early Class II furcation involvements are treated almost entirely with these two steps.

Flattening inter-proximal bone

Flattening of the inter-dental bone requires the removal of very small amounts of supporting bone. It is indicated when inter-proximal bone levels vary horizontally. By definition, most of the indications for this step are one walled inter-proximal defects or so called hemi-septal defects. The omission of flattening results, in increased pocket depth on the most apical side of the bone loss. This step is typically not necessary in class crater formations or flat inter-proximal defects. It is best used in defects that have a coronally placed one walled edge of a predominantly three walled angular defect, and it can be helpful in obtaining good flap closure and improved healing in the three walled defect. The limitation of this step, as with osseous resective surgical therapy in general, is in the treatment of advanced lesions. Large hemi-septal defects would require removal of inordinate amounts of bone to provide a flattened architecture, and the operation would be too costly in terms of bony support.

Gradualizing marginal bone

The final step in the osseous resective technique is also an osteoectomy process. Bone removal is minimum but necessary to provide a sound, regular base for the gingival tissue to follow. Failure to remove small bony discrepancies on the gingival line angles (often called widow's peaks) allows the tissue to rise to a higher level than the base of the bone loss in the inter-dental area. This may make the process of selective recession and subsequent pocket reduction incomplete. This step of the procedure also requires gradualization and blending of the radicular surface. The two osteoectomy steps should be performed with great care so as not to produce nicks or grooves on the roots. When the radicular bone is thin, it is extremely easy to overdo this step, to the detriment of the entire surgical effort. For this reason, various hand instruments such as chisels and curettes are preferable to rotary instruments for gradualizing marginal bone.

Limitations of resective osseoue surgery

Wheeler states that normally the point of buccal bifurcation of the maxillary first molar is approximately 4 mm apical to the cervical line. It follows then, that if in health, the osseous margin is 1-2 mm apical to the cervical line, an average of only 2-3 mm of buccal bone lies coronal to the bifurcation area. Because of a slight difference in the basic morphology of the second molar, the distance between the bifurcation and the cervical line on this tooth is ordinarily greater than that of the first molar. This variation in tooth morphology, combined with the curvature of the arch which places the second molar in a superior anatomical relationship to the first molar, generally positions the point of buccal bifurcation of the second molar several millimeters apical to that of the first molar. Another factor further complicating therapy in the maxillary molar area is the difference in thickness of the buccal alveolar bone covering the roots of the first and second molar teeth. The bucco-lingual long axis of the first molar projects buccally and its roots project palatally. This usually results in a heavier buccal plate, and consequently a thicker osseous covering over the buccal roots of the second molar.

Conclusion

Using strict guidelines and protocols it demonstrated that when properly used; osseous surgery can eliminate and modify defects. Osseous resective surgery has been and remains one of the principal periodontal treatment modalities because of its proven clinical success.

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