Prosthesis-Periodontics Relationship
II. Increase of Clinical Crown and Surgery for Prosthetic Purposes

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One of the most useful procedures in periodontal surgery for prosthetic purposes is the technique of clinical crown increase. However, the technique is not yet fully understood, especially by general dental clinicians who also work in periodontics. In the present study, in addition to a description of the technique, its indications are discussed and the reasons for choosing it as the most appropriate procedure are analyzed.

**Key Words:** periodontal treatment, pre-prosthetic surgery.

Introduction

One of the most important factors necessary for successful restorative dentistry is the preservation of a healthy periodontal insertion, especially from the viewpoint of the long-term prognosis for a restored tooth (Maynard Jr. and Wilson, 1979).

The concept of a preparation with "extension for prevention" presented by Black (cited in Dragoo and Williams, 1981) has influenced the mechanics of restorative dentistry for many decades. Today we know that the cervical area with "autoimmunity" to decaying processes cited by Black is indeed the epithelial insertion area. Black's concept has been criticized by clinicians and researchers for whom the concept of "extension for prevention" is synonymous with "extension for the promotion of periodontal disease" (Dragoo and Williams, 1981).

Inflammatory situations are often created by medical intervention because the area of periodontal insertion is invaded and its health violated. To correct this situation we may use periodontal surgery for prosthetic purposes based on the technique of
clinical crown increase (Figure 1A-D). Other indications for this surgical technique are:
a) damage to crown and root induced by decay or fracture when the dental stump is
submitted to dental or prosthetic procedures; b) root exposure in drilled teeth; c) in
endodontics, to permit clamp retention with absolute isolation of the operating field; d)
in orthodontics, to permit the placement of orthodontic bands or rings; e) after
orthodontic extrusion for the removal of any bone structure that may have accompanied
the additional eruption; f) crown increase for prosthetic purposes in cases of delayed
passive eruption.

Dental restoration without a sufficient amount of supragingival tooth structure
is a common cause of unsuccessful total crowns. The invasion of biological periodontal
space for additional retention will cause iatrogenic periodontal disease with a premature
loss of the restoration (Wagenberg et al., 1989). On the other hand, if the biological space
has already been violated, the biological distance dimension can be recomposed by
making the margins supragingival, thus creating a space for better sculpturing with
adequate functionality and esthetically pleasing results.

Gottlieb and Orban (1933) elaborated the concept of continuous eruption of
the teeth, which they divided into active and passive eruption, the latter being further
divided into 4 stages. In a histometric study, Gargiulo et al. (1961) analyzed the 4 phases
of passive eruption and obtained the following mean distances: gingival sulcus, 0.69 mm;
junctional epithelium, 0.97 mm; the measurements corresponding to insertion of
connective tissue were the most constant ones, with a mean of 1.07 mm. When the above
means are summed, the distance from the gingival margin to the alveolar crest reaches
2.73 mm. This study led to the clarification of the changes that occur in the dental-gingival
region after surgical exposure and healing, and consideration of the data it presented
became obligatory for surgical and prosthetic planning.

The distance from the bone crest to the gingival margin, rounded to 3.00 mm,
represents the biological space of the periodontium. This is a space that the protective
periodontium needs for accommodation and should not be violated (Maynard and
Wilson, 1979). If the restorative margin is positioned within the biological space of the
periodontium, the sulcus area is damaged and a constant inflammation is created and
made worse by the patient’s inability to clean this area (Waerhaug, 1978). This fact was
confirmed by Block (1987) who demonstrated the impossibility of cleaning subgingival
restorations.

Lang et al. (1983) reported quantitative and qualitative changes in the flora
present in subgingival restorations with overhanging margins. These investigators
correlated the changes in microbiota with the potential onset of the inflammatory process
of periodontal disease induced by medical intervention.

Flores-de-Jacoby et al. (1989) demonstrated the effect of crown margin location
on plaque and periodontal health. The authors studied restorations terminating
supragingivally, terminating at the gingival margin level or subgingivally using the gingival
index and plaque index and measuring pocket depth and gingival fluid. One year later,
all indices were higher in restorations with subgingival margins, leading the authors to
Figure 1 - Clinical case with indication of clinical crown increase. A, Vestibular view showing subgingival preparations and marginal inflammation (arrows) after crown removal; B, palatine view of the same case; C, clinical aspect before treatment; D, clinical aspect after treatment.
conclude that, when possible, the restorative margin should be located supragingivally. When the esthetic aspect is a conditioning factor, locating the restoration margin at the gingival margin level or 0.5 mm intrasulcularly may be a safe procedure under ideal conditions of gingival health and plaque control on the part of the patient.

On the basis of the above considerations, we believe that recomposing the dimension of the biological space of the periodontium by periodontal surgery for prosthetic purposes is of fundamental importance in the periodontics-prosthesis relationship. In the present paper, the technique we believe to be most appropriate for this purpose is described and discussed.

Surgical technique

When the objective is to recompose the biological space of the periodontium it is necessary to select the correct technique which, in our opinion, is that using a divided flap positioned apically.

This type of flap maintains the entire muco-gingival complex and conserves the inserted keratinized gingiva, which is an important factor in the prevention of gingival retraction when crowns with subgingival margins are used in periodontal prostheses (Novaes Jr. and Novaes, 1984; Erickson and Lindhe, 1984). This technique does not expose the bone because it maintains the periosteum, a condition which reduces the possibility of postoperative bone resorption (Wilderman, 1964; Matherson, 1988). Another option for obtaining an increase of the clinical crown could be the gingivectomy described by Kronfeld (1935) but the indications for this procedures are limited. For the indication of gingivectomy, a distance of at least 3 mm must exist between the preparation margin and the bone crest and the inserted gingiva should be large enough to permit tissue excision and still result in a margin of the same gingival quality. Usually, these indications are limited to cases of delayed passive eruption.

Another situation in which gingivectomy is indicated is the presence of a periodontal pocket. In such cases, the gingival margin is apparently located in a determined position, but in fact the gingiva, although keratinized, is not inserted. Simple elimination of the pocket by any technique would result in a presumable increase in clinical crown since in these cases the distance between the preparation margin and the bone margin would already be more than the desired 3 mm. Surgery for pocket elimination always results in a more apical position of the gingiva without the need for osteotomy/osteoplasty to reestablish the biological space, but does not represent a real situation of clinical crown increase.

Ingber (1974) described a dental extrusion procedure with orthodontic forces followed by surgery to create an increase in the length of the clinical crown. This type of treatment is indicated for isolated teeth in the anterior region, where the esthetic result is the determining factor. In cases of fracture, tooth decay and subgingival drilling, orthodontic extrusion may be sufficient to expose the lesion to a more coronary position
which is favorable to prosthesis preparation. However, the orthodontic procedure is frequently accompanied by coronary migration of the periodontium together with the extruded tooth. The result is a dislocation of the gingival margin in relation to neighboring teeth which prevents the implantation of an esthetically pleasing prosthesis. The solution is to complement the procedure with pre-prosthetic surgery to increase the clinical crown.

For the reasons discussed above, our surgical technique of choice is a divided flap positioned apically and complemented with osteotomy/osteoplasty, as described below.

Using a Bard Parker no. 15 blade, an incision of parabolic shape is made almost parallel to the dental axis approximately 1 mm from the gingival margin. The area to be operated upon is delimited with parallel relaxing incisions up to the level of the alveolar mucosa. With the aid of a tissue pliers and using a new blade, the flap thickness is dissected from the point where the initial incision meets the relaxing incisions and the flap is lifted, with the periosteum covering the bone left in place. Care should be taken not to dilacerate the periosteum which will play an important role when the wound is sutured. A horizontal incision at the level of the bone crest is then made to remove the gingival collar. When the flap is lifted, the preparation margins and the biological distance area are exposed, with the periosteum covering the bone (Figure 2A, B). The periosteum of the alveolar crest margin is then removed, preparing the site for osteoplasty which provides the 3 mm necessary for the clinical crown increase.

Figure 2 - View of another patient after removal of temporary crowns. A, Invaded biological space (thin arrow), root proximity with a medically induced factor and papilla alteration (thick arrows); B, Periosteum covering the bone (P) and exposure of the biological distance area (arrows) after flap lifting.
Figure 3 - Sequence on a dry skull illustrating the technique. A, Reduced biological space indicating the need for clinical crown increase; B, spherical diamond burr in position for osteoplasty/osteotomy to establish the biological dimension; C and D, reestablished biological space permitting better prosthetic work without invasion of the gingival insertion.
Osteoplasty is then started using a spherical diamond burr, possibly complemented with an Ochsenbein chisel, until a distance of 3 mm is obtained between the preparation margin and the bone crest (Figure 3A-C). The flap is positioned apically coinciding with the bone margin and is fixed at this level using perioseal and lateral sutures. The suture should pass below the perioseum since this is the suture responsible for fixing the flap in the apical position (Figure 4). Surgical cement without eugenol is applied, postoperative instructions are given to the patient and postoperative follow-up is that normally practiced in all periodontal surgeries.

Ross and Gargiulo (1982) added treatment of the alveolar-restoration interface to the technique of clinical crown increase to eliminate factors favoring plaque and calculus accumulation and impairing prosthesis preparation. The main indications for the technique are: irregularities and concavities of the root surface, difference in diameter between crown and root, involvement of the class I furca, and cases of root proximity. This treatment will be described in a future paper.

References


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