Minor Periodontal Surgical Procedures Associated with Orthodontic Treatment

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INTRODUCTION

Aesthetic considerations have influenced the management of dental maladies in varying degrees for many years. Patient awareness and expectations have increased recently to the point that less than optimal aesthetics are no longer an acceptable outcome. On the same plateau; an essential goal of orthodontic treatment is the long-term stability of the result. For this to be achieved the integrity of the dentogingival junction must be respected, and dental restorations and the periodontium must be in harmony. A predictable, successful outcome can only be expected if a complete and accurate diagnosis is obtained and used to generate an appropriate treatment plan and procedure. Another aspect is the orthodontic tooth movement which is the basis of orthodontic treatment and is possible because of the inherent nature of the periodontium. Orthodontic treatment affects the periodontal health on two grounds. On one hand are forces generated to move teeth and on the other, the compromise in oral hygiene.

The forces transmitted to the periodontium by orthodontic appliances quite certainly have a trauma producing effect. Without this trauma producing effect, tooth movement would not be possible. Many advances have been made in understanding the mechanisms involved in the process of tooth

ABSTRACT:

In recent years, advances in techniques and dental materials as well as a growing public interest in developing and maintaining a healthy and attractive smile, has resulted in a greater understanding of the interrelationships between periodontics and orthodontics. A multidisciplinary approach is often necessary to treat and prevent dental problems in patients. Orthodontics and Periodontics are interrelated in a variety of situations. Orthodontic instrumentation may be necessary in certain situations for a successful restoration of periodontal health as well as for satisfactory maintenance of tissue integrity. At par successful orthodontic treatment for many patients will depend on the periodontal preparation before and after treatment and the maintenance of periodontal health throughout all phases of mechanotherapy.

However this article will be mainly concentrating on the minor periodontal surgical procedures which would render optimal orthodontic therapeutic results. This makes an interdisciplinary approach a paramount in achieving a predictable outcome.

Key words: Orthodontics, Periodontics, Corticotomy, Fiberotomy, Frenectomy, Gingivectomy
movement. However there are many pathologic conditions affecting the periodontium that may affect these mechanisms of tooth movement and alter the end result of the orthodontic treatment. Similarly awareness of the pathologic changes or other undesirable changes which can occur in the periodontium as a result of ideal or less than ideal orthodontic procedures would help in better treatment procedure and management of the patients. In addition, since periodontal diseases can secondarily cause malocclusions, very often orthodontic treatment would be an essential adjunct to periodontal therapy. So it’s important for the orthodontist and the periodontist to bear in mind the limitations, advantages and the disadvantages while rendering the treatment to the patient in totality.

To deal with these aspects there are many innovative forms of therapies of periodontal minor surgeries which may be used to improve the orthodontic tooth movement, to stabilize the results and enhance the esthetics.

On a historical perspective; more than 25 years ago Edward described clinical techniques to help prevent rotational relapse re-opening of closed extraction spaces and a simple yet effective technique for frenectomy. At about the same time, a gingivectomy technique to increase the clinical crown length for esthetic improvement of orthodontic results in specific situations was reported. Hence, not to lag behind, this article revolves around the tenet that how minor periodontal surgeries can aid orthodontic treatment in today’s era.

Corticotomy:

These procedures have been used for almost a century to assist tooth movements in orthodontics (Suja 1991).

This surgical procedure involves raising full thickness buccal and lingual flaps and placing vertical osseous grooves extending from just below the interproximal alveolar bone margin to beyond the apices of the teeth and then horizontal grooves to connect the vertical cuts. The orthodontic appliance is then activated immediately post operatively although gingival recession may be a hazard of this procedure.

Periodontally accelerated osteogenic orthodontic procedure (PAOO):

The PAOO protocol derives its origin from Heinrich Kole’s concept of segmental block movement of bone through complete corticotomy. Modern selective alveolar decortication (SAD) and PAOO protocols eliminate morbidity associated with Kole’s “bony block” concepts, without compromising rapid tooth movement. According to Wilcko et al (2001), this rapid movement is not a consequence of bony block movement, but rather due to a transient localized demineralization – remineralisation phenomenon in the bony alveolar housing. Selective decorticating exposes graft material to medullary spaces which helps in osteoblastic activity. Additionally it provides osteopenic conditions in alveolus which potentiates the demineralising effect of orthodontic forces. This demineralization of alveolar housing over the root surfaces leaves the collagenous soft tissue matrix of the bone, which can be carried with root surface and later remineralises upon completion of orthodontic treatment.

Technique: PAOO surgery is performed during the week following bracketing and archwire activation, Facial and lingual selective alveolar decortications is performed utilizing circumscribing corticotomy cuts and intra marrow penetrations. In certain cases the activated bone and exposed root surfaces are covered with the bone grafting material (a combination of DFDBA – Demineralised freeze dried bone allograft and xenograft extender).

Although the PAOO technique requires the utilization of numerous modified diagnostic and treatment parameters, the technique enables to create rapid orthodontic tooth movement and to reduce side effects like root resorption, tooth devitalisation, relapse, inadequate basal bone and bacterial time – load factors like caries and periodontal infection. More significantly, the teeth can be moved two to three times further than it would have been possible with traditional orthodontics alone and so also with an additional advantage of completing cases with an increased alveolar bone volume. This in turn, provides for a more
intact periodontium, a decreased need for extractions, a degree of facial reshaping and increased bony support for teeth and overlying tissues, thereby augmenting gingival and facial esthetics. 7, 8

**Fiberotomy:**

The problem of relapse of orthodontically treated teeth in general and rotated teeth in particular has been recognized for years.

Methods to reduce the occurrence of rotational relapse may include

1) complete correction, or over correction, of rotated teeth
2) stable long term retention with bonded lingual retainer, and
3) fiberotomy.

Two soft tissue periodontal entities may influence the stability: the principle fibers of the periodontal ligament, and the supra-alveolar fibers. Whereas the fibers of the periodontal ligament and the transseptal groups remodel efficiently and histologically completely in only 2-3 months after orthodontic rotation of teeth. The supra-alveolar fibers are apparently more stable with a slower rate of turn over.

Since the gingival soft tissues are composed primarily of nonelastic fibers, the exact mechanism by which the gingival soft tissues may apply a force capable of moving the teeth is yet unknown. From a practical and clinical point of view, however, the supracrestal gingival tissues do contribute to rotational relapse as evidenced by the effect of the circumferential supracrestal fiberotomy (CSF) technique, as first termed by Campbell et al.In 1970, Edwards reported a simple and effective surgical technique to alleviate the influence of the supracrestal fibers presumably have on rotational relapse. 9

**Technique:** It consists of inserting a scalpel into the gingival sulcus and severing the epithelial attachment surrounding the involved teeth. The blade also transects the transeptal fibers interdentally by entering the periodontal ligament space.

Various modifications of the original CSF technique have been described, in which the scalpel is inserted below the gingival margin (Ahrens et al.1970), or the cut is reduced to interdental vertical incisions on the buccal and lingual side. In neither case are surgical dressings indicated, and clinical healing is usually complete within 7-10 days.Rinaldi (1979) stated that the fiberotomy procedure is not recommended during active tooth movement, or in the presence of gingival inflammation when performed in healthy tissues after orthodontic therapy, there is negligible loss of attachment (0.1-0.3). 10, 11 (Fig: 1, 2)

**The papilla split procedure:**

The papilla split procedure of Ahrens et al(1981) has been advocated for use in preventing rotational relapse in cases with minimal attached gingiva. Its effect on the periodontium are minimal. 12

**Frenotomy:**

The maxillary labial frenum is a fold of tissue, usually triangular in shape, extending from the maxillary midline area of the gingiva to the vestibule and midportion of the upper lip. The maxillary labial frenum originates as a postruptive remnant of the tectolabial bands, which are embryologic structures appearing at approximately 3 months in utero and connecting the tubercle of the upper lip to the palatine papilla. The relocation of the attachment in an apical direction is usually accomplished by a normal vertical growth of the alveolar process. The failure of the attached frenal fibers to migrate apically results in a residual band of tissue in-between the maxillary central incisors, which has been implicated as an important cause of persistent midline diastemas. The residual frenal fibers which persist between the maxillary central incisors may also attach to the periosteum and internal connective tissue of the V-shaped intermaxillary suture. In 1939, Hirschfeld first called attention to the marginal attachment of the frenum as an etiologic factor in periodontal disease and recommended its excision. 13

Corn describes in detail the classical frenotomy procedure. He states that a thick frenum resists orthodontic forces and is responsible for relapse of space closure subsequent to orthodontic forces.
Bray (1976), has found a high correlation between the pretreatment existence of “notching” of the interseptal alveolar crest and the relapse of the orthodontically treated maxillary midline diastemas.

In addition to creation of space between the maxillary central incisors, and thus creating an area for food impaction, the frenal tissues have been implicated with poor oral hygiene, due to difficulty in tooth brushing and the resultant inflammatory periodontal destruction. There is a definite paucity of detailed clinical evidence directly correlating the existence of abnormal frenums (frenums which appear abnormally large and/or attached especially close to the gingival margin) and maxillary midline diastemas and consistently cause the relapse movement of orthodontically approximated incisors in a midline diastema situation.

Variant techniques like the “frenotomy” and the “frenectomy” have evolved to eliminate this undesirable relapse phenomenon.

Frenotomy: is a partial removal of the frenum and to relocate the frenal attachment so as to create an increased zone of attached gingiva between the gingival margin and the frenum.

Frenectomy: is the complete removal of the frenum, including its attachment to the underlying bone.

Frenectomies was a commonly performed procedure which was an excisional surgery carried over to the palatal aspect.

Since this procedure includes the complete removal of the frenum, a common complication encountered with this technique is the undesirable loss of interdental papilla. Hence, the frenotomy which is a more superficial procedure, with only partial removal of the frenum and just a relocation of the attachment, is an esthetically preferable procedure lately.(Fig: 3,4,5,6) In frenotomy, the attachment to the gingiva and periosteum is severed and the insertion of the frenum is relocated up to the alveolar mucosa Frenotomy may be indicated in the mandible when a marked frenum attaches within thin gingiva and there is risk of development of labial recession.

Another procedure to eliminate the alleged relapse is the Z plasty technique, which does not remove the frenum but instead is intended to relax the pull of the frenum of the interdental soft tissue.

Gingivectomy:

Robiscek in 1884 and Zentler in 1918 described gingivectomy procedure in detail.

The gingivectomy procedure that is followed today was described by Goldman in 1951. Gingivoplasty: The term refers to surgical recontouring of the gingiva in order to achieve a physiologic contour. Gingival enlargements in orthodontic patients are treated with gingivoplasty.

Although the surgical procedure is similar to that of gingivectomy, the objective is different. The attached gingiva surrounding the teeth is reshaped to provide more esthetic and functional contours in this procedure. Gingivoplasty may be performed with rotary instruments, electrosurgery, laser or surgical blades, knives, scissors and tissue nippers. The final contouring, or gingivoplasty, is used to thin the tissue on the interradicular surfaces and establishes a more fine contour.

Gingivoplasty was also performed by Edwards to eliminate the gingival clefts and invaginations resulting from orthodontic closure of extraction sites which possibly led to the relapse of the therapy.

Gingivectomy: is the complete removal of the soft tissue wall of the pocket.

Although there are other indications for the procedure, from orthodontic point of view gingivectomy can be carried out in presence of persistent gingival swelling where ‘real’ pocketing may be shallow but there is considerable gingival enlargement and deformity. If the inflamed gingival enlargement includes a significant fibrotic component that does not undergo shrinkage after scaling and root planing or are of such size that they obscure deposition on the tooth surfaces and interfere with access to them, then gingivectomy may be the treatment of choice which is likely to produce a satisfactory result in patients undergoing orthodontic therapy.
Procedure: A pocket marker or a periodontal probe is used to outline the base of the pockets with a series of small bleeding points. Once the bleeding points have been established, they form a dotted line that outlines the incision. Incisions may be continuous or discontinuous. Both incisions are begun on the most terminal tooth and continued around until the incision is complete. Incisions can be made with scalpels or gingivectomy knives. The incision begins just apical to the bleeding points the blade is held in such a manner that the incision is as close to the bone as possible for total pocket removal and production of a tissue bevel of 45°. The blade must pass fully through the tissue to the tooth. An orban or Kirkland interproximal knife is used to free the tissue interproximally. Once free, the tissue is removed by using a hoe or heavy scalers. 16

(Fig: 7,8)

Conclusion:

To conclude, periodontal therapy has many benefits to offer the orthodontic patients and is the same vice versa. So successful orthodontic treatment for many patients will depend on the periodontal preparation before treatment and the maintenance of periodontal health throughout all phases of mechanotherapy. With an increasing number of adult patients considering orthodontic treatment, with a propensity for periodontal problems, the variant techniques can be a powerful and attractive option in an orthodontists repertoire. So in all phases of combined orthodontic and periodontal therapy, a close collaboration between orthodontist and periodontist should be established to give an optimal result and spare the patient from dissatisfaction.

Bibliography:
