

Periodontal Procedures adjunct to Orthodontic Treatment

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ABSTRACT

Orthodontists usually face problems with patients suffering from periodontal disease. The need for instituting periodontal treatment is of greater significance in such patients as chronic destructive periodontal diseases cause significant loss of supporting structures of the periodontium. A multidisciplinary approach should involve both orthodontist and periodontist to treat such patients and treatment progress should be evaluated periodically to implement a comprehensive treatment plan. The aim of this article is to highlight the contributing factors and procedures adjunctive to orthodontic treatment.

Key words: orthodontic therapy, ortho-perio interrelation, periodontal disease

INTRODUCTION

The objective of orthodontic therapy is to form a good occlusion relationship, improving the health of the periodontium, and enhance dental and facial esthetics. Periodontal health is an important factor in successful orthodontic tooth movement; this combined with light, consistent and controlled orthodontic force result in the regeneration of bone and allow the teeth to relocate through the alveolar bone. Appropriate forces are maintained to avoid necrosis which leads to undermining resorption. Therefore, it is mandatory to have good periodontal health not only before orthodontic treatment but also during and after orthodontic treatment.¹

Many adults seek orthodontic treatment to correct malocclusion; but a significant percentage of adults also consider orthodontic treatment to prevent occurrence and progression of periodontal disease and they show better compliance which compensate for the slower tissue response. In addition, there is an increased chance of hyalinization in adults as compared to adolescents.^{2,3} All these factors make adult orthodontic treatment more challenging which necessitates for improvised procedures to create a functional dentition in a healthy periodontal environment.

Periodontal procedures in orthodontic patients can be broadly classified as:

1. Periodontal procedures prior to orthodontic treatment
2. Periodontal procedures during orthodontic treatment,
3. Periodontal procedures after orthodontic treatment

Pre-orthodontic periodontal therapy

It is an initial phase of periodontal therapy where periodontal infection is controlled by oral hygiene instruction, professional plaque control and root planing. Initial periodontal debridement is done by non-surgical, subgingival root instrumentation to minimize the inflammation and to repair the tissue which is aimed for gingival health improvement. This stage of periodontal treatment is usually of about 3 month duration.

Pre-orthodontic osseous surgery

Pre-orthodontic osseous surgery depends on the type of defect e.g. osseous crater, hemiseptal defect, three-wall defect, or furcation lesion.⁴

Osseous craters: It is an interproximal, two-wall defect composed of the facial and lingual cortical plates that does not improve with orthodontic treatment. Generally, resective osseous surgery is required which involves reshaping of the defect and reducing the pocket depth that enhances the ability to maintain these areas during orthodontic treatment.^{5,6}

Table 1: Grafts and bone substitutes

Materials of bone origin		Non-bone material	
Vital bone grafts	Non-vital bone grafts	Organic	Inorganic
Autografts	Allografts	- Dentine	- Calcium sulphate
- Bone coagulum	-Lyophilized bone	- Cementum	- Bioceramics
- Bone from post-exodontic alveoli, tubera and edentulous areas	-Demineralised lyophilized bone	- Coral	- Bioactive crystals
- Iliac crest			- Polymethyl and hydroxyethyl methacrylate polymers
Allografts	Xenografts		
- Freeze-dry bone	- Anorganic bovine bone		

Three-wall intra-bony defects: The bony support of the periodontium is lost; which requires bone grafts along with resorbable or non-resorbable membranes in filling of the three-wall defects.⁷ Orthodontic treatment may be initiated if the result of periodontal therapy is stable. Numerous options for bone grafts are available as given in Table 1.⁸

Furcation defects: Furcation involvement is a condition in which bifurcation and trifurcations of multi-rooted teeth are invaded by periodontal disease process. A Nabers probe is used to diagnose tooth furcation involvement (Figure 1). The classification of furcation defects was proposed by Glickman in 1953 (Table 2).⁹ Furcation defects can worsen during orthodontic therapy, hence orthodontists should take care while treating the case and rule out any furcation involvement.^{10,11}

Pre-orthodontic gingival surgery

Gingival recession and root coverage: Alveolar bone dehiscence is a localized defect of the cortical bone which covers the teeth. When the denuded areas extend through the marginal bone, the defect is called as 'dehiscence'.¹² It is a predisposing factor for the development of gingival recession. If the patient shows a minimal zone of attached gingiva or thin tissue, a free

gingival graft is used. It controls the inflammation and should be done before the initiation of orthodontic tooth movement.^{12,13}

Crown lengthening: In some orthodontic cases, where clinical crown height is short; the crown lengthening should be done using 'gingivectomy' prior to orthodontic bonding procedures. In case of patients with shorter clinical crowns in the mandibular arch, apically repositioned flap in combination with gingivectomy can be done for crown lengthening. Apically displaced flap along with gingivectomy increases the width of the attached gingiva providing better results for crown lengthening in case of mandibular teeth.^{14,15,16}



Figure 1: Grade II distal furcation

Table 2: Classification of furcation defects and their management

Furcation Defect	Clinical Presentation	Radiographic Presentation	Treatment
Grade I	Incipient or early lesion, slight bone loss in furcation area.	No radiographic Finding	Scaling and curettage, gingivectomy, bone reshaping, odontoplasty
Grade II	Cul-de-sac lesion, bone destruction, probe penetrates into furcation area.	May or may not show changes	Bone grafts and GTR, Gingivectomy
Grade III	Interradicular bone lost completely, defect covered by gums, not visible clinically.	Radiolucent area seen between the roots	Gingivectomy, apical reposition flap, root resection, hemisection, bicuspidization
Grade IV	Interradicular bone is completely destroyed, gums are receded & tooth furcation is completely visible.	Visible Radiographically	Root resection, hemisection, extraction

Periodontal procedures during/after orthodontic therapy:

Periodontal maintenance therapy: During orthodontic therapy, the patients should take care of oral hygiene and follow instructions on brushing and inter-dental aids strictly e.g. use of orthodontic brush, dental floss etc. The orthodontist should check plaque removal effectiveness and emphasize its importance in between the visits. Periodic periodontal evaluation and check-up should be carried out by the periodontist. After orthodontic therapy, patients must be motivated to maintain good oral hygiene and should maintain regular follow-up.

Fiberotomy: Circumferential supracrestal fiberotomy (CSF) is used to correct the relapse of severely rotated teeth that occurs due to rebound of elastic fibres in the supracrestal tissues. This technique consists of the insertion of a surgical blade into the gingival sulcus and sectioning the epithelial attachment surrounding the involved teeth. The transeptal fibers are transected interdentially by blade. No surgical dressings are needed and clinical healing usually completes by 7-10 days.¹⁷

Frenotomy / Frenectomy: Abnormal frenum attachment results when a v-shaped bony cleft is formed between the two central incisors and a thick frenum resists orthodontic forces and is responsible for the relapse of space closure (Figure 2). The mandibular frenum is associated with a decreased vestibular depth and an inadequate width of the attached gingiva.¹⁸ The area is anaesthetized with local infiltration using 2% lignocaine with 1:80000 adrenaline. The frenum is engaged with a haemostat and inserted into the depth of the vestibule and incisions are placed on the upper surface of the haemostat. The triangular resected portion of the frenum is removed with the haemostat. The edges of the diamond shaped wound are sutured with 4-0 black silk with interrupted sutures. The area is covered with periodontal pack. The pack and the sutures are removed one week post-operatively.¹⁹ Frenectomy is more commonly performed procedure; however the undesirable loss of interdental papilla is a common complication encountered with this procedure. Hence, the frenotomy despite being a superficial procedure, is esthetically preferable.²⁰

Gingivectomy/Gingivoplasty: Gingivoplasty is defined as

surgical recontouring of the gingiva in order to achieve a physiologic contour. It is used to treat gingival enlargements in orthodontic patients. In this procedure, the reshaping of attached gingiva is done to provide more esthetic and functional contours. It involves a pocket marker or a periodontal probe which is used to outline the base of the pocket with small bleeding points; these bleeding points form a dotted line that outlines the incision. The incision begins just apical to the bleeding points and the blade is held in such a manner that the incision is close to the bone for complete removal of pocket. The blade passes through the tissue to the tooth fully; Orban interproximal knife is used to free the interproximal tissue. The tissue is removed by using a hoe or heavy scalers once it is free.²¹

Corticotomy-assisted Orthodontic Treatment (CAOT):

It is defined as a surgical procedure where only the outer cortical bone is cut and the medullary bone is not changed.^{22,23} Full thickness buccal and lingual flaps are raised and vertical osseous grooves are placed which extends from below the interproximal margin to beyond the tooth apices and then horizontal grooves are connected with the vertical cuts (Figure 3).²⁴ The procedure is very effective in Class I malocclusion with crowding, Class II malocclusions which requires expansion or extractions, and mild Class III malocclusions.

Wilckodontics: Wilckodontics is a new sub-branch which provides an increased alveolar bone volume after orthodontic treatment. This is also called the Periodontally-accelerated osteogenic orthodontic procedure that combines alveolar bone corticotomy, bone grafting and orthodontic forces application. It is based on regional acceleratory phenomenon (RAP). It is a bone healing pattern leading to increased width of alveolar bone, short treatment time, increased post-treatment stability, and decreased apical root resorption.²⁵ PAOO technique creates rapid orthodontic tooth movement and reduces side effects like inadequate basal bone, root resorption, tooth devitalisation, periodontal infection and relapse. The teeth can be moved two to three times faster. In certain cases the activated bone and exposed root surfaces are covered with the bone grafting material (a combination of demineralised freeze dried bone allograft, DFDBA and xenograft extender) (Figure 4).^{26,27}



Figure 2: Papillary type of frenal attachment



Figure 3: Corticotomy



Figure 4: Particulate bone graft layered over decorticated alveolar bone

Periodontal maintenance therapy after orthodontic therapy

After completion of orthodontic treatment, it should be made mandatory that the patient should follow periodontal maintenance for at least 6 months. After orthodontic appliance debonding/ debanding; periodontal service shall be required to eliminate periodontal pockets, assist in adequate bone remodelling and narrowing of periodontal space. A radiographic re-evaluation should be carried out by the periodontist to evaluate further periodontal needs.

stable periodontal condition is achieved by the elimination of periodontal pockets in periodontally compromised patients. Inter-disciplinary approach augmented by patient education and good oral hygiene care transform patients with unattractive dentition, irregular teeth and inflamed periodontium into individuals with healthy attractive dentition and radiant smile. Therefore, orthodontic and periodontal considerations should be properly addressed for stable and esthetic outcome.

DISCUSSION

The orthodontic intervention can only be initiated when the periodontal inflammatory process is controlled and



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