

**PERIODONTALLY ACCELERATED OSTEOGENIC ORTHODONTICS****MEENAKSHI PRIYANKA, DR. JAIGANESH**

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*Received: 30 Jul 2013, Revised and Accepted: 21 Aug 2013***ABSTRACT**

Periodontally accelerated osteogenic orthodontics described by Wilcko. Periodontium places the major role in tooth movement during orthodontic was treatment. PAOO is a technique which brings about easy tooth movement in short period of time. This technique involves full thickness flap both labially and lingually, selective alveolar decortication is done and bio-absorbable grafting material is placed over the site of decortication. Orthodontic tooth movement should start after two weeks of surgery. This article reviews on history, principle, techniques, advantages and disadvantages of the PAOO technique.

**Keywords:** Osteogenic orthodontics, Periodontium, Decortication**INTRODUCTION**

The periodontium comprises of gingival, periodontal ligament, cementum and alveolar bone. The alveolar bone is the most mineralized of all and is not an easily malleable tissue. It has its own dynamicity and to regulate its remodeling capacity has always been a challenge on the periodontic as well as orthodontic front. One of the most important reasons why patients are reluctant to wear orthodontic appliance is its longer duration of treatment. The spirit of interdisciplinary collaboration in dentistry has taken traditional orthodontic tooth movement protocols and synthesized periodontal engineering and regenerative surgery, toward a method of rapid tooth movement and also reduces side effects, like root resorption, relapses, inadequate basal bone, bacterial caries and infection.[1]

Accelerated osteogenic orthodontics (AOO) is an amalgamation of two procedures, alveolar decortication and periodontal augmentation, and has been shown to facilitate rapid orthodontic tooth movement.[2] Periodontal accelerated osteogenic orthodontics (PAOO) is a clinical procedure that combines selective alveolar corticotomy, particulate bone grafting, and the application of orthodontic forces. This is theoretically based on the bone healing pattern known as the regional acceleratory phenomenon (RAP). Its results in an increase in alveolar bone width, shorter treatment time, increased post treatment stability, and decreased amount of apical root resorption.

**HISTORY**

DrIlizarov researched the phenomenon and proved that stressing a bone increases metabolic activity and cellular generation, also known in orthopedic science 'bone remodeling, resulting in growth of new bone. The phenomenon was named Distraction Osteogenesis (DO)-growth of new bone by means of surgically 'distracting' the bone. Harold Frost realized that there was a direct correlation between the degree of injuring a bone and the intensity of its healing response.[3] He called this the rapid acceleratory phenomenon(RAP). In RAP there is a temporary burst of localized soft and hard tissue remodeling (i.e. regeneration) which rebuilds the bone back to its normal state.

As early as the 1950s, periodontists began using a corticotomy technique to increase the rate of tooth movement. A corticotomy is the surgical procedure whereby only the cortical bone is cut, perforated, or mechanically altered. In the 1990s, the Dr Wilcko, using computed tomography, discovered that reduced mineralization of the alveolar bone was the reason behind the rapid tooth movement following corticotomies. They used their knowledge of corticotomy and their observations of RAP to develop patented periodontally accelerated osteogenic orthodontics (PAOO) technique in 1995 which is the combination of a selective decortication facilitated orthodontic technique and alveolar augmentation.

**CASE SELECTION**

PAOO can be done on people of any age, as long they have a healthy periodontal situation. According to DrWilcko, the technique has been done on children as young as age 11 and on senior citizens as old as 77. PAOO can be used in most cases in which traditional fixed orthodontic therapy is used. It is efficacious in the treatment of class I malocclusions with moderate to severe crowding, class II malocclusions requiring expansion or extraction.

PAOO cannot be done in patients with dental bone loss, periodontal disease, root damage or poor roots. In addition, if patient have a disease like rheumatoid arthritis which requires regular doses of NSAIDs. PAOO can correct most of the orthodontic problem except class III condition, in which the lower jaw is too long relative to the rest of the face and chin protrudes. Class III cases have many physical constraints which may not lend themselves to AOO treatment.[5]

**PRINCIPLE**

Unlike a usual corticotomy, PAOO does not just cut into the bone, but decorticates it - that is, some of the bone's external surface is removed. The bone then goes through a phase known as osteopenia, where its mineral content is temporarily decreased. The tissue of the alveolar bone release rich deposits of calcium, and new bone begins to mineralize in about 20-55 days. While the alveolar bone is in this transient state, braces can move teeth very quickly, because the bone is softer and there is less resistance to the force of the braces. Research has shown that after the alveolar bone heals and the teeth are in their new desired positions, additional alveolar bone has formed. The DrWilcko and the other researchers have proven that the aftermath of PAOO is as stable and long lasting as conventional orthodontic treatment.[6]

**TECHNIQUE**

The orthodontic therapist determines the plan for the movement, identifying the teeth that will provide anchorage and those portions of the arch that will be expanded or contracted. In some cases the anchorage must be established before the PAOO procedure is initiated. This is most commonly seen in class II malocclusions requiring retractions.

The placement of orthodontic brackets and activation of the arch wires are typically done the week before the surgical aspect of PAOO is performed. If complex mucogingival procedures are combined with the PAOO surgery, the lack of fixed orthodontic appliances may enable easier flap manipulation and suturing. In all cases initiation of orthodontic force should not be delayed more than 2 weeks after surgery. A longer delay will fail to take full advantage of the limited time period that the RAP[4] is occurring.

The orthodontist has a limited amount of time to accomplish accelerated tooth movement. This period is usually 4-6 months, after

which finishing movements occur with a normal speed. Given this limited "window" of rapid movement, the orthodontist will need to advance arch wires sizes rapidly, initially engaging the largest arch wire possible.

#### FLAP DESIGN

Basic flap design is a combination of a full thickness flap in the most coronal portion and split thickness in the apical portions. Split thickness dissection is done to provide mobility of the flap thereby it can be sutured with less tension. Periosteal layer is removed to provide access to the alveolar bone and helps to identify underlying neurovascular structures. Mesial and distal extension can be done to reduce the need for vertical releasing incisions. Interdental papilla should be preserved to obtain better esthetics. So in case of anterior teeth 'tunneling' can be done from the distal aspect.

#### DECORTICATION

The purpose of decortication is to initiate RAP response. No 1 or No 2 round bur and piezoelectric knife can be used. Between the root prominences vertical groove is placed which extends 2 to 3 mm below the crest of the bone. Then vertical corticotomies are connected with the circular shaped corticotomy. Care should be taken to avoid damage to the underlying neurovascular structures.

##### 1. Full thickness flap reflected on buccal aspect



##### 2. Full thickness flap reflected on palatal aspect



#### GRAFTING

Grafting is done in the areas that have undergone corticotomies. Volume of the graft material depends on direction and amount of tooth movement, pretreatment thickness of alveolar bone, and need for alveolar support. Most commonly used materials are deproteinized bovine bone, autogenous bone, decalcified freeze dried bone allograft. Use of platelet-rich plasma or calcium sulfate increases the stability of the graft material. Flaps are closed with nonresorbable interrupted sutures and left in its place for 1-2 weeks. No packing is required. See figure 3, 4.

##### 3. Bone graft material placed over the decorticated areas



##### 4. Bone graft material placed over the decorticated areas



#### ADVANTAGES

1. Enhanced scope malocclusion treatment ( i.e., an increase in the limits of tooth movement and a decreased need for extractions)
2. Decreased treatment times (increased rate of tooth movement)
3. Increased alveolar volume and a more structurally complete periodontium (correction of preexisting fenestrations and dehiscence)
4. Alveolar reshaping, enhances patient's profile
5. Simultaneous recovery of shallow unerupted teeth
6. In certain situations, the additional alveolar bone can also provide improved lip posture
7. Less likelihood of root resorption.
8. History of relapse has been very low
9. There is less need for appliances and head gear
10. Both metal and ceramic brackets can be used

#### DISADVANTAGES

1. Expensive procedure
2. Mildly invasive procedure and like all surgeries it has risk of some pain, swelling, and the possibility of infection.
3. Patients who take NSAIDs on a regular basis or have other chronic health problems will not be treated with this technique.

#### CONCLUSION

PAOO facilitates the orthodontist to get the treatment done with decreased treatment time. ie in traditional orthodontic treatment it takes about 1.5- 2 years whereas by doing PAOO, movement of tooth is obtained within 6-8 months. It enhances the esthetics and post-treatment orthodontic stability. It increases the access of the patient towards orthodontic therapy. The major disadvantage of AOO is, it is very expensive. The success of this treatment depends on the coordination of the orthodontist, periodontist, and oral & maxillofacial surgeon.

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