

# Wilcodontics or Periodontally Accelerated Osteogenic Orthodontics: A Review

## Abstract

An increasing number of adult patients have been seeking orthodontic treatment, and a short treatment time has been a recurring request. To meet their expectations, a number of surgical techniques have been developed to accelerate orthodontic tooth movement. The PAOO (Periodontally Accelerated Osteogenic Orthodontics) or Wilckodontics, technique synergizes selective decortication facilitated orthodontics with periodontal regeneration and alveolar augmentation in order to create rapid orthodontic tooth movement (OTM). Therefore by combining periodontal surgical care together with PAOO plus Orthodontic treatment, patients are more willing to accept comprehensive dental care, since the time required for comprehensive orthodontic therapy can be reduced by 60-75%.

## Key Words

Periodontal regeneration; regional acceleratory phenomena; accelerated osteogenic orthodontics

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## INTRODUCTION

Orthodontic tooth movement (OTM) is a biologic event that involves a series of signal transduction processes that result in alveolar bone remodelling. Interplay of the gene expression activities between osteoblasts and osteoclasts regulate the alveolar bone adaptation to orthodontic forces.<sup>[1]</sup> But over the last two decades, the refinements of an attempt to engineer an “optimal response” of alveolar bone to applied “optimal force” has propelled both the periodontal and the orthodontic specialties directly into the field of surgical dentofacial orthopaedics which not only leads to rapid orthodontic tooth movement, but also provide every young clinician with a protocol that also reduces side effects like root resorption, relapse, inadequate basal bone, and bacterial time/load factors, that is, caries and

infection.<sup>[2]</sup> Surgically assisted orthodontic tooth movement has been used since the 1800s. Corticotomy-facilitated tooth movement was first described by LC Bryan in 1893.<sup>[3]</sup> Further in 1959 Heinrich Kole,<sup>[4-6]</sup> believed that the main resistance to tooth movement was the cortical plates of bone and by disrupting its continuity, orthodontics could be completed in much less time than normally expected. The procedure involves the reflection of full thickness flaps to expose buccal and lingual alveolar bone, followed by interdental cuts through the cortical bone and barely penetrating the medullary bone and since the blocks of bone are moved rather than the individual teeth, the root resorption did not occur and retention time is minimized but because of the invasive nature of Kole’s technique, it was not widely accepted.



Fig. 1: Full thickness flap is reflected on buccal aspect beyond the apices of the teeth



Fig. 2: Vertical corticotomy cuts made between the roots stopping just short of alveolar crest



Fig. 3: Particulate autogenous bone graft laid down on maxilla after selected corticotomy



Fig. 4: Buccal alveolar ridge of maxilla 1 year after selected corticotomy



Fig. 4: Final centric occlusion 1 year after selected corticotomy

Suya (1991)<sup>[7]</sup> reported corticotomy-assisted orthodontic treatment. Suya's technique differed from Kole's with the substitution of a subapical horizontal corticotomy cuts in place of the horizontal osteotomy cut beyond the apices of the teeth.<sup>[8]</sup> His technique was less painful, producing less root resorption, and exhibiting less relapse and believed that the tooth movements were made by moving blocks of bone using the crowns of the teeth as handles thereby completing tooth movement in 3-4 months after which the edges of the blocks of bone would begin to fuse together.<sup>[7]</sup> More recent surgical orthodontic therapy was introduced by Wilcko *et al.*,<sup>[9-12]</sup> which included the innovative strategy of combining corticotomy surgery with surgery initiates and potentiates normal healing process (Regional Acceleratory Phenomena-RAP). RAP accelerates the normal regional healing processes by transient bursts of hard- and soft-tissue

alveolar grafting in a technique referred to as Accelerated Osteogenic Orthodontics (AOO) and more recently to as Periodontally Accelerated Osteogenic Orthodontics (PAOO). Unlike a usual corticotomy, AOO doesn't 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 tissues of the alveolar bone release rich deposits of calcium, and new bone begins to mineralize in about 20 to 55 days. Therefore while the 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. Corticotomy remodelling.<sup>3</sup> Therefore two main features of RAP in bone healing include decreased regional bone density and accelerated bone turnover, which are believed to facilitate orthodontic tooth

movement.<sup>[13,14]</sup> A high osteoclastic activity is observed in the compression side although is also observed in the tension side to a less degree. Histological analysis indicates that at 21st day the remodelling tissues are replaced by a fibrous tissue and later (60 days) by bone. Furthermore, the tissues immediately adjacent to the corticotomy are characterized by an increased width of the periodontal ligament, less calcified spongiosa bone surface and higher counts of osteoclasts. But not only the catabolic activity is increased but also the anabolic activity is increased 3-fold as well. This balances the rate of bone resorption and bone apposition.<sup>[15]</sup> Therefore RAP usually lasts for 4 months in bone and may take 6 to more than 24 months to subside. These procedures are opening “window” for rapid tooth movement and these being futuristic techniques that have created an interest to evaluate the surgically facilitated orthodontic technique.

## METHODOLOGY

### Criteria

#### Inclusion Criteria<sup>[15]</sup>

1. Voluntary participation
2. Legally adult age (>18 years old)
3. Full permanent dentition
4. Patients with high density of bone will be selected
5. Severe anterior teeth crowding
6. Thick periodontal biotype

#### Exclusion Criteria<sup>[15]</sup>

1. Systemic diseases (i.e. diabetes, HIV)
2. Cigarette smoking
3. Under medications: bisphosphonates, anti-epileptic drugs, contraceptives, corticosteroids, estrogen, antihistamine drugs, calcitonin, vitamin D
4. Previous orthodontic treatment
5. Periodontal disease
6. Severe gingival recessions
7. Pregnancy
8. Previous root resorption

### Technique

PAOO surgery is performed during the week following bracketing and archwire activation. After administration of local anesthesia, crevicular incisions are made buccally and lingually extending at least two to three teeth beyond the area to be treated. Full thickness (mucoperiosteal) flap are reflected on both buccal and lingual aspects beyond the apices of the teeth if possible (Fig 1). Any interdental papillary tissue remaining

interproximally should be left in place. After flap reflection, selective decortications can be performed on both buccal and lingual sides. Vertical corticotomy cuts are made between the roots using a diamond round bur (size 2) stopping just short of the alveolar crest (about 3 mm) (Fig. 2). These cuts are connected beyond the apices of the teeth with scalloped horizontal cuts. Cortical perforation can be made at selective areas to increase blood supply to the graft material.<sup>[8]</sup> In certain cases the activated bone and exposed root surfaces are covered with the bone grafting material (mix of Autograft + Allograft, Allograft + Xenograft, or Xenograft + Alloplast] (Fig. 3). Wilcko *et al.*,<sup>[9-12]</sup> recommended the use of mix of demineralized freeze-dried bone and bovine bone with clindamycin. If there is any recession in the teeth, it can be treated at the same time with connective tissue graft or acellular dermal matrix allograft. The mucoperiosteal flap is then sutured with interrupted 4-0 suture being careful to preserve the interdental papillae. The patients are instructed to take amoxicillin, 500 mg t.i.d. for 10 days and chlorhexidine mouth rinse 0.12% b.i.d. for 2 weeks. The sutures are removed after two weeks (Fig. 4 & Fig. 5).<sup>[8]</sup>

### Indications<sup>[16]</sup>

1. Dehiscences and fenestrations over prominent root surfaces.
2. Anterior open bites and deviated midlines.
3. Cross bites and tooth size-arch length discrepancies
4. Conservative alternative to traditional orthognathic surgery.
5. Bucco-lingual width of alveolar ridge is less and extraction is contra-indicated due to facial profile.

### Advantages<sup>[16]</sup>

1. Shortened treatment time (3-4 times).
2. Decreased chance of root resorption following orthodontics.
3. Increased Alveolar bone providing better support to teeth and facial profile
4. Less likelihood for relapse.
5. Since teeth are moving through a softened bone, there is less discomfort associated with teeth movement compared to traditional orthodontics.

### Disadvantages<sup>[16]</sup>

1. More expensive than conventional braces
2. Mild invasive surgery
3. Some swelling and tenderness immediately after surgery

## CONCLUSION

The spirit of interdisciplinary collaboration in orthodontics has expanded the realm of traditional orthodontic tooth movement (OTM) protocols. Successful orthodontic treatment depends on the periodontal preparation before treatment and the maintenance of periodontal health throughout all phases of mechanotherapy. From an aesthetic perspective the PAOO technique not only addresses tooth alignment, but also facial features therefore PAOO technique can be an especially attractive treatment option and be a “win-win” situation for both the orthodontist and the patient.

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