



# Periodontally assisted osteogenic orthodontics: A review

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## **Abstract**

The periodontally accelerated osteogenic orthodontic (PAOO) technique combines selective decortication facilitated orthodontics with periodontal regeneration in order to create rapid orthodontic tooth movement (OTM). This reduces potential side effects like root resorption, tooth devitalization, relapse, inadequate basal bone and bacterial time-load factors like caries and periodontal infection. Tooth movement can be achieved with increased alveolar volume providing for a more intact periodontium, decreased need for extractions, degree of facial remodelling and increased bone support for teeth and overlying soft tissues, thus, augmenting gingival and facial esthetics. With an increasing number of adults considering orthodontic treatment, with a propensity for periodontal problems, PAOO technique can be a powerful and attractive treatment option in dental treatment.

## **Key words**

PAOO, Orthodontics, Periodontal regeneration, Corticotomy.

## **Introduction**

Ideal esthetic, restorative and reconstructive dental treatments are facilitated by favorably positioned teeth and an enhanced muco-gingival complex. Patients requiring comprehensive dental rehabilitation, correction of malocclusion or mutilated occlusion, frequently require orthodontic treatment in order to obtain a predictable, esthetic and functional treatment outcome. Of these patients, few of them may

also present with moderate to advanced periodontitis with gingival recession, requiring the need for periodontal plastic treatment. However, these patients have to undergo orthodontic treatment for 2-3 years which is an obstacle in undergoing ideal rehabilitative dental care. By combining Periodontally Accelerated Osteogenic Orthodontics (PAOO) with orthodontic treatment the time required for comprehensive orthodontic therapy is

reduced by 60-75%. This emerging technology is called Wilckodontics or PAOO.

### Historical background

Corticotomy facilitated orthodontics have been employed in various forms over the past to speed up orthodontic treatment. Kole in 1959 was the first to introduce this as a means for rapid tooth movement [1, 2, 3]. The cortical plates of bone were believed to cause main resistance to tooth movement and by disrupting its continuity, orthodontics could be completed in much less time than normally expected. Kole's procedure included the reflection of full thickness flaps to expose buccal and lingual alveolar bone, followed by interdental cuts through the cortical bone, barely penetrating the medullary bone. These vertical interdental cuts were joined by subapical horizontal cuts which followed osteotomy style, penetrating the full thickness of the alveolus. According to him, as the blocks of bone was being moved rather than the individual teeth, the root resorption would not occur and retention time would be minimized. But, because of the invasive nature of this technique, it was never accepted.

Duker in 1975 [4] using Kole's basic technique investigated the effect of rapid tooth movement using corticotomy technique on the vitality of the teeth and the marginal periodontium. He concluded that the health of the periodontium was preserved by avoiding the marginal crest bone during corticotomy cuts. Also, neither the pulp nor the periodontium were damaged after corticotomy surgery followed by orthodontic tooth movement. The subsequent techniques took this into consideration and the interdental cuts were always left at least 2 mm short of the alveolar crestal bone level.

Suya in 1991 [5] reported corticotomy-assisted orthodontic treatment of 395 adult Japanese patients. Here, he substituting the horizontal

osteotomy cut with a sub apical horizontal corticotomy cuts beyond the apices of the teeth, followed by fixed orthodontic appliances. The cases were completed in between 6 months and twelve 12 months' time. Outstanding results and extreme patient satisfaction with corticotomy procedures were reported. He believed that the tooth movements were made by moving blocks of bone using the crowns of the teeth as handles. He recommended completion of tooth movement in 3–4 months, as the edges of the blocks of bone would begin to fuse together after this time.

Wilcko, et al. [6, 7, 8, 9] recently introduced a more surgical orthodontic therapy which included the innovative strategy of combining corticotomy surgery with alveolar grafting in a technique referred to as Accelerated Osteogenic Orthodontics (AOO) and more recently to as Periodontally Accelerated Osteogenic Orthodontics (PAOO) [8]. The technique uses a comprehensive fixed orthodontic appliance in conjunction with full thickness flaps and labial and lingual corticotomies around teeth to be moved. Teeth movement was initiated two weeks after the surgery, thereafter every two weeks the orthodontic appliance was activated. Wilcko, et al. [8] also reported that this technique reduces treatment time to one-third the time of conventional orthodontics. They indicated the use of PAOO for treatment of moderate to severely crowded Class I and Class II. Several reports indicated that this technique is safe, effective, and extremely predictable, associated with less root resorption and reduced treatment time, and can reduce the need for orthognathic surgery in certain situations. [5, 6, 7, 8, 9, 10, 11, 12, 13, 14]

Lee, et al. [14] conducted a study on 65 Korean adult female patients with bimaxillary dento-alveolar protrusion in order to compare orthodontic treatment outcomes using anterior

segmental osteotomy and corticotomy-assisted orthodontic treatment. It was concluded that orthodontic treatment and corticotomy-assisted orthodontic treatment are indicated for patients with severe incisor proclination with normal basal bone position, with corticotomy-assisted orthodontic treatment having the advantage of shorter treatment duration. Anterior segmental osteotomy is recommended for bimaxillary dento-alveolar protrusion patients with gummy smile, basal bone prognathism, relatively normal incisor inclination, and relatively under developed chin position.

### Rationale of PAOO

Unlike a usual corticotomy, PAOO cuts into the bone and decorticates it, thereby removing some of the bone's external surface. The bone then goes through a phase of osteopenia, where its mineral content is temporarily reduced. Now, the tissues of the alveolar bone release rich deposits of calcium, and soon, new bone begins to mineralize in about 20 to 55 days. As the bone is still in a transient state with the bone being softer and less resistance to forces, braces can move the teeth very quickly. Studies have shown that the results of PAOO are as stable and long-lasting as conventional orthodontic braces [6, 7, 8, 9].

### Indications

- Dehiscence and fenestrations over prominent root surfaces
- Anterior open bites and deviated midlines.
- Cross bites and tooth size-arch length discrepancies:
- Conservative alternative to orthognathic surgery:
- Where buccolingual width of alveolar ridge is less and extraction is contraindicated due to facial profile.
- Moderate to severe malocclusions in both adolescents and adults [6, 7].

### Advantages

- PAOO allows 3-4 times faster orthodontic movements compared to conventional treatment. This results in better patient compliance and also, less of bacterial induced periodontal damage.
- It causes 2-3 fold increase in envelope of tooth movement providing for an expanded alveolar bone base and increased alveolar volume to support the straightened teeth. Hence, it ensures greater stability and less chances of relapse.
- There are lesser chances of occurrence of root fenestration and dehiscence owing to increased alveolar volume.
- PAOO causes reduced complications like devitalization and root resorption [6, 7, 8, 9].

### Disadvantages

Compared to conventional procedures, PAOO is quite expensive. Also it is an invasive procedure; there are quite a few risks. It takes usually a week or two for recovery after surgery during which the patient would have to skip work or school [6].

### Conclusion

PAOO has expanded the realm of traditional orthodontic tooth movement (OTM) protocols. The spirit of interdisciplinary collaboration in orthodontics incorporates periodontal tissue engineering and regenerative surgery to expedite orthodontic tooth movement with reduced side-effects like root resorption, tooth devitalization, relapse, inadequate basal bone and bacterial time load factors like caries and infection. This technique can be a "WIN-WIN situation" with an increasing number of adults considering orthodontic treatment.

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