



## Research Article

### WILCKODONTICS- A NOVEL PROCEDURE FOR RAPID ORTHODONTICS!

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#### ARTICLE INFO

##### Article History:

Received 17<sup>th</sup> October, 2016  
Received in revised form  
20<sup>th</sup> November, 2016  
Accepted 24<sup>th</sup> December, 2016  
Published online January, 30<sup>th</sup> 2017

#### ABSTRACT

Recently, there has been a rise in the number of adult patients looking for orthodontic treatment with requirements regarding the duration of treatment and esthetics. Periodontal accelerated osteogenic orthodontics (PAOO) or Wilckodontics is a clinical procedure that combines selective alveolar corticotomy, particulate bone grafting, and the application of orthodontic forces. This procedure is theoretically based on the bone healing pattern known as the regional acceleratory phenomenon (RAP). PAOO results in an increase in alveolar bone width, shorter treatment time, increased post treatment stability, and decreased amount of apical root resorption

#### Keywords:

Wickodontics,  
Alveolar Bone,  
Regional Acceleratory Phenomenon,  
Corticotomy.

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## INTRODUCTION

The periodontium consists of the investing and supporting tissues of the tooth (gingiva, periodontal ligament, cementum and alveolar bone) (Carranza's clinical periodontology-9th ed). The alveolar wall is surrounded by the supporting bone with which it forms an anatomical unit. The supporting bone includes the buccal and oral cortical plates and the septa. After the eruption period, the relationship between the teeth and their supporting structures remains dynamic, as the former migrate spontaneously within the alveolar process. This implies adaptation mechanisms preserving the anchorage to bone and the integrity of the periodontal ligament, which is a source of progenitor cells renewing the tissues (Jean-Louis Saffar, 1997). An increasing number of adult patients are seeking orthodontic treatment (Mathews, 1997). These patients have different requirements regarding duration of treatment, concerns regarding facial and dental aesthetics, and types of appliance that can be used. Growth is an almost insignificant factor in adults compared to children, and there is increasing chance that hyalinization will occur during treatment.

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Also, cell mobilization and conversion of collagen fibers is much slower in adults than in children. Finally, adult patients are more prone to periodontal complications since their teeth are confined in non-flexible alveolar bone (Ong, 2002). The introduction of *corticotomy-assisted orthodontic treatment* (CAOT) opened doors and offered solutions to many limitations in the orthodontic treatment of adults. The new technique described here provides an increased *net alveolar volume* after orthodontic treatment. This is called the *periodontally accelerated osteogenic orthodontics* (PAOO) technique. It is a combination of a selective decortications facilitated orthodontic technique and alveolar augmentation (Wilcko, 2001). This procedure has several advantages such as reduced treatment time, enhanced expansion, differential tooth movement, increased traction of impacted teeth and an increased post orthodontic stability. With the help of this technique teeth can be moved 2 to 3 times further in 1/3rd to 1/4th the time required for traditional orthodontic therapy (5).

#### Principle of PAOO

One of the main disadvantages of conventional orthodontic treatment is time, requiring more than 1 year for completion. There are three options to shorten the time of treatment: (i) local administration of chemical substances, (ii) physical stimulation (*i.e.*, electrical current or magnets), and (iii) surgery

(i.e., alveolar corticotomy, compression, or distraction). This technique of Wilckodontics involves the removal of a portion of cortical bone just enough to initiate a local response known as the Regional acceleratory phenomenon (RAP) and should not create movable alveolar segments. Orthopedist Harold Frost recognized that surgical wounding of osseous hard tissue results in striking reorganizing activity adjacent to the site of injury in the surgical procedure. He collectively termed this cascade of physiologic healing events the Regional Acceleratory Phenomenon (RAP) (Frost, 1989; Frost, 1989). Following surgical wounding of cortical bone, RAP potentiates tissue reorganization and healing by way of a transient burst of localized hard and soft tissue remodelling (Shih, 1985). This is an intensified bone response (increased osteoclastic and osteoblastic activity, and increased levels of local and systemic inflammation markers) in areas around cuts that extend to the marrow. The duration of RAP depends on the type of tissue, and usually lasts about 4 months in human bone. This phenomenon causes bone healing to occur 10–50 times faster than normal bone turnover (Schilling, 1998). Surgical injury causes transient osteopenia in alveolar bone (i.e., a temporal and reversible decrease in bone mineral density) (Oliveira *et al.*, 2010). This reduces the biomechanical resistance and enables rapid tooth movement through trabecular bone. This phase of transient osteopenia can be prolonged with loading orthodontic application. This is why it is essential to adjust the orthodontic appliance every 2 weeks (Dibart *et al.*, 2009).

### Procedure

The surgical technique for PAOO consists of 5 steps viz. raising of flap, decortication, particulate grafting, closure and orthodontic force application. A proper flap design is essential for the success of any surgical procedure. In PAOO, the flap should provide proper access to the alveolar bone wherein corticotomies are to be performed. Decortication refers to the removal of the cortical portion of the alveolar bone. However, it should be just enough to initiate the RAP response and should not create movable bone segments. Vertical cortical scaring incisions are performed interproximally, extending well beyond the dental apices. A sub apical horizontal osteotomy is done at 10 mm supra apical to the anterior teeth penetrating the buccal and lingual cortical plates and in the post medullary bone. This connects vertical incisions to facilitate what is characterised as “Bony Block concept” that results in a shorter treatment time (6-12 weeks). It is generally accepted that heavier forces must be applied in cases of “bone block” movement after corticotomy to move the tooth–bone block. Bone block movement after osteotomy creates a dynamic microenvironment similar to distraction osteogenesis, but does not show regional demineralization in medullary bone (Anholm *et al.*, 1986).

### DISCUSSION

The procedure of Wilckodontics is advantageous than the conventional orthodontic treatment as it takes lesser time to achieve the results. There is less evidence of root resorption and history of relapse. The dependency on orthodontic appliances such as headgear is also reduced (depending on the case). It has been claimed that orthodontic treatment progresses faster and the results are more stable after corticotomy with minimal risk of complications (Keole, 1959).

Corticotomy with subsequent bone augmentation has been proposed to increase the volume of the alveolar process, to facilitate arch development, to prevent or even treat fenestrations, and to maximize the metabolic response during orthodontic treatment (Wilcko, 2001). Corticotomy-facilitated orthodontics has been indicated for nonextraction treatment of crowding, shortening treatment duration, borderline orthognathic surgery patients, extrusion of ankylosed teeth, intrusion of posterior teeth to close anterior open bites, faster canine retraction in extraction patients, and impacted canines (Eelke, 2014). Contraindications include patients with severe active periodontal disease, inadequately treated endodontic problems, patients on long term medications which will slow down bone metabolism, such as bisphosphonate and NSAIDs and patients on long term steroid therapy due to presence of devitalized areas of bone and patients with inadequate width of attached gingiva (Pan Chern Hwei, 2014). The effects of Alveolar corticotomies on the acceleration of tooth movement were documented in rats, dogs, cats and humans based on split mouth study designs. The outcome of these experiments show that the rate of tooth movement is doubled on the corticotomy treated site (about 1mm/month) (Sirisha, 2014). Generson *et al* described rapid orthodontic treatment for open bite malocclusion in 1978 using alveolar decortication without subapical osteotomy [Generson *et al.*, 1978]. This modified surgical procedure was reported in 1991 and was referred to as corticotomy facilitated orthodontics [Suya, 1991]. In 1991, Suya reported surgical orthodontic treatment of 395 adult Japanese patients with an improved surgical procedure that he referred to as corticotomy facilitated orthodontics. Suya’s surgical technique differed from Kole’s with the substitution of supraapical corticotomy cut in place of horizontal osteotomy cut beyond the apices of the teeth. Suya contrasted this technique with conventional orthodontics. This technique was found to be less painful, producing less root resorption and relapse. He recommended completing the major active tooth movements in 3-4 months (Suya, 1991). In 1986, Anholm *et al* reported treatment of severe malocclusion using corticotomy facilitated orthodontics (Anholm *et al.*, 1986).

Kanno *et al* described a corticotomy procedure used to treat a case of severe open bite, moving the upper posterior bone–tooth segments 7 mm in a superior position. They used anchor plates and elastics three weeks after surgical intervention in two stages. Satisfactory results were obtained after 6 months of orthodontic treatment (Kanno *et al.*, 2007). Dibart *et al* described a tunnel approach with piezoelectric bone cuts. Several vertical incisions are distributed on the attached gingiva through piezo-electric vertical corticotomies. The tunneling approach allows placement of the bone graft. A case of mild crowding was solved within 17 weeks of active treatment with this approach (Dibart *et al.*, 2009).

Studies (Sanjideh *et al.*, 2010) comparing the rate of tooth movement showed that the tooth movement peaked at 22-25 days and then decelerated. During this three week period, corticotomy facilitated side moved twice than the control side. Similar results were obtained in a study (Aboul-Ela *et al.*, 2011) conducted in adults to retract maxillary canines following premolar extractions. Based on the outcome of these studies the length of RAP was probably four months, after which the rate of tooth movement returns to normal.

Studies have shown that corticotomy shortens the treatment time. However, one cannot measure treatment time without measuring treatment quality. The American Board of orthodontics has developed a detailed grading system to assess the quality of orthodontic treatment (Casko *et al.*, 1998). Yet to date there are no RCT's focusing on this aspect of corticotomy. In support of Wilco's concept, published data (Wilco *et al.*, 2009) claims that bone grafting enhances the stability of orthodontic treatment results. Some cases report a greater volume of bone in Computed tomographic Scans. However is the new bone incorporated into native cortical –plate, or is it fibrous material encapsulated on the outside of the cortical plate was evaluated. The scans suggest that it is a fibrous encapsulation (Wilco *et al.*, 2009). Moreover a distinct disadvantage of this procedure is the additional cost, invasive nature and morbidity associated with the surgery (Murphy *et al.*, 2009).

### Conclusion

The procedure of Wilcodontics has made adult orthodontics a reality. The treatment can be accomplished within a shorter period of time which is attributable to the Regional Acceleratory Phenomenon (RAP). The use of this procedure avoids secondary effects of conventional orthodontic treatment such as root resorption or periodontal dehiscence. This technique also shows increased alveolar thickness due to the inclusion of bone grafts, better post orthodontic stability and less incidence of root resorption when compared to conventional orthodontic treatment. As Wilcodontics is a relatively newer procedure long term follow up studies with increased sample size are required to further authenticate this procedure into surgical orthodontics.

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