



RESEARCH ARTICLE

Wilckodontics- A novel procedure for rapid treatment! two case reports

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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 aesthetics. 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). Two case reports display a technique that reduces the treatment time and also reshape the alveolar housing simultaneously. An 18-year-old female patient and a 20-year-old female patient reported in the clinic with the chief complaint of forwardly placed upper front teeth. The surgery included buccal full thickness flap, decortication of cortical plates, concomitant bone grafting and primary flap closure. After this procedure, orthodontic adjustments were done every 2 weeks. Both the cases were approximately completed in 6-7 months with satisfactory results in a short period of time.

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INTRODUCTION

The periodontium is comprised of gingiva, periodontal ligament, cementum and alveolar bone that support and surround the teeth (Michael and Newman). An anatomical unit is formed by the alveolar wall and the supporting bone surrounding it that comprises of cortical plates and septa. The supporting bone includes the buccal and oral cortical plates and the septa. Even after the teeth completely erupt in the oral cavity, they migrate unexpectedly within the alveolar process. This occurs due to the function of adaptation of the periodontal ligament that also provides stem cells for tissue renewal (JEAN-LOUIS SAFFAR, 2000). The number of patients requiring orthodontic treatment has been on the rise (Mathews, 1997). They are demanding on shorter treatment time, aesthetics and the type of appliance that will be used. Periodontal complications tend to occur more frequently in adults due to the non flexible nature of alveolar bone (Ong, 2002). The *corticotomy-assisted orthodontic treatment* (CAOT) or *periodontally accelerated osteogenic orthodontics* (PAOO) is a new procedure that solves some of the problems associated with adult orthodontic treatment. It is a combination of a selective decortications facilitated orthodontic technique and alveolar augmentation (Wilcko, 2001).

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Principle of PAOO

One of the major drawbacks of conventional orthodontic treatment is time, requiring more than 1 year for completion. A clinician can resort to one of the following treatment modalities for reducing the duration 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 acknowledged that surgical wounding of alveolar bone results in remarkable reorganizing activity adjoining the site of injury in the surgical procedure. These surge of events involved in healing were termed as the Regional Acceleratory Phenomenon (RAP) (Frost, 1989 and 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 temporary osteopenia in alveolar bone (i.e., a temporal and reversible diminish in bone mineral density) (10). This reduces the biomechanical resistance and enables rapid tooth movement through trabecular bone. This phase of transient osteopenia can be lengthened with loading orthodontic application. This is why it is indispensable to adjust the orthodontic appliance every 2 weeks (Dibart, 2009).

Case Reports

Case 1: An 18-year-old female patient (Fig 1) presented with forwardly placed upper front teeth.

On extra-oral examination, the patient had an apparently symmetrical mesoprosopic face form and potentially competent lips with a resting lip separation of 5mm. The upper and lower lips were protrusive. On profile examination patient had a convex facial profile. The smile of the patient was symmetrical and consonant with excessive maxillary incisor display. The estimated length of treatment using conventional orthodontics was 1.5 to 2 years. The patient was esthetically conscious and was not receptive to undergo orthodontic treatment for 2 years. When the patient was explained the new treatment option which would include selective decortication and use of bone grafting material with reduction in the duration of orthodontic



Fig. 1a. Pre-treatment view of the patient (Case 1)



Fig. 1b. Occlusal view

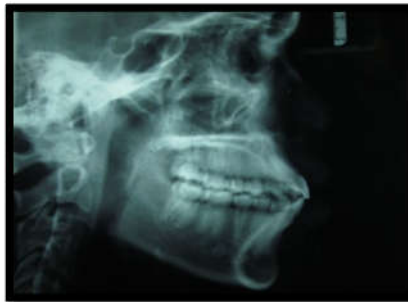


Fig. 1c. Lateral Cephalogram



Fig. 1d. Cast model (Lateral view)



Fig. 1e. Alignment and leveling



Fig. 1f. Pre-operative evaluation of gingiva



Fig. 1g. Reflection of full thickness flap



Fig. 1h. Vertical corticotomies with Carbide bur



Fig. 1i. Particulate bone grafting using DFDBA bone graft



Fig. 1j. Interrupted sutures



Fig. 1k. 1 week postoperative view



Fig. 1l. 2 weeks postoperative view



Fig. 1m. 2 months postoperative view



Fig. 1n. 6 months postoperative view

treatment to a period $\frac{1}{4}$ to $\frac{1}{3}$ of the time needed for conventional orthodontic treatment, she readily accepted the treatment method. There was sufficient amount of attached gingiva on the facial surfaces of maxilla and mandible. However, due to the prominence of the roots there was a reduced amount of alveolar housing facially. The orthodontic treatment plan included maxillary and mandibular braces and anchorage preparation for preventing the upper and lower molars from drifting forward and maintaining their position following tooth movement. The intervals for the orthodontic adjustments averaged 2 weeks, ranging from 1 to 3 weeks.

From bracketing to debracketing the time period for orthodontic treatment was 6 months and 2 weeks, with 12 orthodontic adjustment appointment. Fixed retainers were placed immediately following the removal of the braces.

Case 2: A 20-year-old female patient reported with the chief complaint of forwardly placed upper front teeth. On extra-oral examination the patient had an apparently symmetrical Europrosopic face form and potentially competent lips with a resting lip separation of 4mm. The upper and lower lips were protrusive.



Fig. 2a. Pre-treatment view of the patient (Case 2)



Fig. 2b. Occlusal view



Fig. 2c. Lateral Cephalogram



Fig. 2d. Cast (Lateral view)



Fig. 2e. Alignment and levelling



Fig. 2f. Full thickness reflection

Fig. 2g. Corticotomy of flap



Fig. 2h. Augmentation using DFDBA Bone graft



Fig. 2i. Primary closure of flap



Fig. 2j. 6 months post-operative view

On profile examination patient had a convex facial profile. The smile of the patient was symmetrical and non-consonant with excessive maxillary incisor display. The estimated length of treatment using conventional orthodontics was 1.5 to 2 years. The patient was esthetically conscious and was not receptive to undergo orthodontic treatment for 2 years. When the patient was explained the new treatment option which would include selective decortication and use of bone grafting material with reduction in the duration of orthodontic treatment to a period $\frac{1}{4}$ to $\frac{1}{3}$ of the time needed for conventional orthodontic treatment, she readily accepted the treatment method. The orthodontic treatment plan included maxillary and mandibular braces and a anchorage preparation for preventing the upper and lower molars from drifting forward and maintaining their position following tooth movement. The orthodontic treatment was completed in 6 months and 2 weeks, with 13 orthodontic adjustment appointments. Fixed retainers were placed immediately following the removal of the braces.

Procedure: Orthodontic braces were placed on both the patients and alignment and levelling was done during the week preceding the surgery. The forces used for orthodontic movement were within normal range. The Wilckodontics procedure was carried out under local anesthesia and on both maxillary and mandibular arches at 2 different appointments scheduled 15 days apart in both the patients.

Sulcular incisions were made after which full thickness mucoperiosteal flaps were reflected on the buccal aspect of anterior teeth from mesial aspect of Right First Pre-molar to mesial aspect of Left First Pre-molar in both maxilla and mandible. Special care was taken not to perforate the flap and to retract the flap for proper visibility. Flap was reflected beyond the apices of the teeth. After flap reflection, selective decortication was carried out with the help of carbide bur and copious saline irrigation, buccally in maxilla and mandible. Selective decortication was performed vertically between the roots of the teeth which involved several perforations in the cortical layer with 2mm of bone left from the alveolar crest. The cortical bone was perforated just to penetrate the marrow and induce bleeding points. Following selective decortication, bone augmentation was performed with DFDBA bone graft over the decorticated areas which has potential inductive properties. Bony fenestration and dehiscences were observed in both the patients due to the protrusion of the teeth and root prominences. Excessive amounts of bone grafting was not done to achieve complete primary closure of the flap. The mucoperiosteal flaps were then sutured with 5-0 Vicryl resorbable sutures with preservation of interdental papilla in both the patients. Patients were recalled after 2 weeks for suture removal and orthodontic adjustments and subsequently every 2-3 weeks for orthodontic adjustments. From bracketing to debracketing in patient 1 was 6 months, with 13 orthodontic

adjustment appointments; patient 2 was completed in 6 months and 2 weeks, with 12 orthodontic adjustment appointments. Removable retainers were placed immediately following the removal of the braces. Patients were recalled for periodontal check-up once a month and the patient did not have any complaints. Probing pocket depths were less than 3mm, interdental papillae were preserved, teeth were vital, any bone loss or root resorption apically on the radiograph or gingival recession. The patients were satisfied with the aesthetic results of the treatment procedure.

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. It has been asserted that orthodontic treatment advances faster and the results are more stable after corticotomy with negligible risk of complications (Keole, 1959). PAOO has been proposed to amplify the volume of the alveolar process, to aid in arch development, to prevent or even treat fenestrations, and to maximize the metabolic response during orthodontic treatment (Wilcko, 2001). PAOO 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 comprise patients with severe active periodontal disease, inefficiently 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 insufficient width of attached gingiva (Pan ChernHwei, 2014). Generson et al described the procedure of selective decortications in a case of open bite without subapical osteotomy (Generson, 1978). This procedure was reported in 1991 and was known as corticotomy facilitated orthodontics (Suya, 1991). In 1991, Suya accounted surgically facilitated orthodontics in 395 patients. He modified the procedure by using a supraapical corticotomy instead of a subapical osteotomy beyond the apices of the teeth. The use of this technique led to less pain reported by the patients, less root resorption and relapse. In 1986, Anholm et al reported management of severe malocclusion by means of corticotomy facilitated orthodontics (Anholm, 1986). Kanno et al described a similar procedure for the management of open bite. They employed anchor plates and elastics three weeks after surgical intervention in two stages. The results obtained after 6 months were found to be satisfactory (Kanno, 2007). Dibart et al depicted a tunnel approach with piezoelectric vertical cuts placed on attached gingiva. The tunneling approach permits placement of the bone graft. This technique helped in the management of a case of crowding within 17 weeks of active treatment (Dibart, 2009). Studies (Sanjideh, 2010) contrasting the pace of tooth movement demonstrate that the tooth movement peaked at 22-25 days and then slows down. For the duration of this three week period, the surgically operated side moved twice than the control side. Parallel results were obtained in a study (Aboul-Ela, 2011), where this technique was used for retraction of maxillary canines after the extraction of premolars. Studies have shown that corticotomy curtails the treatment time. Nevertheless treatment quality also plays an

equally important role when measuring treatment time. A grading system has been developed by the American Board of Orthodontics to gauge the quality of orthodontic treatment (Casko, 1998). In support of Wilcko's concept, published data (Wilcko, 2009), claims that the use of bone graft along with selective decortications improves and enhances the permanence of the orthodontic treatment results. Some cases report increased volume of alveolar bone observed radiographically. On the other hand, it was necessary to evaluate whether the newly formed bone is native cortical bone or fibrous encapsulation. The radiographic scans propose that it is a fibrous encapsulation (Wilcko, 2009). Disadvantages of this procedure include expensive and invasive nature of treatment and morbidity related with the surgical procedure (Murphy, 2009).

Conclusion

The procedure of Wilckodontics has made adult orthodontics a reality. The treatment can be accomplished within a shorter period of time that 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 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 weighed against conventional orthodontic treatment. As Wilckodontics is a relatively newer method, long term follow up studies with increased sample size is required to further authenticate this procedure into surgical orthodontics.

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