



CASE STUDY

WILCKODONTICS- AN INTERDISCIPLINARY APPROACH FOR ACCELERATED ORTHODONTIC THERAPY

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ABSTRACT

Tremendous advances in metallurgy and chemistry have been made in past decades. In spite of these advances, traditional orthodontic therapy ranges from 1.5 to 3 years. By stimulating and harnessing the innate potentials of living bone, the teeth can be made to move through the bone very rapidly and when the tooth movement is completed the bone around the roots of the teeth rebuilds itself. The Wilckodontics procedure was introduced by Dr. William Wilcko (Orthodontist) and Dr. Thomas Wilcko (Periodontist). It is patented as Wilckodontics. This procedure includes alveolar decortication with/without augmentation bone grafting technique combined with orthodontics and is called periodontally accelerated osteogenic orthodontics or PAOO. This procedure can be employed as a win-win strategy for the orthodontist, periodontist and especially the patient. This Case Report is of a 22 year old female, who post 1.6 years of fixed orthodontic therapy, achieved no closure in the lower premolar areas and was treated using the PAOO technique.

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INTRODUCTION

Tremendous advances in metallurgy and chemistry have been made in past decades. This can be seen in the evolution of arch wires, bands, brackets, cements, and bonding materials. These advances have improved the manner and efficiency with which the orthodontic forces are transferred to the crowns of the teeth. But in spite of all these advances most conventional fixed orthodontic treatments still require 1½ to 3 years to complete. The PAOO procedure has solved this dilemma by exploiting the dynamics of bone physiology and redirecting the emphasis in tooth movement to the manner in which the supporting bone responds to orthodontic forces rather than just concentrating on the manner in which the forces are applied to the teeth. By stimulating and harnessing the innate potentials of living bone, the teeth can be made to move through the bone very rapidly and when the tooth movement is completed the bone around the roots of the teeth rebuilds itself. The Wilckodontics procedure was introduced by Dr. William Wilcko (Orthodontist) and Dr. Thomas Wilcko (Periodontist) it is patented as Wilckodontics.

It is a relatively new treatment modality which opens the door for successful adult orthodontics and drastically reduces the time taken to complete orthodontic treatment with fewer complications (Vig, 1990). Periodontally accelerated osteogenic orthodontics (PAOO) is a clinical procedure that combines selective alveolar corticotomy, particulate bone grafting, and the application of orthodontic forces (Wilcko, 2009)

Historical background

Corticotomy-facilitated tooth movement was first described by L.C. Bryan in 1893. However it was first introduced in 1959 by Kole as a means for rapid tooth movement. (Köle, 1959) It was 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. Kole's 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 (corticotomy style). The subapical horizontal cuts connecting the interdental cuts were osteotomy style, penetrating the full thickness of the alveolus. Using the crowns of the teeth as handles, Köle believed that he was able to move the blocks of bone somewhat independently of each other because they were only connected by the less-

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dense medullary bone. Because of the invasive nature of Kole's technique, it was never widely accepted.

Rapid acceleratory phenomenon [RAP]

Orthopedist Harold Frost recognized that surgical wounding of osseous hard tissue results in striking reorganizing activity adjacent to the site of injury in osseous and/or soft tissue surgery. He collectively termed this cascade of physiologic healing events the regional acceleratory phenomenon (RAP) (Frost, 1983). Frost noted that the original injury somehow accelerated the normal regional healing processes. This acceleration is the regional acceleratory phenomenon. RAP usually occurs after a fracture, arthrodesis, osteotomy, or bone-grafting procedure, and may involve recruitment and activation of precursor cells necessary for wound healing concentrated at the site of injury. The 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. The RAP begins within a few days of injury, typically peaks at 1–2 months, usually lasts 4 months in bone and may take 6 to more than 24 months to subside. As long as tooth movement continues, the RAP is prolonged. When RAP dissipates, the osteopenia disappears and the radiographic image of normal spongiosa reappears. When orthodontic tooth movement is completed, an environment is created that favours alveolar re-mineralization.

The placement of orthodontic brackets and activation of the arch wires are typically done the week before the surgical aspect of PAOO is performed. 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 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 (Wilcko *et al* 2000,2001,2003,2009). (Wilcko, 2001)

A CASE REPORT

A 22 year old female reported to the department of orthodontics at Dr.D.Y. Patil, School of Dentistry in December 2015 for conventional fixed orthodontic therapy. After approximately 1 year and 6 months, space closure was still not achieved in the area of 34, 44 which was removed before fixed orthodontic therapy began. She then reported to the department of periodontics, for space closure. Her medical history showed no allergies or medical problems. No signs and symptoms of temporomandibular dysfunction was observed. Her intra oral examination revealed Angle's class 1 malocclusion with maxillary and mandibular prognathism.

Surgical technique

After taking care of asepsis and sterilization the surgery was planned. The area selected for surgery was anesthetized using lidocaine hydrochloride 2 % with adrenaline 1:80,000 (Fig. 1, Fig. 2). Flap design: Crevicular incision and vertical releasing incision was place (Fig. 3) to preserve the interdental papilla and a full thickness flap was raised (Fig. 4). Corticotomy: Cortication was done with a straight fissure bur in both 3rd and 4th quadrant under copious irrigation to prevent over heating

of the bone (Fig. 5). The area was sutured with a surgical silk suture (Fig. 6).



Fig. 1. Pre-operative view of 4th quadrant



Fig. 2. Pre-operative view of 3rd quadrant

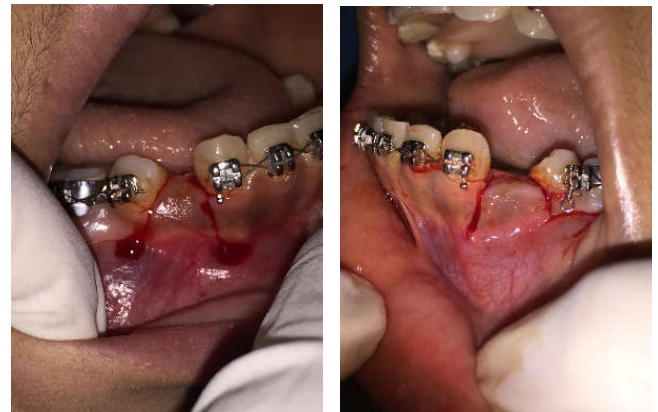


Fig. 3. Horizontal and vertical releasing incision made

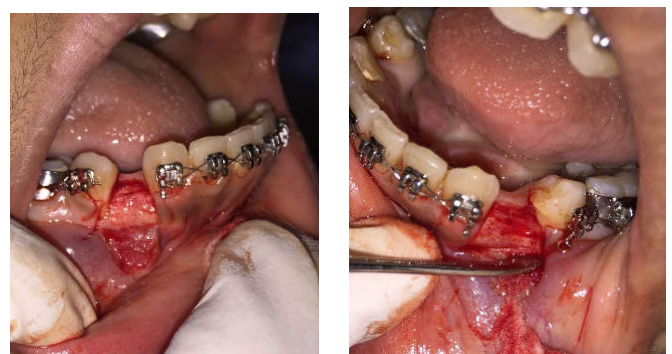


Fig. 4. Full thickness flap reflected

The patient was recalled after 1 month and after 4 months and space closure was seen in both the quadrant. Patient was then sent to the department of orthodontics for archwire activation, to use the process of rapid acceleratory phenomenon for accelerated space closure. Patient was recalled after 7 days for suture removal and then recalled after 4 months for observation. After 4 months, significantly more closure was seen in the 4th quadrant than the 3rd quadrant (Fig. 7).

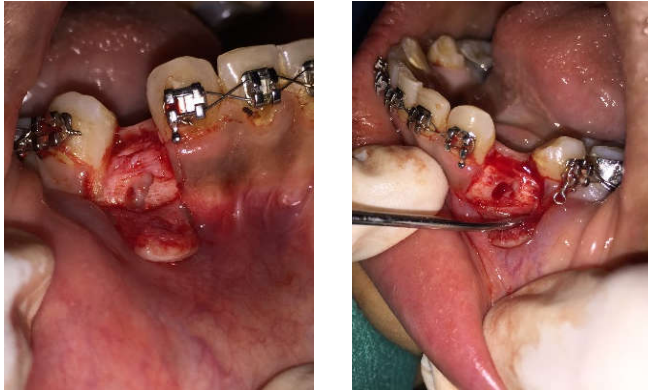


Fig. 5. Corticotomy done

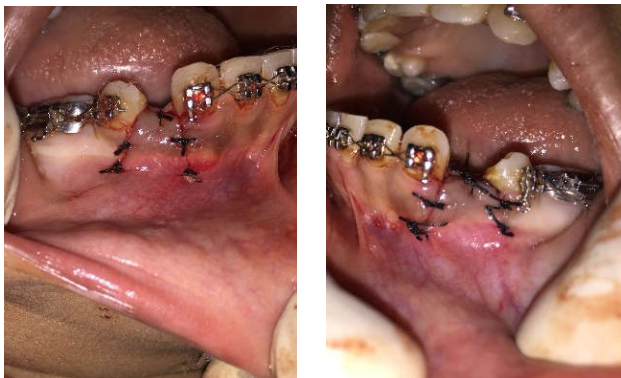


Fig. 6. Silk sutures placed

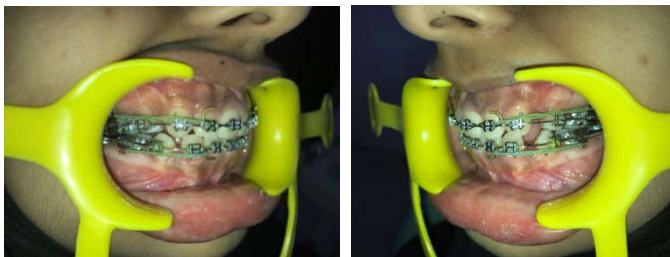


Fig. 7. Significant closure seen 4 months post operatively



Fig. 8. Occlusal view 4 months post-operatively

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 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 and treat fenestrations, and to maximize the metabolic response during orthodontic treatment. (Wilcko, 2009) Corticotomy-facilitated orthodontics has been indicated for non-extraction treatment of crowding, shortening treatment duration, extrusion of ankylosed teeth, intrusion of posterior teeth to close anterior open bites and impacted canines. (Eelke and Hoogveen, 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 gingival (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) 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 wilcko's concept, published data 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 fibro osseous material encapsulated on the outside of the cortical plate was evaluated. The scans suggest that it is a fibro osseous encapsulation. 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 Wilckodontics 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). 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. This case report shows successful space closure after a period of 2.5 years of conventional orthodontic treatment. As Wilckodontics 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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