

Case Report

Periodontally accelerated osteogenic orthodontics

ABSTRACT

The orthodontic treatment is perhaps in terms of duration, the longest performed dental procedure. To accelerate tooth movement, orthodontists and periodontists together have worked out a successful technique termed as Wilckodontics, commonly known as periodontally accelerated osteogenic orthodontics. It is an emerging technology in the field of dentistry. Wilckodontics has solved the dilemma of rapid tooth movement 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. In this article, a 27-year-old male, with a Class I moderately crowded malocclusion, elected to undergo this new treatment option, due to the estimated reduction in treatment time. This case report shows one case of lower anterior crowding done using this technique. The total orthodontic treatment, from bracketing to debracketing, required exactly 6 months, with 12 orthodontic adjustments.

Keywords: Accelerated orthodontics, bone graft, osteotomy

INTRODUCTION

In dental realm, a treatment procedure known as Wilckodontics or periodontally accelerated osteogenic orthodontics (PAOO) is a new procedure which was developed by Dr. William Wilcko and Dr. Thomas Wilcko in Pennsylvania in 2001.^[1] It has helped the dental practitioners to reduce the treatment taken to complete an orthodontic case. PAOO can be described as an interdisciplinary treatment approach which utilizes tissue engineering principles with periodontal regenerative surgery which, in turn, creates rapid orthodontic tooth movement. The clinical procedure involves selective alveolar corticotomy, particulate bone grafting, and application of orthodontic forces. Teeth are moved 2–3 times faster than the normal time required for traditional orthodontic treatment. This procedure is based on bone healing pattern known as regional acceleratory phenomenon (RAP).^[2] The surgical technique consists of the following steps – flap design, decortication, bone graft, primary closure, patient management, and orthodontic adjustments after surgery. Corticotomy surgery provides for a periodontal ligament-mediated acceleration in tooth movement as a result of a stimulated RAP in conjunction with the proper morphologic situation of a thin layer of bone in the direction of movement. The induced increase

in bone turnover and decrease in mineral content of the bone (demineralization) are conducive to accelerated tooth movement. The inclusion of a grafting procedure makes it possible to simultaneously augment and reshape the supporting alveolar bone.^[3]

Treatment results suggest that the need for extractions may be reduced. Preexisting alveolar fenestrations over root prominences can be eliminated, thus reducing the probability of bony dehiscence formation. Additional lip support can also be achieved with the alveolar augmentation.^[4] The following case report shows this technique in a Class I malocclusion crowding case which was finished within 6 months from the beginning of treatment.

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CASE REPORT

A 27-year-old male had a Class I moderately crowded malocclusion [Figure 1]. He had not had the opportunity to have orthodontic treatment when he was younger and hinted that he was hoping to have orthodontic work completed before he got married within this year. The estimated length of treatment time using conventional orthodontic techniques was 1 year. When presented with the option of having his teeth straightened in one quarter to one-third the time needed for conventional orthodontics, he readily accepted. He did not object to the inclusion of a periodontal surgical procedure with resorbable grafting materials. He had a healthy periodontal status. Radiographically, there did not appear to be any significant bone loss, and clinically, there were no probing depths >3 mm. There was an adequate zone of attachment and no gingival recession. The orthodontic treatment plan included maxillary and mandibular braces and called for expansion and rounding of the arches to accomplish the decrowding. Both maxillary and mandibular bands and brackets were placed during the week preceding the PAOO surgery. In addition, maxillary and mandibular nickel–titanium wires were fully engaged from first molar to first molar. Care was taken to remove interproximal bonding flash, which could make surgical suturing difficult.

The surgery was performed on the mandibular anterior region at the same surgical appointment, under local anesthesia. Labial sulcular incisions were made using a 12 B Bard-Parker blade (BD, Franklin Lakes, NJ, USA) in the anterior region of the mandibular teeth.

No vertical releasing incisions were used. As much as possible of the interdental papillae were reflected with the full-thickness labial flaps. At the instruction of the orthodontist, selective partial decorticating (bone activation) was performed on the labial aspects of the mandibular anterior teeth and premolars [Figure 2]. These anterior teeth would be undergoing the major movement and the molars would serve mostly as anchorage units.

The limited labial decorticating was accomplished with circumscribing corticotomy cuts outlining the roots of the

teeth and small vertical perforations where possible. The interradicular vertical corticotomy cuts began a couple of millimeters below the alveolar crest and extended 2–3 mm beyond the apices of the teeth. No bony luxating was performed following the partial decorticating. An established resorbable grafting mixture for osseous augmentation consisting of approximately equal amounts by volume of demineralized freeze-dried bone allograft (DFDBA) and bovine bone was used. DFDBA (Musculoskeletal Transplant Foundation, Edison, NJ, USA) and bovine bone (Bio-Oss 0.25–1.0 mm; Osteohealth, Shirley, NY, USA) were mixed dry and then wet with a clindamycin phosphate/sterile water solution (approximately 10 mg/mL) just before placement. The wet grafting mixture was then spread over the partially decorticated bone labially. On average, the layer of grafting material was between 2 and 3 mm thick. The full-thickness flaps were returned to their original position and sutured into place with interrupted loop 4/0 Gore-Tex suture material (W.L. Gore, Flagstaff, AZ, USA). Care was taken to properly reposition the interdental papillae. Suture removal was performed 2-week postsurgery, and excellent healing was seen [Figure 3]. Crowding was corrected within 3 months of starting the treatment [Figure 4]. The case was debonded within 6 months of bonding the brackets [Figure 5]. The patient was very happy with the treatment as it was done within the time span mentioned to him.

DISCUSSION

Correction of a Class I moderately crowded case utilizing a new orthodontic treatment modality has been presented. In a 27-year-old male patient, total orthodontic treatment time was 6 months 2 weeks. This bone augmentation procedure is safe and effective and can be used to cover preexisting bony fenestrations over the root prominences.^[4] In certain situations, the additional alveolar bone can also provide improved lip posture. In an evaluation of this new

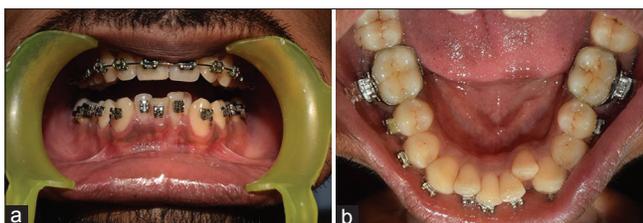


Figure 1: Pretreatment (a) 2 mm opening, (b) mandibular arch

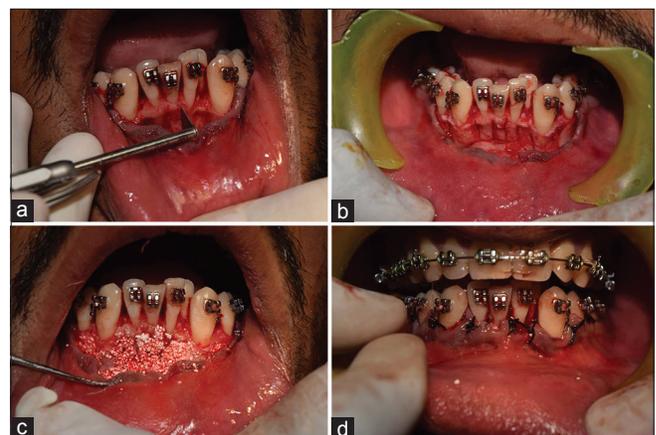


Figure 2: (a) Flap raised, (b) decortication, (c) bone graft, (d) suturing

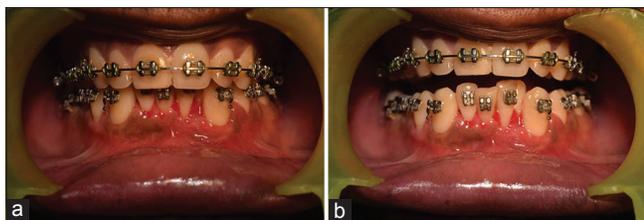


Figure 3: Postsuture removal (a) occlusion, (b) 2 mm opening

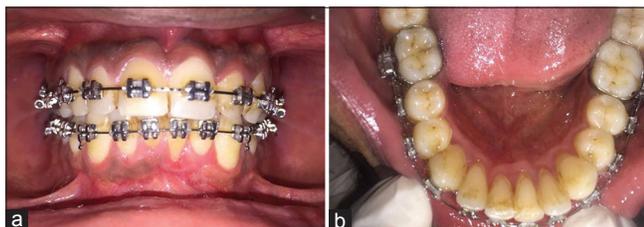


Figure 4: Posttreatment (a) occlusion, (b) mandibular arch

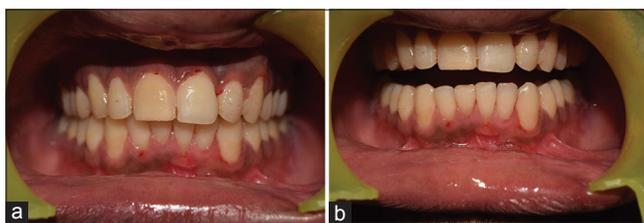


Figure 5: Posttreatment (a) occlusion, (b) 2 mm opening

orthodontic method, Hajji demonstrated increased thickness of alveolar bone at the cephalometric landmark Point B in the PAOO group, when compared to nonsurgery orthodontic therapies.^[5]

Regarding tooth movement, this is the technique that requires the demineralization of a relatively thin layer of bone on the root surface of the tooth in the direction of intended movement. This transient, reversible osteopenia of the thin layer of bone permits the root of the tooth to carry the demineralized collagenous matrix of the bone with it and a reactionary bone formation.^[6,7] This results in net increased alveolar volume which can provide for a more intact periodontium, a decreased need for extraction, a degree of facial reshaping, and an increase in bony support for both the teeth and overlying soft tissue.

The orthodontic appointments for decrowding cases utilizing the PAOO procedure consist of normal wire changes, elastic usage, and orthodontic mechanics, only at a greatly accelerated rate as compared to conventional orthodontic treatment.^[8,9] In decrowding cases, excessive orthodontic forces are not used and are not needed to achieve these accelerated rates of tooth movement.^[10] The drawback of this technique is that it is expensive, it has risks like all surgeries, it is contraindicated in patients who take non-steroidal anti-

inflammatory drugs regularly. Pain, swelling and chances of infection may also be there.

CONCLUSION

A successful treatment by Wilckodontics or PAOO technique can be achieved by proper coordination between the orthodontist and the periodontist with proper case selection. This new procedure combines the advantages of corticotomy-facilitated orthodontics and periodontal alveolar augmentation. The periodontal alveolar augmentation can provide an improvement in the structural integrity of the periodontium. Considering the increasing demand of adult orthodontic patients to decrease their treatment time, this technique will lead to an increase in the number of patients accessing to orthodontic treatment. PAOO requires a numerous modified diagnostic and treatment parameters, but once these are mastered, the orthodontist has a powerful new treatment option to offer the patient.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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