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Surgically Facilitated Orthodontics in an Adult Orthodontic Patient- A Case Report

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ABSTRACT

An increased number of adult individuals are seeking orthodontic treatment due to improved awareness of dental esthetics and function. Adult patients present with unique challenges for the orthodontist such as extensive restorative work, missing teeth, thin alveolar bone, and bone loss. Additionally, they demand efficiency in scheduling and speedy treatment. Periodontally accelerated osteogenic orthodontics (PAOO) or surgically facilitated orthodontics (SFO) is a surgical procedure to accelerate orthodontic tooth movement and minimize the resultant periodontal complications. It works by applying a series of vertical cuts in the cortical part of the alveolar bone and applying bone graft to the area. The resultant inflammation accelerates bone turnover and the resultant orthodontic tooth movement. The corticotomy along with bone graft is believed to improve alveolar bone thickness, expanding the range of orthodontic tooth movements. Though the effects of SFO are documented in terms of tooth movement, in this case report we present the benefits of SFO on alveolar bone height and width with the use of CBCT, along with timing of orthodontic treatment and tooth movement.

Keywords

Adult orthodontics, Surgically facilitated orthodontics, Periodontally accelerated osteogenics.

Introduction

An increasing number of adult patients are seeking orthodontic patients. While orthodontic treatment for adults is feasible, it comes with its own set of challenges. Bone turnover is usually slower in adults, resulting in slow tooth movement and increased treatment time. Additionally, there is a higher risk of periodontal complications such as recession, bone loss, fenestrations, and dehiscence. Since growth is an insignificant factor in adult patients, increased orthodontic forces to cause rapid tooth movement may result in hyalinization and periodontal complications [1].

To address these issues, historically, surgically assisted tooth movement had been proposed as a treatment to standard orthodontic procedures. Kole hypothesized that reduction in treatment time in orthodontics was possible when continuity of cortical plates is disturbed [2]. He penetrated the alveolus' length horizontally, so this invasive procedure failed to become mainstream. With passage of time and improvements in surgical techniques, a less invasive form surgically facilitated orthodontics or periodontally accelerated osteogenic orthodontics became more acceptable to accelerate orthodontic tooth movement and minimize the resultant periodontal complications [3,4]. It is done by performing selective corticotomies combined with bone grafting, followed by application of orthodontic force to accelerate tooth movement. In

this case report we evaluate the clinical and radiographic outcomes of surgically facilitated orthodontics in an adult patient.

Case Report

A 56-year-old female patient was referred by her dentist for closing the midline diastema in the maxillary arch and correction of overlapping anterior teeth in the mandibular arch. Extraoral clinical examination did not reveal any significant facial asymmetry. The patient had a bimaxillary convex profile with 21.6 mm lip length. Nasolabial angle and mentolabial fold were within normal limits.

Dental examination revealed missing #s 2 and #30. #19 was root canal treated with gold crowns present on both #15 and #19. Pt was class I molar and canine on the left side and class I molar and super class I canine on the left side. (Figure 1) Arch length analysis showed ~ 5 mm of spacing in the upper arch due to the midline diastema, lower arch showed adequate arch length. Bolton analysis showed ~1.3 mm of maxillary excess and/or mandibular deficiency. Temporo mandibular joint showed normal range of motion and with no signs of active TMD. Cephalometric findings showed mild proclination of the maxillary teeth (U1-SN= 116) and mandibular (L1-MP=95) molars. Mandibular incisors were procumbent relative to the body of mandible as evident by a L1-NB measurement of 15.1 mm (normal=4 mm). The upper and lower lips were slightly protrusive relative to the esthetic plane. CBCT evaluation showed limited to no bone at the occlusal half of the mandibular central incisors (Figure 2-4).

The orthodontic treatment plan included leveling and alignment of the mandibular dentition, retraction of the mandibular anterior teeth to create clearance (overjet) to retract the maxillary incisors and to close the midline diastema. Interproximal reduction was included as needed, while maintaining the patient in harmonious occlusion. Because of the limited bone in the mandibular anterior teeth and the age of the patient where growth could not be used for an advantage, hence she was referred to periodontics department for a periodontally accelerated osteogenic orthodontics procedure before starting the treatment (Figure 5).

Figure 1: Initial presentation of the patient.

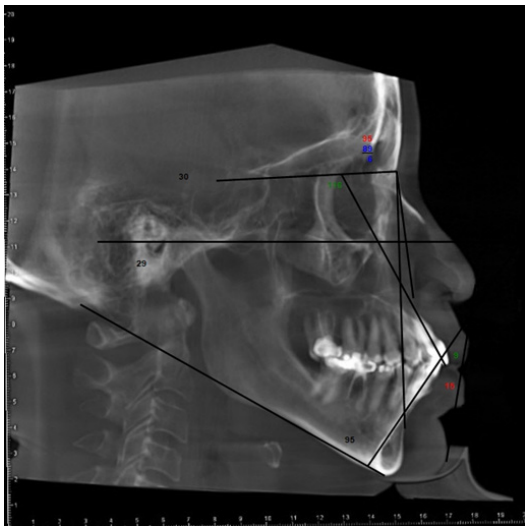

Figure 2: Cephalometric analysis.

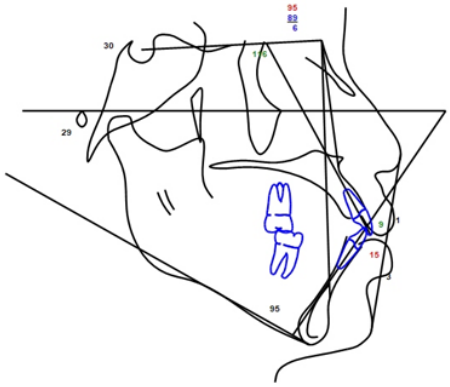

Figure 3: Cephalometric tracing.

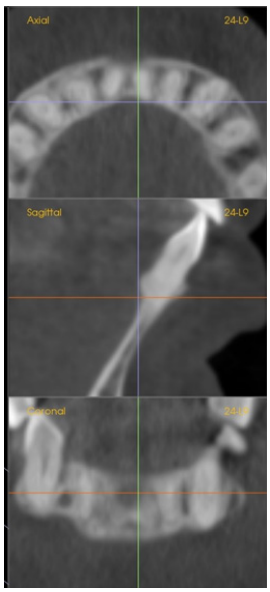

Figure 4: Pre op CBCT view showing reduced bony support on the buccal of lower anterior teeth.

Figure 5: Pre surgical view after bracket placement.

Periodontally accelerated osteogenic orthodontics procedure: After periodontal assessment and performing periodontal maintenance, surgical procedure was carried out to facilitate the orthodontic tooth movement. The surgical procedure was carried out after the patient was anesthetized in the mandibular arch with IAN block, long buccal block and buccal and lingual infiltration with 3 carp (1.7mL each) 2% Lidocaine w/ 1:100,000 epi and 1 carp (1.7mL each) 0.5% mg Marcaine w/ 1:200,000 epi. Intrasulcular incision on buccal and lingual were made from #20 to 29 and full thickness mucoperiosteal flap reflected. Crater defects presented between #25,26,27 (Figure 6).

Figure 6: Full thickness flap reflection.

Acteon piezo ultrasonic surgery at D3 setting was used to perform interdental corticotomy cuts both buccally and lingually (Figure 7). High speed carbide round bur used to make cortical perforations at apex and on areas of defects of #26,27. 2.5CC of freeze-dried bone allograft bone was placed on buccal/lingual alveolar bone. Bone also placed in interdental defects of #25,26,27 (Figure 8). Flaps were passively approximated and sutured using 4-0 Vicryl and 4-0 PTFE using continuous sling and single interrupted sutures. Gauze pressure applied and hemostasis achieved (Figure 9 and 10). Post-Op Instructions Given to patient- written and verbal.

Figure 7: Corticotomy cuts placed on the buccal.

Figure 8: Bone graft placement on the buccal.

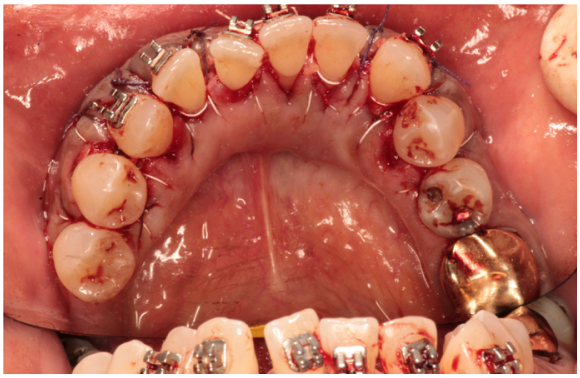

Figure 9: Occlusal view of flaps sutured.

Figure 10: Buccal view of sutured flaps.

Orthodontic progress: Immediately following the PAOO procedure, 0.014 NT was placed and followed by 018 SS. Spaces were closed on 018 SS and 0.020 round stainless-steel wire. The case was finished and retained with a fixed retainer between the maxillary centrals and a removable Essix retainers in both arches in a treatment time of 9 months. Patients' chief complaint was addressed, and the maxillary diastema and lower overlapping were corrected. CBCT taken before PAOO and on post op CBCT taken after completion of orthodontic treatment showed significant buccal and lingual radicular bone increase in lower anterior areas. The areas of fenestrations and dehiscence seen at the lower anterior region were resolved post treatment with surgically facilitated orthodontic movement. The entire orthodontic treatment was completed in 9 months for an adult patient (Figure 4, 11 and 12).

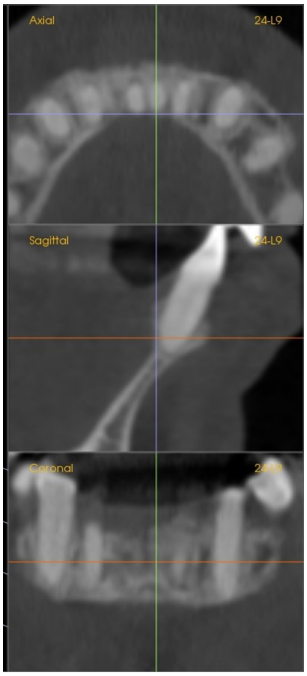

Figure 11: Post orthodontic CBCT view showing increased bone width on buccal of lower anterior teeth.

Figure 12: Final presentation of the patient post treatment.

Discussion

Periodontally accelerated osteogenic orthodontics (PAOO) is a surgical procedure to accelerate orthodontic tooth movement and minimize the resultant periodontal complications. It works by applying selective corticotomies combined with bone grafting followed by application of orthodontic force. It is believed that PAOO result in accelerated tooth movement, post-treatment stability, and increased buccal bone dimensions [5]. This procedure allows performance of orthodontic treatment on older patients, in areas of periodontal involvement and in areas where tooth movement might otherwise cause fenestrations and dehiscences.

The localized injury caused by the corticotomy cuts accelerates the healing process due to the recruitment of inflammatory cells at the site of injury, thus enhancing the wound –healing, a phenomenon commonly known as Rapid Acceleratory Phenomenon or RAP. RAP facilitates orthodontic tooth movement by decreasing the bone density at the corticotomy sites and increasing the rate of bone turnover. RAP typically peaks at 1-2 months, lasts for 4 months. After completion of orthodontic treatment, alveolar remineralization occurs resulting in teeth stability [6]. Many variations of technique and procedure exist as regards to depth of the corticotomy cuts, use of cortical perforations, type of bone grafting material used and whether membrane is used during the procedure [7]. In our case report we showed that the even in an adult patient, that are considered difficult to treat esthetically pleasing results were obtained in a relatively short period of time. Also, stability of the lower anterior teeth was enhanced as post treatment the roots of the teeth were present entirely in bony housing.

Conclusion

The case demonstrates that in selected cases surgical intervention prior to orthodontics results in predictable results and improvement in health, esthetics and function.

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