Technical Note

Acceleration of Intruding Anterior Tooth by Alveolar Corticotomy

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Abstract

True intrusion is one of the difficult and complex goals to achieve which requires clinical judgment, skills, and experience. Intrusion requires less force level than other tooth movement, but it requires delicacy since the entire stress is concentrated in the apex of the root. Although true intrusion alone is not challenging, eliminating the adverse effect while intruding requires tedious skills of the clinician. A 17-year-old male patient with Class I malocclusion with open bite has a prominent maxillary cortical bone. He had a convex profile with an unpleasant smile. To reduce the bulkiness of cortical bone and to intrude the upper anterior, so the decision was made to perform corticotomy.

Keywords: Corticotomy, intrusion, retraction

Introduction

Alveolar corticotomy is a surgical procedure limited to the cortical portion of the alveolar bone. Corticotomy-facilitated orthodontics is a therapeutic procedure that helps orthodontic tooth movement by accelerated bone metabolism due to controlled surgical damage. It is considered an intermediate therapy between orthognathic surgery and conventional orthodontics.[1]

This method claims to have several advantages. These include a reduced treatment time, enhanced expansion, intrusion and open bite correction, manipulation of anchorage, increased traction of impacted teeth, accelerated canine retraction, and also gives post-treatment stability.[2-4] Corticotomy facilitated tooth movement was first described by L. C. Bryan in 1893 and was introduced by Kole in 1959. Kole's used a combined interradicular corticotomy and supra-apical osteotomy technique.[5] Because of the invasive nature of Kole's technique, it was never widely accepted.[4] In 1975, Duker used Kole's technique which preserves the health of the periodontium by avoiding the marginal crest bone during corticotomy cuts.[6] In 1978, Generson revised Kole's technique with a 1-Stage corticotomy only technique without supra-apical osteotomy. In 2000, Hajji reported that corticotomy makes tooth movement faster because the bone blocks move with the tooth because the force applied to the tooth is transmitted into the osteotomy gap through the periodontal ligament. The most recent surgical orthodontic therapy was introduced by Wilcko in 2001, which included combining corticotomy surgery with alveolar grafting technique referred as accelerated osteogenic orthodontics (AOO) and more recently as periodontally AOO (PAOO) which is also termed as wilckodontics.[2,4]

What are the possible limitations and contraindication of periodontally accelerated osteogenic orthodontics?

1. Patients with active periodontal disease[4]
2. Individuals with inadequately treated endodontic problems
3. Patients intake of corticosteroids,
4. Persons who are taking any medications, such as bisphosphonates and nonsteroidal anti-inflammatory drugs[6]
5. Cases where bimaxillary protrusion is accompanied with a gummy smile, which might benefit more from segmental osteotomy.[2]

Mechanism underlying corticotomy

Healing event after corticotomy is regional accelerated phenomenon (RAP) which is responsible for the rapid tooth movement. RAP was first described by Frost in 1893. He noted that the original injury somehow accelerated the normal regional healing processes. This phenomenon is regional

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acceleratory phenomenon, i.e., increasing the activity of osteoclasts and osteoblasts which leads to bone remodeling and rapid tooth movement.[7] RAP usually occurs after a fracture, arthrodesis, osteotomy, after placing implants procedure and may involve recruitment and activation of precursor cells necessary for wound healing concentrated at the site of injury.[8,9]

The increase of orthodontic tooth movement is influenced by bone turnover, bone density, and hyalinization of the PDL. The RAP begins within a few days of injury; it peaks at 1–2 months, last 4 months in bone and may take 6 to more than 24 months to subside.[3,9]

Case Report

A 17-year-old male patient had a chief complaint of proclination and spacing of upper and lower incisors. He had angle Class II malocclusion with anterior open bite [Figure 1]. He had an unpleasant smile. The presence of thick cortical bone in the anterior region was needed to intrude upper anterior, and the decision was made to perform PAOO. After the initiation of orthodontic treatment till both the maxillary and mandibular arches reach 17 × 25 stainless steel (ss) wire.

Surgical procedures

A modified corticotomy procedure was carried out under local anesthesia. A mucoperiosteal flap was elevated labially beyond the apices of the upper incisors.[10] The vertical cuts were performed from the distal of the right upper lateral incisor leaving 2 mm from the alveolar bone tip to the distal of the left upper lateral incisor and the cortical bone was removed by tungsten carbide bur with continuous saline irrigation [Figure 2]. These incisions preserve the interdental papilla on the buccal sides of the maxillary anteriors, and no flap elevation or corticotomy was performed on the lingual or the palatal side in this case. Care was taken not to damage neurovascular bundles.[10,11]

Platelet-rich fibrin was placed on apical region of anteriors. The horizontal envelope mucoperiosteal flap was extended to the apical region of the anteriors. The mucoperiosteal flaps were replaced and sutured with 4–0 silk sutures. The patient was given amoxicillin, 500 mg tid for 3 days. The sutures were removed after a week and advised to use chlorhexidine mouthrinse 0.12% bid for 2 weeks.

Orthodontic procedures

Full maxillary and mandibular braces (17 × 25 ss) with conventional brackets were placed before periodontal surgery. Soon after a week of periodontal surgery, continuous burst one intrusive arch was given which was made in 17 × 25 TMA wire [Figure 3]. Elastic thread was placed from molar hook to helices of the intrusive arch for retraction with intrusion. After 15 days of recall, the deep bite got reduced from 6 to 2 mm.

After 2 months of periodontal surgery, the continuous intrusive arch was removed. Eight months after surgery detailing of the occlusion was completed [Figure 4].

The following orthodontic results were achieved:

1. Ideal occlusion was obtained
2. Open bite correction was made
3. Anterior deep bite was corrected from 6 mm to 2 mm

Figure 1: Preoperative photo

Figure 2: Corticotomy procedure

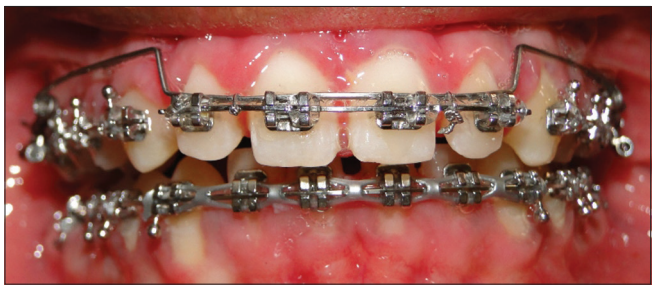

Figure 3: 17 × 25 TMA intrusive arch

Figure 4: Postoperative after intrusion

4. Straight profile
5. Pleasant smile.

Discussion

Optimal force for effective intrusion without root resorption is 20–25 g per tooth. If the PAOO procedure is performed, heavy intermediate force is the best protocol, because it will initiate RAP. Rapid tooth movement is explained by the bone remodeling which is coined as RAP. According to Hajji, an average treatment time for the PAOO procedure was one-third to one-fourth of traditional orthodontic treatment.[5] Wilcko *et al*. reported an average of 6.1 months of treatment time for the PAOO procedure.[9] However, unlike the procedures described by Köle and Wilcko *et al*., corticotomy was performed only at the buccal aspects of the maxilla in this case.[2,12] This was in agreement with Germeç *et al*., who reported rapid tooth movement when corticotomy was performed at the buccal aspects of alveolar bone.[11] The researchers noted that the elimination of palatal and lingual corticotomy reduced the length and the extent of the surgery and avoided the risk of violating vital lingual anatomy.

Conclusion

Successful intrusion is a significant clinical challenge to orthodontists.[13] Alveolar corticotomy is an effective treatment to decrease the treatment time, reduces the incidence of root resorption, and it increases the quality of the treatment.[10] Conservative corticotomy technique, which eliminates the lingual approach which reduces the operation time and patient discomfort.[11] However, this procedure should be carefully applied with respect to the teeth, bone, and surrounding tissues to avoid the risk of damage of neurovascular bundle, devitalization of the teeth, and periodontal damage.[11]

The biological mechanisms generated by corticotomies is reflected in the structure of trabecular bone, which provides an opportunity to enhance certain orthodontic movements.[6] Interest in the use of alveolar corticotomies as an adjunct to orthodontic treatment is growing thanks to a deeper understanding of its effects which brings about shortened treatment time.[6]

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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