Speedy orthodontics: A case report

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Management of severe rotation poses a great challenge for the orthodontist, especially when cortical anchorage occurs. The conventional methods require excessive treatment time, rely on patient compliance, and can cause root resorption. A groundbreaking new procedure developed by Wilcko et al, which is actually a modification of the conventional corticotomy procedure, amalgamates the orthodontic mechanics, alveolar decortications, and augmentation procedure to make treatment time three to four times faster than conventional orthodontic techniques. This procedure uses the dynamics of bone physiology and redirects the emphasis in tooth movement to the manner in which supporting bone responds to orthodontic forces applied to the tooth. This article includes a case report in which the technique is used on a patient who has a severely rotated mandibular left canine. ORTHODONTICS (CHIC) 2013;14:e96–e100. doi: 10.11607/ortho.911

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Complex malocclusions such as severe rotation have always been associated with a major setback in orthodontic treatment in terms of prolonged treatment time. In recent years conventional techniques like rotation wedges, elastics, springs, and implants have been used to generate couple. However, with the development of corticotomy-assisted orthodontics, various new options have opened up for enhancing orthodontic treatment. Advantages over conventional nonsurgical procedures include reduced treatment time, increased alveolar volume,1 and reduced root resorption. This article emphasizes the effectiveness of corticotomy-assisted orthodontics in correcting rotation. In this particular case, it is used successfully to correct rotation of the mandibular left canine.
ACCELERATED OSTEOGENIC ORTHODONTICS

Corticotomy-assisted orthodontics is a unique blend of orthodontic mechanics with alveolar decortications and an alveolar augmentation procedure. This technique is three to four times faster than conventional methods, thereby reducing the overall treatment time. Alveolar corticotomies are surgical interventions limited to the cortical portion of alveolar bone.

In the last decade, this approach has changed the way orthodontic procedures are performed. As it was rapidly accepted among various practitioners, a number of modifications were attached to its procedures. Most notably, when Kole’s corticotomy procedure was the norm, the Wilcko brothers introduced accelerated osteogenic orthodontics, which drastically reduced various side effects of the Kole procedure, such as damage to the periodontium and tooth pulp vitality, and also avoided the use of radicular corticotomies and suprapapical osteotomies. All these advantages thereby efficiently reduced the treatment time considerably and produced an overall net increase in alveolar volume.

REGIONAL ACCELERATORY PHENOMENON

In 1983, Frost introduced the regional acceleratory phenomenon (RAP), the sole principle upon which the acceleratory osteogenic orthodontic procedure was made practical. RAP is a local response to a noxious stimulus in which tissue forms faster than in the normal regional regeneration process. The healing process is enhanced, with healing occurring two to ten times faster than normal physiologic healing. Demineralization occurs at both the cut site as well as at adjacent bone, hence the term regional. Acceleratory refers to exaggerated or intensified bone response in cuts that extends to the bone marrow. RAP healing is a complex physiologic process with features involving accelerated bone turnover and decreased regional bone density. Following surgical insult to the cortical bone, RAP increases the tissue reorganization and healing by a transient burst of localized hard and soft tissue remodeling. The initial phase of RAP results in increased cortical bone porosity due to increased osteoclastic activity. There is strong indirect evidence that the calcium depletion and diminished bone densities result in rapid tooth movement. RAP begins within a few days of surgery, attains peak values at 1 to 2 months, and then may take 6 to 24 months to subside.

ACCELERATED OSTEOGENIC ORTHODONTICS SURGICAL TECHNIQUE

Accelerated osteogenic orthodontics is an interdisciplinary technique that requires the expertise of an orthodontist and an oral surgeon. Orthodontic brackets and archwires are placed at least 1 week prior to the day of surgery. This surgery was performed under local anesthesia. A full-thickness flap was raised labially and linguually using a sulcular releasing incision where tooth movement was required. Full-thickness flaps were raised at the interdental papillae, except between the maxillary central incisors because the nasopalatine foramen precludes the need for bone activation in this area. Flaps were raised beyond the apices of the teeth to avoid damaging the neurovascular complexes exiting the alveolus. The buccal and lingual corticotomy cuts and cortical bone perforations were made adjacent to the malpositioned teeth using low-speed round burs. These cuts should not enter the cancellous bone in order to avoid any risk to the underlying structures. After the bone activation was done, a reason-
able amount of particulate bone grafting material was layered over the activated bone. This graft was first wet with a solution of clindamycin phosphate, bacteriostatic water, and platelet rich plasma of 5 mg/mL. This provides an antibiotic effect as well as a medium for placement. The graft material can be bovine bone powder or 100% demineralized freeze-dried bone graft. The quantity of bone graft depends on the quality of the preexisting bone. The quantity can vary from 0.025 to 1 mL or more per tooth. The flap is repositioned using nonresorbable suture materials. As soon as the flap repositioning is done, orthodontic force should be applied to the teeth. Sutures are left in place for a minimum of 2 weeks. Orthodontic adjustment should be made every 2 weeks. One should bear in mind that tooth movement that occurs at this stage is purely physiologic and not the repositioning of segments of bone. An uninterrupted blood supply is highly essential in order to provide rapid bone remodeling at the adjacent alveolar bone. Osteoclastic activity increases, and temporary intrabony osteopenia occurs at the same time, with the decortications inducing the osteopenic activity.

CASE REPORT

A 15-year-old male patient came to the authors’ department with the chief complaint of anteriorly displaced maxillary anterior teeth. The case was diagnosed as an Angle Class I malocclusion on a Class I skeletal base with orthognathic maxilla and mandible, maxillomandibular dentoalveolar proclination and protrusion, single-tooth crossbite in relation to the right mandibular canine, midline diastema of 2 mm, severe distobuccal rotation of the left mandibular canine, overjet of 8 mm, and overbite of 5 mm. Extraction of all first premolars was planned to resolve the proclination and reduce the overjet.

A 0.018-inch Roth preadjusted edgewise appliance was bonded, and a 0.016-inch coaxial wire was placed on both arches for initial leveling and aligning (Fig 1). Gradual progression was made up to 0.016 × 0.022-inch nickel titanium (NiTi) wire. Meanwhile, over a period of 8 months, most of the conventional techniques were tried to derotate the left mandibular canine, but unfortunately a slight amount of root resorption was observed in relation to the apical third. At that juncture, accelerated osteogenic orthodontics were performed. Partial decortication was carried out, followed by bone grafting (Fig 2) and suture placement. Orthodontic derotation force was generated with the use of 0.016 × 0.022-inch NiTi piggyback wire, which was fully engaged into the bracket slot with the help of a ligature tie and an E-chain attached from the button that was bonded onto the distal surface of the canine to the rigid 0.017 × 0.025-inch stainless steel base archwire with offset (Fig 3). The NiTi
wire was fully engaged into the canine bracket on the day of surgery, and the E-chain was changed once in 2 weeks (Fig 4). After 4 weeks, the canine was fully derotated (Fig 5); conventional space closure followed (Fig 6). The before and after derotation IOPA revealed no root resorption but improved bone level (Figs 7 and 8).
CONCLUSIONS

Corticotomy-assisted orthodontics is an effective and reliable technique to treat severe malocclusions while reducing the treatment time and increasing the treatment quality. Reduced root resorption, increased alveolar volume, and reduced chairside time are the basic advantages of this method over the conventional techniques. However, this technique should be carefully performed to avoid the risk of devitalization of the teeth and periodontal damage. Long-term follow-up studies need to be performed to evaluate the effects of corticotomy-assisted orthodontics on retention and stability.

REFERENCES