

CASE REPORT

Treatment of an Ankylosed Maxillary Central Incisor By Single-Tooth Osseous Osteotomy

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ABSTRACT

Treatment of an Ankylosed Maxillary Central Incisor By Single-Tooth Osseous Osteotomy

Ankylosis is the fusion between the mineralized root surface and the alveolar bone and led to development of infraocclusion. Osteocorticotomy is a surgical procedure in which the intact ankylosed tooth and adjacent bone are either repositioned in 1 step or moved orthodontically. This case report describes the treatment of a boy, aged 14.9 years, whose ankylosed maxillary right central incisor had been infraoccluded due to the trauma. We performed a segmental osteotomy with in a single-stage surgery to allow for inferior repositioning of the tooth and bone. This technique permits optimal repositioning of the tooth and allow rapid movement of teeth with the block of bone. The traction of the single-tooth osteotomy block can be repositioned to the desired position immediately by vertical extrusion bends, vertical elastics, a coil spring, a nickel-titanium wire, or a simple distraction device.

KEYWORDS

Central incisor, Orthodontic treatment, Osteotomy, Tooth movement

ÖZ

Ankilozed Maksiller Santral Kesici Dişin Tek-Diş Kemik Osteotomisi İle Tedavisi

Ankiloz, mineralize kök yüzeyi ile alveolar kemik arasında füzyon sonucu infraoklüzyona neden olan durumdur. Osteokortikotomi, ankiloz diş ve bu dişin etrafındaki kemiğin birlikte ortodontik olarak pozisyonunun değiştirildiği tek basamaklı cerrahi prosedürdür. Bu vaka raporu, travma sebebiyle sağ maksiller santral insizorü infraoklüzyonda olan 14.9 yaşındaki erkek hastanın tedavisini tanımlamaktadır. İnför pozisyonundaki diş ve kemiğin segmental osteotomisi tek basamaklı olarak uygulanmıştır. Bu teknik dişin optimal repozisyonuna ve dişle birlikte kemik segmentin hızlı hareketine izin verir. Tek diş osteotomi bloğunun istenilen pozisyona hareketi vertikal ekstrüzyon bantları, vertikal lastik, yay, nikel titanyum tel veya basit distraksiyon apareyi ile yapılabilir.

ANAHTAR KELİMELE

Santral kesici, Ortodontik tedavi, Osteotomi, Diş hareketi

Tooth ankylosis is histologically defined as an abnormal adhesion of alveolar bone to dentin or cementum and is apparently caused by trauma to the periodontal membrane during or after tooth eruption.^{1,2} Ankylosis has some predisposan factors such as sistemic conditions, trauma or periapical enfektions of tooth and surgical procedures. Specially acute trauma history of tooth like avulsion or intrusion, put at risk periodantal tissue wholeness, are the principal causes of ankylosis.³ The diagnosis of ankylosis can be made by both clinical and radiologic assessments. It is difficult to diagnose ankylosed teeth in the early stages. Detection of dental ankylosis is generally established through clinical findings such as the precense of infraocclusion, a characteristic metallic sound on percussion and missing tooth mobility.^{4,5} However, most common method of diagnosing ankylosis in impacted teeth is the lack of orthodontic movement over a defined period of time^{1,5} Total ankylosis can be demonstrated radiographically by the absence of any periodontal space. It is difficult to diagnose when

ankylosis occurs only in a small area on the buccal or lingual surface.^{1,5} Thus, the 2-dimensional imaging has limited value in the early detection of ankylosis. The development of 3-dimensional imaging systems, such as cone beam computed tomography (CBCT), provides a positive diagnosis of ankylosis.^{1,5,6} Treatment methods for ankylosed teeth include extraction, decoronation, restoration, surgical subluxation, ostectomy, osteocorticotomy and distraction osteogenesis. Nowadays, new treatment method for the movement of ankylosed teeth is defined. This method formed by a single-tooth dento-osseous osteotomy and alveolar bone distraction using customary orthodontic multibracket appliances and not call for a special distraction device.⁷

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CASE REPORT

A 12 year old boy came to the orthodontic clinic with a chief complaint of anterior teeth view and unerupted teeth. His mother accepted and permitted that, his child taken at Pamukkale University, Faculty of Dentistry, before, during and after his treatment can be used for any kind of domestic and/or abroad scientific meeting and/or publication.

He had no systemic condition, but he had a trauma history a several years ago. Clinical and radiographic findings revealed; his maxillary right incisor crown fractured and ankylosed and infraocclusion. (Figure 1).



Figure 1.

Preoperative 3-dimensional Computed Tomographic Image

He had also an asymmetric gingival margins caused by ankylosis of the this teeth. (Figure 2)



Figure 2.

Preoperative dentition, facial view

Ankylosed tooth was measured 4 mm infraocclusal compare to the neighbour teeth.(Figure 1) There was lack of periodontal space around the tooth by radiographically.(Figure 3)



Figure 3.

Preoperative Panoramic Radiograph

Another findings he had class III molar relationship and right first molar, deciduous canine crossbite with 2 mm overjet and 2 mm overbite on the left maxillary incisor. (Figure 2, Figure 3) At the beginning orthodontic traction had been performed for tooth eruption. Firstly Hyrax expander was used to solution posterior crossbite then MBT brackets with 0.022-in slots were bonded on all teeth, with tubes on molars. A 0.014-in nickel-titanium archwire was applied for initial leveling, and there was no movement on ankylosing tooth. After alignment and leveling of maxillary dental arch, a 0.017 * 0.025 stainless steel archwire with a 2 mm step-up bended maxillary teeth and added two grunlock attachment. After this unsuccessful treatment, the patient was referred to surgery clinic for osteotomy. There was sufficient gap (3 mm) among the roots of the maxillary right and left central incisors and maxillary right central incisor and lateral incisor for interdental osteotomies. When the patient aged 14,9 years, he was admitted to the oral maxillofacial clinic and a CBCT was performed for pre-operative assessment. The length of the maxillary right central incisor was 25 mm and the distance between the root apex of the tooth and the floor of the nasal cavity was 4 mm. (Figure 1)

We planned a segmental osteotomy with in a single-stage surgery under the local anaesthesia to allow for inferior repositioning of the tooth and bone. The horizontal cut was planned at 2 mm distance between root apex and nasal cavity. A horizontal incision was made from the maxillary right lateral incisor to the maxillary left canine on the labial mucosa above the mucogingival junction. Mucoperiosteal flap was raised to expose the surgical site. The kretinized tissue of buccal mucoza was preserved when the horizontal incision was made due to the risk of disturbance of the blood flow to the region. A piezo surgery device (Variosurg, NSK, JAPAN) was used for the osteotomy cuts. Two vertical osteotomy were performed divergent occlusally and facially (interdental

osteotomy) between the maxillary left central incisor and the right lateral incisor. (Figure 4)



Figure 4.

Interdentary and subapical osteotomy for repositioning of the ankylosed maxillary right central incisor

Then, the two vertical cuts were combined with a third subapical osteotomy, located horizontally 2 mm over the root apex. Osteotomy procedure was taken so kindly for not to impair the palatal tissue. The alveolar segment successfully leveled in the maxillary arch with a harmonic gingival margin. Finally, the flap was closed. The distraction process was approved by corrective the 5 mm step bend and use of active elastomeric power chains (Ormco, Glendora, Calif) one week after the surgery (Figure 5).



Figure 5.

Orthodontic traction of ankylosed upper right central incisor with power chain (Ormco, Glendora, Calif.)

Ideal overcorrection of vertical and sagittal position was achieved (2 months after surgery) (Figure 6), fine alignment was succeeded by using the "floating bone" term.

After distraction period case was continued orthodontic treatment. The patient's, orthodontic treatment still continues, due to the congenital deficiencies of mandibular second premolars (Figure 7).



Figure 6.

Two months after surgery. Ideal overcorrection of vertical and sagittal position was achieved.



Figure 7.

One year after surgery the panoramic radiography. Orthodontic treatment still continues.

DISCUSSION

The traditional approach of an ankylosed teeth is extraction of the tooth and reconstruction with prostheses. But, this technic caused to a large alveolar bone defect and tends to be more complicated when the ankylosed tooth has been extracted in the puberty phase. And this defect induces esthetic challenges during the restoration.^{7,8} In growing patients dental implant, bone grafting and prosthetic solutions may be associated with esthetic problems. Additionally the disadvantages of these reconstructive procedures are add cost, donor site morbidity, immun reaction and infection transmission.^{7,9,10} A promising approach for ridge preservation at an ankylosed tooth site was suggested by Malmgren in 1984 as an alternative for extraction, which means decoronation.^{11,12} This surgical procedure intends to utilize the process of root replacement by bone tissue for maintaining adequate growth of the alveolar bone to allow optimal implant insertion. Surgical luxation is the other method of treating ankylosis. This method purposed to break the fusion between the

between the cementum and the bone. However, following repair process usually ends up with relaps of ankylosis.⁶ Distraction osteogenesis is a way to make a new bone formation and not to require bone grafting. This term was first described by Ilizarov¹³ in a orthopedics journal in 1971 and get into the maxillofacial surgery by MacCarthy et al.¹⁴ in 1992. Distraction osteogenesis has some advantages such as, long-term stability of treatment outcomes, preservation of blood flow by way of palatal region and lower risk of anatomic formation damage. However, this technic necessitates extensive surgical procedure, large expensive distractors and good oral hygiene care after surgery. The traction of the single-tooth osteotomy block can be repositioned to the desired position immediately by vertical extrusion bends, vertical elastics, a coil spring, a nickel-titanium wire, or a simple distraction device.¹⁵

In the present case, traction of teeth and alveolar block was repositioned with the vertical elastics and elastomeric chain, and distraction devices were not applied, with benefit from expense, oral hygiene, and patient's comfort. However, this technic has inhibition in the quantity of motion due to the opposition of the attached gingiva. The ankylosed teeth should have sufficient periodontal tissue for the segmental osteotomy. In many ankylosis cases, soft tissue is inadequate because of the lack of vertical growth. This is a limiting factor for the movement of the segment. The excessive stretching of soft tissues also effects the stability of the segment.¹⁰ Blood supply for region is also another inhibiting condition. On the other hand, gingival recession occurs in the long time follow-up.⁶ Moreover, root resorption is a principal challenge throughout the treatment of permanent tooth ankylosis.⁷

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