

Case Report

Corticotomy-assisted therapy for orthodontic space closure— A case reportAnahita Punj¹, Biju Thomas², Amitha Ramesh³, Santhosh Shenoy⁴¹PG Student, Department of Periodontics, A.B Shetty Memorial Institute of Dental Sciences, Nitte University, Deralakatte, Mangalore, Karnataka-575018, India.²Professor and Head of Department, Department of Periodontics, A.B Shetty Memorial Institute of Dental Sciences, Nitte University, Deralakatte, Mangalore, Karnataka-575018, India.³Professor and Head of Department, Department of Periodontics, A.B Shetty Memorial Institute of Dental Sciences, Nitte University, Deralakatte, Mangalore, Karnataka-575018, India.⁴Additional Professor and Head of Department, Department of Periodontics, A.B Shetty Memorial Institute of Dental Sciences, Nitte University, Deralakatte, Mangalore, Karnataka-575018, India.***Corresponding author**

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Abstract: Corticotomy, is one of the preferable means to obtain rapid tooth movement, early closure of spaces and avoid the need of an orthognathic surgery in selected cases, where in the conventional fixed orthodontics may take longer time or may be unable to provide the necessary results. In this, selective vertical and horizontal decortication cuts are made around teeth to be moved, which increases the tissue turnover and generates a state of osteopenia, allowing rapid movement of the tooth. In the present case, corticotomy was used as an adjunct for the closure of space present distal to the upper maxillary canine, which due to the presence of thick buccal bone over the maxillary right canine would have taken a longer time to close.

Keywords: Tooth movement techniques, orthodontic space closure, decortication

INTRODUCTION

A major reason for the patients today, undergoing orthodontic therapy is aesthetics, due to which not just adolescents, but even the number of adults opting for orthodontic treatment has increased. However, successful orthodontic treatment can be difficult in these groups of patients when treating adult patients due to the cessation of dentoalveolar development after adolescence. This makes the average orthodontic treatment time for adults, considerably longer than for adolescent patients, which ranges from 18.7 to 31 months [1-3]. Long duration of treatment makes the patient non-compliant and demotivates the patient in need for orthodontic therapy. They are also prone to periodontal complications since their teeth are confined in non-flexible alveolar bone [4]. These factors make orthodontic treatment of adults different and challenging as well as necessitate special procedures to decrease the treatment duration without causing much harm to the tissues. This led to the development of corticotomy-assisted orthodontic treatment (CAOT), which provided solutions to many limitations in the orthodontic treatment of adults. This method has several advantages, such as reduced treatment time, enhanced expansion, differential tooth

movement, increased traction of impacted teeth and more post-orthodontic stability [5]. Surgically assisted orthodontic tooth movement has been used since the 1800s. Corticotomy-facilitated tooth movement was first described by L.C. Bryan in 1893, published in a textbook by S. H. Guilford [6]. In 1959, Kole [7] advocated rapid tooth movement on the basis, that the disruption of the continuity of cortical bony plate, could remove the resistance to tooth movement, ultimately resulting in space closure and cross bite correction. Kole's surgical preparations included interdental and sub apical horizontal cuts, resulting in the appearance of outlined "bony block" (tooth-bone unit) movement. In 1975, Duker [8] used Kole's technique on beagle dogs and concluded that corticotomy did not affect pulp or periodontium. Suya [9] (1991) substituted the sub apical cuts in place of horizontal osteotomy beyond teeth apices. Wilcko *et al.*; [10-12] (2000, 2001, 2003) called corticotomy as accelerated osteogenic orthodontics (AOO), which was later changed to periodontally accelerated osteogenic orthodontics (PAOO) in 2008 [13]. This case report is aimed at the presentation of a case, in which corticotomy was carried out for rapid tooth movement to achieve closure of space distal to maxillary right canine.

CASE REPORT

A 26-year old adult male patient was referred to the department of Periodontics, for opinion regarding the possibility to carry out corticotomy for canine retraction, as the orthodontist anticipated that the thickened bone over the maxillary right canine (13) may interfere with space closure.

The patient had a medical history of ectodermal dysplasia and was currently undergoing orthodontic therapy. Extra-oral examination was unremarkable with the patient exhibiting a class III skeletal pattern. Intraoral examination revealed Angle's class I molar relation, class III canine relationship on left side with cross bite between 13 and 43 and spacing

between teeth due to oligodontia. There was a bony enlargement observed in relation to 13 (maxillary upper right canine). There was an open space between 13 and 15 which was not getting closed with the conventional fixed orthodontic therapy (Figure 1). The gingival biotype was thin and there was presence of an aberrant high buccal frenum attachment. There was no active periodontal disease and an adequate amount of attached gingiva was present. The patient had a good oral hygiene and brushing habit of twice a day using medium bristle brush and toothpaste using up and down and vibratory motions. The orthopantomograph showed no abnormality suggestive of any bony pathology in the alveolar bone or surrounding area of 13. (Figure 2).

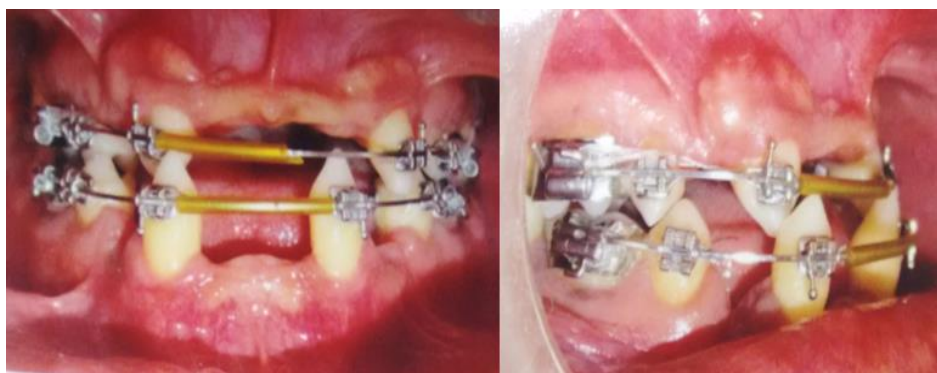


Fig-1: Intraoral examination and preoperative view



Fig-2: Orthopantomograph Surgical Procedure

Oral prophylaxis was carried out and after keeping the patient on regular follow up and maintenance visits, corticotomy in relation to 13 was planned. The procedure was chosen to accelerate the tooth movement of 13 in order to close the space between 13 and 14. Informed consent was obtained from the patient after thorough explanation of the risks and benefits of the clinical procedure planned. The arch wires were removed on the day of surgery and replaced after the surgery.

Local anaesthetic, 2% lignocaine hydrochloride containing adrenaline at a concentration of 1:80,000 was used. On the buccal aspect of the tooth involved, in order to preserve the interdental papilla, a

sub marginal incision was made, starting from mesial line angle of 13 to distal line angle of 15 by using Bard parker number 15 blades (B.P.Blade). Next, vertical incisions were given at the two extreme ends of the initial sub marginal incisions extending till the Mucogingival junction (MGJ). Due to the presence of an aberrant attachment of the buccal frenum between 13 and 15, the buccal frenotomy was done and another vertical incision was given along the attachment of the buccal frenum to avoid tearing of the buccal flap. As a result two full-thickness flaps were reflected using a periosteal elevator till the mucogingival junction. Next, the flap in 13 areas was reflected beyond the mucogingival junction to expose the apex of 13. After reflection of the mucoperiosteal flap, the area of 13 was

inspected which showed the presence of a bony ledge over 13 (Figure 3). The corticotomy procedure was started after slight debridement with ultrasonic scalers. A straight fissure bur was initially used to reduce the bulk of the bony ledge, to create favourable bone morphology and facilitate the corticotomy procedure (Figure 4 A). Using a round carbide bur with saline irrigation perforations were made distal to 13 on the cortical bone in between roots of 13 and 14. These perforations did not extend to the medullary bone and were made parallel to the root of 13. These corticotomy

perforations were then joined to form vertical corticotomy cuts, which extended approximately 1-2 mm past the apices of the teeth and connected with horizontal corticotomy cuts. The vertical corticotomy cuts were stopped about 2 mm short of the alveolar crests (Figure 4 B). Both corticotomy cuts and perforations were extended through the entire thickness of the cortical plate, just barely into the cancellous bone. No flap elevation or corticotomy was performed on the palatal or lingual side in this case.



Fig-3: Bony ledge seen after flap reflection

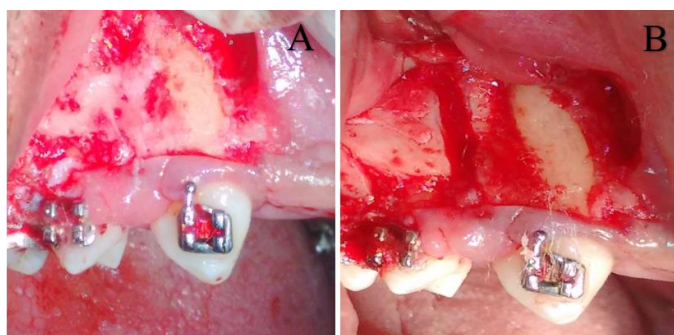


Fig-4: A. After thinning of the bony ledge B. Vertical corticotomy cuts

Two types of bone grafts, that is, xenograft (Osseo mould®) and alloplast (Nova bone®) were mixed and placed over the decorticated area and it was covered by a collagen membrane. The membrane was pre-sutured to the area using 4-0 restorable suture material and later bone graft was added beneath it (Figure 5). The membrane was sutured and the flaps

were thinned and repositioned for suturing. The two flaps were sutured using 3-0 silk sutures using interrupted suturing technique to approximate the flaps to its correct interdental positions. Next, the vertical incisions were sutured using interrupted sutures at the three areas (Figure 6).

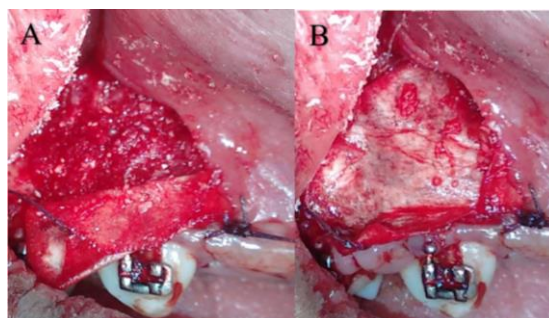


Fig-5: A. Pre-sutured membrane and application of bone graft. B. Membrane placed over bone graft



Fig-6: Suturing of flap

The area was secured with a periodontal dressing (Coe-pack®) for few days. Post-surgical instructions were given and amoxicillin, 500 mg thrice a day for 7 days, chlorhexidine mouth rinse 0.12% twice daily for 2 weeks and diclofenac sodium as needed was prescribed for postoperative discomfort. After 2 weeks suture removal was done and healing was

in progress (Figure 7). The patient's orthodontic treatment was continued and force was applied on 13 and after every 2-3 weeks. The patient was recalled after one (Figure 8), three and six months (Figure 9) which showed complete healing of the surgical area and rapid closure of space. Currently the patient is undergoing orthodontic treatment.



Fig-7: Postoperative view after suture removal



Fig-8: One month postoperative view



Fig-9: Three months postoperative view

DISCUSSION

In the past 50 years, rapid tooth movement without significant root resorption has been reported and treatment time has been reduced to one-third to one-fourth that of traditional non-extraction and extraction orthodontic treatments [14]. Wilcko's PAOO technique [10-13], involved use of comprehensive fixed orthodontic therapy coupled with surgical procedure. The surgical procedure included raising a full thickness flap, labial and lingual corticotomies around the teeth to be moved, and the application of bone graft material over the decorticated areas, followed by suturing of the flap. The tooth movement is initiated after two weeks of surgery and activation carried out at every two weeks thereafter. The procedure of corticotomy, potentiates the normal healing process and the regional accelerated phenomenon (RAP) given by Frost [15] in 1983. RAP begins within few days of injury, and is a process by which tissue forms faster than the normal regional regenerative process. It peaks at one to two months and lasts for 4 months in bone. This induces a state of osteopenia which allows the tooth along with the bony block to move in the desired direction.

In this case, buccal bony plate was thinned to allow rapid site closure, which in accordance with findings of Iino *et al.*; [16] and Gantes *et al.*; [17]. Rapid movement occurs from the lack of osseous resistance and not from excessive orthodontic force. Modification of the original PAOO technique, referred to as 'segmental corticotomy' was used in this case, where only buccal cortical plate was exposed for corticotomy. This approach was more conservative and reduced patient morbidity. Post-surgery the healing was uneventful and after 2 weeks orthodontic forces were applied. The space closure was obtained in 1 – 3 months, signifying the rapidity of the space closure. The case was followed up for 6 months and the patient at the time is still undergoing orthodontic therapy. There are other variations of the original PAOO technique including flapless "piezocision" and transmucosal micro-osseous perforations, [18-19] which although are more conservative could not be performed due to the presence of a thick bony cortical ledge at the region of interest to be treated.

CONCLUSION

In this case the patient was happy with the final outcome of the surgery which allowed rapid closure of the space without causing significant morbidity. Thus, corticotomy, when carried out in a properly selected case, can facilitate early space closure and shorten the treatment time to a great extent which is amenable to both patient and clinician to achieve the desired therapeutic goal. It should also be remembered that it is not a rescue technique but, rather, a tool to be used with proper planning and thought.

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