CASE REPORT

Orthodontic Treatment made Simple! - A Case Report and Review

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ABSTRACT

In recent years, advances in techniques and dental materials as well as a growing public interest in developing and maintaining a healthy and attractive smile have resulted in a greater understanding of the interrelationships between periodontics and orthodontics. Orthodontics and periodontics are interrelated in a variety of situations. Corticotomy-assisted orthodontic treatment is an established and efficient orthodontic technique that has recently been studied in a number of publications.This case report illustrates the orthodontic treatment combined with the corticotomy technique in a 25-year-old adult male patient to accelerate tooth movement and shorten the treatment time. The addition of the decortication procedure to the conventional orthodontic therapy decreased the duration of treatment significantly. Successful closure of the space between the maxillary left canine and second premolar was achieved.Thus, comprehensive orthodontic treatment with the aid of the decortication technique is an effective treatment option in adults to achieve a significant reduction in the treatment duration.

Keywords: Corticotomy, Orthodontics, Periodontics, Regional acceleratory phenomena.

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INTRODUCTION

An increasing number of adult patients are seeking orthodontic treatment. There are several psychological, biological, and clinical differences between the orthodontic treatment of adults and adolescents. Adults have more specific objectives and concerns related to facial and dental esthetics, the type of orthodontic appliance, and the duration of treatment. Growth is an almost insignificant factor in adults compared to children, and there is an increasing chance that hyalinization will occur during treatment.[1] In addition, cell mobilization and conversion of collagen fibers are much slower in adults than in children. Finally, adult patients are more prone to periodontal complications since their teeth are confined in non-flexible alveolar bone.[1] These considerations make orthodontic treatment of adults different and challenging as well as necessitate special concepts and procedures, such as the use of invisible appliances, shorter periods of treatment, the use of lighter forces, and more precise tooth movements. The development of corticotomy-assisted orthodontic treatment opened doors and offered solutions to many limitations in the orthodontic treatment of adults. This method claims to have several advantages. These include a reduced treatment time, enhanced expansion, differential tooth movement, increased traction of impacted teeth and, finally, more post-orthodontic stability.

Alveolar corticotomies (ACS) are defined as a surgical intervention limited to the cortical portion of the alveolar bone, whereas in osteotomies, both cortical and trabecular bone materials are removed in considerable quantities, and in ACS, the incision must pierce the cortical layer and, at the same time, penetrate into the bone barrow only minimally.[2] After the first reports by the Wilcko *et al*.,[3] a wide array of combined ACS-orthodontic treatment techniques have been described in the literature.

The indications for the use of ACS in orthodontics have been grouped into three main categories: [3] (1) To accelerate corrective orthodontic treatment, as a whole, (2) to facilitate the implementation of mechanically challenging orthodontic movements, and (3) to enhance the correction of moderate to severe skeletal malocclusions.

Despite an increasing number of reports on the use of ACS as an aid to orthodontic treatment, few studies have reported setbacks when employing this combined treatment. Recently, however, Wilcko *et al*.[4] gave an objective account of scenarios where the use of

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ACS-orthodontics should be avoided, i.e., (1) patients showing any sign of active periodontal disease, (2) individuals with inadequately treated endodontic problems, (3) patients making prolonged use of corticosteroids, and (4) persons who are taking any medications that slow down bone metabolism, such as bisphosphonates and nonsteroidal anti-inflammatory drugs.

CASE REPORT

A 25-year-old male was referred to orthodontic consultation for deep bite and retropositioned lower incisors which were not allowing maintenance of oral hygiene in the lingual aspect of the lower incisors and attrition of the lower incisors. He strongly expressed the demand for a rapid completion of his treatment, citing professional, and personal reasons. During the orthodontic treatment, it was observed that the space between the maxillary left canine and second premolar was not reducing [Figure 1]. Thus, the patient was referred to the Department of Periodontics, AECS Maaruti Dental College and Research Center. His dental history included regular dental visits and complete oral prophylaxis. The periodontal evaluation revealed a healthy scenario. Clinically, there was no periodontal pocketing, and the zone of attached gingiva was deemed adequate. Radiographic examination revealed no significant bone loss, and all of the erupted permanent teeth registered vital to ice. All surgical procedures were performed after obtaining the consent of the patient. Under local anesthesia, full-thickness envelope flap was raised with sulcular incisions on the buccal sides of maxillary left pre-molar regions only [Figure 2]. No flap elevation or corticotomy was performed on the palatal side in this case. Care was taken not to damage neurovascular bundles. After flap reflection, selective decortications were performed on the buccal side using round burs with water irrigation in the region of maxillary left second premolars [Figure 3]. The corticotomy perforations were extended through the entire thickness of the cortical plate, just barely into the cancellous bone. Post-treatment evaluation of the patient revealed good preservation of the interdental papilla with no gingival recession. Complete closure of space between the maxillary left canine and second premolar was observed [Figure 4]. Treatment objectives were achieved, and the teeth are in good interdigitation with adequate overbite.

DISCUSSION

To be considered effective, orthodontic treatment must meet the goals established during planning within the shortest possible time without compromising the quality and stability of the results and, finally, preserving the long-term health of periodontal tissues. Optimal tooth movement requires the combination of well-planned orthodontic forces[5] and an alveolar bone that offers less resistance to movement, i.e., less dense and with increased bone metabolism.[6] When alveolar bone metabolism is increased, the orthodontic movement is accelerated.[6] Effective tooth movement enhancement has been demonstrated in laboratory studies with animals after the administration of certain drugs[7] or by changing the optimal levels of hormones involved in regulating bone metabolism.[8] Since the first reports about the combination of corticotomies and orthodontic movement, it was believed that ACS delineated bone blocks which were linked together only by bone marrow, which would be more easily moved by the forces delivered by the orthodontic appliance.[9] It was suggested that, due to the surgical cut, the greater resistance to tooth movement offered by the cortical bone would be reduced and, consequently, orthodontic movement would be increased.[10] It was reported that the increased efficiency of orthodontic treatment was not due to greater ease in moving the blocks limited by bone corticotomies but rather by increased bone turnover in response to surgical trauma.[1] This change in bone physiology would result in a localized decrease in trabecular bone density, which, in turn, would offer less resistance to tooth movement.[2]

In particular, the formulation of this latter theory to explain the effects of ACS was based on the physiological responses that occur during the bone healing process. After any trauma to bone tissue, remodeling, which is commonly found in the bone tissue structure, is greatly increased to accelerate the repair process and, consequently, functional recovery.[11] Soon after suffering structural damage, bone tissue goes through a biological stage called Regional Acceleratory Phenomenon, characterized by increased metabolism and decreased density, both transient and localized. Recent animal studies have helped to broaden our understanding of what happens to the alveolar bone after an ACS. Oliveira *et al*.[2] noted that, in dogs, both localized and transient alveolar bone density appeared to be lower. The largest decreases in bone density were recorded immediately and 7 days, after surgery. Measurements taken 14 and 28 days post-surgery showed gradual recovery. When surgical trauma was limited to the cortical bone, it caused significant changes in the structure of the trabecular bone near the surgical site and a decrease in both volume and density. There was an increase in trabecular bone size, reduced connection between these structures, and a decline in trabecular bone density. These results are consistent with the characteristics of the Regional Acceleratory Phenomenon (RAP) observed in long bone healing and thus suggest that this phenomenon is also

Figure 1: Pre-operative photo showing space between maxillary left canine and 2nd premolar

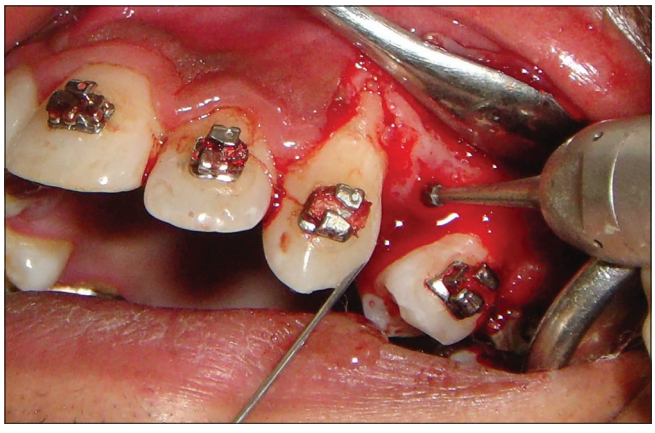

Figure 2: Full-thickness envelope flap raised

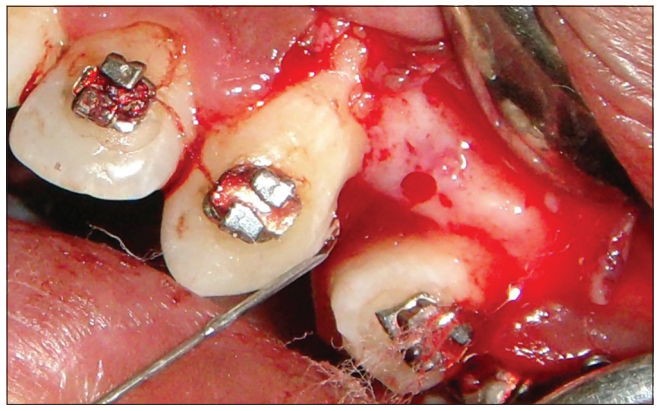

Figure 3: Selective decortication performed on the buccal side using round burs

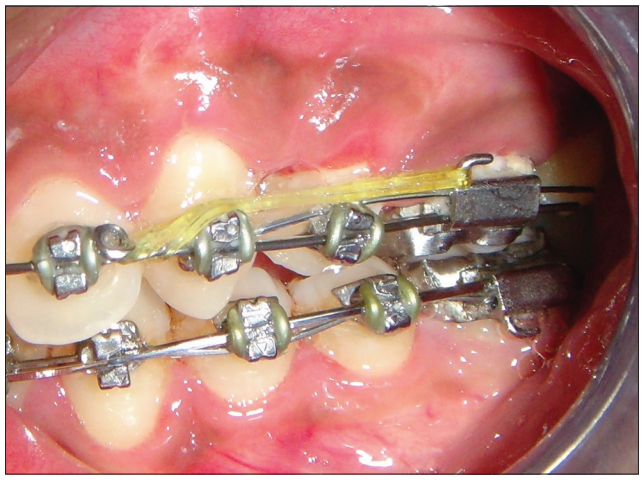

Figure 4: Closure of space between the maxillary left canine and second premolar

present in alveolar bone following the performance of ACS.

Thus, corticotomy surgery initiates and potentiates normal healing process (RAP).[12-14] RAP is local response to a noxious stimulus and describes a process by which tissue forms faster than the normal regional regeneration process. By enhancing the various healing stages, this phenomenon makes that healing occurs 2–10 times faster than normal physiologic healing.[15] The RAP begins within a few days of injury, typically peaks at 1–2 months, usually lasts 4 months in bone, and may take 6 to more than 24 months to subside.[12-14]

There are systemic and histological evidences supporting the theory that the enhancement of tooth movement after ACS is due to an increase in the phenomenon of demineralization and remineralization observed in bone turnover.[16-18] Results reported for rats showed a 3-fold increase in anabolic and catabolic processes up to 21 days after the performance of ACS, showing that the effects on trabecular bone were both intensive and extensive. Results of another study showed that the density of the alveolar bone surrounding the tooth has been assumed to simulate the one occurring after corticotomy to increase tooth movement rate.[19]

CONCLUSION

Comprehensive orthodontic treatment with the aid of the decortication technique is an effective treatment option in adults to achieve a significant reduction in the treatment duration. In addition, with the combination of both periodontal surgery and orthodontic treatment, this option would be an excellent approach for managing pre-existing periodontal problems through increasing the alveolar volume and reducing the likelihood of gingival recession.

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