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Case Report

Impact on the Periodontium after Corticotomy Assisted Orthodontic Treatment: A Case Report

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ABSTRACT

One of the most crucial objectives in the treatment of adult patients' malocclusions is the reduction of orthodontic treatment duration. Between orthodontic surgery and traditional orthodontics, corticotomy-assisted orthodontic treatment may be regarded as a middle-ground approach. Adult patients with severe malocclusion have been found to benefit from it in terms of shorter treatment times and the ability to use traditional orthodontic techniques. This treatment involves a surgical procedure and the immediate application of stronger orthodontic forces used. This method has significantly reduced the duration of orthodontic therapy and removed the possibility of bone and tooth pulp necrosis. Recently, some patients treated with the corticotomy surgery reported satisfactory treatment of severe adult malocclusion. Here, we report a case of corticotomy of maxillary region referred from the Department of Orthodontics, which was done in the Department of Periodontology, Institute of Dental Sciences, Bareilly.

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Key words: ???

INTRODUCTION

Growth is a relatively minor aspect in adults when compared to children, and the likelihood of hyalinization occurring during treatment increases. Furthermore, the mobilization of cells and the transformation of collagen fibers happen at a much slower rate in adults than in children. Finally, adult patients are at a greater risk for periodontal complications because their teeth are situated in rigid alveolar bone.[1]

These considerations make orthodontic treatment of adults different and challenging, as well as necessitate special concepts and procedures, examples include the use of nearly invisible appliances, reduced treatment duration, application of lighter orthodontic forces, and improved accuracy in tooth movement. In addition, corticotomy-assisted orthodontic treatment has been introduced as an adjunct to conventional therapy and has addressed numerous challenges associated with orthodontic care for adults. The innovative method outlined here results in a greater net alveolar volume following orthodontic treatment, known as the periodontally accelerated osteogenic orthodontics (PAOO) technique.

PAOO is a surgical adjunct designed to shorten orthodontic treatment time. The procedure generally follows five steps: Raising a full-thickness flap, selective decortication of cortical bone, placement of particulate bone grafts, flap closure, and immediate application of orthodontic forces. The surgical intervention creates controlled injury to the cortical plate on both labial and lingual aspects of the teeth that require movement.

This injury stimulates a transient biological response known as the regional acceleratory phenomenon (RAP), which results in temporary demineralization and a state of localized osteopenia. In this environment, teeth can be repositioned more rapidly compared to conventional movement mediated solely by periodontal ligament (PDL) activity. Regular monitoring, usually every 2 weeks, allows orthodontists to guide and utilize this accelerated phase effectively.

Clinically, PAOO has shown advantages in managing moderate to severe dental crowding, Class II malocclusions requiring expansion or extractions, and selected mild Class III cases. By combining surgical and orthodontic principles, it enhances treatment efficiency while maintaining periodontal health and providing the opportunity for arch expansion and alveolar augmentation.[2]

The conventional view of orthodontic tooth movement is that of a cell-mediated process orchestrated predominantly within

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the PDL. Sustained force on a tooth translates into a PDL cell population shift wherein pleomorphic fibroblasts are converted to osteoblasts, and osteoclasts are derived from the influx of blood-borne monocytic precursors.[3] With time, the lamina dura undergoes osteoclasis in the area of PDL "pressure," and bone apposition occurs in the areas of PDL "tension." It is well known that massive cell death and hyalinization occur within the PDL during routine orthodontic tooth movement, but can be minimized by judicious application of light forces.[4] It typically takes from 3 to 5 weeks for this zone of sterile necrotic tissue to be eliminated and repaired, during which time tooth movement by frontal resorption is virtually at a standstill. The PAOO technique offers various benefits, including shorter treatment duration, improved expansion, selective tooth movement, better traction for impacted teeth, and greater stability after orthodontic treatment.[5] Utilizing this method allows for greater manipulation of teeth beyond the limitations of the existing alveolar volume, enabling teeth to be moved 2–3 times further in only one-third to one-quarter of the time typically needed for conventional orthodontic procedures.[6]

Here, we report a case of corticotomy of maxillary region referred from the Department of Orthodontics, which was done in the Department of Periodontology, Institute of Dental Sciences, Bareilly.

CASE REPORT

A 27-year-old male patient named Mr. Rajkumar referred from the Department of Orthodontics with the chief complaint of Upper incisor proclination and spacing [Figure 1a and b]. Angle's Class I malocclusion with anterior spacing was the diagnosis made for him. Retraction and intrusion of the upper anterior were the treatment plans. The anterior area included thick cortical bone. The therapy has to be completed as soon as possible. Therefore, it was decided to treat this patient using PAOO. Before treatment, the patient's informed consent was obtained, and there was no relevant medical history. Before the surgery, plaque scores, probing depths, and clinical attachment levels were recorded.

Surgical procedures

After administration of local anesthesia, a crevicular incision is created that extends at least 2–3 teeth beyond the region that has to be treated, both buccally and lingually [Figure 1a and b]. If feasible, both buccal and lingual faces beyond the tooth apices display the full thickness (mucoperiosteal) flap [Figure 2]. Muscle attachments should not be disturbed, nor should any of the neurovascular bundles leaving the bone be damaged. It is best to preserve any interdental papillary tissue that is still interproximally present.

The osteotomy of the buccal cortical plate was carried out using piezosurgical tips (OTS7, OTS7-4, OTS7-3; Mectron S.p.A., Italy). The extent of the osteotomy was guided by the mesiodistal width of the roots and the apical position of the root tips. To preserve the interproximal bone peaks and prevent resorption, vertical corticotomy cuts were terminated approximately 5 mm apical to the alveolar crest and extended in a Y-shaped fashion toward adjacent teeth. Horizontal corticotomies were performed 2–4 mm above the root apices [Figure 3], with cut depth restricted to the cortical plate thickness. Following decortication, demineralized freeze-dried bone allograft (DFDBA) was placed over the prepared sites [Figure 5]. The mucoperiosteal flap was repositioned and secured with interrupted 4–0 sutures, ensuring careful preservation of the interdental papillae [Figure 6].

Post-operative instructions

Postoperatively, patients were prescribed Amoxicillin 625 mg and Metronidazole 400 mg, each to be taken 3 times daily for 7 days. In addition, a 0.10% chlorhexidine mouth rinse (Eludril; Pierre Fabre Santé, France) was recommended twice daily, along with gentle toothbrushing restricted to the surgical area for 2 weeks. Supragingival plaque control was performed on the 7th and 14th post-operative days, and sutures were removed after 2 weeks [Figure 7].

Orthodontic therapy was reinitiated approximately 2 weeks after surgery, with appliance adjustments scheduled at intervals of 1–3 weeks, averaging around 2 weeks [Figure 8]. Throughout the orthodontic phase, patients were advised to attend periodontal recall visits every 3 months to assess oral hygiene and ensure the maintenance of periodontal health.

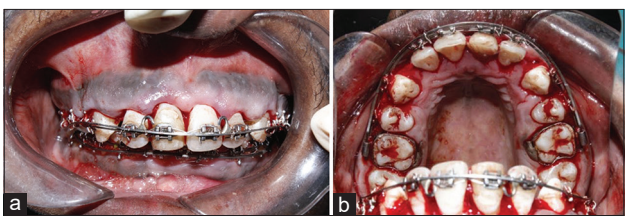

Figure 1: (a) Crevicular incisions in buccal aspect. (b) Crevicular Incisions in palatal

Figure 2: ??? AQ4

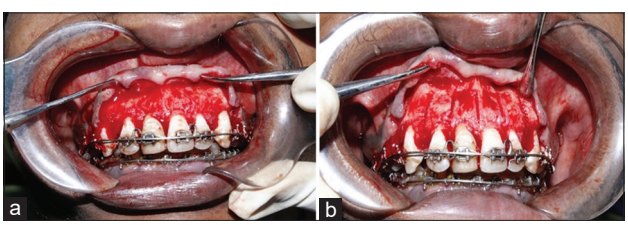

Figure 3: (a and b) the osteotomy of the buccal cortical plate of the alveolar

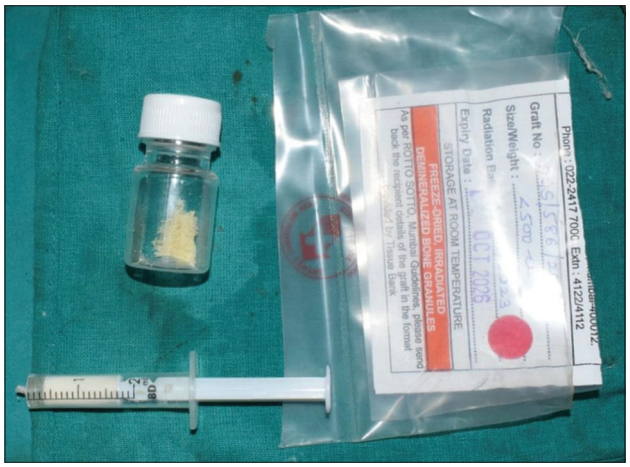

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Figure 5: The decorticated regions were covered with demineralized freeze-dried bone allograft +hydroxyapatite bone graft materials

Figure 6: Simple interrupted sutures

DISCUSSION

Corticotomies with and without bone grafting had no negative impact on the surrounding soft tissues. Although osseous abnormalities were formed, there was no periodontal attachment

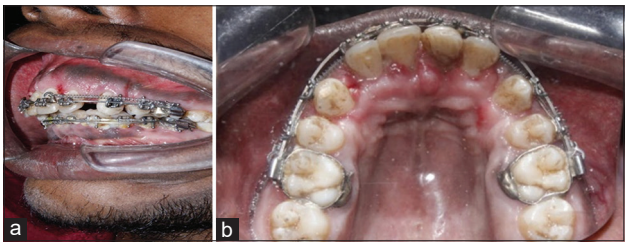

Figure 7: (a) Buccal view immediately after corticotomy with active orthodontic mechanics in place. (b) Occlusal view immediately after corticotomy with active orthodontic mechanics in place

Figure 8: After completion of the orthodontic treatment phase accelerated by corticotomy, the de-bonding procedure was carried out

loss around the second premolar. Lee *et al.* also found that AQ3 corticotomies with bone grafting did not compromise periodontal tissue integrity. Due to their simplicity of use, accessibility, and lack of donor site morbidity, allografts are the most commonly employed in corticotomy surgeries today.[7] Despite possessing merely osteoconductive and maybe osteoinductive qualities, research in the orthopedic and oral surgery literature shows that allografts can produce beneficial results.[8] Allografts are often extracted from human cadaveric bone, although they can also be sourced from living human donors and processed in fresh, frozen, freeze-dried, mineralized, or demineralized forms.[9]

Grafts are treated using a variety of techniques after harvesting, including physical debridement and ultrasonic cleaning. The method employed in this case report included a complete flap raising, interdental corticotomy cut placement, DFDBA graft placement, and decortication of bone on the buccal and palatal sides to preserve the vascular supply to the interdental papilla.[10] The 3-0 vicryl sutures were used to seal the flap. Because the final recordings were made without any appliances on the teeth after the orthodontic treatment was finished, and the first recordings were made after the brackets and bands were placed, the results of this study should be evaluated carefully. Clinical parameters, pocket depth, and attachment changes demonstrate that the surgical procedure was not excessively damaging to the periodontal tissues.

Following the corticotomy procedure, orthodontic forces were applied within 2 weeks, facilitating accelerated tooth movement and significantly reducing the overall treatment duration. This

outcome aligns with documented evidence supporting the PAOO technique as an effective modality for enhancing orthodontic efficiency by leveraging the RAP to achieve faster and biologically supported tooth movement.

Gingival recession was minimal, and the interdental papillae were preserved, ensuring a good post-treatment esthetic result. Wilcko *et al*.[11] discussed the use of the particulate bone grafts after a corticotomy treatment. A patient with severe maxillary transverse constriction whose premolars were enlarged by more than 3 mm was documented in the case report. The authors asserted that the cortical bone's buccolingual thickness had increased. Lamellar bone was qualitatively detected in a bone sample obtained 2 years after retention. The fact that the teeth can be pushed 2–3 times farther than would be achievable with standard orthodontics alone, and that the cases can be finished with an enhanced alveolar bone volume, outweighs the relevance of the higher pace of tooth movement.[8] A more intact periodontium may result from this increased alveolar capacity.

While it is clear that new buccal bone growth is possible after corticotomies in conjunction with bone augmentation, the volume of new bone was not necessarily adequate to compensate for the extent of tooth movement, and many unknowns still remain.

CONCLUSION

From an esthetic perspective, PAOOs not only facilitate efficient tooth alignment but also contribute to the enhancement of facial profile and soft-tissue harmony, making it a unique form of in vivo tissue engineering. The integration of periodontal surgery with orthodontic mechanics provides a comprehensive approach that addresses both dental and facial esthetics, particularly in the lower third of the face.

Although the successful execution of PAOO requires careful case selection and familiarity with modified diagnostic and treatment protocols, it offers orthodontists an advanced treatment modality with significant benefits. With the increasing number of adult patients seeking orthodontic care—often accompanied by periodontal considerations—PAOO represents an appealing interdisciplinary option. Its advantages extend not only to patients, through reduced treatment time and improved esthetics, but also to orthodontists and periodontists by expanding the scope of collaborative treatment possibilities.

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