

Periodontal Accelerated Osteogenic orthodontics: A Predictable Interdisciplinary Approach in Adult Orthodontics – A Report of Two Cases

V. Vijayalaxmi Malali¹, Manab Kosala², S. K. Bhandari³, Amrit Thapa⁴

¹Department of Periodontology, Affiliated Faculty, Army Dental Centre (Research and Referral), Dhaula Kuan, New Delhi, India, ²Department of Periodontology, Armed Forces Medical College, Wanowrie, Pune, Maharashtra, India, ³Department of Oral and Maxillofacial Surgery, Armed Forces Medical College, Wanowrie, Pune, Maharashtra, India, ⁴Command Military Dental Centre, Kolkata, West Bengal, India

Email for correspondence: viju_chandu@yahoo.com

ABSTRACT


There has been a considerable surge in the percentage of adult patients seeking for orthodontic intervention over the past few decades. These adult patients are highly motivated, cooperative, and compliant toward the treatment. At the same time, the expectations of the adult patients to get an effective and esthetic treatment in a shorter duration of time present a challenge to the orthodontic professionals. The orthodontists, for a while, are on a constant lookout for modalities to fasten the tooth movement. However, with the interdisciplinary collaboration, the realm of orthodontics has considerably expanded the conventional orthodontic treatment protocols. To address the concerns of the overall orthodontic treatment time, a number of less invasive interim surgical techniques have been developed. These techniques have not only aided in accelerating orthodontic tooth movement but also have found high acceptance among the patients as well as the dental community. Periodontal accelerated osteogenic orthodontics (PAOO) is one such clinical procedure. It combines alveolar corticotomy and particulate bone grafting. The surgical procedure is followed by the application of orthodontic forces. Here, we have two cases of Angle's Class I malocclusion with bimaxillary protrusion managed with fixed orthodontic mechanotherapy and PAOO. This procedure is theoretically based on the regional acceleratory phenomenon, which is a bone healing pattern. The tooth movement was enhanced shortening the treatment time and increasing post-treatment stability. The cases were completed with increased alveolar volume and intact periodontal housing. The desired degree of facial remodeling and facial esthetics was achieved. The present paper reports two such cases.

Key words: Corticotomy, orthodontics, osteogenic, periodontal

INTRODUCTION

At present, the orthodontic clientele has seen a trend with an increased number of adult patients seeking orthodontic treatment.^[1] Treating adult

patients take into consideration a number of factors as compared to adolescents. There are differences at psychological, biological, and clinical levels between the orthodontic treatments of adults and adolescents. The adult patients have clear and specific objectives related to facial and dental esthetics, the type of orthodontic appliance, and the duration of treatment. Growth factor is almost insignificant in adults. The chance of hyalinization occurring during treatment is also greater. In addition, the bone remodeling is much slower in adults and is more prone to periodontal complications.^[2] Hence, adult patients pose a challenge in orthodontic

Quick Response Code	Article Info:
	doi: 10.5866/2018.10.10192
	Received: 30-09-2018
	Revised: 26-10-2018
	Accepted: 20-11-2018
	Available Online: 05-01-2019, (www.nacd.in)© NAD, 2019 - All rights reserved

practice. Special concepts and procedures have been introduced to address these challenges such as the use of invisible appliances and lingual orthodontics.

The introduction of corticotomy-assisted orthodontic treatment has opened avenues offering solutions to many limitations in the orthodontic treatment of adults. This may be considered as an intermediate therapy between orthognathic surgery and conventional orthodontics. This technique has several advantages, including faster tooth movement, shorter treatment time, and safer expansion of constricted arches, enhanced post-orthodontic treatment stability, and extended envelope of tooth movement. The new technique is called the periodontally accelerated osteogenic orthodontics (PAOO). It is a combination of selective decortication facilitated orthodontic technique and alveolar augmentation.^[3] Two cases of bimaxillary protrusion having Class I malocclusion were planned to be treated with fixed mechanotherapy followed by PAOO to accelerate the finishing and reduce the overall treatment duration.

CASE REPORT 1

A 14-year-old female patient reported to the orthodontist with the complaint of excessive visibility of upper front teeth. On intraoral examination, the patient had a Class I molar relation, Class I canine relation, proclined upper and lower anterior teeth, potentially competent lips, and excessive incisal display. No abnormalities were detected on lateral cephalograph and orthopantomographic evaluation. The treatment objectives were maintenance of Class I molar and canine buccolingual relation, correction of excessive incisal display, and leveling and alignment followed by finishing and detailing. The patient was treated by fixed mechanotherapy after extraction of all the four first premolars [Figure 1]. The patient was then referred to the periodontist for opinion regarding the PAOO. PAOO was done under LA in the upper arch. A modified incision design was used, wherein the incision was given 1.5 mm apical to marginal gingival following the scalloped contour of marginal gingival from distal of 13 to distal of 23, the mucoperiosteal flap was elevated; vertical osteotomy cuts were placed interdentially to a depth of 1 mm up to the entire length of the root followed by decortications of the labial plate [Figure 2]. Particulate alloplastic bone substitute was placed in the decorticated area and sutures were placed [Figure 3]. Analgesics were prescribed and post-surgical instructions given.



Figure 1: Case report 1 – clinical picture showing that the patient was treated by fixed mechanotherapy after extraction of all the four first premolars for proclined upper and lower anterior teeth



Figure 2: A modified incision design was used, wherein the incision was given 1.5 mm apical to marginal gingival following the scalloped contour of marginal gingival from distal of 13 to distal of 23, the mucoperiosteal flap was elevated; vertical osteotomy cuts were placed interdentially to a depth of 1 mm up to the entire length of the root followed by decortications of the labial plate

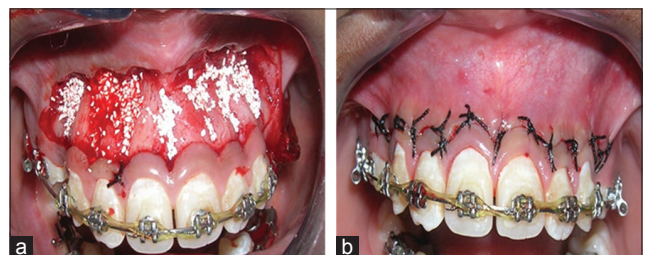


Figure 3: (a and b) Particulate alloplastic bone substitute was placed in the decorticated area and sutures were placed

Active orthodontic treatment was started 2-week post-PAOO. Intrusion and retraction of upper

anterior and closure of the extraction spaces were done on 0.016 0.022 SS wire in 018 Roth with loop mechanics. The intrusion factor incorporated in the loop using high alpha and the loops were activated 1 mm/month. This was accomplished within 4 months. Finishing and detailing were done within 2 months [Figure 4]. Retention protocol was followed after completion of fixed mechanotherapy.

CASE REPORT 2

The second case was a 20-year-old female patient with similar presentation managed on parallel lines. The patient had a Class I molar relation, Class I canine relation, proclined upper and lower anterior teeth, potentially competent lips, and excessive incisal display. No abnormalities were detected on lateral cephalograph and orthopantomographic evaluation. The treatment objectives were maintenance of Class I molar and canine buccolingual relation, correction of excessive incisal display, and leveling and alignment followed by finishing and detailing. The patient was treated by fixed mechanotherapy after extraction of all the



Figure 4: Intraoral view of pre- and post-treatment showing correction of upper proclined anteriors by periodontal accelerated osteogenic orthodontics



Figure 5: Case report 2 – clinical picture showing that the patient was treated by fixed mechanotherapy after extraction of all the four first premolars for proclined upper and lower anterior teeth

four first premolars [Figure 5]. PAOO was done under LA in the upper arch from distal of 13 to distal of 23 [Figure 6]. Active orthodontic treatment was started 2-week post-PAOO. Intrusion and retraction of upper anteriors and closure of the extraction spaces were done using two temporary anchorage devices placed between the roots of lateral incisor and canine [Figure 7].

DISCUSSION

A number of surgical modalities on alveolar ridge were proposed aimed at intervening orthodontic treatment. Out of the lot, the PAOO procedure proposed by Wilcko *et al.* has gained wide acceptance. PAOO can be used in most of the cases requiring orthodontic treatment to accelerate tooth movement. It has been particularly effective in treating moderate-to-severe crowding, in Class II malocclusions requiring expansion or extractions, and mild Class III malocclusions.^[3-5] PAOO can be done in both maxillary and mandibular arches. However, the decision regarding the site of PAOO is based on clinical judgment. The surgical steps consist of elevation of flap, decortication, particulate grafting, closure, and orthodontic force application. Patients with ongoing periodontal disease are not good candidates for PAOO. In addition, PAOO should not be considered as an alternative for surgically assisted palatal expansion in the treatment of severe posterior crossbite. PAOO is contraindicated in cases where bimaxillary protrusion with a gummy smile, which is benefited by segmental osteotomy.^[6]

The rapid tooth movement results in shortened treatment time, which is advantageous to the periodontal health of the patient. The rate of tooth movement is 2–3 times greater than possible with conventional orthodontic mechanics.^[7] The orthodontic treatment objectives with PAOO procedure in both of the cases discussed above were met in just 1/2–1/3 of the reported conventional treatment time which is in accordance with Bell (2009). The proponents of the PAOO claim that the cases can be finished with an increased alveolar bone volume, particularly increase in the post-treatment buccolingual thickness of the buccal bone. In addition, they also noted that the fenestration and dehiscence defects on the buccal of the roots were covered on surgical reentry. These observations have given credibility to the inclusion of the augmentation procedure at the time of the corticotomy surgery.^[3] The likelihood of the development of new dehiscence further



Figure 6: Case report 2 – periodontal accelerated osteogenic orthodontics was done under LA in the upper arch from distal of 13 to distal of 23



Figure 7: Case report 2 – intrusion and retraction of upper anteriors and closure of the extraction spaces were done using two temporary anchorage devices placed between the roots of lateral incisor and canine

contributing to gingival recession is considerably reduced.^[8] The augmentation protocol has been followed in both of our clinical cases. Periodontal examination of anterior teeth revealed no increase in pocket depths or gingival inflammation or recession. The post-treatment panoramic and periapical radiographs revealed well-aligned teeth with root parallelism and no periapical pathology or resorption of the roots in the treated area was noted. The post-treatment results of both of the cases are in accordance with the results of the study by Wilcko *et al.*, 2001. The need for extraction is reduced and an appreciable degree of facial reshaping achieved. Similarly, in the above cases, the protrusive facial profile drastically improved. The proclination of upper anterior teeth was eliminated and the large overjet was reduced to normal limits.

All of these suggest that the dynamics of the physiologic tooth movement in these patients might be more appropriately described as a demineralization-reminerization process, rather than bony block movement or resorption-apposition. This perspective

is substantiated by the fact that there is a growth protein component in the soft tissue matrix of bone.^[9,10] The selective partial decortication of the alveolar bone provides an opportunity to incorporate bone augmentation at the time of the surgery. The reshaped alveolar bone provides additional support for the roots of the teeth and perioral musculature at the end of orthodontic treatment. PAOO as a surgical intervention creates an osteoporotic situation that is conducive for rapid orthodontic tooth movement, induced within the alveolar bone without increasing the risk of apical root resorption. The alveolar bone can be simultaneously augmented and reshaped. Case selection and treatment planning is to be done by a team of Orthodontist and the Periodontist. The overall treatment plan is determined by the orthodontist.^[11]

CONCLUSION

PAOO has found applicability in a wide range of orthodontic cases. It not only addresses the tooth alignment and treatment duration but also ensures a healthy and an intact periodontium at the end of the treatment. Being an intermediate therapy between orthognathic surgery and conventional orthodontics, it offers the scope of management of malocclusion by reduction of extractions and orthognathic surgery. An amalgamation of periodontal surgery and orthodontic treatment has provided practical solutions to address the esthetics of the entire lower face with higher degree of stability in clinical outcomes. A comprehensive treatment of a patient is possible with this interdisciplinary approach. The PAOO technique serves as an attractive treatment option for the triad of orthodontist, the periodontist, and the patient.

REFERENCES

1. Mathews DP, Kokich VG. Managing treatment for the orthodontic patient with periodontal problems. *Semin Orthod* 1997;3:21-38.
2. Ong MM, Wang HL. Periodontic and orthodontic treatment in adults. *Am J Orthod Dentofacial Orthop* 2002;122:420-8.

3. Wilcko WM, Wilcko MT, Bouquot JE. Rapid orthodontics with alveolar reshaping: Two case reports of decrowding. *Int J Periodontics Restorative Dent* 2001;21:9-19.
4. Dibart S, Sebaoun JD, Surmenian J. Piezocision: A minimally invasive, periodontally accelerated orthodontic tooth movement procedure. *Compend Contin Educ Dent* 2009;30:342-4, 346, 348-50.
5. Dibart S, Surmenian J, Sebaoun JD, Montesani I. Rapid treatment of class II malocclusion with Piezocision: A report of two cases. *Int J Periodontics Restorative Dent* 2010;30:487-93.
6. Lee JK, Chung KR, Baek SH. Treatment outcomes of orthodontic treatment, corticotomy-assisted orthodontic treatment, and anterior segmental osteotomy for bimaxillary dentoalveolar protrusion. *Plast Reconstr Surg* 2007;120:1027-36.
7. Bell WH, Finn RA, Buschang PH. Accelerated orthognathic surgery and increased orthodontic efficiency: A paradigm shift. *J Oral Maxillofac Surg* 2009;67:2043-4.
8. Gantes B, Rathbun E, Anholm M. Effects on the periodontium following corticotomy-facilitated orthodontics. Case reports. *J Periodontol* 1990;61:234-38.
9. Urist MR, Iwata H, Ceccotti PL, Dorfman RL, Boyd SD, McDowell RM, *et al.* Bone morphogenesis in implants of insoluble bone gelatin. *Proc Natl Acad Sci USA* 1973;70:3511-5.
10. Fiorellini J, Nevins M. Repair and regeneration of oral tissues: The molecular approach. *Postgrad Dent Series* 1996;3:3-10.
11. Murphy KG, Wilcko MT, Wilcko WM, Ferguson DJ. Periodontal accelerated osteogenic orthodontics: A description of the surgical technique. *J Oral Maxillofac Surg* 2009;67:2160-6.