Case Report

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"A Multidisciplinary Approach to Space Closure in Adult Orthodontic Patient: A Case Report Using PAOO"

Abstract:
Periodontally Accelerated Osteogenic Orthodontics (PAOO) is an interdisciplinary procedure that combines selective alveolar corticotomy, bone grafting, and orthodontic force application to accelerate tooth movement through the regional acceleratory phenomenon (RAP). This technique significantly reduces treatment duration while maintaining periodontal stability. This report presents the case of a 19-year-old female who reported to the Department of Periodontology with a persistent extraction space between the maxillary right canine and second premolar, four months after extraction of the first premolar. Conventional orthodontic mechanics failed to close the space. PAOO was performed in the first quadrant, followed by immediate orthodontic activation. Healing was uneventful, and complete space closure was achieved. Radiographic evaluation confirmed periodontal stability with no root resorption. The case highlights the effectiveness of PAOO in managing orthodontic space closure in adults and underscores the value of interdisciplinary care.

Key-words: Periodontally Accelerated Osteogenic Orthodontics, corticotomy, orthodontic space closure, regional acceleratory phenomenon (RAP), interdisciplinary therapy.

Introduction:

Malpositioning of tooth is the abnormal position of tooth with in the dental arch relative to its ideal anatomical or functional location. Patient come to the orthodontics for correction of Malpositioning of the tooth. But some orthodontic patients put their dental health in risk and frequently avoid dental treatment due to the longer period of time. [1] To overcome this problem Interdisciplinary approach among orthodontic and periodontics is very crucial for shorter treatment time which fastens the procedure.

A modern interdisciplinary approach the combination of corticotomy facilitated orthodontic treatment and periodontal alveolar augmentation has been introduced in 1995 by Dr. William Wilcko (an Orthodontist) andDr. Thomas Wilcko (a Periodontist) known as Accelerated osteogenic orthodontics (AOO) and more recently to as PAOO. PAOO which has been widely popular as Wilkodontics.[2,3]

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In 2001, Wilcko et al reported a revised rapid orthodontic corticotomy-facilitated technique that included periodontal alveolar augmentation, called Periodontally accelerated osteogenic orthodontics; it demonstrated acceleration of treatment to one third of the usual time.[4] .

The role of periodontics in the PAOO is knowledge about biology of the procedure which helping the orthodontics to get faster and stable result. This procedure is based on the bone healing pattern known as the regional acceleratory phenomenon (RAP).

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RAP described by H. Frost in 1983, is a tissue reaction to a noxious stimulus that increases the healing capacities of the affected tissues.[5] It is composed by 4 phases: activation, resorption, reversal and formation. In activation- interaction of RANK and RANKL which resorb bone.Bone resorption lasts for about 2 weeks, after which the osteoclasts undergo programmed cell death or apoptosis. In the reversal phase, pre-osteoblasts migrate into the resorbed cavity and differentiate later into osteoblasts. Mature osteoblasts secrete osteoprotegerin. It can bind the RANKL, thus preventing the further activation of the preosteoclasts. The secreting osteoblasts secrete layers of osteoid, and the resorption cavity is slowly refilled and mineralized in about 3–4 months.[6]

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.[7,8] When orthodontic tooth movement is completed, an environment is created that favors alveolar re-mineralization.[9]

In this regard, Various non-surgical and surgical methods have been proposed to speed up orthodontic tooth movement like Photobiomodulation,[10] Corticotomy,[11] low level laser therapy[12], micro-osteoperforation[13] and piezocision[14].

This article presents a case of successful orthodontic space closure in a young adult patient treated with PAOO after conventional mechanics failed to close an extraction space, demonstrating the clinical utility and interdisciplinary significance of this procedure.

Case Presentation:

A 19-year-old female patient undergoing fixed orthodontic treatment of classII malocclusion with bimaxillary protrusion referredto department of periodontology for periodontally accelerated orthodontic closure of extraction space between maxillary right canine and 2nd premolar.

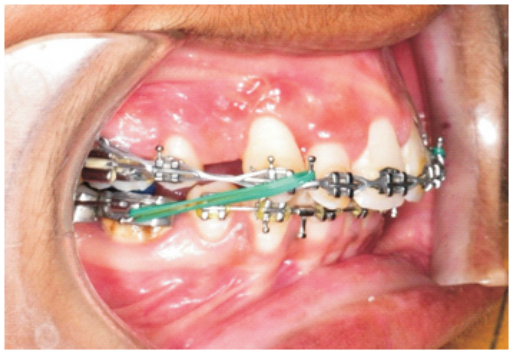


Fig1-Preoperative buccal view

Thorough examination has been done by medical, dental history and intra oral, extra oral and radiographic examination. Intraoral examination revealed satisfactory oral hygiene, healthy gingival tissues, and a clearly visible extraction space distal to the maxillary right canine. Radiographic evaluation confirmed adequate alveolar bone support, normal root morphology, and absence of resorption or pathology. After detailed counseling and informed consent, PAOO was planned in the first quadrant.

Surgical Procedure: After administration of local anesthesia (Lignocaine 2% with 1:80,000 adrenaline)crestalincision was given in the edentulous area irt 14. A combination of full-thickness flapin the most coronal aspect of flap and partial thickness flap apical to 3 to 4 mm beyond the mucogingival junction were elevated.

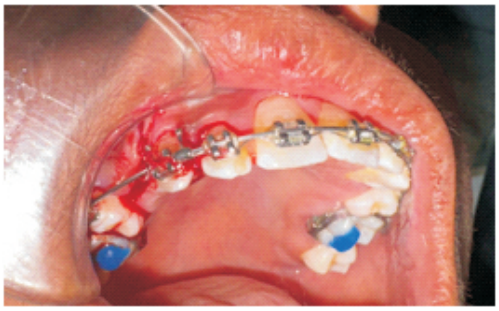


Fig 2–Incision

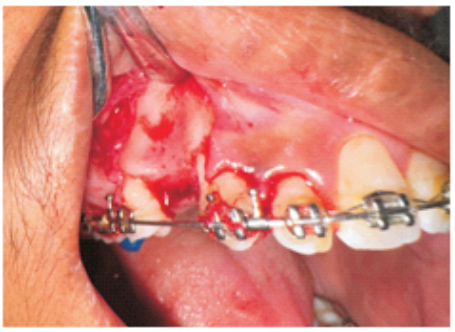


Fig 3– Full Thickness Flap Reflection

Using rotary instruments under cold saline irrigation, a vertical corticotomy were placed in the interradicular space approx. 0.5 mm deep, midway between the root prominences in the alveolar bone.

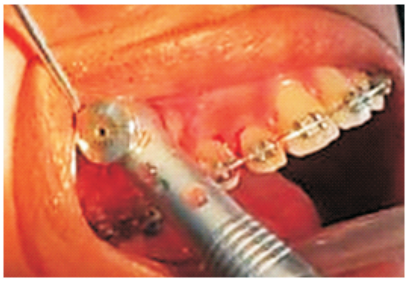


FIG 4- Vertical corticotomy done with rotary instrument

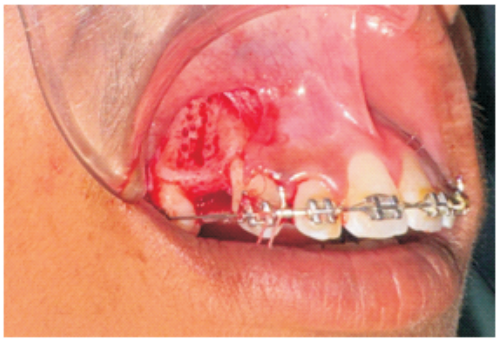
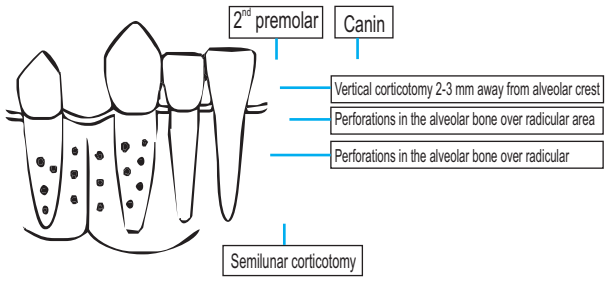


Fig.5– Vertical corticotomy done with rotary instrument

These vertical cuts extended 2–3 mm from the alveolar crest to approximately 2 mm beyond the apices of the roots. At the apical aspects of the roots, semilunar corticotomy cuts were made to join the vertical grooves.



Multiple perforations were created in the alveolar bone over the radicular surfaces with a round bur with a depth of approx. 0.5 mm. Following corticotomy, particulate bone graft (G-Graft, 0.9–1.9 mm particle size) was placed into the corticotomy sites to enhance alveolar volume.

Fig. 6– G Graft Placed

Fig. 7– Suture With 4-0 Silk Suture

The flap was repositioned and secured with non-resorbable silk sutures. Sutures were removed after 10 days.

Postoperatively, the patient was prescribed Capsule Novamox 500 mg thrice daily for 5 days, Tablet Zerodolsp twice daily for 5 days, and advised to rinse with 0.2% chlorhexidine twice daily. Brushing was avoided in the operated area for 1 week. Orthodontic treatment was re-initiated within 2 weeks of surgery. A 0.019" × 0.025" stainless steel wire was engaged with 250 g of force applied. Appliance activation was done every 2 weeks. After 6 months complete closure of the extraction space was achieved. Clinical and radiographic evaluations confirmed stable periodontal support and absence of root resorption.

Fig .8– Post Operative Buccal View After 6 Months

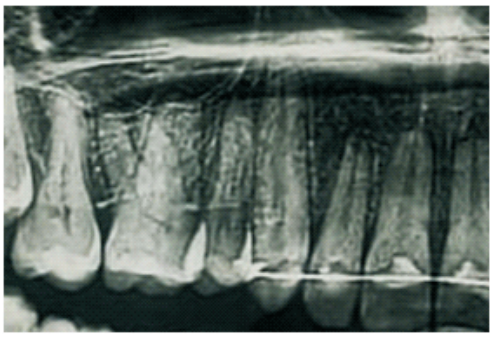


Fig. 9– Post Operative Radiograph

Discussion:

Adult orthodontic therapy is sometimes hindered by biological limitations that lengthen treatment times and raise the possibility of unfavorable outcomes including root resorption and periodontal disease. [15, 16] In these situations, PAOO and other supplementary techniques offer a practical way to speed up tooth movement while maintaining periodontal integrity.

The Regional Acceleratory Phenomenon (RAP), which causes temporary osteopenia and speeds up bone remodeling after selective corticotomy, is the biochemical underpinning of PAOO [18]. Orthodontic tooth movement is aided by

decreased mechanical resistance during this time of increased tissue turnover [19]. In addition to increasing alveolar bone volume and speeding up movement, PAOO lowers the risk of fenestration, dehiscence, and soft tissue recession by combining corticotomy with alveolar grafting [17,21].

Numerous clinical investigations have confirmed PAOO's benefits. When compared to traditional orthodontics, Wilcko et al. [17] showed that treatment duration could be shortened by as much as two-thirds. PAOO improves periodontal results and lowers the incidence of root resorption, according to Hassan et al. [20] and Leethanakul et al. [21]. According to a systematic review by Hoogeveen et al. [22], orthodontics with surgical assistance produces predictable outcomes in terms of crowding reduction and space closure. Improvements in soft tissue phenotype, such as greater gingival thickness and keratinized tissue, have also been proposed by more recent research [22].

These advantages are highlighted in the current scenario. PAOO allowed for quick space closure in less than ten months, with consistent periodontal and radiographic results, even though traditional mechanics had initially failed to close the extraction space. The preservation of gingival health and lack of root resorption are consistent with earlier studies [23]. Significantly, the process increased patient satisfaction and treatment effectiveness, underscoring PAOO's value as an auxiliary in all-encompassing orthodontic therapy.

PAOO is not without its restrictions, though. The technique requires surgical intervention, which may lead to patient reluctance and increased morbidity [22]. Other possible obstacles include the requirement for interdisciplinary cooperation and financial concerns. Furthermore, there are currently few long-term prospective trials, and further research is needed to determine long-term effectiveness even if the evidence supports the stability of outcomes in the short to medium term [24]. Piezocision and other minimally invasive procedures have demonstrated potential in lowering morbidity without sacrificing effectiveness [25]. Furthermore, biologic adjuncts such growth factor-based grafts and platelet-rich plasma might improve results even more in the future.

Conclusion:

This case demonstrates the successful application of PAOO in facilitating orthodontic space closure where conventional treatment alone had failed. By harnessing the biologic principle of RAP, PAOO provided accelerated tooth movement, preserved alveolar bone support, and resulted in stable esthetic and periodontal outcomes.

The clinical implications of this report are significant. PAOO not only shortens treatment duration, thereby improving patient compliance, but also enhances alveolar architecture through grafting, reducing the risk of periodontal complications. Successful execution requires appropriate case selection, patient motivation, and close collaboration between orthodontists and periodontists.

In conclusion, PAOO should be considered a reliable and valuable adjunctive therapy in adult orthodontics, particularly in cases where conventional mechanics fail to achieve desired results within reasonable time frames.

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