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Research Article

PERIODONTALLY ACCELERATED OSTEOGENIC ORTHODONTICS WITH PIEZOSURGERY: AN INTERDISCIPLINARY CASE REPORT

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A R T I C L E I N F O

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A B S T R A C T

Introduction: Case report of a young adult patient affected by edentulous space in anterior maxillawhich was rehabilitated with interdisciplinary approach.
Aim: This technique minimizes the discomfort level and shortens the treatment time as compared to that with traditional corticotomy procedure.
Material & Method: A 17 yearold male patient with a Class I malocclusion with spacing of nearly 8mm reported to department of orthodontics and wanted to complete the treatment in short period. Piezosurgery is a new surgical modalitythat can be used over traditional oral surgical procedures. Decortication was done with piezosurgery and later on orthodontic phase was carried out which include closure of spaces using power chains.
Result: The Closure of spaces was achieved in three months.
Conclusion: The overallduration of treatment required is less when compared to traditional orthodontic treatment.

INTRODUCTION

Periodontal accelerated osteogenic orthodontics (PAOO) is a clinical procedure that combines selective alveolar corticotomy, particulate bone grafting & the application of orthodontic forces. Bone marrow is an excellent source of mesenchymal cells, which will differentiate into osteoblasts with the appropriate molecular signalling. To increase the access of bone marrow to the healing site, perforations of the cortical plate have been recommendedbecause they act as a mechanical or non-infective stimulus that increases blood perfusion to the healing site and the release of growth factors that will improve the normal unperturbed regeneration process. This is a process referred to in the litera-ture as the regional acceleratory phenomenon (RAP). RAP was first described by Frost in 1983.

Distraction Osteogenesis has become a very useful modality in the field of surgical Orthodontics to provide rapid tooth movement. Rapid tooth movement provides a beneficial concept over existing traditional concepts of orthodontic treatment by bringing and regulating the remodelling process. In this technique alveolar bone decortication was done which reduces the resistance offered by thick alveolar housing and then initiates the regional acceleratory phenomenon which increases hard and soft tissue remodelling and further helps to regenerate the bone to its normal state.[1] Piezoelectric bone surgery, also simply known as piezosurgery, is a new technique developed by Italian oral surgeon Tommaso Vercellotti in 1988 utilizing an innovative ultrasonic surgical apparatus, known as the Mectronpiezosurgery device.[2]Piezosurgery is first described by Jean and Marie Curie in 1880, based on the piezoelectric effect. Piezosurgeryderived from Greek word 'piezen' meaning pressure. The principle on which piezosurgery works is 'pressure electrification', according to which piezoelectricity is found in certain crystals like quartz, rochelle salt and ceramics. These when subjected to electrical charges, expand and contract alternately after acquiring electrical polarization to produce ultrasonic waves, since ultrasonic waves are mechanical in nature, they can induce disorganization and fragmentation of different bodies.[3]Piezosurgery improves intraoperative safety in bone surgery, as compared to that available by the traditional manual and motor driven instruments. It is used for bone cutting and is based on ultrasonic microvibrations. The vibrations obtained are amplified and transferred onto the piezosurgery insert upon the bony tissue, results, in the presence of irrigation with physiological solution, in the cavitation phenomenon, with a mechanical cutting effect, exclusively on mineralized tissues.[4]

CASE REPORT

A 17 year old male patient came to the department of Orthoodontics with a chief complaint of unesthetic appearance due to diastema in maxillary central incisors. The patient was systemically healthy with no adverse habits. Before proceeding

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to treatment plan, the whole non-surgical as well as surgical phase of the treatment was explained to the patient and written consent was signed by the patient's relative. It was decided that after initial levelling and alignment by Orthodontist, Piezosurgical decortication procedure will be done in the department of periodontology followed by final orthodontic treatment.

Surgical Procedure

Before starting with the surgical procedure, oral prophylaxis was done. The surgical procedure was performed under aseptic surgical protocols. Then patient was asked to rinse mouth with 0.2% chlorhexidine gluconate solution for one minute. The maxillary anterior region selected for surgery was anaesthetized by bilateral infraorbital nerve block followed by nasopalatine nerve block and local infiltration anaesthesia using local anaesthetic solution of 2% xylocaine containing 1:80,000 concentration of epinephrine. Incision was given with the help of 15 no. blade between maxillary central incisor and full thickness periosteal flap was raised on buccal and palatal aspect to get access to the underlying alveolar bone [Fig 1-2].

Figure 1 Pre-Operative Site wrt #11 & Incision was given

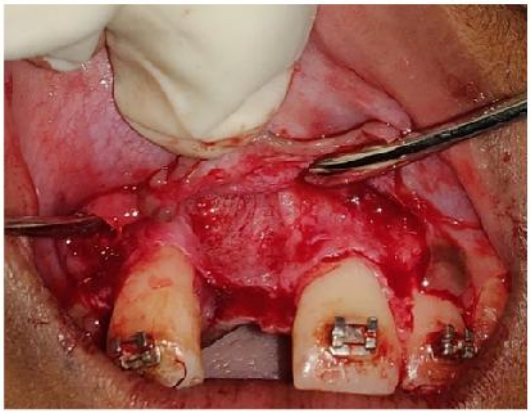

Figure 2 Flap Reflection Done

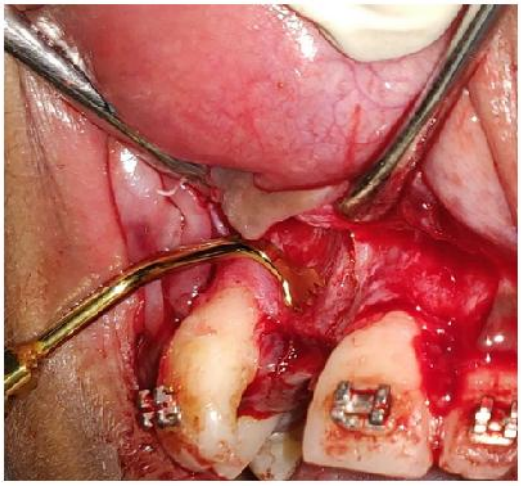

Figure 3 Decortication done with UL4 Insert

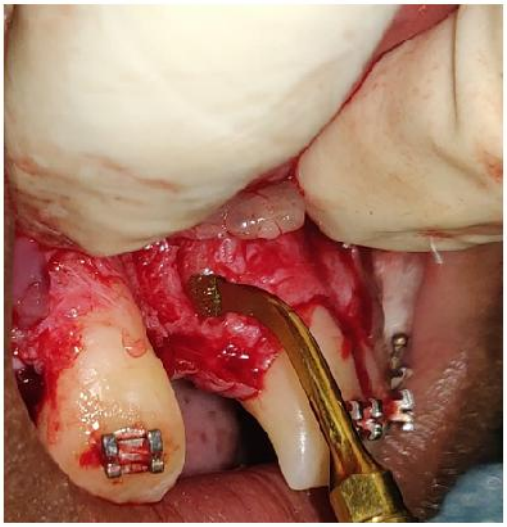

Figure 4 Decortication done with OL3 Insert

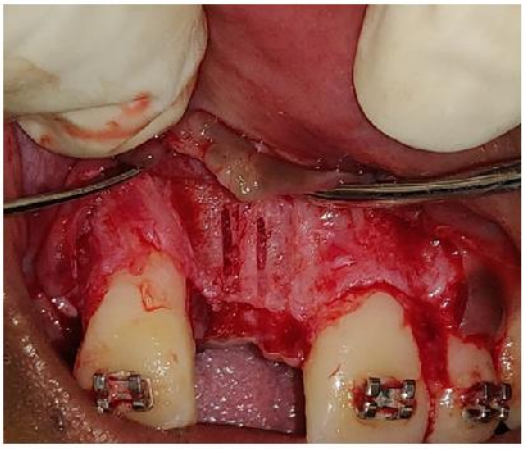

Figure 5 Decortication Completed

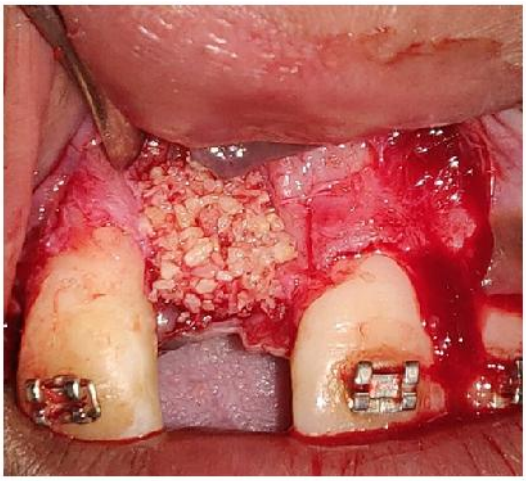

Figure 6 FDBA Bone Graft

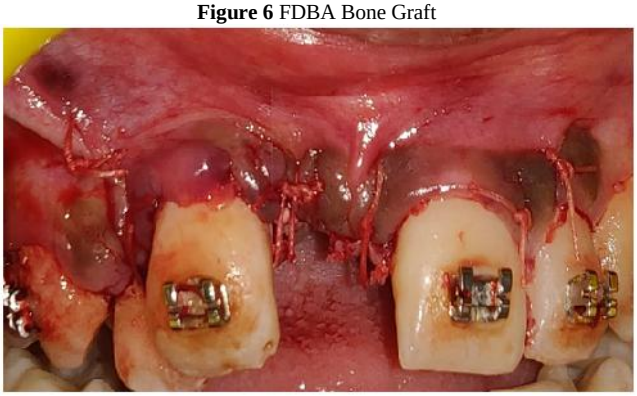

Figure 7 Bone Grafting Done

Figure 8 Sutures Given

Figure 9 Post-operative after 3 Months

Then with the help of piezosurgery UL4 insert vertical cuts are made which were refined with the help of OL3 blunt insert which completed the decortication [Fig3-5]. Piezosurgery works on minimal pressure and precise cutting. Excessive pressure limits the movement of the instrument tip and generating a significant amount of heat. To increase cooling effectiveness, physiological sodium chloride solution at a temperature of approximately 4^0C was used for irrigation. Freeze-DriedBone Allograft procured from Tata Memorial Hospital Tissue Bank, Mumbai mixed with normal saline was placed on the prepared site [Fig 6-7]. After that flap was approximated and sutures were placed with the help of PGA/PLA suture [Fig 8]. Postoperative instructions were given to the patient along with the medications. Patient was recalled after 10 days and 3months for follow up and the desired results was achieved [Fig 9].

DISCUSSION

Patients today are very much conscious about their appearance and specially smile. Hence, there is significant increase in number of patients including older adults who are seeking orthodontic treatment to enhance their smile. Dento-alveolar surgeries such as decortication and osteotomy can alter the bone biology of tooth movement and reduces the treatment duration.[5]Decortication procedures are based on the regional acceleratory phenomenon (RAP) and normal bone healing mechanisms.[6]Periodontally Accelerated Osteogenic Orthodontic (PAOO) treatment simplifies orthodontic treatment in adult patients and makes it possible to accomplish complex movements in relatively shortperiods. In this case Piezosurgery was used for PAOO procedure. The decortication was characterized by precision, selective cutting, maximum surgical control, and less soft tissue injury which facilitated the preservation of the root integrity. Because of the instrument's precision and use of allograft, bone regeneration is more likely. Healing was rapid, and showed minimal morbidity. Piezosurgeryhas various advantages over conventional decortication devices were experienced like precise cutting and safety.[7]The outcome of the case favours with the results found by Tomaso Vercellotti and Andrea Podesta[8] where piezosurgery microsaw was used to eliminate cortical bone resistance to achieve faster orthodontic tooth movement reducing treatment time by 60-70% and use of allograft for achieving periodontal regeneration.[9]

RESULT &CONCLUSION

Piezosurgery assisted PAOO facilitated orthodontic treatment is an effective treatment approach to decrease the treatment time and also to overcome the limitations of traditional decortication instruments. However, the results obtained are good, thus more clinical studies are required including more number of subjects and long-term follow-up.

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