

Case Report

Rapidifying the Orthodontic treatment using Peizosurgery: A Case ReportDr. Chinmay H. Khandait¹, Dr. Vikas Pakhare², Dr. Sunita Shrivastav³, Dr. Kaustubh Khatod⁴¹PG student in Department of Orthodontics, Sharad Pawar Dental College. Sawangi Meghe, Wardha ,Maharashtra.²Lecturer in Department of Periodontics, Sharad Pawar Dental College. Sawangi, Meghe Wardha ,Maharashtra.³Professor and Head of Department in Orthodontics Sharad Pawar Dental College. Sawangi, Meghe Wardha , Maharashtra.⁴Senior Lecturer in Department of Conservative and Endodontics, Sharad Pawar Dental College Sawangi, Meghe Wardha, Maharashtra.***Corresponding author**

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Abstract: A Case report demonstrate a new orthodontic method that shortens the treatment time with minimizing the discomfort level to the patient as compared to that with traditional corticotomy procedure. A 18 year-old male patient with a Class I malocclusion with spacing of nearly 7mm reported department of orthodontics and wanted to complete the treatment in short period. Piezosurgery is a relatively new surgical technique which can be used over traditional oral surgical procedures. Initially treatment presurgical orthodontics was being carried out for initial leveling and alignment followed by Piezosurgery and later Post-surgical orthodontic phase was carried out which include closure of spaces using power chains. The Closure of spaces was achieved in one month. The total treatment time required was much lesser than traditional orthodontic treatment.

Keywords: orthodontic method, Piezosurgery

INTRODUCTION

Wilckodontics has become a very useful modality in the field of surgical Orthodontics to provide rapid tooth movement. Regulating the remodelling process to bring about rapid tooth movement provides a beneficial concept over existing traditional concepts of orthodontic treatment. In this technique decortication of the alveolar bone is carried out which reduces the resistance offered by thick alveolar housing as well as it initiates the Regional acceleratory phenomenon (RAP) due to which there is increase in hard and soft tissue remodelling which helps to regenerate the bone to its normal state [1].

Corticotomy procedures are performed using either manual or motor-driven instruments such as reciprocating surgical burs, saws or trephines. Manual instruments offer good control when small amounts of bone, with less dense mineralization, require to be removed but they are difficult to control in cortical bone, particularly when precise cuts are needed. Whereas conventional tools such as oscillating saws and chisels require large exposure of the surgical site with associated trauma to adjacent soft tissues [2]. Motor driven instruments also generate a significant

amount of heat in the cutting zone which may alter or delay the healing response [3].

Piezosurgery is a relatively new surgical technique which can be used over traditional oral surgical procedures, and in some cases replace traditional procedures [4]. Compared with traditional instruments the movement of the Piezosurgery knife is very small, so the cutting precision is greater and causes less discomfort for the patient [5]. The Piezosurgery device requires lesser manual force as compared to traditional instruments while operating thus makes the instrument more controllable and allowing greater intra-operative control.

CASE REPORT

An 18 year old male patient reported to the department of Orthodontics with a chief complaint of unesthetic appearance due to a spaced dentition and proclined upper front teeth (Fig-1). The patient was healthy with no deleterious habits. Before proceeding 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. It was decided that after initial levelling and alignment by

Orthodontist, Piezosurgical corticotomy procedure will

be done followed by final orthodontic treatment.



Fig-1: Pretreatment Clinical View

Pre-surgical Orthodontic Treatment Phase

Initially MBT 0.018” prescription was selected. Initial levelling and alignment was started by using performed 0.016 NiTi archwires followed by 0.016 X 0.022 NiTi archwires and sequentially 0.017 X 0.025 NiTi archwires. The orthodontic treatment

continued till the level slot line up was achieved and the arches were well coordinated (Fig-2). The time interval required for this presurgical orthodontic phase was 63 days. After which Piezo-surgical corticotomy was scheduled.



Fig-2: After initial levelling and alignment

Surgical phase

Before surgery the orthodontic wire placed for pre-surgical alignment was removed to facilitate the surgical procedure in the maxillary arch. Aseptic surgical protocol was followed throughout the surgical procedure. Prior surgery, patients face was painted with Povidone-Iodine solution (Troydine, Troikaa Pharmaceuticals Ltd). Then patient was asked to rinse mouth with 0.2% chlorhexidine gluconate (Rexidine® INDOCO REMEDIES LTD) 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 (Ligno-Ad Local Anaesthetic, Proxim Remedies, India). Modified approach was followed for raising full thickness periodontal flap on buccal aspect, to get access to the underlying alveolar bone. It was initiated by internal bevel incision, using Bard-Parker surgical blade number 15 (GLASSVAN® NIRAJ INDUSTRIES PVT. LTD), 5mm from the tip of interdental papilla, upto the alveolar bone, extending from distal aspect of maxillary left canine to distal aspect of maxillary right canine, preserving the gingiva over the cervical region and avoiding unnecessary exposure of alveolar bone which may cause undue bone resorption, vertical releasing incisions were also given extending up to the depth of the vestibule from both ends of the horizontal incision to ensure the adequate

exposure of the alveolar bone(Fig.3.1) . Mucoperiosteal flap was then elevated with the help of periosteal elevator. Similar technique was followed to raise full thickness periodontal flap on palatal aspect, however vertical releasing incisions were avoided.

The muco-periosteal flap was elevated well beyond the apices of the anterior teeth both buccally and palatally using periosteal elevator. After raising the flap, greatest mesiodistal width of the anterior teeth (based on Orthopantograph) and the elevations formed on the alveolar process by the convexity of the roots, guided the markings (Fig.3.2) of vertical bone cuts on the cortical bone which were made at a distance of 5mm from the tip of the interdental papilla to 2-3 mm beyond the apices of all the anterior teeth both buccally and palatally. On the palatal aspect the markings were slightly convergent towards the centre of palate as they followed the alignment of the roots of teeth in accordance to the shape of palate.

After the markings were made, vertical bone cuts in the cortical bone were given on the markings with Piezosurgical Unit (Mectron Piezosurgery 3) using OT 7 insert (Figure 3.3). The frequency of the Piezosurgery device was set between 25 and 30 kHz. This frequency causes microvibrations of 60-210 µm amplitude, providing the Piezosurgery hand piece with power exceeding 5W. The hand piece is guided firmly over the bone, but without excessive force. The

Piezosurgery device needs only minimal pressure, permitting a precise cut. Excessive pressure acts in a clearly counterproductive manner, limiting 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° C was used for irrigation. After prolonged cutting, the hand piece warms up so a short pause may be necessary to allow it to cool [6]. The vertical cuts were made from the distal of the right

maxillary canine to the distal of left canine. The depth of the cuts was 1.5mm-2mm (the thickness of cortical bone). The vertical cuts were joined using the horizontal cuts 2mm-3mm apical to the root apex. Similar procedure was followed both facially and palatally. After this the bleeding was controlled, the flaps were repositioned and closed with interrupted sutures (SILK 3-0, ETHICON, JOHNSON AND JOHNSON LTD).



Fig-3.1:

Fig-3.2:

Fig-3.3:

Surgical Photographs

Post-Operative Care

One of the advantage of using Piezosurgery device is lesser post-operative pain,^[7] therefore after surgery, only mild analgesic tablets of Acetaminophen 400 mg, thrice daily for five days was prescribed along with antibiotic consisting of Amoxicillin 500 mg three times a day for five days post-surgical period. Also 0.12 % chlorhexidine gluconate mouthwash (Rexidine® INDOCO REMEDIES LTD) twice daily, for 4-6 weeks was prescribed and patient was instructed not to brush the teeth in the treated area. In order to reduce any chance of post-operative swelling cold fomentation was advised only for the first post-surgical day.

One week post-surgery, sutures were removed, supragingival scaling was done and patient was

instructed to clean the teeth in the treated area with chlorhexidine gluconate mouthwash 0.12% (Rexidine® INDOCO REMEDIES LTD) using cotton pellet followed by soft tooth brush. Follow-up was done after 3 weeks, 6 weeks and 12 weeks, for clinical examination to see any evidence of postoperative gingival recession or pocket formation.

Postsurgical Orthodontic treatment phase

After surgery a 0.017 X 0.025 SS wire was placed immediately on next day along with conventional “e” chains and 15 days activation was followed .The 7 mm of spacing was closed in a span of 30 days with well aligned crown and root positions (Figure 4).



Fig-4: Post-surgical photographs 1 month after active orthodontic treatment

In this case report, patient with Class I malocclusion, with maxillary anterior spacing was treated by Pre-surgical orthodontic treatment for initial alignment, followed by Piezosurgery assisted alveolar corticotomy procedure and subsequently final active orthodontic treatment. Ideal aesthetic and functional results were achieved in five months (pre-surgical orthodontics-63 days, post-surgical orthodontics 1 month). After a follow up of one year there was no

evidence of any adverse periodontal effects such as gingival recession or periodontal pockets. Radiographic examination post corticotomy showed significant space closure between maxillary anterior teeth with no significant reduction in the crestal bone height, no marked apical root resorption as compared to pre corticotomy (Figure 5.1,5.2,5.3). There were no post-operative complications like mobility or loss in vitality of any tooth.



Fig-5.1: Pretreatment OPG

Fig-5.2: OPG after Piezosurgery



Fig-5.3: Post treatment OPG

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 get their misaligned teeth in alignment to enhance their smile. Comprehensive orthodontic treatment time ranges between approximately 1.5 to 2.5 years, depending upon treatment options and individual characteristics according to the American Association of Orthodontists [8]. Dento-alveolar surgeries such as corticotomy and osteotomy can alter the bone biology of tooth movement and reduces the treatment duration [9-11]. Corticotomy procedures are based on the regional acceleratory phenomenon (RAP) and normal bone healing mechanisms [1, 12]. RAP healing is a complex physiologic process which involves increased bone turnover and decreased regional bone density. RAP accelerates tissue reorganisation and healing by temporary burst of localised hard and soft tissue remodelling. Another important principle of corticotomy procedure is that it decorticates the bone which results in transient osteopenia, where mineral content of the bone is temporarily decreased. The osteogenic cells of the alveolar bone start forming rich deposits of calcium and a new bone begins to mineralize in about 20 to 55 days. Now while the alveolar bone is in this transient state, braces move teeth more rapidly, because the bone is soft and thus causes less resistance to the force of braces. Corticotomy-facilitated (CF) orthodontics simplifies orthodontic treatment in adult patients and makes it possible to accomplish complex movements in relatively short periods.

In this case Piezosurgery was used for corticotomy procedure. The precision of the Piezosurgery micro-saw provided a safe corticotomy around the root. The micro-invasive osteotomy was characterized by precision, maximum surgical control,

and selective cutting action which facilitated the preservation of the root integrity. Because of the instrument's precision, bone regeneration is more likely. Healing following the use of piezosurgery micro saw was rapid, and showed minimal morbidity. Numerous advantages of Piezosurgery over conventional corticotomy devices were experienced like precise cutting and safety [13], lesser force required providing greater surgical control [14], almost bleeding free surgical site [15] selective cutting and minimal operative invasion [16], faster bone regeneration and healing process as oxygen molecules released during cutting have an antiseptic effect and ultrasound vibration stimulates cell metabolism [14, 16, 17] no risk of emphysema, decreased post-operative pain [9], and last but not the least reduced traumatic stress to the patient as the device produces less noise and only micro-vibrations [15]. The outcome of the case was in accordance with the results found by Tomaso Vercellotti and Andrea Podesta [17] where piezosurgery microsaw was used to eliminate cortical bone resistance to achieve faster orthodontic tooth movement reducing treatment time by 60-70%.

CONCLUSION

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

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