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# Lower Third Molar Impactions - Efficacy of Piezosurgery In Comparison With Conventional Rotatory Technique.

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## Abstract

### Introduction

The presence of an impacted or a partially impacted third molar in the mandible may have several conditions associated with it such as pericoronitis, odontogenic abscess, trismus, distal caries, periodontal pocket of the second molars, development of follicular cysts and crowding of lower incisors. Therefore, they have to be frequently extracted to prevent any of these consequences. During the disimpaction of the lower third molars, the most essential phase is the osteotomy, for which many techniques have been advocated. These techniques include usage of rotatory, chisel and mallet, and recently introduced piezoelectric technique. The innovation of piezoelectric surgery, which utilizes ultrasonic vibrations, has created an approach for precise and safe osteotomies. Piezoelectric surgery is very efficient for osteotomy because it works selectively around the soft tissues, including nerves and blood vessels, which remain unaffected. It is ideal for complicated or complex surgeries where soft and delicate structures are very close to the osteotomy sites; this is due to its ability to cut mineralized structures. In Maxillofacial surgery, it has been used for sinus augmentation and more recently it has been used for third molar surgeries.[1] Piezosurgery has a significant disadvantage of a longer operating time, which may cause more discomfort in the post-operative period. However, the conventional rotatory method contributes significantly to post-operative trismus, edema and paraesthesia which leads to delayed healing; the advantage of piezosurgery is that it uses ultrasonic micro-vibrations to cut bone effectively with minimal damage to the surrounding soft tissue, which promotes rapid post operation wound healing. We compared the piezosurgery with rotatory technique for osteotomy in the removal of impacted lower third molars in terms of intra-operative time, post-operative healing, post-operative pain, post-operative trismus and post-operative swelling.

### Methodology

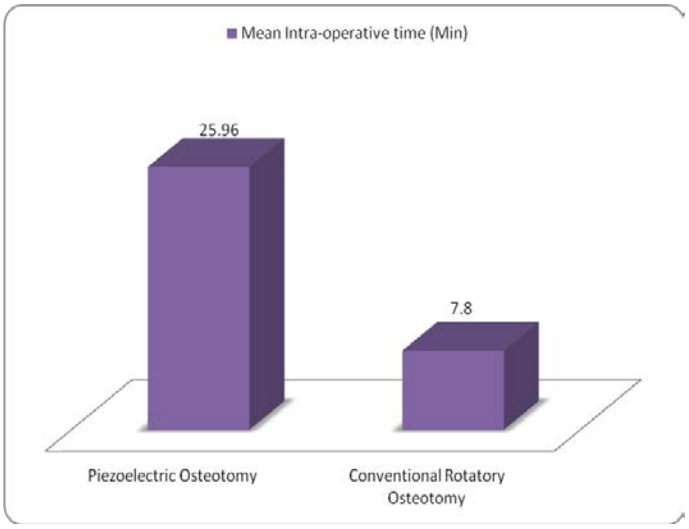
This prospective study was conducted with a study sample consisting of a total of 50 patients who reported to Department of Oral and Maxillofacial Surgery at D.A.P.M.R.V Dental College, Bangalore from June 2016 to June 2017. Pre-operatively all cases were investigated with Orthopantomographs. Bilaterally symmetrical impacted teeth with the same difficulty score were evaluated and chosen by Pederson's difficulty index.[2] Group I (N=50) consisted of patients who gave consent for piezoelectric technique and group II (N=50) consisted of the same patients undergoing conventional rotatory

osteotomy technique. All patients were given a prophylactic dose of amoxicillin 500 milligrams 1 hour before operation. All operations were done by the same surgeon under local anaesthesia consisting of 2% lignocaine hydrochloride with 1:80,000 adrenaline. In both groups, the site was prepared with povidone–iodine solution, and a conventional Ward's incision was made to reflect the flap. A mucoperiosteal flap was raised with a periosteal (Molt's No. 9) elevator to expose the impacted tooth and surrounding bone. A no. 702 straight fissure bur in a straight handpiece at 35,000 rpm or the piezotip was used for guttering at the buccal or distal aspect of the tooth. A no. 703 straight fissure bur was used to section the tooth when needed. At all times cutting of bone and tooth was accompanied by copious irrigation with saline solution. Following the guttering, the tooth was elevated out of the socket using coupland's elevator. The wound was irrigated with povidone iodine and saline solution. The flaps were repositioned and the socket sutured with 3-0 black silk. Patients were recalled for suture removal on day 7. The post-operative protocol included antibiotic therapy (amoxicillin 500 mg in three daily doses for 5 days and Metronidazole 400 mg in three doses for 4 days) and analgesics (diclofenac 50 mg every eight hours) as necessary for pain control, supplementary with a chlorhexidine 0.2% mouthwash (three times daily for one week). All subjects were advised to use cold compresses immediately after extraction. The intra-operative time was measured in minutes. Post-operative pain, edema and trismus were evaluated on day 1, 3 and 7.

**Results**

**A. Intra-operative time**

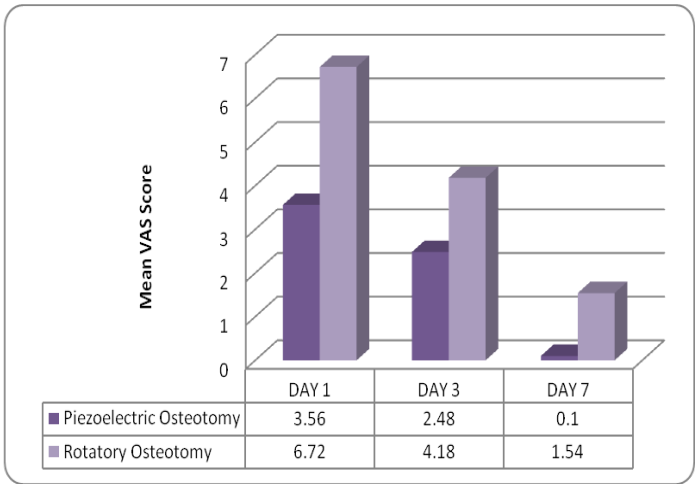
The intra-operative time was 25.96±5.026 minutes in Piezoelectric Osteotomy and 7.80 ± 2.10 minutes in Conventional Rotatory Osteotomy. There was a statistically significant difference in the intra-operative time between Piezoelectric & Conventional Rotatory Osteotomy techniques. (p=0.001)




**Graph 1: Comparison of Intra-operative time between Piezoelectric & Conventional Rotatory Osteotomy techniques**

**B. Post-operative pain**

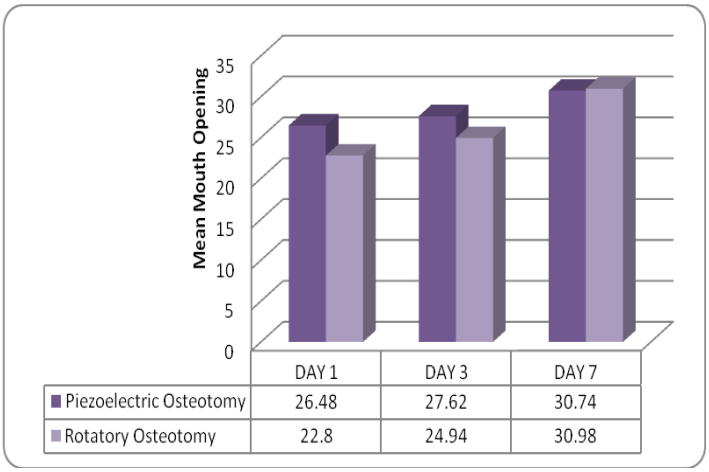
Mean post-operative pain on day 1 was 3.56 ± 1.29 in Piezoelectric Osteotomy and 6.72 ± 0.92 in conventional Rotatory Osteotomy. After 7 days, it was 0.10±0.30 in Piezoelectric and 1.54±0.73 in conventional Rotatory Osteotomy. There was a statistically significant difference in post-operative pain (VAS Score) between Piezoelectric & Conventional Rotatory Osteotomy. (p=0.001)




**Graph 2: Comparison of post-operative pain (VAS Score) between Piezoelectric & Conventional Rotatory Osteotomy techniques.**

**C. Post-operative trismus**

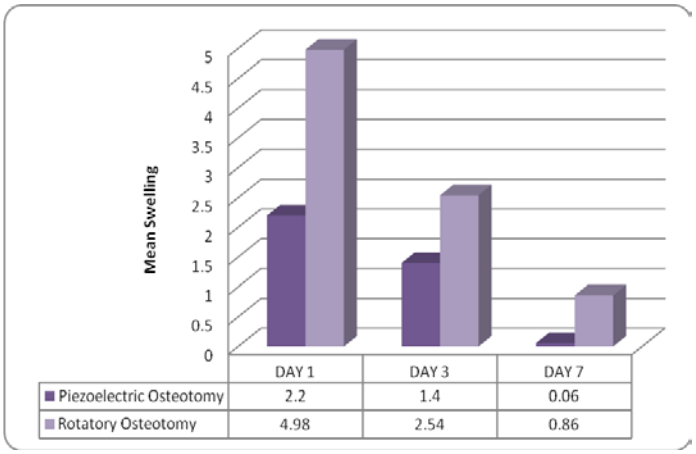
Mouth opening on post-operative day 1 was 26.48±3.68 mm in Piezoelectric Osteotomy and 22.80±2.53 mm in Rotatory Osteotomy on day 1. After 7 days, mouth opening was almost same in both the groups and it was 30.74±3.4 mm in Piezoelectric and 30.98±3.17 mm in Rotatory Osteotomy. There was statistically significant change in Postoperative Trismus/Mouth Opening (mm) from day 1 to day 7 among the Piezoelectric & Conventional Rotatory Osteotomy techniques. (p=0.001)




**Graph 3: Comparison of Postoperative Trismus/Mouth Opening (mm) between Piezoelectric & Conventional Rotatory Osteotomy techniques**

**Post-operative edema**

Mean post-operative edema significantly reduced from day 1 to day 3 and from day 3 to day 7. Mean swelling size was 2.20±1.32 mm among Piezoelectric and 4.98±0.95 mm among Rotatory Osteotomy on day 1. After 7 days itwas 0.06±0.240 and 0.86±0.75 in Piezoelectric and Conventional Rotatory Osteotomy techniques respectively. There was statistically significant change in Postoperative swelling (mm) from day 1 to day 7 among the Piezoelectric & Conventional Rotatory Osteotomy techniques. (p=0.001)




**Graph 4: Comparison of Postoperative Swelling (mm) between Piezoelectric & Conventional Rotatory Osteotomy techniques.**

**Discussion**

The aim of this study was to investigate the efficiency of piezosurgery osteotomy over the conventional rotatory osteotomy in surgical extraction of lower third molars. Piezosurgery works on the principle of oscillation for performing osteotomy of mineralized tissue and it provides clean, sharp cuts of the bone. It also helps in preserving the integrity of soft tissues as its surgical action ceases on contact with the non-mineralized tissues.[3,4]

In 1975, Horton et al., conducted an experimental study to rule out the effects on healing of the alveolar bone when the bone osteotomy was performed by three different methods i.e. with the help of chisel, rotary bur and ultrasonic instrument.[5] The results of the study concluded that the best healing of the alveolar bone was obtained when the osteotomy was performed by chisel followed by ultrasonic instrument and lastly by the rotary instrument.

Piezosurgery generates very small oscillations in the amplitude of 60 to 200µm horizontally and 20 to 60µm vertically, thus it provides precise and safe osteotomy cuts.[4] It is very easy to handle the device when compared to rotary hand piece or an oscillating saw as there is no need for supplemental force to oppose the rotation or oscillation of the instrument.[6] Also, piezosurgery has an

added advantage over rotatory instruments in that its ultrasonic vibrations break down the irrigation liquid into very small particles i.e cavitation phenomenon, which produces a haemostatic effect that ultimately gives a clear unhindered vision of the operating field.[7]

The intensity of pain felt was evaluated based on Visual Analogue Scale (VAS). [8] The VAS score was higher when the impactions were performed using the rotatory osteotomy with a statistically significant difference from the piezosurgical group. Studies done by Troedhan et al., concluded that there was 50% reduction in the pain when piezosurgery was used for surgical extraction for third molars.[9] The studies done by Barone et al., and Sivolella et al., showed a higher VAS score with conventional instruments but their results were not statistically significant.[10, 11] Rullo et al., reported that there was reduction in pain when odontectomy was performed with piezosurgical instrument only for "simple extraction" cases, whereas in "complex extraction" cases the post-operative pain was significantly greater in the piezosurgical group.[12] This was attributed to the longer time taken for the extraction of complex cases with more release of mediators of pain like prostaglandin $E_2$, bradykinin and other mediators.[13] Mantovani et al., stated that, despite more time taken for the surgical procedure, the VAS score was lower in the piezosurgical group.[14] These were similar to our study and can be attributed to the minimal damage to the soft tissue caused by piezosurgery.

Trismus was evaluated by a set of vernier callipers, which was a frequently cited method. There was a statistically significant greater mouth opening in the piezosurgical group on post-operative days 1, 3 and 7. Studies by Barone et al., showed significant improvement in mouth opening on post-operative days 1, 3 and 7 in the piezosurgery group but wasn't statistically significant.[11] Significant higher values were recorded in the piezosurgical group on post-operative days 3, 5 and 7 in the comparative study done by Goyal et al., [15] Sortino et al., showed that 24 hours post extraction values of piezosurgery group were statistically better than the rotary group.[16] Even the results of Piersanti et al , which evaluated trismus everyday post-operatively, found statistically better trismus value on post-operative day 2.[10] Our follow up of the study on post- operative day 7, showed the same mouth opening value in both the groups indicating complete recovery of the subject after the surgery in both the groups.

In our study the technique used for measurement of edema provided a volumetric measurement. There was a statistically significant decreased swelling in the piezosurgical group on post-operative days 1, 3 and 7 as compared to the Rotatory group. Barone et al., mentioned that the measurement of swelling has highly observational bias as it involves three dimensional registration and intraoral swelling can also manifest as facial oedema, their study showed significantly higher value of swelling in the micromotor group.[11] Goyal et al., concluded that significant lower values of swelling was present in piezosurgery group on post-operative day 3, 5, and 7.[15] Troedhan et al concluded that there was 50% reduction in the swelling when piezosurgery was used for surgical extraction for third molars.[9] Mantovani et al showed statistical significant difference in swelling especially on post-operative day 7, so were the results of study done by Piersanti et al.[10,14]

According to the study done by Oikarinen, there's a direct effect of duration of operation on post-operative pain, trismus and swelling.[13] However, Benediktsdóttir et al reported that post-operative outcomes were independent of the time taken for the surgical procedure.[17] Our study shows that despite of more time (mean time = 25.8 minutes) taken by piezosurgery unit as compared to the rotatory osteotomy (mean time = 7.8 minutes) there was

statistically significant reduction in the post-operative pain, trismus and swelling. These findings were to the studies done by Goyal et al, Sivolella et al, Mantovani et al which can be attributed to the less injury to the soft tissue by piezosurgery as its surgical action ceases on contact with the non-mineralized tissue.[14, 15,18] As our study considered the mean value to statistically analyse the time taken for all the procedures and no attempt was made to analyse the time taken according to the difficulty of extraction. Piezosurgical unit is more efficient in controlling the post-operative pain but it is more time consuming and an expensive tool for the surgical removal of third molar.

**Conclusion**

Piezosurgery in third molar surgery reduced pain post-operatively better than the conventional Rotatory technique. Additionally there was speedier improvement in trismus, reduction in swelling. The surgical operating time was the only disadvantage to the piezosurgery over all beneficial performance. Although there are many ways and means to reduce the post-operative discomforts after performing surgical extraction of third molar, piezosurgical unit can be incorporated as one of them for the recovery of the patient, which is the ultimate goal of oral and maxillofacial surgeons.

**References**


1. Vercellotti T. Technological characteristics and clinical indications of piezoelectric bone surgery. Minerva Stomatol. 2004 May;53(5):207-14.
2. Pederson GW. Surgical removal of tooth. In: Pederson GW, editor. Oral surgery. Philadelphia: WB Saunders; 1988.
3. Schlee M, Steigmann M, Bratu E, Garg Ak. Piezosurgery: basics and possibilities. Implant Dent 2006; 15:334-340.
4. Vercelloitti T, Nevins ML, Kim DM, Nevins M, Wada K, Schenk Rk, et al. Osseous response following resective therapy with piezosurgery. Int J Periodontics Restorative Dent 2005; 25:543-549.
5. Horton JE, Tarpley TM Jr, Wood LD. The healing of surgical defects in alveolar bone produced with ultrasonic instrumentation, chisel and rotatory bur. Oral Surg Oral Med Oral Pathol 1975; 39(4):536-546.
6. Ewers R, Fock N, Millesi-Schobel G, Enislidis G. Pedicled sandwich plasty: a variation on alveolar distraction for vertical augmentation of the atrophic mandible. Br J Oral Maxillofac Surg. 2004 Oct;42(5):445-7
7. Smith WI, Marnett LJ. Prostaglandin endoperoxide synthase: structure and catalysis. Biochim Biophys Acta 1991; 1083(1):1-17.
8. Price DD, Mcgrath PA, Rafii A, Buckingham B. The validation of visual analogue scales as ratio scale measures for chronic and experimental pain. Pain 1983; 17(1):45- 56.
9. Troedhan A, Kurrek A, Wainwright M. Ultrasonic piezotome surgery: Is it a benefit for our patients and does it extend surgery time? A retrospective comparative study on the removal of 100 impacted mandibular 3rd molars. Open Journal of Stomatology 2011; 1:179-184.
10. Piersanti L, Dilorenzo M, Monaco G, Marchetti C. Piezosurgery or conventional rotary instruments for inferior third molar extractions? J Oral Maxillofac Surg 2014; 72:1647-1652.
11. Barone A, Marconcini S, Giacomelli L, Rispoli L, Calvo JL, Covani U. A randomized clinical evaluation of ultrasound bone surgery versus traditional rotary instruments in lower third molar extraction. J Oral Maxillofac Surg 2010; 68:330-336.
12. Rullo R, Addabbo F, Papaccio G, D'aquino R. Piezoelectric device vs. conventional rotative instruments in impacted third molar surgery:

Relationships between surgical difficulty and postoperative pain with histological evaluations. J Cranio-Maxillo-Fac Surg 2013; 41:e33-e38

13. Oikarinen K, Postoperative pain after mandibular third-molar surgery. Acta Odontol Scand 1991; 49(1):7-13.
14. Mantovani E, Arduino PG, Schierano G, Ferrero L, Gallesio G, Mozzati M et al. A split-mouth randomized clinical trial to evaluate the performance of piezosurgery compared with traditional technique in lower wisdom tooth removal. J Oral Maxillofac Surg 2014; 72:1890-1897.
15. Goyal M, Marya K, Jhamb A, Chawla S, Sonoo PR, Singh V et al. Comparative evaluation of surgical outcome after removal of impacted mandibular third molars using a piezotome or a conventional handpiece: a prospective study. Br J Oral Maxillofac Surg 2012; 50:556-561.
16. Sortino F, Pedullà E, Masoli V. The piezoelectric and rotatory osteotomy technique in impacted third molar surgery: Comparison of postoperative recovery. J Oral Maxillofac Surg 2008; 66:2444-2448.
17. Benediktsdóttir I, Wenzel A, Petersen JK, Hintze H. Mandibular third molar removal: risk indicators for extended operation time, post operative pain, and complications. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2004; 97(4):438- 446.
18. Sivolella S, Berengo M, Bressan E. Osteotomy for lower third molar germectomy: Randomized prospective crossover clinical study comparing piezosurgery and conventional rotatory osteotomy. J Oral Maxillofac Surg 2011; 69:15-23.