

Original Research

Comparison of piezosurgical and conventional rotary technique in impacted third molar extractions: An original study

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ABSTRACT:

Aim: To compare the postoperative outcomes in impacted mandibular third molar extraction using piezosurgery and conventional rotary technique. **Methods:** 100 patients with symmetrical impacted lower third molars were included in this study. Measurements for mouth opening and swelling were taken preoperatively on the day of surgery and 1 week after surgery. Pain was evaluated using Visual Analog Scale (VAS) from first postoperative day for six consecutive days. **Results:** Increase in facial swelling was more in the rotary group than piezosurgery group with statistically significant values ($p = 0.025$). Rotary group had higher values for postoperative pain as compared to piezosurgery on all the days and the difference was statistically significant on each day except second postoperative day. **Conclusion:** Extraction of impacted lower third molar results in more favourable outcome when carried out by piezosurgery technique.

Keywords: Impacted third molar, Osteotomy, rotary, Piezo-electric surgery

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INTRODUCTION

Extraction of impacted third molars is one of the most common oral surgical procedure done under local anesthesia.¹ The transalveolar extraction of impacted lower third molars produces a significant degree of trauma to the surrounding hard and soft tissues, which results in inflammation manifesting as pain, edema and reduced mouth opening.² Osteotomy is one of the most critical step during this procedure and various methods have been described.

When conventional rotary bur technique is used for osteotomy, marginal osteonecrosis is produced due to high temperature during the procedure due to which continuous irrigation of saline is required.³ Recently, piezoelectric surgery technique has been used to overcome the disadvantages associated with conventional rotatory technique.

Piezoelectric technique (Piezotome) uses an alternating current, which when applied results in alternate expansions and contractions of the crystal.⁴ Its handpiece has an oscillation frequency of 28–36 KHz with microsurgical precision and selective hard

tissue cutting action, which reduces the chances of inferior alveolar or lingual nerve damage.⁵

Traditionally, impacted third molars are often removed using rotary osteotomy techniques. However, conventional rotary cutting instruments are potentially injurious because they can generate excessively high temperatures during bone drilling, which leads to marginal osteonecrosis, and can impair osseous regeneration and healing.⁶⁻⁸ Recently, with the tendency toward minimally invasive surgery, Piezosurgery—a new osteotomy technique—has been introduced in oral and maxillofacial surgery.

Therefore, in this study, we performed an extensive literature search of RCTs and conducted meta-analyses to compare piezosurgery with conventional rotary osteotomy techniques, with regard to surgery time and postoperative sequelae, including pain, swelling, and trismus.

METHODS

This split mouth study was conducted from December 2018–December 2019 in patients with

presence of bilateral symmetrical impacted lower third molars with a similar extraction difficulty (as per Pederson difficulty index⁸) and with an age ranging from 18 years to 45 years.

Patients were randomly allocated into the two said groups via computer generated random allocation method. Patients with the following conditions were excluded from the study: teeth affected with acute infections, such as pericoronitis, an acute alveolar abscess, patients on steroid therapy, patients with conditions in which there is probable altered cortisol levels, patients affected with conditions in which there is decreased salivary secretion (e.g; patients taking atropine, antidepressants, calcium channel blockers, antihistamines, Sjogren's syndrome, and radiotherapy), a known case of diabetes mellitus and/or hypertension, alcoholic patients, patients with smoking habits, pregnant patients, lactating mothers and patient allergic to penicillin or other drugs used in the postoperative period.

This study followed the statement of ethical principles for medical research involving human subjects as per 'Declaration of Helsinki'. All patients were informed about the procedure and possible complications involved and signed a detailed informed and written consent form. Treatment began after obtaining full medical history and after radiologic investigations i. e; orthopantomograms (OPG).

SURGICAL TECHNIQUE

Following local anesthesia (2% lignocaine with 1:2,00,000 adrenaline), a conventional 'Ward's incision' was made and reflection of a mucoperiosteal flap was done with a periosteal elevator (Molt no 9) to expose the underlying tooth and bone. Bone overlying the tooth was removed by standard 'Moore-Gillbe Collar' technique. In group I, conventional rotary method was used with a carbide fissure bur under copious irrigation with normal

saline while in group II, osteotomy was carried out using piezotome surgical kit. Tooth sectioning was done using bur while taking care to avoid contact with bone. Tooth was removed and closure done with 3-0 non-absorbable black braided silk suture. Pressure pack was then placed over the extraction site following which standard postoperative instructions were given.

VARIABLES ASSESSED

Pain was evaluated on postoperative days 1, 2, 3, 4, 5 and 6 using Visual Analog Scale (VAS). Mouth opening and swelling were evaluated immediately before starting the surgery and on 7th postoperative day. Mouth opening was evaluated by measuring the interincisal distance (millimeters) with a ruler at maximum mouth opening position from mesioincisal angle of upper right central incisor to mesioincisal angle of lower right central incisor. Swelling was evaluated by a method described by Schultze-Mosgauet al.⁹ Measurements were taken using a flexible scale in closed mouth position by marking five fixed points and three surgical base lines connecting the said fixed points. Duration of surgery was also recorded between placement of incision and the placement of last suture. Patient was then recalled after 30 days for surgical extraction of the contralateral mandibular third molar with the other technique.

DATA ANALYSIS

Data was arranged in Excel spread sheet while taking care to ensure that there was no data entry error. Continuous variables were described as mean \pm standard deviation or median with interquartile range as applicable. The mean in two groups was compared using paired t-test/ Wilcoxon signed rank test as applicable. Repeated measures analysis using Friedman test was done to compare multiple readings of pain.

RESULTS

Table 1: Comparison of VAS pain score between rotary and piezosurgery groups

Postoperative day	Group	Mean(SD)	Median	P value
1	Rotary	6.6 (3.04)	6.00	0.0223
	Piezosurgery	4.6 (2.67)	4.00	
2	Rotary	4.7 (3.15)	5.00	0.07488
	Piezosurgery	3.5 (1.88)	3.00	
3	Rotary	4 (3.65)	2.00	0.01966
	Piezosurgery	2 (2.11)	2.00	
4	Rotary	3 (2.35)	4.00	0.03351
	Piezosurgery	1.50 (1.88)	3.00	
5	Rotary	2.5 (1.83)	2.00	0.07488
	Piezosurgery	1.5 (1.39)	4.00	
6	Rotary	2.2 (1.75)	3.00	0.05447
	Piezosurgery	1 (1.05)	2.00	

Table 2: Comparison of increase in swelling between rotary and piezosurgery techniques

Group	Median	Mean	P-Value
Rotary (50)	0.500	0.6745	0.02576
Piezosurgery (50)	0.250	0.4657	0.04361

Sixty patients were females and forty were males with age range of 21–32 years (mean age of 24.7 years). The duration of time taken for surgery (mean \pm standard deviation) was 37.3 ± 6.98 min in the rotary group, while in the piezosurgery group it was 58.5 ± 5.50 min with a p value of 0.005857.

When the comparison was done between the 2 groups for postoperative pain, rotary group had higher mean values as compared to piezosurgery on all the days (Table 1). Increase in the facial swelling was more in the rotary group than the piezosurgery group with a p value of 0.025 (Table 2).

DISCUSSION

Advanced principles of physics with introduction of newer instruments have reduced the difficulty and morbidity in third molar surgery. One such innovation is piezosurgery or the application of piezoelectricultrasonic vibrations to make precise and safe osteotomies.¹⁰

Any surgical insult to the oral tissues produces inflammation in the post-surgery period which manifests as pain, swelling and a reduction in mouth opening (trismus), the degree of which depends on the duration of surgery, site involved, surgeon's experience, degree of tissue injury, the technique used, patient's systemic health status and associated medical therapy.¹¹ These three variables (pain, swelling and trismus) were assessed in transalveolar removal of lower third molars and a comparison of these variables was done with rotary technique versus piezosurgery technique.

Transalveolar extraction using piezosurgery took a longer time as compared to the rotary method in our study which was similar to the results of studies conducted by Sivoletta et al.,¹² Basheer et al.,¹³ Mozatti et al.,¹⁴ Bartuli et al.¹⁵ and Mantovani et al.¹⁶ Studies conducted by Basheer et al.,¹³ Goyal et al.¹⁷ and Mantovani et al.¹⁶ concluded that piezosurgery technique resulted in less postoperative pain as compared to rotary technique, hence favouring our study results.

Even though a longer surgery time was required for piezosurgery technique, it resulted in better postoperative outcomes in our study. This can be attributed to the specific characteristics of piezosurgery cutting mechanism. The microsurgical precision in the cutting due to micro vibrations with linear oscillation of 20–80 μm , as well as the selective action on hard mineralized tissues resulted in this favourable outcome.⁵ In piezosurgery, the need for pressure application is reduced as compared to conventional technique, hence increasing surgical control for the operator. The ultrasonic vibrating insert on contact with the saline solution produces

microscopic vapor bubbles which lead to cavitation phenomenon and improving the visibility of operative field by limiting the extravasation of blood. Scanning electron microscope studies have demonstrated irregular surface in surgical field while using bur in rotary handpiece, whereas a perfectly clean surface immediately covered with fibrin is observed after bone cutting using piezosurgical technique.⁵

Piezosurgery can be considered as a better alternative to conventional rotary technique especially in mandibular third molars with a less surgical difficulty.³ Our study, with only one patient having a severe Pederson difficulty index score, also demonstrated better postoperative results using piezosurgery technique similar to the results obtained in previous studies.

The main disadvantage of piezosurgery noticed so far besides expense and the risk of breakage of the surgical tips is the increased operating time as a result of the slow rate of cutting. The time of surgery can be improved by the operator's experience. Increasing the sample size with longer duration of follow-up and taking bone specimen for histological examination from the surgical site can add valuable findings to the previous results.

CONCLUSIONS

Within the limitation of this study, it can be concluded that piezosurgery reduces postoperative pain, trismus, and swelling and enhances the postsurgical quality of patient's life. Also, it may play an important role in increasing bone density within the extraction socket and decreasing the amount of bone loss along the distal aspect of the mandibular second molar. The piezosurgery technique was a better alternative to rotary technique in terms of postoperative outcomes of pain, edema and trismus, in spite of the increased surgery duration in piezosurgery technique.

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