ISSN- O: 2458 - 868X, ISSN–P: 2458 – 8687
Index Copernicus Value: 49. 23
PubMed - National Library of Medicine - ID: 101731606

International Journal of Medical Science and Innovative Research (IJMSIR)
IJMSIR : A Medical Publication Hub
Available Online at: www.ijmsir.com
Volume – 3, Issue – 6, November - 2018, Page No. : 283 - 291

Surgical disimpaction of mandibular third molars: A comparative study on clinical effects of three different osteotomy techniques

[1]Dr. Aparna Ray, Post graduate, Oral & Maxillofacial Surgery, I.T.S- CDSR, Murad Nagar
[2]Dr. Amit Gupta, Reader, Oral & Maxillofacial Surgery, I.T.S- CDSR, Murad Nagar
[3]Dr. Vidhi C. Rathi, Reader, Oral & Maxillofacial Surgery, I.T.S- CDSR, Murad Nagar
[4]Dr. Pradeep Sharma, Senior Lecturer, Oral & Maxillofacial Surgery, I.T.S- CDSR, Murad Nagar
[5]Dr. Harsha Jain, Professor, Oral & Maxillofacial Surgery, I.T.S- CDSR, Murad Nagar
[6]Dr. Sanjeev Kumar, Professor& Head, Oral & Maxillofacial Surgery, I.T.S- CDSR, Murad Nagar
Corresponding Author: Dr. Vidhi C. Rathi, Reader, Oral & Maxillofacial Surgery, I.T.S- CDSR, Murad Nagar

Type of Publication: Original Research Paper
Conflicts of Interest: Nil

Abstract

Aim

The aim of this study is to find out the ideal osteotomy technique while removing impacted mandibular third molar with minimal post-operative discomfort to the patients using three different osteotomy techniques.

Material and method

Sample size of 15 patients 6 males, 9 females with a mean age of 27.43 ± 5.27. Unilateral extractions were required in all patients. All the patients were randomly allocated to three groups (n=5 in each) depending on the two different speed of the handpiece and piezoelectric device used for osteotomy (Group-A ; slow=20000rpm, Group-B fast=40000rpm and Group-C piezoelectric device=5). All the patients were clinically evaluated for pain using VAS score, swelling and mouth opening pre-operatively, post-operatively at day1 and 7.

Results

Parameters assessed in this study were –pain (visual analog scale VAS score), swelling and mouth opening (interincisal opening in all the three groups at baseline, 1st and 7th postoperative day. Comparing the three groups pain scores with ($P < 0.05$) a statistically significant difference was found for pain on 7th postoperative day between the three groups and a significant difference was noted on comparing the swelling at postoperative day 1 for Group-C. No significant difference was noted with regard to mouth opening amongst the three groups.

Conclusion

This study demonstrated us that there is no major difference in postoperative sequelae irrespective of the type of osteotomy techniques are used for removal of impacted mandibular third molar. However piezosurgery group showed significantly better reduction of swelling & control over pain and on 1st & 7th postoperative day respectively. Piezosurgery also does help in soft tissue protection, optimal visibility in the surgical field, decreased blood loss, less vibration and noise, increased comfort for the patient, and protection of tooth structures compared to coventional techniques.

Introduction

Exodontia is an integral part of oral & maxillofacial surgery. Removal of impacted molars particularly the mandibular third molar are one of the routinely performed procedures. Any surgical procedure is almost always accompained with certain amount of post-operative discomfort . To conduct a surgical procedure without post- operative sequelae is impossible but to minimize the extent must be thought about. Impacted mandibular third molars can cause severe pain, indirectly can also be the underlying cause of numerous disorders in the mouth, jaw and facial regions. Completely impacted or unerruted third molars in the mandible can have several consequences. These include pericoronitis, regional pain, abscess, trismus, distal caries, periodontal pocket of the second molar, development of follicular cysts, and crowding of lower incisors. Therefore symptomatic or asymptomatic impacted third molars are often extracted to reduce the above-mentioned clinical symptoms. As a result, their removal is often necessary, and their surgical removal is the most frequently undertaken oral surgical procedure.[1]

To remove such embedded teeth , not only surgical expertise and acumen are required but also application of correct and most efficient surgical technique plays an important role in minimizing the post -operative discomfort. Bone cutting or osteotomy is one of the most critical steps in disimpaction for which severeal different osteotomy techniques are used, and if they are used without caution, they can be dangerous.[2] Amongst all the osteotomy techniques rotary cutting instruments are potentially injurious because they produce excessively high temperatures during cutting of the bone, which can produce marginal osteonecrosis and impair regeneration and healing.[3] Third molar surgical removal is one of the most frequent and delicate therapies among the surgical operations Oral & Maxillofacial Surgeons must perform. The high-speed rotary handpiece is the most commonly and widely used instrument for impacted tooth removal. However, recently, the piezosurgery technique has been used to carry out safe and effective bone removal using piezoelectric ultrasonic vibrations. Both the tools are used by oral surgeons for osteotomy and odontotomy during surgical third molar extraction.[4]

It was Horton et al. (1970) who first proposed the clinical application of ultrasonics in oral and maxillofacial surgery and found superior results than conventional methods of osteotomies. In 1988 an Italian oral surgeon Vercellotti was the first to develop Piezosurgery with intention to overcome the limits of traditional instrumentation in osseous surgery by modifying and improving conventional ultrasound technology.[5]

Piezosurgery is an osteotomy technique using microvibrations at an ultrasonic frequency to perform efficient bone cutting.[6] The piezoelectric device has been useful for application in complex surgical sites, such as the posterior mandible, where the osteotomy lines are of necessity close to vulnerable structures such as nerves and blood vessels; ultrasonic vibrations allow a selective and defined cutting action, leading to a higher level of precision and safety and less tissue damage than using common rotating instruments (burs).[7,8] Its mechanism of action is based on the ability of certain ceramics and crystals to deform when an electric current is passed across them, resulting in microvibration at ultrasonic frequency. A frequency of 25 to 30 KHz, from a nitride-hardened or diamond-coated insert, allows for selective cut of bone tissue.[9]

Infact piezoelectric surgery techniques have opened up a new age for osteotomy, osteoplasty and exodontia in maxillofacial and oral surgery. As well as being selective, the micrometric cuts possible via these techniques

maximize surgical precision, resulting in minimal damage to soft tissue. In addition, the cavitation effect provides maximum intraoperative visibility and a blood-free surgical site.[10]

As far as literature review is concerned, it suggests that there has been no such study till date which has been pulished regarding the direct comparision of the cutting efficacy and postoperative sequelae of piezosurgery and the two different speed of the handpiece at slow=20000rpm, fast=40000rpm, so this study has been done fill the void by comparing the same , however further long term prospective & randomized studies will be required for definitive results.

Materials and methods

To conduct the research purpose, a single-center, randomized study was designed and implemented. The study population included all the patients attending the Department of Oral and Maxillofacial Surgery at I.T.S Dental College, Muradnagar, Ghaziabad, Uttar Pradesh, India, for evaluation of surgical removal of unilateral mandibular third molar teeth. This study was carried out for 1 years, i.e., from February 2017 to February 2018.

A sample size of 15 patients 6 males, 9 females with a mean age of 27.43 ± 5.27. Unilateral extractions were required in all patients [Figure 1]. All the patients were randomly allocated in three groups through a lottery system. Each group included 5 patients (n=5). In one group, surgical extraction of mandibular third molar was done using conventional rotatory osteotomy at 20000 rpm, in second group the osteotomy was done using conventional rotatory osteotomy at 40000 rpm and in the third group, extraction of lower third molar was done using Piezotome. All the surgical extractions were done by a single surgeon and informed consent was taken from all enrolled patients for the study.

Inclusion Criteria

- Healthy individuals above 18 years of age who willingly participated in the study.
- Individuals having vertical, mesioangular, horizontal mandibular third molar impactions based on radiographic interpretation.

Exclusion Criteria

- Individuals with systemic disease that could influence healing
- Individuals who do not provide consent
- Individuals who had acute local infection involving the impacted teeth.
- Alcoholism
- Drug abuse
- Oral submucus fibrosis

Study design

Preoperatively all the patients underwent routine blood investigation and also in every patient orthopantomographic radiographs and intraoral periapical radiograph was obtained to ensure the exact anatomical location of the impacted tooth and its distance from IAN Figure 1.

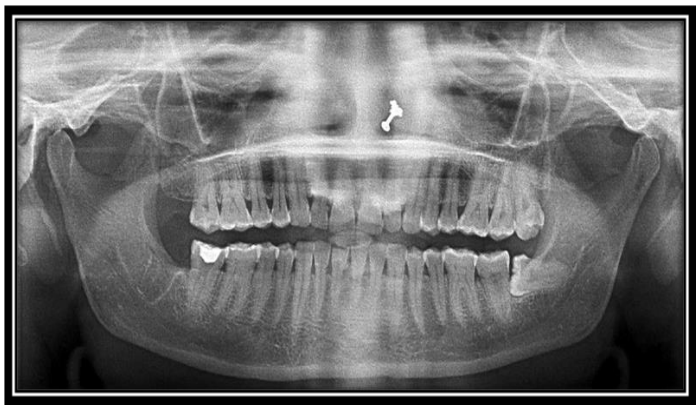


Figure 1: Preoperative orthopantomogram.

All patients were informed about surgery and all possible complications preoperatively. The protocol design was approved by the I.T.S Centre for Dental Studies & Research, India, on 30thNovember 2016.

Surgical technique

Instruments

The osteotomies using the conventional rotating bur were carried out with a round stainless steel bur mounted on an NSK surgical high-speed straight handpiece which was used at 20,000 rpm in Group A., at 40000rpm in Group B and for Group C, surgical instruments for ultrasound osteotomies, the Mectron Piezosurgery Device (Mectron Medical Technology, Carasco, Italy) was used according to the manufacturer's instructions (water flow set at maximum) using a special application tip designed for osteotomy.

Procedure

All the surgical procedures were carried out under aseptic conditions and were performed by a single surgeon under local anesthesia. 1.8 ml of lignocaine 2% with 1:200,000 adrenaline was used for classical inferior alveolar nerve block along with long buccal nerve block and lingual nerve block. In all the three groups, a full-thickness mucoperiosteal flap was raised on the buccal aspect of the third molar with a periosteal elevator to expose the bone. Disto-buccal guttering was done using the standard Moore & Gillbe Collar technique (Moore1965) and root sectioning or crown sectioning was performed with a high-speed handpiece and fissure burs wherever required. During guttering 0.9% normal saline was used as a constant in all the three techniques of osteotomy and was continuously used to

irrigate the osteotomy area to prevent thermal osteonecrosis over the bone. Thereafter, the tooth/root fragments were removed with an elevator in all the three groups. After tooth removal, the extraction sockets were inspected, curetted for granulation tissue removal, and flushed with sterile saline solution. 3-0 silk sutures were used for wound closure & hemostatsis was achieved.

In Group-A: In 5 patients impacted mandibular molar were removed using handpiece with slow speed (20000 rpm) [Figure2, 2a–f].

a) Preoperative intraoral view, (b) incision and flap reflection ,(c) buccal guttering , (d) removal of impacted molar (e) sutured wound (f) extracted tooth.

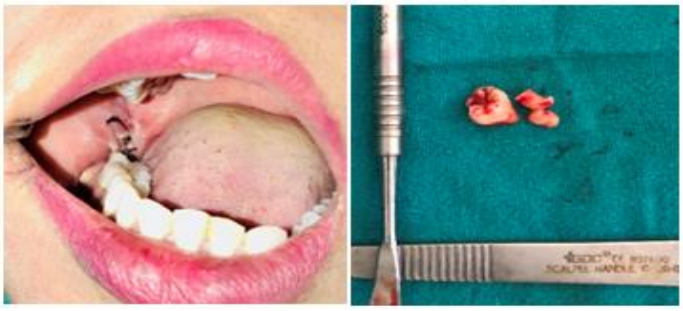
In Group-B: In 5 patients impacted mandibular molar were removed using handpiece with high speed (40000 rpm) [Figure3, 3a–f].

(a) Preoperative intraoral view, (b) incision and flap reflection ,(c) buccal guttering , (d) removal of impacted molar.

(e) sutured wound (f) extracted tooth.

Figure [Figure4a–f]. In the Group-C: In 5 patients impacted mandibular molar were removed using piezosurgery unit.

(a) Preoperative intraoral view, (b) incision and flap reflection ,(c) buccal guttering , (d) removal of impacted molar,x.



(e) sutured wound (f) extracted tooth.

All patients in the study routinely received postoperative dose of oral antibiotics in the form of capsule ampicillin 250 mg plus cloxacillin 250 mg and tablet metronidazole 400 mg three times daily for 5 days and analgesics in a combination of tablet ibuprofen 400 mg and paracetamol 325 mg three times daily for 3 days. The patients were recalled on the 1stand 7th postoperative days for follow-up and evaluation of pain scroe, swelling, and mouth opening.EvaluationPain, swelling, trismus were the parameters that were noted and analyzed on preoperative visit, 1stand 7th day postoperatively and was s evaluated..Postoperative pain was assessed with a visual analog scale (VAS) of 10 units together with a graphic rating scale.[8] Trismus was evaluated by measuring the interincisal distance at maximum mouth opening (mm) with a ruler. Facial measurements were collected at baseline preoperatively and on 1stand day 7 after suture removal to evaluate any swelling. This was achieved using a 3-0 silk suture to measure the distance between the trangus and each of 5 facial reference point-linear distances to lateral canthus, ala of nose, corner of mouth, pogonion and angle of jaw was recorded.[9]

SR.NO.	PRE-OP			POST- OP DAY -1			POST- OP DAY - 7		
	PAIN	SWELLING (MEAN)	MOUTH OPENING (MM)	PAIN	SWELLING (MEAN)	MOUTH OPENING (MM)	PAIN	SWELLING (MEAN)	MOUTH OPENING (MM)
A1 POOJA GUPTA	10	109.6	40.1	5	115.2	20	2	112	42
A2 KUSH	4	107.6	42	2	106.2	24	1	103.4	39
A3 ANKIT KUMAR	7	94.6	49	4	110.2	31	2	103	32
A4 CHANDER PRAKASH	8	110.8	40	7	112.8	21	3	107.4	40
A5 ARSHI	9	100.8	40	6	111	31	1	101.2	41

lateral canthus, ala of nose, corner of mouth, pogonion and angle of jaw was recorded.[9]

GROUP-A(SLOW SPEED 20000 rpm).

SR.NO.	PRE-OP			POST- OP DAY -1			POST- OP DAY - 7		
	PAIN	SWELLING (MEAN)	MOUTH OPENING (MM)	PAIN	SWELLING (MEAN)	MOUTH OPENING (MM)	PAIN	SWELLING (MEAN)	MOUTH OPENING (MM)
B1 UDDESHYA	4	100	40	7	110.2	21	1	119.8	27
B2 ASHISH GUPTA	0	90.6	42	5	97.4	20	0	102.8	52
B3 AFREEN	5	96.6	42	3	101.4	22	1	97.6	46
B4 TAYABA	10	99	38	7	103.6	22	5	102.2	39
B5 FARZANA	1	107.4	38	8	109.4	21	2	97.8	39

GROUP-B (HIGH SPEED 40000 rpm).

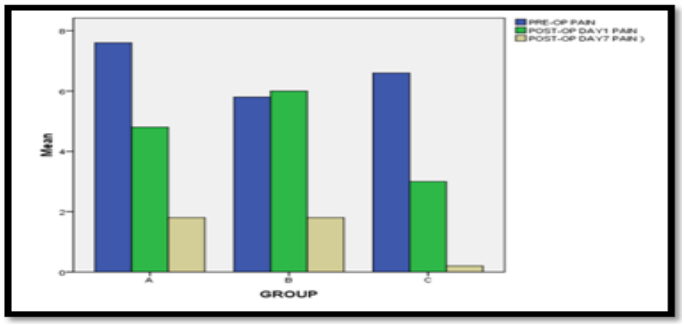
SR.NO.	PRE- OP			POST- OP DAY -1			POST -OP DAY - 7		
	PAIN	SWELLING (MEAN)	MOUTH OPENI (MM)	PAIN	SWELLIN (MEAN)	MOUTH OPENI (MM)	PAIN	SWELLING (MEAN)	MOUTH OPENI (MM)
C1 JYOTI KAUSHIK	9	99.2	46	4	101.8	18	1	98.6	27
C2 SANJU CHAUHAN	7	100.4	37	3	104.6	18	0	102.4	32
C3 RAKHI	8	104.2	37	2	105.6	25.5	0	102.8	32
C4 JAMIR BEG	6	110.6	48	1	111.2	47	0	108.6	48
C5 NEETU	3	98.6	35	5	99.6	26	0	98.8	35

GROUP-C(PEIZOELECTRIC DEVICE).

Results

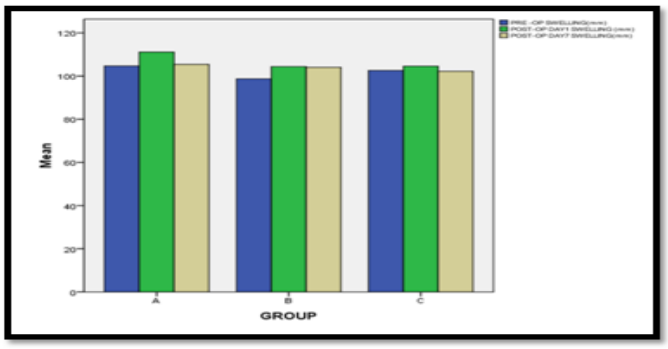
The parameters assessed in this study were, pain (VAS), swelling and mouth opening (interincisal opening) in all the three group at baseline, 1st and 7th postoperative day. The preoperative values for both groups in term of facial dimension, mouth opening and pain were compared and were found to be statistically nonsignificant. The P values for facial pain, dimension, mouth opening was considered

significant when the values are P ≤0.05.Kruskal wallis test between Group-A, Group-B & Group-C showed no significant difference in pre-operative pain and post-operative day 1 pain values but there was a significant difference on 7th post-operative day. On applyling Mann Whitney test between Group-A and Group-B, no significant difference was found in pre-operative pain and post-operative day 7 pain scores but the difference was significant in terms of post-operative day 1 swelling with P =0.032.

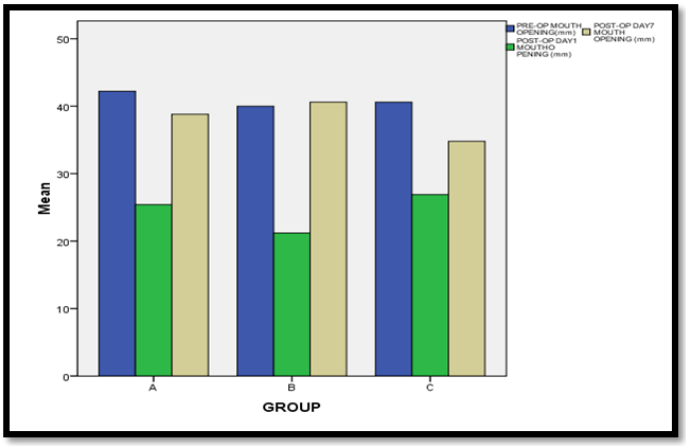


Graph 1 Represents variation in pain in all the three groups at different time interval.

On applyling Mann Whitney test between Group-A and Group-C, no significant difference was found in pre-operative pain but a significant difference was found between the post-operative day 7 pain scores with P =0.016. Also the difference was significant in terms of post-operative day 1 swelling with P =0.056.There was an increase in swelling in group-B both in post-operative day 1 and day 7.



Graph 2 Represents variation in swelling in both groups at different time interval.



Graph 1 Represents variation in mouth opening in all the three groups at different time intervalStatistical analysis showed no significant difference in mouth opening amongst the three groups at set time intervals.

Test Statistics[b]

	PRE-OP PAIN	POST-OP DAY1 SWELLING (mm)	POST-OP DAY7 PAIN)
Mann-Whitney U	10.500	2.500	10.000
Wilcoxon W	25.500	17.500	25.000
Z	-.424	-2.095	-.546
P value(2-tailed)	.671	.036	.585
Exact P value [2*(1-tailed P value)]	.690[a]	.032[a]	.690[a]
a. Not corrected for ties.			
b. Grouping Variable: GROUP			

Test Statistics[a,b]

	PRE-OP PAIN	POST-OP DAY1 PAIN	POST-OP DAY7 PAIN)
Chi-Square	.553	4.962	6.859
df	2	2	2
Asymp. P value	.758	.084	.032

Discussion

Impacted wisdom teeth which do not fully erupt into the mouth because of blockage from other teeth impaction . If the wisdom teeth impacted in the mouth, pain can develop with the onset of inflammation or infection or damage to the adjacent teeth. Common accepted hypothesis that determine eruption is the angle at which the 3rd molars sit,

the stage of root formation of 3rd molars at the point of screening, depth of impaction, how much room there is for eruption as well as the size of the 3rd molar. Many problems associated with the removal of mandibular third molar impaction have led us to compare the prevalent technique for their efficacy. The high-speed rotary handpiece is the most commonly and widely used instrument for impacted tooth removal. However, recently, the piezosurgery technique has been used to carry out safe and effective bone removal using piezoelectric ultrasonic vibrations. Both the tools are used by oral surgeons for osteotomy and odontotomy during surgical third molar extraction.4The present study was undertaken to assess clinically the level of effectiveness of three different bone cutting techniques and approaches to remove investing bone in the removal of impacted teeth.[11] Compared with surgery using rotary techniques, piezosurgery was more time-consuming due to the slower micrometric cutting action of the piezoelectric device. Surgery time using the ultrasonic osteotomy tended to be shorter as the surgeons accumulated more experience.[12]Although the piezoelectric technique is associated with longer surgery time, we believe that with increased experience and the improvement of the technique, piezosurgery will witness reduced surgery time. In our study there has been a significant difference pain in piezosurgery patients on 7th post-operative day. Also the swelling has also reduced significantly on 1st post-operative day. Moreover, the surgeons' skills and experiences and patients' pain sensitivity might be different, which could influence the assessment of the level of postoperative pain. More or larger homogeneous RCTs are needed to validate our findings.In a study carried out by Sortino et al. in 2008, postoperative outcome was compared in mandibular third molars treated by piezoelectric surgery or by rotary osteotomy technique. One hundred patients with impacted mandibular third molars were included in the study. Fifty patients were treated by rotary osteotomy technique and fifty by the piezoelectric osteotomy technique. In both the groups, odontotomy was always completed with a tungsten carbide fissure bur at high speed, taking care to avoid contact with bone. Twenty-four hours after surgery, two different parameters, facial swelling and trismus, were evaluated in both groups. They concluded that the piezoelectric osteotomy technique produced a reduced amount of facial swelling and trismus twenty-four hours after surgery, but a longer surgical time was required when compared with the rotary osteotomy technique. [13] We have clearly found that the results of our study were similar as in the study done by Sortino et.al.Infact the reasons for complications associated with the extraction of impacted third molars can be equipment related, and may include the speed of the drill, torque of the handpeice, and repeated use of the bur. Modern techniques of osteotomy such as the peizotome and hard tissue lasers have reduced the potential for trauma to adjacent structures. During removal impacted third molar, various techniques of bone removal can be used like chisel and mallet, low speed burs using micromotor, high speed bur using airotor, piezoelectric device, lasers etc.The Piezotome delivers a micrometric cut involving the minimum surface area; this may be one of the factors that contribute to the good results obtained. The management of the flap through careful manipulation of tissue might also explain our findings for pain, swelling, and trismus. The main advantage of Piezosurgery is its selective cut that recognises the hardness of tissues and works only on mineralised structures, so causes no damage to soft tissues.[14]Osteotomies were done with a minimal risk of an increase in temperature and marginal osteonecrosis as a result of thermal injury. In addition, the oscillating tip

drives the irrigation solution, which allows for better visibility and the evacuation of detritus (through the cavitation phenomenon, which is implosion of gas bullae into blood vessels during bony cutting which produces a haemostatic effect and so reduces blood loss in the operating field, compared with conventional osteotomy burs. During operation the Piezotome allows easy control of the entire cutting procedure, and increases tactile control and precision of cutting. [15,16]The main disadvantages of Piezosurgery reported so far (besides expense and the risk of breakage of the surgical tips), 22 concerns the increased operating time as a result of the slow rate of cutting, 23 although cutting times end to decrease as the operator gains experience.[17]

Conclusion

This study demonstrated us that there is no major difference in post postoperative sequelae irrespective of the type of osteotomy techniques are used for removal of impacted mandibular third molar. However the patients done using piezosurgery showed significantly better control over pain and reduction of swelling on 7th & 1st postoperative day respectively. Piezosurgery also does help in soft tissue protection, optimal visibility in the surgical field, decreased blood loss, less vibration and noise, increased comfort for the patient, and protection of tooth structures compared to coventional techniques. However further long term prospective & randomized studies will be required for definitive results.

References

1. Jiang Q, Qiu Y, Yang C, Yang J, Chen M, Zhang Z. Piezoelectricmversus conventional rotary techniques for impacted third molar extraction: a meta-analysis of randomized controlled trials. Medicine 2015 Oct;94(41):1-7.
2. Praveen G, Rajesh P, Neelakandan RS, Nandagopal CM. Comparison of morbidity following the removal of mandibular third molar by lingual split, surgical bur and simplified split bone technique. Indian J Dent Res. 2007;18:15–8.
3. Kerawala CJ, Martin IC, Allan W, Williams ED. The effects of operator technique and bur design on temperature during osseous preparation for osteosynthesis self-tapping screws. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 1999;88:145–50.
4. Bartuli FN, Luciani F, Caddeo F, De Chiara L, Di Dio M, Piva P, Ottria L, Arcuri C. Piezosurgery vs high speed rotary handpiece: a comparison between the two techniques in the impacted third molar surgery. Oral Implantol 2013 Jan-Mar;6(1):5-10.
5. Vercellotti T. Technological characteristics and clinical indications of piezoelectric bone surgery. Minerva Stomatol. 2004;53:207–14.
6. Pavlíková G, Foltán R, Horká M, Hanzelka T, Borunská H, Sedý J. Piezosurgery in oral and maxillofacial surgery. Int J Oral Maxillofac Surg. 2011;40:451–7. [PubMed]
7. Rullo R, Addabbo F, Papaccio G, D'Aquino R, Festa VM. Piezoelectric device vs. conventional rotative instruments in impacted third molar surgery: Relationships between surgical difficulty and postoperative pain with histological evaluations. J Craniomaxillofac Surg. 2013;41:e33–8. [PubMed]
8. 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;68:330–6.
9. Arakji H, Shokry M, Aboelsaad N. Comparison of piezosurgery and conventional rotary instruments for removal of impacted mandibular third molars: a

randomized controlled clinical and radiographic trial. Int J Dent 2016;2016:1-7.

10. Gopal I. Comparison of a piezoelectric and a standard surgical handpiece in third molar surgery. 2010 Jan
11. Singh V, Alex K, Pradhan R, Mohammad S, Singh N. Techniques in the removal of impacted mandibular third molar: A comparative study. Eur J Gen Dent 2013;2:25-30
12. Beziat JL, Bera JC, Lavandier B, et al. Ultrasonic osteotomy as a new technique in craniomaxillofacial surgery. Int J Oral Maxillofac Surg 2007; 36:493–500
13. 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;66:2444–8.
14. Robiony M, Polini F, Costa F, Vercellotti T, Politi N. Piezoelectric bone cutting in multipiece maxillary osteotomies. J Oral Maxillofac Surg 2004;62:759–61.
15. Garg AK. Using the Piezosurgery device: basics and possibilities. Dent Implantol Update 2007;18:1–4.
16. Gruber RM, Kramer FJ, Merten HA, et al. Ultrasonic surgery – An alternative way in orthognathic surgery of the mandible. A pilot study. Int J Oral Maxillofac Surg 2005;34:590.
17. Beziat JL, Bera JC, Levandier B, Gleizal A. Ultrasonic osteotomy as a new technique in craniomaxillofacial surgery. Int J Oral Maxillofac Surg 2007;36:493–500.