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Original Article

Comparative analysis of the surgical and postsurgical outcomes of third molar removal using piezoelectric surgery and rotary bur

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ABSTRACT:

Introduction: Third molar surgery is one of the most commonly performed procedure. Conventionally the surgical handpiece with bur is employed for osteotomy and odontectomy. Piezosurgery offers distinct advantage. The present study was to compare the surgical and postsurgical outcomes of third molar removal using piezoelectric surgery and rotary bur. **Aim and Objectives:** 1.To compare the duration of the surgery using piezoelectric and surgical osteotomy technique. 2.To evaluate the post surgical swelling, pain and trismus between the two groups. **Materials and Methods:** The study consisted of 15 randomly selected patients who underwent disimpaction by conventional rotary method (group A) on one side and with piezosurgery (group B) on the contralateral side and consented for the same. Facial swelling and trismus were evaluated in both groups on the First, Third and seventh days post operatively. Pain was evaluated from post-operative days 1-7 using Visual Analogue Scale. **Results:** Pain was significantly lower in the piezosurgery group(B) in post operative 1st 3rd 7th day Compared with rotary (group A) . Facial measurements were taken preoperatively using 4 baseline (S1, S2, S3, S4) and was compared with facial swelling on 1st, 3rd, 7th postoperative day in both the groups .) There was significant reduction in swelling in piezoelectric group as compared to rotary group. The significant reduction in trismus was seen in piezoelectric (group B) on 1st, 3rd,7th day compare to group A (rotary). The Mean surgical time was longer in group B comparing to group A. **Conclusion:** The piezoelectric osteotomy technique produced a reduced amount of facial swelling and trismus, as per evaluation of these parameters on the 3rd and 7th day after surgery, as well as reduced amount of post-operative pain from days 1-7. A longer surgery time was required for piezosurgery when compared with the rotatory osteotomy technique.

Key Words: Piezoelectric surgery, impacted mandibular third molar, piezosurgery, rotatory technique.

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INTRODUCTION

Impacted third molars are frequently encountered in oral diagnostic work up. Approximately 20% of the developed countries population has impacted teeth,[1] out of which mandibular and maxillary third molars are the most common. It has been well documented that impacted third molars, either partial or complete, are associated with several complications. Therefore impacted third molars are often electively removed to reduce the incidence of such complications. Surgical removal of third molar is one of the most frequently delivered therapies that requires delicate dextrity. The surgical removal of impacted third molars may lead to various postoperative complications including pain, swelling, trismus, nerve injury, bleeding, and dry sockets. Different strategies are adopted to reduce these complications, including altering the technique of the osteotomy.[3]

Usually impacted third molars are removed using rotary instrumentation for osteotomies. However, conventional rotary cutting instruments are potentially injurious because they run on high speed generating excessively high temperatures during bone drilling, which leads to marginal osteonecrosis, and can impair osseous regeneration and healing. With a tendency toward minimally invasive surgery, piezosurgery has been introduced in oral and maxillofacial surgery for various procedures. While using a piezoelectric device, piezosurgery has a much lower risk of visible injury to the adjacent soft tissue, leading to more favourable osseous repair and remodelling.[3] Since its approval for commercial use in 2002, it has been successfully utilized

for many surgical procedures, such as maxillary sinus lifting, autologous bone graft harvesting, bone splitting, lateralization of the inferior alveolar nerve, orthognathic and neurologic surgeries.[4-6] Vercellotti et al[9] reported that the piezoelectric device (piezosurgery) can be an effective tool for carrying out maxillary sinus surgeries. These reports have encouraged use of piezoelectric device as an alternative to rotary instruments. Piezoelectric surgery techniques have opened up a plethora for procedures like osteotomy, osteoplasty and exodontia in maxillofacial and oral surgery Micrometric cuts are possible via piezo surgery. Jiang et al.(2015) compared piezosurgery and conventional rotary osteotomy techniques in third molar extraction. They concluded that although the patients undergoing piezosurgery experienced longer surgical time compared to conventional rotary techniques, they developed less amount of swelling, less pain and minimal postoperative trismus. [8] There is a need to study and compare the healing process between the rotatory burs and piezoelectric device. In the literature, OT7 Ref. n°: 03370007 insert tip has been used more often for piezosurgery. The purpose of this study was to compare piezosurgery with rotary osteotomy techniques, with usage of OT insert tip 5, with regard to surgery time and the severity of postoperative sequelae, including pain, swelling, and trismus. For the effective cutting of highly mineralized bone with a saw-shaped insert, high power levels are required.

MATERIAL AND METHODS

Study entailed the use of piezoelectric device (from Mectron Company) for one group and rotatory bur for the other group of patients for the removal of mandibular third molars

A prospective clinical study was done on 30 patients which was divided into two groups of 15 each using simple randomization. After obtaining detailed case history, the procedure was explained to each patient and written informed consent was obtained. After recording case history, Intra oral periapical radiograph / orthopantomograph was obtained and preoperatively all patients were administrated with 2% of lignocaine HCL and adrenaline with 1:200000 concentration. In Group A, the impacted tooth was surgically extracted using surgical osteotomy technique and in Group B the impacted tooth was surgically extracted using piezoelectric surgery. Ward's incision was placed using no. 15 Bard-Parker blade and a full thickness mucoperiosteal flap was reflected using Howarth's p eriosteal elevator. (Fig- 1,2)

In group A, osteotomy and odontectomy were performed using no. 702 SS White carbide burs of 1.5mm diameter and 7mm head length on a straight surgical handpiece . Normal saline dispensed by syringe was used as an irrigant. The wound socket was irrigated using a combination of povidone-iodine and normal saline. Wound closure was done using non-resorbable 3.0 black braided silk sutures. Primary closure was done by placing a single interrupted suture, and the releasing incision was left to heal by secondary intention in all cases. Postoperatively, patients were prescribed penicillin derivatives for five days and a combination of NSAIDs for three days. (fig- 4)

In group B, osteotomy was done using OT6 inserts There is a range of inserts depending on size, shape and material. The procedure was performed at moderate pumping speed, using cool normal saline attached to the pump as an irrigant. Piezosurgery inserts should be moved forwards and backwards continuously at a high speed with minimum pressure. Slow movements over the bone and excessive pressure on the handpiece will decrease the micro-movements and cause an increase in the bone temperature.[4] After exposure of the impacted tooth, odontectomy was performed using no. 702 SS White carbide burs of 1.5mm diameter and 7mm head length with a straight hand piece. The wound socket was irrigated using a combination of povidone-iodine and normal saline. Wound closure was done using non-resorbable 3.0 black braided silk sutures. Primary closure was done by placing a few simple interrupted sutures, and the releasing incision was left to heal by secondary intention in all cases. Postoperatively, patients were prescribed penicillin derivatives for five days and a combination of NSAIDs for three days.(fig 4 and fig 5)

Intraoperative Parameters Examined

Time taken was recorded from the start of bone cutting until the end of the procedure.

EVALUATION CRITERIA:

Pain, swelling and trismus was evaluated on postoperative days 1, 3 and 7. Pain was evaluated using Visual Analog Scale in preoperative and postoperative Period**.** Facial swelling was evaluated by recording measurements from six fixed points and five surgical base lines in order to cover all possible directions of extension of swelling using a measurement tape.[7]

S1: from the lateral canthus of the eye to the angle of the mandible.

S2: from ala of the nose to angle of the mandible.

S3: from the corner of the mouth to the angle of the mandible.

S4: from the menton to the angle of the mandible. (fig 9,10,11.12)

Trismus was evaluated with a caliper instrument by measuring the interincisal distance preoperatively and comparing it with measurements made in preoperative and postoperative days 1, 3 and 7.[4]

Piezoelectric device uses a modulated ultrasonic frequency that permits bone cutting by microstreaming and cavitation phenomenon. The device consists of hand piece and foot switches that were connected to a power source.. A surgical straight hand piece connected to a micromotor was utilized for bone cutting with the aid of external saline irrigation. Rotary speed ranged from 25,000 to 35,000 RPM. S.S. 702 fissure bur was used for bone cutting. Fig (9)

FIG- 1

Fig 2

Fig-3

Fig –4 (group A flap raised)

Fig-5(group – bone guttering)

Fig –6 (extraction of socket)

Fig- 7 (suture placed)

Fig- 8 (bone guttering with piezosurgery)

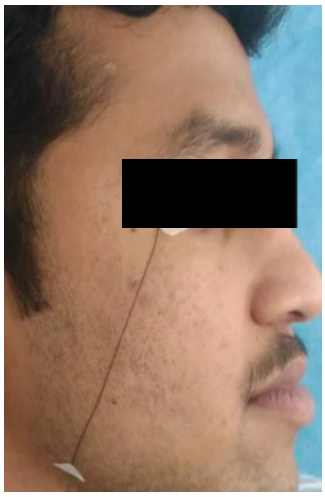


FIG- 9 S1: from the lateral canthus of the eye to the angle of the mandible

Fig -10 S2: from ala of the nose to angle of the mandible.

Fig-11 S3: from the corner of the mouth to the angle of the mandible.

Fig-12 S4: from the mention to the angle of the mandible.

Inclusion criteria

1. Patient having horizontal impaction
2. Bilateral symmetrical impaction cases in same patient

Exclusion criteria :

Patients who are taking antibiotics for current infection , or those who have taken antibiotics in the past 6 weeks or who require antibiotic prophylaxis before extraction eg; valvular heart disease or with prosthetic joint replacement.

1. Acute pericoronitis, severe periodontal disease or local infection involving the impacted teeth at the time of operation.
2. Pregnant women
3. Cancer patients and those undergoing radiotherapy.
4. Patients with systemic diseases

RESULTS

The Statistical Analysis was done using SPSS v.22 software IBM. Corp... .

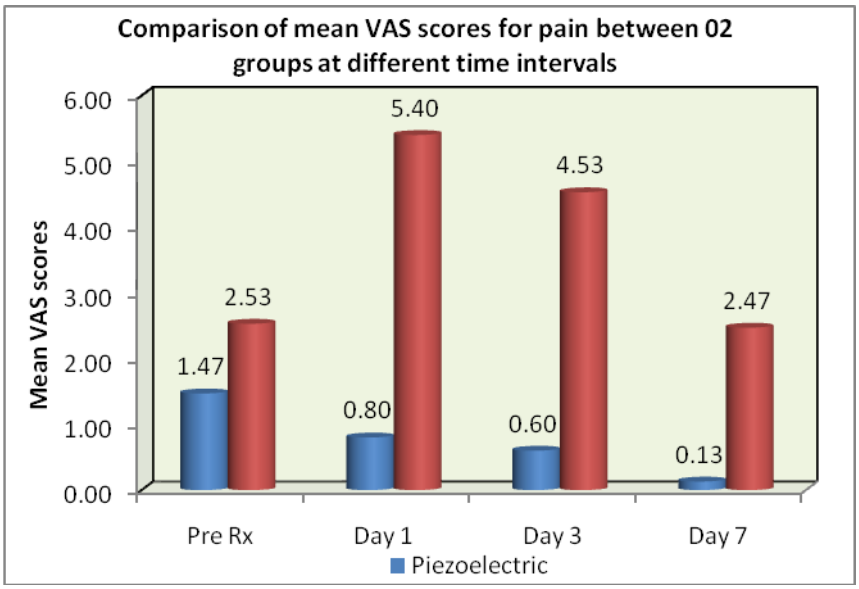
A descriptive analysis of the data was present as frequency, mean, and standard deviation (SD).Student unpaired t test was used to compare the mean duration of time consumed & VAS Scores for Pain between group 1 & group 2. The level of significance was set at $P<0.05$.

PAIN: Pain was significantly lower in the piezosurgery group(B) in post operative 1^{st} 3^{rd} 7^{th} day Compared with rotary (group A)

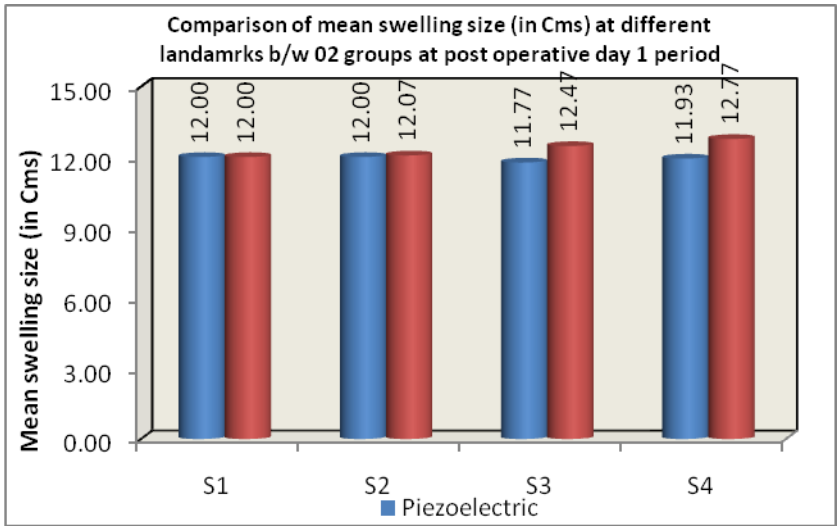
SWELLING : Facial measurements were taken preoperatively using 4 baseline (S1,S2,S3,S4) and was compared with facial swelling on 1^{st},3^{rd},7^{th} postoperative day in both the groups .) There was significant reduction in swelling in piezoelectric group as compared to rotary group

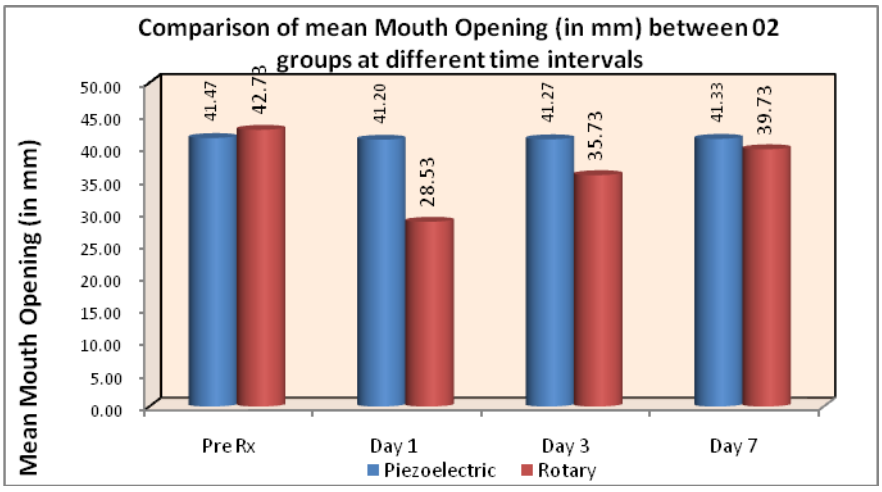
MOUTH OPENING: The significant reduction in trismus was seen in piezoelectric (group B) on 1^{st} ,3^{rd} ,7^{th} day compare to group A (rotary)

TIME DURATION : The Mean surgical time was longer in group B comparing to group A. : Depicts comparision of "time of surgery" According to the test the Mean surgical time was longer in group B (42.07) comparing to group A (12.33).The mean difference between two groups is found to be 29.74.it gives a P value of less than 0.001 indicating that it was statistically significant.



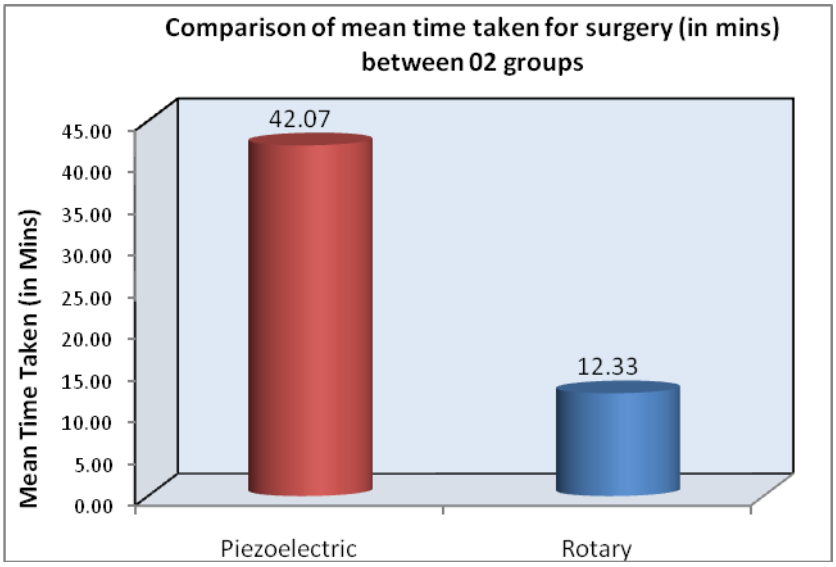
GRAPH 1: Comparison of mean swelling size (in Cms) at different landamrks b/w 02 groups at post operative day 1 period, 3rd, 7th day





MOUTH OPENINGS <35 YEARS

GRAPH 2: Comparison of mean Mouth Opening (in mm) b/w different time intervals in each study group



GRAPH 3: Comparison of mean time taken for surgery (in mins) between 02 groups

DISCUSSION

Surgical removal of impacted mandibular third molars is one of the most frequent oral surgical interventions. This study compares rotary technique with piezoelectric surgery for surgical removal of third molars . The instrumentation for piezosurgery was effortless due to the fact that the force exerted by the operator, necessary for the osteotomy was less by about 0.5kg, compared to rotational burs that apply about 2-3kg of pressure .The piezoelectric tip vibrated within a width of 60 to 200 mm at a modulated ultrasonic frequency, and by the means of vibration on the insertion of the mounted tip of the instrument. Amplitude of longitudinal vibration depends on the device which ranges from 40 to 200 µm, while vertical vibration is between 20 and 60 µm duration. Therefore, although the piezoelectric technique is associated with longer duration of surgery approx.23minutes, especially during hard tissue cutting . ie odontectomy, minimum pressure is applied on the handpiece .with a contact load of 150 g The main advantage of piezosurgery is its selective cutting as it distinguishes the hardness of tissues and works only on mineralised structures tissue.[5-7] Osteotomies were done with a minimal risk of an increase in temperature and therefore, marginal osteonecrosis as a result of thermal injury was absent.[26] In addition, the oscillating tip drives the irrigation solution, which allows for better visibility and the evacuation of debris (through the cavitation phenomenon, which is implosion of gas bullae into blood vessels during bone cutting which produces a haemostatic effect, and so reduces blood loss) in the operating field, compared with rotatory osteotomy burs. During operation, the piezoelectric device allows easy control of the entire cutting procedure, and increases tactile control and precision of cutting.[7]

In the present study, postoperative pain score was recorded, and it was significantly lesser in the piezoelectric surgery site than while using the rotary instrument. Piezoelectric device uses a frequency of 25–29 kHz, because the micromovements that are created at this frequency (ranging between 60 to 210mm) cut only mineralised tissue, cut at frequencies higher than 30kHz. This selective cutting may be one of the reasons for reduced swelling. Piezoelectric bone surgery appears to be more efficient in the first phases of bony healing; it encourages an earlier increase in bone morphogenetic proteins, controls the inflammatory process better, and stimulates remodelling of bone as early as 56 days after treatment.[3] Micrometric cut involving minimum surface area may be one of the factors that contribute to the good results obtained.

Vercelotti et al where they compared piezosurgery with carbide burs in ostectomy and osteoplasty and proved that there is better bone healing in terms of quantity and quality when using piezosurgery in osseous surgeries.[8] Moreover, Rullo et al analysed the bone histology and found well-defined histological differences between the bone samples collected with the bur and the ultrasonic device. They reported that more integrity of the bony structure, well-designed osteotomy lines, and no evidence of bone heat osteonecrosis characterized the bone samples harvested with the piezoelectric device.[6]

Within the limitations of this study, when the overall outcome was compared in the two groups, we found significantly less pain, trismus, and facial swelling after third molar extraction using the piezoelectric device. Despite the increased duration of surgery and cost of equipment, the final outcome suggests that use of piezosurgery for bone cutting give a valuable alternative for extraction of third molars. [3]

CONCLUSION

A longer surgery time was required for piezosurgery when compared with the rotary technique for removal of impacted mandibular third molars. The piezoelectric device's property of selective cut and cavitation phenomenon has proven to be advantageous over rotatory bur during osteotomy.

REFERENCES:

1. JIiang Q, Qiu Y, Yang C, Yang J, Chen M, Zhang Z. Piezoelectric versus conventional rotary techniques for impacted third molar extraction. J med 2015; Oct 94(41):1-7
2. Bartuli FN, Luciani F, Caddeo F, Chiara LDE, Didio M, Piva P, et al. Piezosurgery vs High Speed Rotary Handpiece : A comparision Between the two techniques in the impacted third molar surgery. Oral Implantol(Rome). 2013 Jul 15;6(1):5-10.
3. Tsai JS , Chen YL, Chang HH, Shyu YC, Lin CP. Effect of piezoelectric instruments in healing propensity of alveolar sockets following mandibular third molar extraction. J Dent Sc . 2012(7); 296-300.
4. Tsai JS , Chen YL, Chang HH, Shyu YC, Lin CP. Effect of piezoelectric instruments in healing propensity of alveolar sockets following mandibular third molar extraction. J Dent Sc . 2012(7); 296-300.
5. Barone A et al. "A Randomised Clinical Evaluation of Ultrasound Bone Surgery Versus Traditional Rotary Instruments in Lower Third Molar Extraction". J Oral MaxillofacSurg 2010; 68:330-336.
6. Barone A et al. "A Randomised Clinical Evaluation of Ultrasound Bone Surgery Versus Traditional Rotary Instruments in Lower Third Molar Extraction". J Oral MaxillofacSurg 2010; 68:330-336.
7. Vercellotti T. "Essentials in Piezosurgery, Clinical Advantages in Dentistry". 2009; 1: 1-45.
8. Labanca M, Azzola F, Vinci R, Rodella L.F. "Piezoelectric surgery: Twenty years of use." British Journal of Oral and Maxillofacial Surgery.2008; 46:265-269.

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