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PIEZOELECTRIC VERSUS CONVENTIONAL ROTARY TECHNIQUES FOR IMPACTED LOWER THIRD MOLAR SURGERY

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ABSTRACT

The purpose of the study was to compare piezo surgery and low speed rotary hand piece technique with regard to surgery time, pain, swelling, and trismus after removal of impacted lower third molars .Twenty patients selected from the Outpatient Clinic, Department of Oral and Maxillofacial Surgery, Faculty of Dental Medicine, Al Azhar University, Cairo, Boys. Their ages ranged from 19 to 30 years old. All patients complained of mesio-angular impacted lower third molar. Patients were divided randomly into two groups (10 patients each). All the patients were subjected to osteotomy around the impacted mandibular third molar using either piezo tome (test group) or the conventional technique (control group). The patients were evaluated after surgery at first, third, fifth, seventh and fifteenth day to evaluate pain, trismus and edema. Results: It was revealed that the difference between the two groups in pain and trismus was statistically significant in all days where test group recorded lower value than in control group except fifteenth day in evaluation of trismus. The difference between two groups in evaluation of edema was significant in clinical evaluation but not statistically significant in all days. Conclusion: Piezo surgery is an excellent tool for reducing the risk of complications and improving of the patient's wound in whole postoperative period.

INTRODUCTION

Extraction of impacted wisdom teeth is one of the most common oral surgical procedures accompanied by several intraoperative and postoperative complications [(1)]. These complications include damage of soft and hard tissues around the tooth; they occur during and immediately after the surgery and significantly depend on the tooth position in bone. Postoperative complications include prolonged numbness in the region of the inferior alveolar nerve, swelling, pain and limited mouth opening that can last in some patients for several weeks [(2)].

After impacted wisdom teeth are indicated for removal, a surgeon must employ the best strategy to minimize complications and accelerate postoperative recovery. There are different strategies are adopted to reduce complications, including changing the technique of the osteotomy[(3)]. Traditionally, impacted third molars are often removed using rotary osteotomy techniques. One of these is conventional rotary hand pieces. It is injurious because they can generate over heat during bone removal which lead to osteonecrosis and impair osseous regeneration and healing [(4)].

In order to overcome some of these problems, a newly developed piezoelectric device (piezo tome) has been recently introduced for different osteotomies procedures. This device is suggested to find clinical application in periodontal surgery, sinus grafting, intraoral gaining of bone chips and teeth extraction [(5)].

Piezoelectric surgery technique has opened 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 [(6)].

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Piezoelectric surgery is not injury to soft tissues, including nerves and blood vessels. Traditional burs and micro saws do not distinguish between hard and soft tissues [7]. In addition, the cavitation phenomenon produces an important hemostatic effect to optimize intraoperative visibility and permit great intraoperative visibility control, which increases safety [8].

Aim of the study:

The aim of the study was to compare piezoelectric versus conventional rotary techniques for impacted lower third molar extraction.

PATIENTS AND METHODS:

This study was conducted on 20 patients selected from the outpatient clinic, Department of Oral and Maxillofacial Surgery, Faculty of Dental Medicine, Al Azhar University, Cairo, Boys. All patients complained of mesio-angular, classII impacted lower third molar. The patients were divided randomly into two groups (10 patients each) All the patients were subjected to osteotomy around the impacted mandibular third molar using either piezotome in the study group or the conventional technique: fissure surgical bur mounted on low-speed handpiece in the *control group*.

Study design: Clinical, prospective and randomized controlled trials.

Patient selection: The patients were selected according inclusion and exclusion criteria

I-Inclusion criteria:

1. Age between 19 and 30 years.
2. Free from any systemic disease that affect bone healing.

II-Exclusion criteria:

1. Health conditions that would preclude surgical procedure (such as uncontrolled diabetes).
2. Any pathological condition that may affect bone healing (such as chronic bone disease or previous irradiation).
3. Patients who had acute infections such as pericoronitis, acute alveolar abscess and oral submucous fibrosis at the time of operation.

Each patient singed a written consent before surgery

Pre-operative period:

Clinical Examination:

All the patients were subjected to complete history taking including name, age, sex, occupation, residence, and chief complaint, medical and dental history.

All the patients were subjected to intraoral examination to determine the condition of soft tissue covering the impacted third molar, and the condition of pericoronal soft tissue.

Radiographic Examination:

Panoramic view and a digital periapical x-ray film were taken for all the patients to evaluate and classify the impacted third molar and the amount of the bone around it.

Measurements:

1. All the patients were subjected to measure the maximum mouth opening by digital caliper which has two arms, one of them touch the mesial surface of upper central incisor and the other touch the mesial surface of lower central incisor.
2. Measurement thickness of the cheek for all patients, by digital caliper, which has two arms, one of them touch lingual surface of the crown of the lower first molar and the other arm touch tangent skin of the cheek.
3. All the patients were subjected to measure the line between the tragus to the corner of the mouth by flexible meters.

4. All the patients were subjected to measure the line between the tragus to the pogonion by flexible meters.

Operative period:

1. The control group, Bone removal was accomplished with a no 703 fissure surgical bur mounted on a straight angle low speed handpiece. Bone guttering was performed distal to the second molar from the mesio-buccal to disto-buccal aspects of the impacred teeth. The interlocked mesial cusp was removed by a fissure surgical bur mounted on high speed handpiece which splitting from buccal surface to lingual surface of the cusp. Then a suitable elevator was placed mesially at the neck of the tooth and rotated to move it distally and occlusally.

2. The study group, Bone removal around the lower third molar was accomplished with piezotome device using BS1S insert in piezotome device. The interlocked mesial cusp was removed by a fissure surgical bur mounted on high speed handpiece which splitting from buccal surface to lingual surface of the cusp. (Ultrasonic generator Acteon group17 Merignac Cedex, France) Then a suitable elevator was placed mesially at the neck of the tooth and rotated to move it distally and occlusally.

Post-operative period:

Post-operative evaluation was done clinically as follows:

1. Post-operative pain:

Pain was evaluated at first, third and fifth postoperatively through the visual analogue scale (VAS) [4] recorded from 0 to 10.

2. Post-operative swelling:

Swelling was evaluated while the patient was sitting in an upright position. The measurements were taken from the tragus of the ear to corner of the mouth and from the tragus of the ear to the pogonion .These measurements were taken by flexible meters produced by IKEA. The data was collected in first, third, fifth, seventh, fifteenth days postoperatively.

3. Post-operative trismus:

Trismus was evaluated postoperatively at first, third, fifth, seventh, fifteenth days through measuring the maximum mouth opening using a digital caliper applied between the upper central incisors and the lower central incisors at the midline.

RESULTS

I.Time of operation

There was a significant increase in time of operation in study group in comparing to control group as shown in table1.

TABLE (1): Comparing of time operation between study group and control group(sec)

Time of operation (min.)	Study (n= 10)	Control (n= 10)	Test of sig.	P
Min. – Max.	40.0 – 70.0	30.0 – 55.0	t= 3.240*	0.005*
Mean ± SD.	54.50 ±10.39	41.0 ± 8.10		

**: Statistically significant at p ≤ 0.05*

II. Postoperative Pain:

There was significant decrease in pain score in study group compared to controls as shown in table2.

TABLE (2): Comparing of pain between the study and control groups

Pain	Study (n= 10)	Control (n= 10)	*MW	P
Post-operative 1st Day Min. – Max. Mean ± SD.	 3.0 – 5.0 3.70 ± 0.67	 6.0 – 7.0 6.30 ± 0.48	0.000*	<0.001**
3rd Day Min. – Max. Mean ± SD.	 2.0 – 3.0 2.50 ± 0.53	 5.0 – 6.0 5.30 ± 0.48	0.000*	<0.001**
5th Day Min. – Max. Mean ± SD.	 1.0 – 2.0 1.40 ± 0.52	 4.0 – 5.0 4.30 ± 0.48	0.000*	<0.001**

MW, p: U and p values for* **Mann Whitney test *for comparing between the two groups*

***: Statistically significant at p ≤ 0.05*

III. Postoperative trismus:

There was significant decrease in trismus in study group compared to controls as shown in table3.

TABLE (3): Comparing of mouth opening in the study and control groups. (cm)

Trismus	**Study (n= 10)**	**Control (n= 10)**	**t**	**P**
Pre-operative Min. – Max. Mean ± SD.	 4.2 – 4.9 4.5 ± 0.2	 4.3 – 4.9 4.6 ± 0.2	1.043	0.311
Post-operative 1st Day Min. – Max. Mean ± SD.	 3.2 – 4.0 3.7 ± 0.2	 2.2 – 3.2 2.8 ± 0.3	6.793*	<0.001*
3rd Day Min. – Max. Mean ± SD.	 3.4 – 4.1 3.8 ± 0.2	 2.1 – 3.0 2.6 ± 0.3	10.391*	<0.001*
5th Day Min. – Max. Mean ± SD.	 3.8 – 4.6 4.2 ± 0.2	 2.3 – 4.0 2.98 ± 0.6	5.967*	<0.001*
7th Day Min. – Max. Mean ± SD.	 4.0 – 4.7 4.4 ± 0.2	 2.8 – 4.3 3.6 ± 0.5	4.680*	0.001*
15th Day Min. – Max. Mean ± SD.	 4.2 – 4.9 4.5 ± 0.2	 4.3 – 4.9 4.6 ± 0.2	1.149	0.266

T test

**: Statistically significant at p ≤ 0.05*

V. Postoperative swelling:

Statistically there was no significant difference between two groups as shown in Table4 .

Table (4): Pre and post-operative swelling and comparison between the control and study groups.(cm)

Swelling(linear measurement - cheek thickness)	Study (n= 10)	Control (n= 10)	MW	P
Pre-operative				
Min. – Max.	0.25 – 6.40	0.45 – 5.40	43.500	0.623
Mean ± SD.	3.71 ± 1.96	3.25 ± 1.67		
Post-operative				
1st Day				
Min. – Max.	0.75 – 6.90	1.60 – 6.50	49.500	0.970
Mean ± SD.	4.21 ± 1.97	4.43 ± 1.65		
3rd Day				
Min. – Max.	0.64 – 6.80	1.70 – 6.70	44.500	0.677
Mean ± SD.	4.10 ± 1.98	4.55 ± 1.69		
5th Day				
Min. – Max.	0.50 – 6.70	1.50 – 6.40	47.500	0.850
Mean ± SD.	3.99 ± 1.97	4.31 ± 1.67		
7th Day				
Min. – Max.	0.40 – 6.60	0.80 – 5.70	46.000	0.762
Mean ± SD.	3.85 ± 1.96	3.59 ± 1.68		
15th Day				
Min. – Max.	0.25 – 6.40	0.45 – 5.40	44.500	0.677
Mean ± SD.	3.66 ± 1.96	3.28 ± 1.67		
Median				

MW, p: U and p values for **Mann Whitney test**

DISCUSSION

In the present study, in agreement with Vercellotti[9], there was less bleeding during the operation with piezosurgery, this may be due to the cavitation effect of the cooling device with physiological saline solution, which helped to leave the working area bloodless. While in conventional rotary technique, there was more bleeding which made the surgeon lack of visibility produced difficulty in extraction.

The main disadvantages of Piezosurgery reported are expense and the risk of breakage of the surgical tips [10]. There was no broken of the surgical tips observed in the present study due to care with using of piezosurgery. Increased operating time as a result of the slow rate of cutting, although cutting times tend to decrease as the operator gains experience [11].

At the seventh post-operative day, sutures were removed and a good gingival healing was found, no signs of infection or inflammation and no wound dehiscence, this indicates the precision, selectivity and the atraumatic cutting action of the piezotome. These clinical observations are in agreement with Sivolelia et al, who observed that soft tissues presented no signs of inflammation and no pain was felt upon palpation on seventh day after using piezosurgery for osteotomy to remove a blade implant [12].

This study is also in agreement with the results of Enislidis et al who found an eventful soft tissue wound healing after using piezosurgery. Compared to mechanical drilling, the inflammatory cell infiltration and the revascularization were more pronounced in ultrasonic group and the percentage of new bone formation was more important [13].

Regarding the postoperative pain, the present study showed that from the first to the fifth postoperative day, there was less pain in the study group as compared to the control group, this result was statistically significant on the all days. This finding is in agreement with Vercellotti, who observed minimal postoperative pain when using piezo surgery [9]. However, some authors have observed that longer interventions are typically associated with increased levels of pain [6].

As regards the postoperative swelling, there was less swelling in the study group than in the control group from the immediate postoperative to the seventh postoperative day. This finding is in agreement with Francesco et al who reported that the piezoelectric osteotomy technique decrease the postoperative swelling in the first 24 hours after surgery when compared with the rotary osteotomy technique [14]. Our results are also in agreement with Robiony et al who observed minimal postoperative swelling and pain when using piezo surgery [15].

In the current study, we observed that despite extended operating time the VAS, trismus were all significantly lower in the piezo tome group. This is in contrary to the study done by Oikarinen [16] who stated that the duration of operation correlates significantly with trismus, pain, and total intake of analgesics. Our observation matches with the study done by Benediktsdottir et al. [17] who reported that the postoperative outcome was independent of the extent of the operating time and the VAS immediately postoperatively .

CONCLUSION

From the above mentioned results the following conclusions could be drawn:-

1. Complete recoveries without any complication were reported in all patients in test group.
2. Piezotome has a unique properties such as precise cutting, less bleeding, cavitation effect, but it tack longer time in comparing to convention tool
3. In the present study showed that piezosurgery is an excellent tool for reducing the risk of complications and improving of the patient in whole postoperative period.

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