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RESEARCH ARTICLE

CAN PIEZOSURGERY MINIMISE THE POST OPERATIVE SEQUALE IN THIRD MOLAR SURGERY: A SPLIT MOUTH STUDY

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Abstract

Background: Despite the use of various instruments for removal of third molars the magnitude of severity of postoperative sequelae still remains a question unanswered. Our study uses a post operative symptom severity scale (Posse) to assess the quality of life after the procedure in comparison to conventional rotary.

Aim: Evaluate the Efficacy between the piezotome and conventional rotary in removal of mandibular third molars. **Material and Methods:** third molar extraction was performed using conventional rotary on one side and piezotome on the other within interval of 7days.

Results: The present study was a split mouth study in which piezosurgery can be used in a day-to-day case basis despite the longer duration of surgery.

Conclusion: It is an excellent tool to reduce the risk of complication and to improve post - operative outcome. Although we would not say it is an economical option and also it may be more time-consuming.

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Introduction

One of the most critical steps involving the surgery of third molar is osteotomy which is done by using chisel, hammer and low speed rotary². The use of these instruments produces significant amount of trauma to the bone as well as the vital structures². Osteotomy is followed by significant post-surgical sequelae which involves pain, swelling, restricted mouth opening and sometimes may involve prolonged difficulties such as paraesthesia, dry socket and infection, which impact significantly the day-to-day activities³. To overcome specific limitations and complications of post-operative sequelae, Piezotome a device utilising ultrasound technology was introduced in dentistry which works on the principle of ultrasonic frequency^{4,5}. These ultrasonic vibrations allow selective cutting of bone with a higher level of precision and better handling and with less tissue damage^{3,6}. Use of piezotome gives higher level of safety by sparing the vital structures in the surrounding, producing less noise and improving the visibility by cavitation effect.^{3,6,7,8}. Although the advantages weigh more towards the use of Piezotome because of its atraumaticity, precision in surgery and most importantly enhancing the bone healing by minimising the micro trauma, but is criticised for its lengthening of procedure and excessive time consumption making it unsuitable for day-to-day practice⁹. The primary motive of this study is to evaluate the efficiency and the duration for removal of bone around impacted mandibular molar with Piezotome and conventional rotary bur. This study also compares the post-operative outcomes of osteotomy performed with Piezotome and conventional rotary by evaluating the parameters such as swelling, reduced mouth opening, pain and long-term complications like paraesthesia, alveolar

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osteitis, and infection. In addition to the above we formulated a questionnaire to know about the comfort and post-operative quality of life of patients who underwent extractions using piezotome and conventional rotary.

Material and Methodology:-

Inclusion criteria was (1) Patients aged between 18-70 years of age (2) Bilateral symmetrical impacted mandibular third molars (3) Controlled systemic diseases and willing for follow up. Exclusion criteria included (1) Patients younger than 18 or older than 70 years of age (2) Medically compromised status (4) Patients on bisphosphonates, oral or IV, Refusal to follow up and written consent (5) Patients with acute infections.

All the patients were explicitly explained about the procedure of surgical extraction using conventional rotary and piezotome and written consent was taken.

Study was conducted after approval from institutional ethical committee

Randomisation

Randomised selection was done on bases of lottery, in those slips were the method of intervention. Conventional rotary was used to perform osteotomy in patients under group A and piezotome was used to perform osteotomy in patients under group B. Each procedure was performed at interval of 1 week. To eliminate the operator, bias all the procedures with respect to both the sides were performed by same surgeon. To avoid any kind of observer and behaviour bias the operating surgeon and patients were blinded about the study.

Methodology:-

10 patients (10 for each procedure) reporting to department of Oral and Maxillofacial Surgery for removal of bilateral impacted mandibular molars were included in the study. Detailed case history, pre-operative photographs and orthopantomograms were taken. Angulation, depth, ramus relationship, and relation to the inferior alveolar canal was assessed. All the patients were explicitly explained about the procedure of surgical extraction using conventional rotary and piezotome and written consent was taken. Time interval between the procedures was 7 days.

Procedure and Technique

All the patients were given amoxicillin - clavulanic acid 625mg 1 hour pre procedure. After Extraoral and intra oral scrubbing using 5% Povidone-Iodine solution left out to dry for at least 2 minutes. Antiseptic mouthwash was used before the start of the procedure. Preparation of incision site was done with swab soaked in 5% povidone-iodine solution and left for 2 minutes. Patients were draped with double layer sterile drapes.

In both control group and piezotome group, inferior alveolar nerve block, long buccal nerve block followed by surgical site infiltration was given using 2% lignocaine with 1:200,000 adrenaline. Conventional ward's incision was used to expose the impacted third molar.

Osteotomy

In control group, osteotomy was done using conventional rotary attached with tungsten carbide bur no. 702 along with copious saline irrigation and tooth was extracted, socket was inspected for any debris and if required debrided and primary closure was done using braided 3-0 silk suture. (Fig 1)

In piezotome group, osteotomy was performed using BS1S9 mm saw tip, frequency was set at the range of 25-30 kHz, Osteotomy was performed unidirectionally in mesial to distal direction and tooth was extracted. Socket was inspected for any debris and if required debrided and primary closure was done using braided 3-0 silk suture (Fig 2).

Standard postoperative instructions were given and considering the maximum dosage, Acetaminophen 500mg was prescribed as analgesic SOS (taken as required or used as needed). Patients were recalled there after according to the study protocol and parameters were recorded.

Evaluation of parameters

Surgical Time Taken

Surgical time taken was recorded in minutes on day of surgery from point of incision till final suture was placed.

Swelling¹⁰

Swelling was measured using measuring tape from tragus to corner of mouth and from tragus to the corner of the mouth on post-operative days 3, 5 and 7. (fig 3)

Trismus

Trismus was measured by evaluating the inter incisal distance (cm) using a ruler on postoperative days 3, 5 and 7. (fig 4)

Pain^{11,24}

Pain was evaluated using visual analogue scale.

Post Symptom Severity (PoSse) Scale¹²

A comprehensive questionnaire was given to each patient on post-operative day 7. The questions pertain to scales which include patient's ability to enjoy food, speak properly, altered sensation, appearance, pain, sickness and interference with daily activities. Data were expressed in the form of table and graphics.



Piezotome cube (ACTEON)



OSTEOTOMY USING ROTARY



OSTEOTOMY USING PIEZOTOME



EVALUATION OF TRISMUS



EVALUATION OF SWELLING



Pre Operative OPG



Post Operative OPG

Statistical Analysis

Data was analysed using Statistical Package for Social Sciences (SPSS) version 21, IBM Inc. Summarized data was presented using Tables and Graphs. Fried mann test was used for comparison of (two or more repeated) paired data

and Wilcoxon paired t test was used for pair wise comparison. A level of $p < 0.05$ was considered statistically significant.

Results:-

The present study was a split mouth study in which 20 surgical extractions were performed. Patients had a mean age of 27.37 years. Time taken for extraction was significantly higher for the piezo group (45.46 min) when compared to rotary group (34.35 min) (Table 1). Pain was significantly lower in piezo group when compared to group A on Day 3 ($p < 0.010^*$) & Day 5 ($p < 0.033^*$) (Table 2). Patients who underwent piezosurgery had taken less number of analgesics. The mouth opening in piezo group patients showed statistically significant difference on day 3, 5, day 7 (Table 3). With respect to swelling, on day 3 the test group showed significant difference in the size of swelling (Table 4). Only one patient with paresthesia in the control group and none in the test group. On comparison, in the piezo group 60% patients complained about the quality of life postoperatively which was assessed using post operative symptom severity scale (PoSse) (Table 5)

Table 1:- Comparison of Time Taken for Procedures.

		Mean	SD	T VALUE	P VALUE
Group A: Control	ROTARY GROUP	2061.80	203.64	-1.136	0.0001*, SIG
Group B: Test	PIEZO GROUP	2728.30	162.49		
PAIRED T TEST, LEVEL OF SIGNIFICANCE SET AT $P \leq 0.05$ SIG: SIGNIFICANT NS: NON SIGNIFICANT					

Table 2:- Comparison Of Vas Scores.

TIME INTERVALS			VAS SCORES			
			Mean	SD	Z VALUE	P VALUE
DAY 3	Group A: Control	ROTARY GROUP	5.7	1.1595	-2.585	0.010*, sig
	Group B: Test	PIEZO GROUP	3.7	0.8233		
DAY 5	Group A: Control	ROTARY GROUP	3.8	0.9189	12.126	0.033*, sig
	Group B: Test	PIEZO GROUP	3	0.4714		
DAY 7	Group A: Control	ROTARY GROUP	1.5	0.9718	-1.611	0.107, NS

	Group B: Test	PIEZO GROUP	0.8	0.7888		
DAY 15	Group A: Control	ROTARY GROUP	0	.0000 ^a	0.00	1.00
	Group B: Test	PIEZO GROUP	0	.0000 ^a		
WILCOXON PAIRED T TEST, LEVEL OF SIGNIFICANCE SET AT $P \leq 0.05$ SIG: SIGNIFICANT						

Table 3:- Comparison Of Mouth Opening.

TIME INTERVALS			MOUTH OPENING			
			Mean	SD	Z VALUE	P VALUE
DAY 3	Group A: Control	ROTARY GROUP	19.10	1.29	-2.844	0.004*, SIG
	Group B: Test	PIEZO GROUP	26.60	2.32		
DAY 5	Group A: Control	ROTARY GROUP	24.40	2.95	-2.680	0.007*, SIG
	Group B: Test	PIEZO GROUP	30.30	3.30		
DAY 7	Group A: Control	ROTARY GROUP	30.90	3.78	-2.375	0.018*, SIG
	Group B: Test	PIEZO GROUP	34.50	3.06		
DAY 15	Group A: Control	ROTARY GROUP	39.00	2.79	0.00	1.00
	Group B: Test	PIEZO GROUP	39.00	2.79		
WILCOXON PAIRED T TEST, LEVEL OF SIGNIFICANCE SET AT $P \leq 0.05$ SIG: SIGNIFICANT						

TIME INTERVALS						
			Mean	SD	Z VALUE	P VALUE
DAY 3	Group A: Control	ROTARY GROUP	4.36	0.41	-2.820	0.005*, SIG
	Group B: Test	PIEZO GROUP	3.80	0.27		
DAY 5	Group A: Control	ROTARY GROUP	3.01	0.83	-0.632	0.527, NS
	Group B: Test	PIEZO GROUP	2.91	0.38		
DAY 7	Group A: Control	ROTARY GROUP	1.18	0.73	-1.633	0.102, NS
	Group B: Test	PIEZO GROUP	1.04	0.48		
DAY 15	Group A: Control	ROTARY GROUP	Not recorded			
	Group B: Test	PIEZO GROUP	Not recorded			
WILCOXON PAIRED T TEST, LEVEL OF SIGNIFICANCE SET AT $P \leq 0.05$ SIG: SIGNIFICANT						

Table 4:- Comparison Of Swelling**Table 5:-** Comparison Of Post Symptom Severity Scale (Posse) Among Two Groups.

	Group A: Control				Group B: Test				P value
	Yes		No		Yes		No		
	n	%	n	%	n	%	n	%	
1. Affected enjoyment of food	10	100	0	0	6	60	4	40	0.043*,SIG
2. Unable to open mouth	10	100	0	0	7	70	3	30	0.105, NS
3. Voice effected	0	0	10	100	0	0	10	100	NA
4. Speech effected	0	0	10	100	0	0	10	100	NA

5. Tingling of lips and tongue	1	10	9	90	0	0	10	100	0.500,NS
6. Numbness of lips and tongue	1	10	9	90	0	0	10	100	0.500,NS
7. Face or neck bruised	0	0	10	100	0	0	10	100	NA
8. Face or neck swollen	0	0	10	100	0	0	10	100	NA
9. Pain controlled by pain killers	10	100	0	0	10	100	0	0	NA
OPTION :	7 days		15 days		7 days		15 days		
10. Pain for how many days?	6	60	4	40	10	100	0	0	0.043*,SIG

Sig: Significant , Ns: Non Significant

Discussion:-

This study was designed to compare the efficacy of piezotome and conventional rotary device in terms of time taken for the surgical procedure, swelling, trismus, paraesthesia and quality of life post operatively.

According to the literature removal of third molar using a piezotome causes minimal post operative sequelae, although there are reports of increase in the duration of surgery^{9,11,13}. E.K. Badenoch-Jones et al. had published about the reduced incidence of trismus, pain, and swelling but increase in the operating time using piezotome. Lago-Mendez et al. reported that operation duration correlates significantly with trismus, pain, and total intake of analgesics⁷. Beziat JL et al. in his investigation showed that the time required for procedure decreases as the operator gains experience¹⁵.

From the results obtained in our study, use of piezotome for osteotomy resulted in much longer duration of surgery. This might be because of the slower speed and precise cutting action by piezotome¹⁴. Other reasons for a longer duration of osteotomy may be because of their unidirectional movement (28,000 – 36,000 osc/sec.) and rate of bone removal (60 and 200 µm)^{8,16}. These findings agree with Goyal et al. who found that time required was significantly higher in the piezosurgery group than in the conventional technique¹. The average VAS score was 5 in rotary group and 3 in piezotome group on 3rd postoperative day. The better new bone formation allows a better healing process and justifies the significant lower postoperative pain observed in the patients of piezo group. The main variable that can influence the healing process is level of inflammation that occurs immediately and the speed by which the regeneration process may begin^{15,17}. In our study, it was observed that number of analgesics that were taken after surgery by the patients in rotary group were greater when compared to the patients in the piezo group. The same was reported by Kerawala et al.¹⁸.

One of the major causes for post-operative trismus is due to acute intense pain experienced by the patients during initial postoperative course^{14,18}. Pedersen et al. explained the strong interrelation between postoperative pain and trismus²⁰. The initial restriction in the mouth opening on day 3 and day 5 of follow up was due to the inflammatory mediators that are reproduced after the trauma inflicted by the procedure. However, in our study we observed that patients in the rotary group had more restricted mouth on day 7 of follow up, when compared to the piezotome group. The microtrauma caused by the rotary drill results in trauma which causes more swelling and pain, is the reason for increased duration of trismus²¹. These findings are similar to study conducted by Sortino et al. In our study, patients in piezo group resulted with less amount of swelling compared to the rotary group on day 3 and day 7²².

Although, we encountered one case of paraesthesia with the use of conventional rotary method. We did a questionnaire based on the post symptom severity scale which were given to the patient on day 3, 5, 7 and 15^{19, 23}. We interpret that patients in the piezo group had better quality of life. The piezosurgery delivers a micrometric cut involving the minimum surface area; this may be one of the factors that contribute to the good results obtained²³. The management of the flap through careful manipulation of tissue might also explain our findings for pain, swelling, and trismus. Mentioning about the disadvantages of our study we could not establish the relationship between the degree of impaction and its relation to increase in the duration of surgery time. We were not able to establish whether the duration of osteotomy could be reduced with increase in operator experience,

due to our limited sample size. Other drawbacks of this study were that we were not able to include the radiographic or histological evidence to show the better healing in piezo surgery.

Conclusion:-

Our findings indicate that piezosurgery an excellent tool to reduce the risk of complication and to improve post-operative outcome. Although we would not say it is an economical option and also time-consuming. However, in certain instances to avoid surgical morbidity in close proximity to nerve or vessel a longer duration surgery may be justified. Further randomised control trails and systematic reviews may bring us much clarity on these issues.

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