

ORIGINAL ARTICLE

MEASURE OF FREQUENCY OF ALVEOLAR OSTEITIS USING TWO DIFFERENT METHODS OF OSTEOTOMY IN MANDIBULAR THIRD MOLAR IMPACTIONS: A DOUBLE-BLIND RANDOMIZED CLINICAL TRIAL

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Background: Dento-alveolar surgical procedures involving third molar teeth are the most common surgical procedure in the field of surgery. The objective of this research was to analyse the impact of surgery on the incidence of alveolar osteitis after surgical removal of mandibular third molar and to compare two different bone cutting methods following impacted mandibular third molar surgery.

Methods: This double blinded randomized clinical trial was executed at the OPD of Department of Oral and Maxillofacial Surgery, Dow University of Health Sciences, Karachi. The study duration was four months. It was conducted on 60 patients needing unilateral mandibular third molar impaction removal. Patients were randomized to two groups (i.e., physio dispenser group and slow speed handpiece group) before surgery. The surgical procedure was performed under local anaesthesia by using standardized cross infection protocol. The frequency of alveolar osteitis was evaluated on third-day postoperatively. Alveolar osteitis was diagnosed and confirmed by patient's history and clinical evaluation. Post-operative sequelae were observed and recorded objectively. **Results:** Out of 60 patients, five patients experienced alveolar osteitis, and the incidence rate was 8.3%. A significant *p*-value of 0.000 was calculated using binomial test for comparison of alveolar osteitis among both groups. Inter-examiner reliability was assessed by kappa and good (62%) agreement, which was found among the examiners, who diagnosed alveolar osteitis clinically. Post-operative sequelae were insignificant in slow speed hand piece group. **Conclusion:** It was observed that alveolar osteitis was reported in physio-dispenser group; similarly, post-operative complications were also more in this group as compared with slow speed-hand piece group. No surgical complications were observed in slow speed-hand piece group suggesting slow speed hand piece mode of osteotomy to be safer for third molar extraction as compared with physio-dispenser.

Keywords: Alveolar Osteitis; Bone cutting; Mandibular third molar surgery

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INTRODUCTION

Dento-alveolar surgical procedures involving third molar teeth are the most common surgical procedure in the field of surgery.¹ The surgical removal of third molar teeth have a number of complications including pain, swelling, bleeding, alveolar osteitis (AO) or nerve dysfunction.²

Dry socket (alveolar osteitis) is one of the prevailing complications following third molar removal that is characterized by excruciating pain that increases on the third day after extraction. Due to alveolar osteitis, increase in recovery time corresponds to increased cost as the patient needs multiple visits to manage this condition. A chlorhexidine rinse on the day of the surgical procedure and several days after the surgery have been associated with the decreased incidence of alveolar osteitis.³ Bone cutting is the most crucial step in the surgical extraction of the impacted third molars and

different bone cutting instruments are used like conventional slow speed hand-piece, physio-dispenser and piezoelectric (ultrasonic bone cutting instrument) method.⁴

Physio-dispenser is mainly used in implant surgery, but its use for osteotomy during third molar surgery is not so uncommon.⁵ Constant irrigation or externally used saline is used to lower down the temperature, as heat is the principal factor for producing post-surgical sequela and has untoward effects on bone healing and regeneration. The complexity associated with AO is dependent on the depth of bone impaction^{6,7} with an increased risk in females as compared to males⁸. The risk increases with the older age due to the increased vascularity. It further depends on upon the duration of surgery, the longer the duration, the increased risk of incidence of AO.^{1,5,9} Marginal osteonecrosis, impaired regeneration and healing are the detrimental effects of rotary instruments because of their

speed during cutting of bone. Newer instruments after meticulous research have been introduced to overcome the unfavourable and unforeseen effects after osteotomy.⁴

The ability to predict the surgical difficulty of lower third molar extraction is essential when designing a treatment plan and it helps to assess the competence of the dental practitioner for the specific procedure, reduce complications, improve the preparation of the patient and assist in terms of the postoperative management of inflammation and pain. This ability to predict the difficulty of third molar extraction has been found to vary according to the experience of the consultant with the procedure.^{10,11}

The surgical removal of third molar impaction has been accounted as the most common extraction within the dental practice.^{1,5,9,10,12,13} However, a condition may appear after the surgical extraction of a molar, which has been termed as alveolar osteitis. It has been observed as the most common post-operative complication^{3,8,14,15} with a repeated severe pain with a recurring need for hospital visits. With routine dental extractions, the incidence of alveolar osteitis has been observed from 0.5–5% and the 1–37% with the extraction of mandibular third molars.^{8,14,16} The condition of alveolar osteitis has been believed to be avoided by a lavage of the oral cavity and a preference of antibacterial mouthwash prior to extraction.

The triangular flap design technique has been used to estimate wound dehiscence; a 2-cornered flap is being applied on extraction side. The intensity of pain, swelling and trismus may be reduced while using a flap design technique.^{12,15,17} Manoj Goyal *et al* used the conventional rotatory hand piece and a Piezosurgical unit for the extraction of lower third molar, the pain, trismus, and oedema was evaluated.⁴ More pain was associated with the conventional group who were in need of an intense analgesic as compared to the Piezosurgery group. More post-surgery swelling was being observed in the conventional group. Generally, it has been observed that the use of Piezotome showed more favourable result.²

Alveolar osteitis has been believed to be prevented by packing of medication as an immediate placement after surgery; this may decrease the rate of alveolar osteitis occurrence.^{2,3} A chlorhexidine rinse on the day of the surgical procedure and several days after the surgery have been associated with a decreased incidence of alveolar osteitis.^{1,3,5} Beside flap design, bone depth, irrigation during procedure, and medication; mode of osteotomy also plays a major role in causing AO.^{4,8} In under-developed countries like Pakistan, most of the dental out-patient departments and clinics use slow-speed handpiece as mode of osteotomy.

In this clinical trial, we investigated the incidence of alveolar osteitis following third molar

surgery using two different bone cutting methods. The study was intended to analyse the frequency of the alveolar osteitis by both methods of removal, i.e., physio-dispenser and slow speed hand piece.

MATERIAL AND METHODS

This double blinded randomized controlled trial was conducted at the Department of Oral and Maxillofacial Surgery, Dow International Dental College, Dow University of Health Sciences, Karachi.

The sample size was calculated by using N PASS sample collection software. Using PASS v11, a repeated measures design with 1 between factor and 1 within factor has 2 groups with 4 subjects each for a total of 8 subjects. Each subject was measured 3 times. This sample achieves 100% power to test factor B if a Geisser-Greenhouse Corrected F-Test is used with a 1% significance level and the actual effect standard deviation is 2.27 (an effect size of 2.78), achieves 100% power to test factor W if a Geisser-Greenhouse Corrected F-Test is used with a 1% significance level and the actual effect standard deviation is 4.76 (an effect size of 11.67), and achieves 100% power to test the BW interaction if a Geisser-Greenhouse Corrected F-Test is used with a 5% significance level and the actual effect standard deviation is 4.76 (an effect size of 11.67). Therefore, a total of 60 participants were selected that comprised of 30 participants in each group.

The study population included 60 patients (both male and female). They required extraction of mandibular third molar and were between the age category of 20 to 50 years having bony impactions with no systemic disease. Patients having any medical condition in which extraction was contraindicated and the patients who were allergic to penicillin were excluded from the study. Study duration was of six months, i.e., July–October 2016.

Sixty consecutive patients were included in the study. Randomization was done on the basis of osteotomy technique. Sealed opaque envelopes having paper cuttings of equal size and weight were used and included two interventions, i.e., the conventional slow speed handpiece group and physio-dispenser group. Every patient hand-picked an envelope pre-operatively.

The level of difficulty of procedure was ascertained by two clinicians to minimize operator's bias. The operator then made surgical preparations for that specific procedure written on the paper cutting. After taking complete dental and medical history, surgical impaction removal procedure was started. The amount of anaesthesia was kept constant for every patient, i.e., two cartridges for both groups. Triangular flap was raised for the surgical removal of the tooth for all the participants. The amount of irrigant was constant, i.e., 100 ml in both the groups. Duration of the surgical procedure was recorded from incision till extraction. 3.0

silk suture was used and three sutures were applied for the socket closure. The patients were recalled on the third and seventh-day post-operatively. The diagnosis of AO was made on the clinical ground by two clinicians; the presence of denuded socket, foul smell and intense pain at the extraction site. SPSS version 16 was used for statistical analysis of the data. The binomial test was applied to check the incidence of alveolar osteitis among both study and control group.

RESULTS

Out of 60 patients, 25 were males and 35 were females having mean age of 30.92±11.33 and 28.20±6.75 mean (SD) respectively. For descriptive statistics; frequency, the mean and standard deviation were calculated for age, gender, tooth no, the number of pain killers, bone cutting method and the difficulty level of surgery

(Table-1). Table-2 has been divided into two sections including the level of agreement between the 2 clinicians and the symmetric measures. The observed incidence of AO in this study was 8.3% with a total number of 5 cases of AO that were only observed in physio-dispenser group. In order to analyse the effect of incidence of alveolar osteitis in both groups binomial test was implied, indicating significant results with *p*-value <0.001 was observed in slow speed hand group. The cross-tabulation results obtained through SPSS have shown the measure of agreement of examiner 1 and examiner 2. It has been observed that alveolar osteitis was confirmed by both surgeons in 5 cases. The reliability between the decisions of both examiners has been found 62% by using kappa.

Table-1: Frequency and descriptive statistics

		Frequency	Mean (S.D.)	Minimum	Maximum
Age	Below 25	30	29.33±(8,966)	20	50
	Above 25	30			
Tooth number	38	20	1.67±.475	1	2
	48	40			
Bone cutting method	Physio-dispenser	30	1.50±.504	1	2
	Slow speed hand piece	30			
Difficulty level	Easy	28	1.53±.503	1	2
	Difficult	32			
Pain killers needed other than the prescription in 7 days	12 tabs	45	13.00±1.931	12	18
	More than 12 tabs	15			

Table-2(a): Agreement on clinical diagnosis of Alveolar Osteitis by Clinician 1 and 2

Clinician 1		Clinician 2	
		Yes	No
	Yes	5	3
	No	2	50
Total cases of AO by both clinicians		5	55

Table-2(b): Agreement on clinical diagnosis of Alveolar Osteitis by Clinician 1 and 2 (Kappa)

Number of valid cases	Measure of agreement (Kappa)	<i>p</i> -value
60	0.619	<0.001

Table-3: Binomial test of alveolar osteitis with respect to bone cutting method

Bone cutting method	Total number of cases	Frequency of Alveolar osteitis n (%)	<i>p</i> -value
Physio-dispenser	30	5 (8.3)	< 0.001
Slow speed handpiece	30	0	

DISCUSSION

With the incidence of alveolar osteitis being 8.3% in this study with physio-dispenser group, the slow-speed hand piece mode of osteotomy proved to be more effective. Kolokythas *et al* stated incidence of alveolar osteitis between 1–37.5% and is higher in surgical extractions.¹⁴

Alveolar osteitis is considered as typical post extraction pathology and 95–100% cases were reported within a week of extraction. In our study, most patients were observed on the third day after surgery for assessment of AO.^{8,14} Most studies showed increased incidence of alveolar osteitis in females as compared to

males but reverse was observed in this study where all five cases of AO were male patients.⁸

Age was categorized in two groups; all five cases of AO were observed in the group having age above 25 yrs. These findings of the study correlate with the previous literature.⁸ More incidence of AO was due to immense amount of heat production and high rmps with equal amount of irrigant used as coolant for dissipating the heat effect.¹⁷

Tolstunov *et al* associates flap design applied along with the irrigation of socket through saline as two major perspectives with the reduced incidence of post-operative complications. On the contrary current study

has used constant amount (100 ml) of normal saline irrigation and triangular flap design applied in both groups.¹⁹ The use of triangular flap is directly associated with the decreased incidence of alveolar osteitis as stated by Haraji, *M et al.*¹⁷

From the perspective of antibiotics, the rationale behind the prescription was to control the occurrence of alveolar osteitis along with other post-operative complications. Tarakji, *et al*⁸ has stated that the usage of antibiotics is directly associated with the lower incidence rate of alveolar osteitis.

Regarding the limitations of the study number of female patients was more than the male patients. Newer osteotomy technique was not used to identify more comprehensive outcomes as this was not available due to cost effectiveness. Therefore, future studies with embellished methodology, state of the art osteotomy technique with equal number of patients of both genders and a larger sample size to ascertain the association of AO with bone cutting techniques are required.

CONCLUSION

It is concluded from the results of the study that the alveolar osteitis has been reported with physio-dispenser group. The literature regarding alveolar osteitis is not consistent and often conflicting the objective criteria to diagnose AO still lacking. Triangular flap and usage of saline during extraction along with antibiotics was done to avoid the complications of alveolar osteitis.

Conflict of interest: All authors declared that there is no conflict of interest.

AUTHORS' CONTRIBUTION

HR, AH and AHS: conceptualized the basic idea of the work. AHS: Supervised the project and helped in data collection. AH: Supervised the project and drafting of manuscript. HR: Data collection, drafting, compilation of result and statistical analysis. KA: Drafting and statistical analysis. MA and SM: Permissions sorted

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