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Original Research

Mandibular third molar impactions in male adults: Relationship of Operative time and Types of impaction on inflammatory complications

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Abstract:

Background: This paper investigates the relationship betweendifferent types of impactions with post-operativeinflammatory tissue reaction.

Materials & Methods: Consecutive patients with only mandibular third molar impactions were included in our study. They were classified by winter's classification. The disimpactions were performed under local anaesthesia. Time for surgery was noted for each surgical procedure. Postoperative inflammatory complication in terms of pain, swelling and trismus were noted.

Results: 150 male patients in the age groupof 18-40 years were studied. Inflammatory tissue reactions were increasing with more operative time. Distoangular and Horizontal impactions were associated with more pain on first 3 days of surgery along with more swelling and trismus. Vertically impacted teeth were associated with least complications.

Conclusion: Post operative morbidity was increasing along with moreoperating time and increase in the depth of mandibular third molar impaction.

Key Words: Operative time length, pain, third molar, trismus

Introduction

The mandibular third molar surgery is a common surgical procedure in the speciality of oral surgery.[1] Inflammatory tissue reactions are commonly noted in terms of pain, swelling and trismus.[2,3] The main reason behind this is the surgical procedure.[4] This effects the quality of life of the patient and results in restricted daily activities.[3,4] Many dentist stress on better control of these complications in patient who undergo third molar extractions. Previous studies regarding recovery from third molar surgery is not completely reported.[4]

There are various factors that influence the postoperative outcome,which can be divided into immediate and late complications.[2,3] Pain, swelling and trismus are considered as immediate tissue reactions.[3] Age of the patient, smoking habit, oral hygiene maintenance, type of impaction, depth of impaction, density of surrounding, design of incision and duration of operationalso plays a vital role in these complications.[5-9]

A systematic review of the literature showed that operative time of surgical procedure and depth of impaction were one of most common factors that affect the postoperative outcome.[10] Some of the studies showed that older patients subjected to more extractionsand involving a greater number of sutures, more operative time, result in the more intense inflammatory tissue reaction.[7] Obimakinde OS et al[11] findings shows that atgreater depth mandibular third molar impaction result at oral depth in more post operative inflammatory tissue reactions.Some of the studies have been done before to evaluate postoperative complications after mandibular third molar disimpaction but these studies everdone by radiologic assessments and the effects of different variables on post-operative outcome were not completely studied.[11-13]

Impacted lower third molar was classified by winter's classification in our study based on a periapical radiograph or orthopanthomograph.[14,15] We follow the winter's classification of impaction in our study.[14,15]

Definition of operating time varies according to different studies. We follow the method of Akinwande JA in our study.[16-18] Hedefined the operative time as the time lapse

between the beginnings of bone drilling to the completion of suturing in our study.

The present study evaluates the patient's factors, which contribute to operative and tooth factors during the surgical procedure of mandibular third molar impactions and its relationship with pain, swelling and trismus and compare our findings with some other previous studies.

Materials and Methods

Consecutive patientsin the age group of 18 to 40 years having impacted teeth in mandible, referred to the oral surgery clinic of university hospital and full filled the following inclusion criteria with due permission of local ethical committee were recruited in the study.

Inclusion criteria:

- Male patients with impacted mandibular third molar and without systemic disease (Winter's classification, Pell and Gregory Class I-B)
- No contraindication to use routine medications.

The standard painting and draping was done. Preoperatively all patients used 5-6 ml of 0.12% chlorhexidine for 3 min.The classical inferior alveolar and long buccal nerve block technique used to achieve effective anaethesia at site of surgery with 1: 2,00,000 lignocaine with adrenalin. Astandard ward's incision was used. Ostectomy was carried out with a flat fissure bur (S.S.White, No 701) along with constant irrigation with saline. Tooth was removed and followed by socket cleaning. Tooth sectioning was done when needed.After achieving proper hemostasis, flap was repositioned andsutured hermetically with 3-0 black braided silk. Two sutures taken distal to second molar and one suture was at reliving incision. Post operative instruction were given.

This included the following.

- Ice pack application for 6 hrs after surgery, alternating 30 min of application with 30 min pause.
- Soft diet for 3 to 4 days and 0.12% Chlorhexidine twice daily after diet.
- Cap. Amoxicillin 500 mg/Tab. Brufen 400 mg, thrice a day for 5 days.
- Patients were given a card to note the pain and swelling score daily also called for follow up on 2nd, 5th and 7th postoperative day
- Sutures were removed on 7th day of surgery.

Evaluation Criteria:

The following parameters were recorded.

Operative time (OP):

The operation time was noted from the start of putting surgical intra oral incision at site of impacted third molar up to completion of suturing at surgical site with a stopwatch. Operative time was divided in four groups.

Group 1: ≤20 Minutes, Group 2: 21-26 / Minutes, Group 3:27-32, and Group 4: 33-38 /Minutes

Mouth Opening (Trismus):

Mouth opening was assessed by measuring the inter incisal distance between the upper and lower right central incisor on the 2rd, 5th and 7th days after surgery by Boyle's gauge-a venire calibrated caliper. Three readings were taken for each patient and average was determined.Maximum inter-incisal distance (MID) was used as the index of trismus.

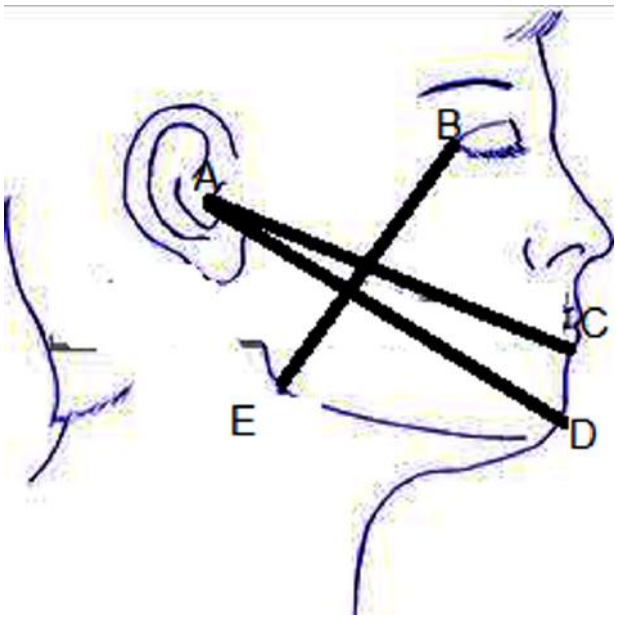

Figure 1: Facial swelling measurement by joining the 3 lines AC, AD and BE

Pain (VAS score):

Subjective method ofvisual analogue scale was used for evaluation of pain. It consisted a pain rating scale subdivided into equal parts, one end of the card related to no pain and other to extremely severe pain (Table 1) and they were asked to fill the record everyday on pain rating scale for seven days, except days they came for follow up (2^{nd}, 5^{th}, 7^{th} days) post operatively making references to predetermined values.

Swelling:

It was assessed by using following points on site of surgery. First point corresponded to horizontal line joined outer corner of the mouth and pogonium to the midline of the tragus of the ear lobe [AC, AD], while other vertical line joined from outer lateral canthus of the eye and inferior point on mandibular angle[BE] [Figure 1]. It was measured with a thread and then transferred on scale.[18] Facial measurement was taken preoperatively and subsequently on 2^{nd}, 5^{th} and 7^{th} days after surgery. The average data was calculated from the difference of postoperative and preoperative values.

Data was analyzed and calculated with Statistical Package for Social Sciences (SPSS) 15.0 for Windows. A multivariate analysis was done for all variables.

Results

Total of 150 patients in the age group of18 to 40 years with a mean (SD) age of 26.34 years were studied.

The operating time was divided in four groups. The distribution of operative time and its effect on mouth opening, pain and swelling is shown in Table 2 and Table 3

Table 1: VAS scale to evaluate pain : Reference values given to the patients.

0	No pain	The patient feels well
1	Slight pain	If the patient is distracted he does not feel the pain
2	Mild pain	The patient feels pain even if concentrating on some activity
3	Moderate pain	The patient is very disturbed but nevertheless can continue with normal activities
4	Severe pain	The patient is forced to abandon normal Activities
5	Extreme pain	The patient must abandon every type of activity and feels the need to lie down

Table 2: Influence of operative time on post operative pain.

Operative Time/Minutes	Visual analogue scale : VAS score							
		Day 1	Day2	Day3	Day4	Day5	Day6	Day7
≤ 20	Mean	2.80	2.32	1.84	1.48	0.64	0.44	0.04
	N	25	25	25	25	25	25	25
	Std.Deviation	0.70	0.62	0.68	0.71	0.70	0.58	0.20
21-26	Mean	3.52	2.74	2.11	1.28	0.54	0.35	0.09
	N	52	54	54	54	54	54	54
	Std.Deviation	0.92	0.75	0.57	0.62	0.53	0.52	0.29
27-32	Mean	4.04	3.37	2.58	1.85	0.88	0.54	0.15
	N	54	52	52	52	52	52	52
	Std.Deviation	0.83	0.82	0.72	0.84	0.67	0.60	0.36
33-38	Mean	4.26	3.40	2.68	2.05	1.42	0.68	0.32
	N	19	19	19	19	19	19	19
	Std.Deviation	0.93	1.01	1.00	0.91	0.83	0.74	0.47
Total	Mean	3.67	2.98	2.30	1.61	0.79	0.47	0.13
	N	150	150	150	150	150	150	150
	Std.Deviation	0.98	0.89	0.76	0.81	0.71	0.59	0.34
	P value	0.000	0.000	0.001	0.013	0.000	0.180	0.040

respectively. There was increase in intensity of the pain with the increasing operative time on day 1 (p = 0.000). The difference between the operative time was statistically significant on day 2 and 5 but not significant on day 7 for trismus and swelling. There was an increase in size of swelling and more trismus with increasing operative time.

The relationship of type of impaction and its effect on trismus, pain and swelling is shown in Table 4 and Table 5 respectively. Horizontal impaction was associated with higher VAS score on Day 1, 2 and 3. (p = 0.000, 0.000 and 0.001). Distoangular and Horizontal impactions were associated with more swelling (p=0.000, 0.000 and 0.006 on days 2, 5 and 7 respectively). Vertical impaction was associated with the least degree of facial swelling (on day least is Mesioangular) and best mouth opening among the types of impaction.

A multivariate analysis of the effect of type of impaction and operative time on pain, swelling and trismus is shown in Table 6. Using Pillai's trace, Operative time, with an eigen value of 0.765, contributed least to the dependent variables pain, swelling and trismus. Interaction of type of impaction and operative time had the highest Eigen value of 1.44 as compared to other factors matrix test, indicating that the interactions of type of impaction and operative time affected pain, swelling and trismus observed in operated patients. The significance of models (p<0.05) is an indication that results in our study were appropriate.

Table 3: Effect of operative time on post operative swelling and Trismus.

Operative Time/Minutes		Swelling/mm			Mouth opening/mm		
		Day2	Day5	Day7	Day2	Day5	Day7
≤ 20	Mean	6.40	2.34	0.16	28.96	35.56	41.52
	N	25	25	25	25	25	25
	Std.Deviation	1.29	0.72	0.40	3.39	2.55	1.58
21-26	Mean	6.75	2.40	0.31	25.77	33.05	40.33
	N	54	54	54	54	54	54
	Std.Deviation	1.09	0.78	0.47	3.65	3.80	1.62
27-32	Mean	7.45	2.93	0.37	24.02	31.25	40.28
	N	52	52	52	52	52	52
	Std.Deviation	1.09	0.74	0.47	3.07	3.13	1.52
33-38	Mean	7.70	2.98	0.57	22.73	30.57	40.26
	N	19	19	19	19	19	19
	Std.Deviation	1.34	0.79	0.58	3.10	2.94	1.32
Total	Mean	7.05	2.65	0.34	25.31	32.53	40.50
	N	150	150	150	150	150	150
	Std.Deviation	1.23	0.80	0.49	3.84	3.64	1.60
	P value	0.002	0.020	0.064	0.000	0.000	Unidentified

Discussion

The postoperative period of removal of impacted third molar is sometime associated with distresss to the patient due to pain, swelling and trismus, which affects his day to day activities.

This study has shown that operative time and angulation of the third molars definitely play a role in the incidence of postoperative inflammatory tissue reaction. According to the various reviews, third molar surgery results in physical injury to the soft tissues, which initiate sequential release of mediators from mast cells and some other cells such as histamine, serotonin, bradykinnin and prostaglandins, which participate in inflammatory process.[19,20] Postoperative swelling results from collection of protein rich inflammatory exudates and spasm of muscles fibres result in restricted mouth opening. Pain, Swelling and Trismus may be a result of the formation of such mediators of inflammation present after surgery in response to tissue injuries.

In our study, pain was assessed with VAS score. It is a sensitive method for recording pain. Berge TI et al [19,20] had done a thorough investigation of visual analogues scale for assessment of pain and he came to the conclusion that pain, can be successfully assessed with VAS.

In our study it showed that increase in operative time was result in higher VAS score, more swelling and reduced mouth opening as per Table 2 and 3.

Greater depth and more angulation towards ramus region results in more bone removal, which might be responsible for increase in operative time and more soft tissue manipulation during procedure. This was one of the reasons that increase in operative time in our study was associated with more pain, swelling and trismus on the 2nd and the 5th day after surgery but on the 7thday most of the patients recover completely. There was a gradual increase of inflammatory complications, when more time was associated with surgery, which resulted in more tissue injuries and stimulation of the release of mediators for inflammation. This was considered as one of the reasons for more pain, trismus and swelling.

In our study distoangular (n = 38) impactions were more common. Vertically impacted third molars were associated with the least complications. Distoangular and horizontal third molar impactions were associated with more

Table 4: Relationship between types of impaction and post operative pain.

Type of Impaction	Visual analogue scale							
		Day 1	Day2	Day3	Day4	Day5	Day6	Day7
MA	Mean	3.24	2.56	1.98	1.32	0.61	0.29	0.05
	N	37	37	37	37	37	37	37
	Std.Deviation	0.72	0.55	0.43	0.52	0.50	0.51	0.16
V	Mean	2.97	2.20	1.60	1.38	0.45	0.361	0.02
	N	36	36	36	36	36	36	36
	Std.Deviation	0.81	0.81	0.75	0.93	0.68	0.48	0.23
DA	Mean	4.28	3.50	2.71	1.84	1.12	0.61	0.25
	N	39	39	39	39	39	39	39
	Std.Deviation	1.00	0.94	0.84	0.84	0.80	0.67	0.44
H	Mean	4.10	3.28	2.58	1.84	0.92	0.60	0.18
	N	38	38	38	38	38	38	38
	Std.Deviation	0.65	0.79	0.61	0.75	0.63	0.63	0.39
	P value	0.000	0.000	0.001	0.013	0.000	0.180	0.040

Table 5: Effect of operative time on post operative swelling and Trismus.

Type of Impaction		Swelling/mm			Mouth opening/mm		
		Day2	Day5	Day7	Day2	Day5	Day7
MA	Mean	6.24	2.17	0.20	27.02	34.05	40.56
	N	37	37	37	37	37	37
	Std.Deviation	0.95	0.65	0.42	3.51	2.58	1.46
V	Mean	6.18	2.25	0.17	27.44	34.83	41.16
	N	36	36	36	36	36	36
	Std.Deviation	1.02	0.72	0.33	4.01	2.90	1.48
DA	Mean	7.98	3.13	0.59	19.55	25.51	40.35
	N	39	39	39	39	39	39
	Std.Deviation	0.80	0.64	0.57	3.43	4.05	1.81
H	Mean	7.72	2.99	0.39	22.31	28.94	39.97
	N	38	38	38	38	38	38
	Std.Deviation	0.92	0.72	0.48	9.77	2.80	1.42
	P value	0.000	0.000	0.006	0.001	0.000	Unidentified

MA: Mesioangular impaction
V: Vertical impaction
DA: Distoangular impaction
H: Horizontal impaction

complications. These could be due to difficulty in extractions and the need for more bone removal and more operative time indistoangular and horizontally impacted teeth.[10] In the study of Bui Chi H[5] maximum number of third molar were horizontally positioned. In another study by Susarla SM et al [21] and Chuang SK et al[22] horizontal and mesioangular impacted teeth were more common. It may be due to geographic variation in race.In our study distoangular impacted third molars were associated with higher degree of VAS score, more swelling and trismus as compared to other type of impacted teeth (Mesioangular, Vertical, Horizontal) as per Table 4 and 5. This is comparable to some previous reports of cases performed by similar bur technique under local anesthesia.

The difficulty reportedly in decreasing order has been distoangular, horizontal, vertical and mesioangular in our study. Chiapasco et al[2] in their study reported 6.5% complication rate with distoangular impaction as opposed to 2.7% of vertical impaction. They concluded that it could be a reflection of surgical aggressiveness. Howeverour findings, contradicted those of Monaco G et al[23], found that duration and type of extraction and post-operative complications are not inter dependent. These could be due to the sample size or the different study setting and different factors that were studied.

The methodology used in our study was more specific to avoid the bias and improve the statistics as compared to some other previous studies.[2,5,13,17,18,24,25] Results of our study suggested that post operative pain, swelling and trismus differed depending on the characteristics of the patient's age. Surgery characteristics, such as operating time and type of impaction were also factors but due to the clinical observational nature of the study and small sample size, they could be considered as limitations of the study.

Table 6: Multivariate Tests.

Effect		Value	F	Hypothesis df	Error df	Sig.
Opertime	Pillai's Trace	0.765	2.053	39.000	234.000	0.001
	Wilks' Lambda	0.408	2.046	39.000	225.800	0.001
	Hotelling's Trace	1.063	2.035	39.000	224.000	0.001
	Roy's Largest Root	0.537	3.224(b)	13.000	78.000	0.001
Impaction	Pillai's Trace	0.894	2.546	39.000	234.000	0.000
	Wilks' Lambda	0.300	2.900	39.000	225.800	0.000
	Hotelling's Trace	1.725	3.303	39.000	224.000	0.000
	Roy's Largest Root	1.329	7.976(b)	13.000	78.000	0.000
Opertime * Impaction	Pillai's Trace	1.449	1.240	117.000	756.000	0.054
	Wilks' Lambda	0.182	1.271	117.000	581.507	0.040
	Hotelling's Trace	2.041	1.295	117.000	668.000	0.028
	Roy's Largest Root	0.737	4.761(b)	13.000	84.000	0.000

Conclusion

In conclusion, inflammatory complications after third molar surgery still remain an important factor at the early postoperative periods. The outcome of the third molar operations such as pain, swelling and mouth opening depends on the characteristics such as depth of impaction and operative time.

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