

The Effect of the Difficulty of Surgical Extraction of Impacted Mandibular Third Molars on the Postoperative Inflammatory Response

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ABSTRACT

Introduction: Third molar removal under local anesthesia is one of the most common procedures in oral surgery and it has a direct effect on the patient's quality of life. This study aims to investigate the effect of surgical difficulty of the extraction of impacted mandibular third molars determined by technique and duration of surgery on the postoperative inflammatory response.

Materials and methods: A prospective observational study was conducted on 54 patients who had undergone surgical removal of impacted mandibular third molar under local anesthesia; surgical difficulty was determined by technique and duration of the surgery. The postoperative pain was recorded throughout 7 days postoperatively, while swelling and trismus were evaluated on the 2nd and 7th day after surgery. The postoperative pain, swelling and trismus were correlated with the surgical difficulty.

Result: The highest score of pain was recorded at the day of surgery and then it decreased gradually, the maximum facial swelling and trismus were at 48 hours and subsided at the 7th day postoperatively. Duration and technique of extraction demonstrated a non-significant difference on pain, facial swelling increased significantly with bone removal whereas trismus increased significantly with increased duration.

Conclusion: The degree difficulty of surgical extraction of impacted mandibular third molars measured by technique and duration had a non-significant effect on postoperative pain, whereas technique was associated with postoperative facial swelling and duration was associated with trismus.

Key words: Impacted mandibular third molars, Surgical difficulty, Postoperative inflammatory response

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INTRODUCTION

Impacted tooth is a tooth that is not allowed from erupting into dental arch within the estimated time because of malposition, lack of space or a physical barrier within the pathway of eruption [1]. The surgical removal of impacted mandibular third molars is one of the most commonly performed dent alveolar procedure in oral and maxillofacial surgery and is associated with various postoperative complications [2,3].

Postoperative pain, swelling, and trismus following third molar surgery are thought to arise from the inflammatory response as a direct and immediate consequence of the surgical procedure [4], and they negatively affects the

patient's postoperative quality of life[5,6], thus it is essential to evaluate surgical difficulty and to inform the patient of the potential challenges.

Surgical difficulty measured in different ways has been reported to be one of the factors related to postoperative minor complications [5,6,7], some authors believe it is difficult to estimate difficulty through radiologic methods alone and that actual difficulty can only be estimated intraoperative [8]. A number of studies have used operating time and surgical technique as determinants of difficulty [5,8,9].

It is not clear which measure of surgical difficulty; surgical technique or duration, is a better indicator for the intensity of the postoperative inflammatory response, therefore, the aim of this study was to investigate the effect of surgical difficulty of the extraction of impacted mandibular third molars determined by technique and duration of surgery on postoperative pain, swelling and trismus.

MATERIALS AND METHODS

This prospective cohort study included patients who underwent surgical extraction of impacted mandibular third molar under local anesthesia at the Department of Oral and Maxillofacial Surgery, College of Dentistry, University of Baghdad during the period extending from December 2018 to September 2019. Patients with any medical condition that prevent any surgical intervention, patients with history of head and neck radiotherapy, pregnant women, patients with Impacted teeth associated with any pathology such as acute infections, cysts or tumors, or patients with missing lower second molar on the side of surgery were excluded from this study.

The institutional research ethics committee approved the protocol of this study and each patient signed an informed consent to participate in the study. Along with clinical examination a preoperative panoramic radiograph was obtained for all the patients. The radiographic evaluation included the assessment of the angulation (Winter's classification), class and depth of impaction (Pell and Gregory classification) and the assessment of the root formation and shape, number, pattern of the roots, in addition to evaluation of the investing bone, space or contact of the impacted lower third molar in relation to the mandibular second molar.

The Preoperative measurements obtained as baseline data for all the patients included: The maximum mouth opening by measuring the interincisal distance between upper and lower central incisors, the direct facial measurements were performed by measuring three lines on five fixed points using a measuring tape; the first line extended from the angle of mandible to the lateral canthus of eye, the second line extended from the middle of tragus to the oral commissure and the third line extended from the middle of the tragus to the soft tissue pogonion.

All the surgical extractions were performed by one operator under local anesthesia, a triangular flaps was reflected and elevators were used to extract the teeth unless bone removal or tooth sectioning was needed, the duration of surgery was calculated in minutes starting from the first incision to the last suture. All patients received postoperative antibiotics in addition to

Ibuprofen 400 mg/three times daily to reduce the postoperative inflammatory pain and swelling.

The operative difficulty was determined by the surgical technique and the duration of extraction [10]. With respect to the surgical technique the degree of difficulty was considered low when the extraction was performed by elevators alone, moderate when bone removal (osteotomy) was required and high when osteotomy and tooth sectioning was required for tooth extraction. For duration of surgery, the difficulty was considered low when the duration of surgical extraction was less than 15 minutes, moderate when the duration was 15-30 minutes and high when the duration was more than 30 minutes.

Forty eight hours and 7 days postoperatively, the facial measurements were repeated in a manner as described earlier to assess the degree of postoperative swelling and the maximum mouth opening was also measured to determine the degree of trismus. Postoperative pain was assessed using a numerical rating scale of 0-10 where 0 indicates no pain and 10 indicates the worst possible pain. Pain was assessed at 6 pm on the day of surgery while for the rest of days at 10 am till the 7th day.

The independent variables in this study were the preoperative measurement as a baseline of facial measurement and maximum mouth opening, and the degree of surgical difficulty determined by the technique of surgical extraction and the duration of surgery. The dependent (outcome) variables were the scores of the pain numerical rating scale during the 7 postoperative days, assessment of facial measurement and mouth opening at 48 hours and 7th day postoperatively, these were compared with the preoperative measurements to assess the degree of postoperative facial swelling and trismus respectively, and correlated them to the degree of surgical difficulty. The data were analyzed using IBM SPSS Statistics for Windows, Version 25.0. Armonk, NY: IBM Corp. The continuous data were presented as mean, standard deviation (SD) and ranges. Categorical data were presented by frequencies and percentages. Independent t-test was used to compare the continuous variables accordingly. Paired t-test was used to compare the swelling and mouth opening scores on baseline and after two and seven days. A level of P value less than 0.05 was considered significant.

RESULTS

Fifty four patients participated in this study, these were 38 females (70.37%) and 16 males (29.63%). Their age range was 16-39 years, with a mean ± SD of 23.91 ± 4.46 years. Of these 54 cases of impacted mandibular third molar there were 34 (62.9%) right side and 20 (37.1%) left side. The operative time range was 3-103 minutes with mean ± SD of 19.3 ± 17.3 minutes. According to the surgical technique, the distribution of the operative difficulty were 22 (40.7%) high, 18 (33.3%) low and 14 (26%) moderate, while according to duration of surgery there were 26 (48.1%) low, 19 (35.1%) moderate and 9 (16.8%) high difficulty.

The mean reported pain score was highest on the day of surgery and subsequently declined steadily, as shown in (Figure 1). There was non-significant difference in pain scores during 7 days postoperatively in relation to the surgical difficulty measured by technique and duration (Table 1).

The differences in facial measurements and mouth opening at 48 hours and 7th day postoperatively compared with the preoperative facial measurements and mouth opening (baseline) were statistically significant (Table 2). The correlation of the differences in facial measurements and mouth opening with the operative difficulty measured by surgical technique and duration is summarized in (Tables 3 and 4).

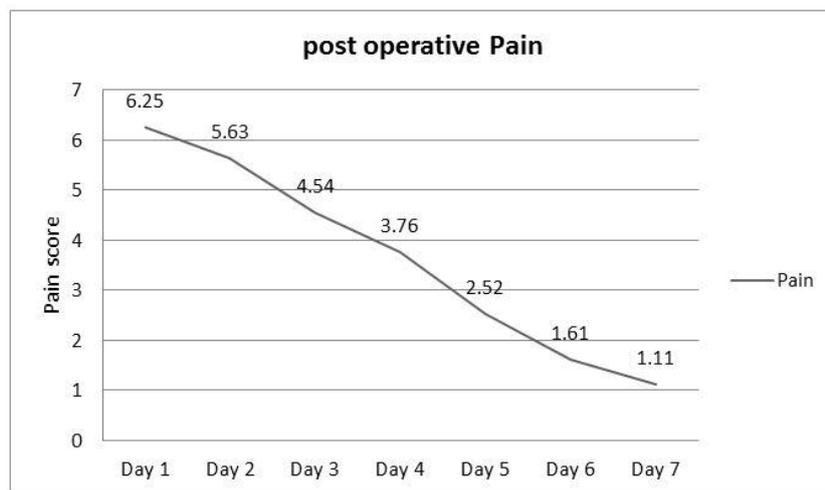


Figure 1: Pain scores for the first week post-operatively.

Table 1: Pain scores during 7 days postoperatively in different difficulty categories according to technique and duration of surgical extraction.

Time	Pain scores according to difficulty								
	Low			Moderate			High		
	Technique	Duration	*P value	Technique	Duration	*P value	Technique	Duration	*P value
Day 1	6.61 ± 2.8	6.23 ± 2.5	0.65	5.93 ± 1.9	6.26 ± 2.3	0.65	6.14 ± 2.1	6.22 ± 1.6	0.91
Day 2	5.67 ± 2.0	5.92 ± 2.3	0.69	5.4 ± 2.2	5.36 ± 2.7	0.94	5.8 ± 3.0	5.33 ± 2.5	0.71
Day 3	4.44 ± 2.2	4.69 ± 2.4	0.73	4.66 ± 2.6	4.15 ± 2.7	0.51	4.52 ± 2.6	4.88 ± 2.1	0.64
Day 4	3.61 ± 2.5	3.76 ± 2.5	0.85	3.86 ± 2.2	3.52 ± 2.1	0.62	3.8 ± 2.3	4.22 ± 2.0	0.59
Day 5	1.83 ± 2.0	2.11 ± 2.1	0.66	2.93 ± 1.9	2.73 ± 2.0	0.87	2.8 ± 1.8	3.22 ± 1.3	0.55
Day 6	0.88 ± 1.7	1.15 ± 1.8	0.63	1.86 ± 1.5	1.78 ± 1.4	0.9	2.04 ± 1.5	2.55 ± 1.1	0.31
Day 7	0.66 ± 1.5	0.76 ± 1.3	0.82	1.26 ± 1.0	1.31 ± 1.2	0.94	1.38 ± 1.3	1.66 ± 1.3	0.57

*paired t-test

Table 2: The differences in facial measurements and mouth opening after 48 hours and seven days postoperatively compared with preoperative baseline readings.

Variable	Pre-operative (baseline)	48 hours	7 days	P-Value * 48 hours vs. baseline	P-Value * 48 hours vs. 7 th day	P-Value * 7 th day vs. baseline
Facial measurement/mm Mean ± SD	123.1 ± 8.4	127.8 ± 7.9	124.8 ± 7.9	0.001[S]	0.001[S]	0.017[S]
Mouth opening/mm Mean ± SD	46.05 ± 7.8	33.14 ± 9.9	40.0 ± 8.1	0.001[S]	0.001[S]	0.001[S]

* Paired t-test, [S] significant

Table 3: Relation of technique and duration with facial measurement.

Difficulty	Time Difference	Technique		Duration		*P-value
		Mean of difference	SE of difference	Mean of difference	SE of difference	
Low	Preoperative vs. 48 hrs	1.81	0.399	3.67	1.39	0.0001 [S]
	48 hrs vs. 7 days	-1.61	0.426	-1.74	0.347	0.2797
	Preoperative vs. 7 days	0.21	0.377	1.94	1.33	>0.0001S
Moderate	Preoperative vs. 48 hrs	7.33	2.47	5.53	0.695	0.0047[S]
	48 hrs vs. 7 days	-3.79	0.745	-3.83	0.531	0.8615
	Preoperative vs. 7 days	3.55	2.51	1.7	0.656	0.0043[S]
High	Preoperative vs. 48 hrs	5.38	0.57	5.89	1.11	0.0996
	48 hrs vs. 7 days	-3.61	0.554	-4.82	1.05	0.0002[S]
	Preoperative vs. 7 days	1.77	0.467	1.07	0.995	0.0117[S]

*paired t-test, [S] significant, SE Standard of error

Table 4: Relation of technique and duration with mouth opening.

Difficulty	Time Difference	Technique		Duration		P-value
		Mean of difference	SE of difference	Mean of difference	SE of difference	
Low	Preoperative vs. 48 hrs	-7.11	1.3	-8.12	1.17	0.0106[S]
	48 hrs vs. 7 days	4.28	0.547	4.92	0.587	0.0007[S]
	Preoperative vs. 7 days	-2.83	0.923	-3.19	0.744	0.1613
Moderate	Preoperative vs. 48 hrs	-12.5	2.06	-16.26	2.45	>0.0001S
	48 hrs vs. 7 days	6.79	0.99	7.32	1.02	0.147
	Preoperative vs. 7 days	-5.72	1.5	-8.95	2.04	>0.0001S
High	Preoperative vs. 48 hrs	-17.91	2.33	-19.67	3.3	0.1019
	48 hrs vs. 7 days	9.05	1.24	11.56	2.14	0.0003[S]
	Preoperative vs. 7 days	-8.86	1.72	-8.11	1.68	0.275

DISCUSSION

The extraction of impacted lower third molars results in postoperative inflammatory process which is usually characterized by pain, soft tissue swelling and a degree of trismus. The postoperative recovery process generally takes around 7 days, with inflammation being the primary side effect during the healing period [11]. There are few studies that correlate the postoperative inflammatory response with the degree of difficulty of the surgical extraction of the impacted third molars defined by duration and technique of surgery which was aim of this study in an attempt to determine which indicator of operative difficulty best correlates with the postoperative inflammation.

This study showed that pain did not depend on the degree of surgical difficulty with patients experiencing similar degrees of pain severity irrespective of the degree of difficulty, also there was no significant difference between the surgical technique and duration of surgery in relation to postoperative pain which in line with

other studies that have not found an association between severity of pain and duration of surgery [12,13] and degree of surgical trauma [12,14]. This may be attributed to the fact that pain is a subjective experience and its assessment is influenced by many factors other than surgical difficulty such as age, sex, and anxiety levels [15,16].

The facial measurements as an indicator for postoperative swelling showed a general trend of significant increase 48 hours postoperatively that subsided significantly 7 days after surgery; this is in keeping with other studies that made similar observation [6,17]. The lowest difference in facial measurements during the follow up period was observed in cases that were categorized as low difficulty measured by the surgical technique which indicates that cases that required only flap reflection and did not need osteotomy to complete the extraction resulted in a minimal swelling postoperatively, whereas cases that required osteotomy resulted the highest amount of swelling especially during the first 48 hours postoperatively. This may

be explained by the fact that bone osteotomy results in greater degree of tissue injury and thus more inflammatory response. In this context the surgical technique constitutes a better indicator than the duration of surgery in determining the extent of postoperative swelling.

With respect to mouth opening as an indicator for postoperative trismus, this study showed that there was significant decrease in maximum mouth opening 48 hours postoperatively compared with that taken preoperatively and 7 days after surgery, this is in keeping with other studies that made similar observation [17,18,]. This study demonstrated that the duration of surgery had a more significant effect on the degree of trismus than the surgical technique especially 48 hours after surgery which indicates that the longer the duration of the operation the greater degree of trismus which is in agreement with Lago-Mendez et al. [5] who suggested that operation duration correlates significantly with trismus.

CONCLUSION

Pain did not depend on the degree of surgical difficulty measured by technique and duration. The facial measurements showed a significant increase 48 hours postoperatively that subsided significantly 7 days after surgery, and its magnitude was significantly associated with the surgical technique. There was significant decrease in maximum mouth opening 48 hours postoperatively compared with that taken preoperatively and 7 days after surgery, the duration of surgery had a more significant effect on the degree of trismus than the surgical technique especially 48 hours after surgery which indicates that the longer the duration of the operation the greater degree of trismus.

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