

Factors Associated with Trismus Severity Following Impacted Lower Third Molar Surgery: A Prospective Study

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INTRODUCTION

The surgical extraction of lower third molars is the most frequent intervention in oral surgery field¹ which is frequently associated with an unpleasant postoperative experience by the patients, referred to as postoperative morbidity² the limitation in mouth opening or trismus is one of the most common immediate post-operative complication³ This is due to a complex array of factors, majority of which are related to the inflammatory process⁴

ABSTRACT:

Trismus a severely restricted mouth opening after surgical extraction of lower third is a problem which is commonly encountered by the dental practitioners. This interferes with patients normal oral hygiene and eating habits

OBJECTIVE: The purpose of this study was to identify the risk factors for trismus after mandibular third molar surgery in different post-operative times and to assess the risk factors associated with severity of trismus

METHODS: In this prospective cohort study 159 consecutive cases in which removal of impacted lower third molars were evaluated. Five groups of variables have been studied with twenty three subgroups and forty six divisions. Interincisal distance measurements were carried out on 1st, 2nd, 5th and 7th days postoperatively to measure the trismus in each time respectively

RESULTS: The peak level of trismus was noted on the first post-operative day and then started to subside gradually, the noticed risk factors were width II and III ($p=0,000$), depth B and C ($p=0,000$), lingual flap retraction ($p=0,000$), increase difficulty of surgical extraction ($p=0,000$; P.E.S.0.341) and prolong operation time ($p=0,000$). Other factors either have not or have only a little significant effect.

CONCLUSION: We have noticed that there is a lot of factors that affect the degree of post-operative trismus, the degree of difficulty of the surgical extraction and prolong surgical procedure were the main risk factors for the trismus in all post-operative days due to increase in the amount of tissue trauma

Key words: lower third molar, surgical extraction, post-operative trismus

Several factors have been mentioned by authors⁵⁻⁷ that influence the occurrence of trismus including age; gender; medications; smoking; previous infection; poor oral hygiene; difficulty of extraction; length of extraction; surgical time; technique and surgeon experience

In this prospective study, the postoperative trismus associated with surgical extraction of impacted mandibular third molars will be measured and evaluated in different times and the predictive risk factors with estimation of their risk degree which will enable the surgeon to predict and counsel high risk patients in order to offer a preventive strategy.

MATERIAL AND METHODS

Data Sampling and Criteria

The present prospective cohort study which investigated 231 consecutive cases of removal of impacted lower third molars in 107 outpatients with the mean age of (21.54±5.41) years and range of (17-29) years was performed by same surgeon in Dental Department of AlYarmouk University College between November 1, 2010 and April 31, 2012. The inclusion criteria included healthy individuals with no systemic diseases; Patients are not given preoperative antimicrobial drugs or other medications that might influence healing, only one impacted tooth extracted each visit and for all procedures, local anesthesia alone is used. The exclusion criteria included the lingual splits technique and female patients who are pregnant or lactating. The study design was approved by the Research and Ethics Committees of University. All patients were informed as to the nature of the surgical and experimental procedures, and informed consent was obtained before surgery.

Study Variables

The variables of the study are sets of variables suspected to be related to complications. These sets of predictor variables are divided into five groups as shown in (Table 1):

- 1- Patient variables included sex, age
- 2- Indication for removal included pain, prophylactic, resorption of adjacent distal root of second molar, orthodontic purpose and associated pathological lesion.

- 3- Preoperative conditions variables included smoking and oral contraceptive.
- 4- Radiographical variables in which the Bell and Gregory⁸ and Winter⁹ radio-graphical classifications are used to document the position of the impacted mandibular third molars. Then these classifications are used to predict the surgical difficulty and classified into: simple, moderate and difficult in addition to the assessment of roots numbers.
- 5- Operative-specific variables included type of flap (envelop or triangular), lingual flap retraction, bone removal, tooth sectioning, and the operation time, which is with the mean of 22.7±14.12 minutes and range of 7.5-39 minutes and is classified into three groups (<17), (18-25) and (>25) minutes.

Surgical Technique

All surgical procedures were performed in the same clinic with similar equipment by same surgeon. The surgical field and all the surgical material are sterile with the same surgical assistant in all the cases. One lower third molar extracted in each operation with the protocol that include local anesthesia, A 1.8 mL of 2% lidocaine hydrochloride with 1:80,000 adrenaline solution was deposited at a rate of 1 mL/min, all teeth were removed from a buccal approach using either triangular or envelop flap. When it necessary to raise a lingual flap, a Howarth periosteal elevator is used to protect the lingual periosteum and the lingual tissues. Bone removal is done with burs in the conventional manner and, if necessary, the tooth is divided with burs before elevation. The flaps are sutured with a 4-0 silk suture.

Postoperative instructions and prescribed drugs are explained to the patient. For the first 5 postoperative days all patients have given antibiotics (amoxicillin 750 mg every 8 hours), drugs for patient with peptic ulcer (ranitidine 300 mg three times daily) and an anti-inflammatory drug (ibuprofen 600 mg every 8 hours for 4-5 days). And a mouth rinse (0.2% chlorhexidinedigluconate) is performed every 12 hours for 15 days.

Postoperative Assessment

Patients have been told to contact the clinic for any postoperative problem or if certain symptoms

occur, such as pain that could not be relieved by the prescribed analgesics or post-operative bleeding. There were no serious complication in all the cases. All patients have been reviewed on 1st, 2nd, 5th and 7th days postoperatively. The suture material is removed after one week.

Trismus Assessment and Measurements

A baseline measurement was carried out just before the surgery and similar measurements were carried out on on 1st, 2nd, 5th and 7th days postoperatively. A single professional operator, repeating the procedure three times on each patient, made the measurements using a rigid plastic metric ruler. The average of measurements was then taken (in mm) and recorded.

Trismus was assessed by measuring the differences in mouth opening (interincisal distance preoperatively and on post-surgery).

The difference between the postoperative and preoperative measurements was calculated to measure the trismus (mm) in four different times as shown in (table2).

Statistical Analysis

The data obtained are statistically analyzed by SPSS (SPSS for windows, version 13, SPSS Inc., Chicago, IL, USA), the One-way analysis of variance (ANOVA) tests allow to determine if one given variables has a significant effect on postoperative swelling. The level of significance is set at (*P*) less than. 01or. 05. Partial eta-squared is used to measures the strength of association and the effect of size of variables on postoperative swelling. An LSD Pairwise Comparison Test was applied for each of the independent variables which have a significant effect on postoperative trismus. The results were presented as the mean \pm standard deviation and standard error of mean.

RESULTS

Post-Operative Trismus Evaluations

Interincisal distance measurements were carried out on on 1st, 2nd, 5th and 7th days postoperatively to measure the trismus in each time respectively, we have found that interincisal distance fall in three broad groups as shown in (table2). The peak level of post-operative trismus is in the first 24 hours and the trismus continues in rare cases till the end of 7th post-operative day.

Risk Factors

There is no statistical significant difference between patient variables; indication for removal variables and preoperative conditions except the female gender which has a significant effect on the postoperative trismus on the 5th postoperative day only as shown in (table3)

The most statistics significant radiographical variables and operative-specific variables of multivariate analysis on increasing the postoperative swelling are shown in (table 3). The other factors have no statistical significant differences on the postoperative complications. Eta squared values indicate that effect size of difficulties in the 5stpostoperative day on postoperative trismus which was medium while all other estimated effect sizes were relatively weak as shown in (table 3).

Comparisons test was applied for each of the independent variables which have a significant effect on postoperative swelling as shown in (table 4) to see the most statistics significant variables between sub groups. So the most highly significant risk factors with high strengths of correlation in all the post-operative times as shown in (table3) are:

1. Width: Class II and III impaction
2. Depth: Level B, C impaction
3. Difficulty: Moderate difficulty and very difficult
4. Lingual flap retraction
5. Operation time: 18-25 and >25 minutes.

DISCUSSION:

The surgical removal of lower third molars surgery is mostly characterized by postoperative trismus¹⁰ which is usually caused by inflammation within the muscles of mastication leading to spasm secondary to the raising of a mucoperiosteal flap¹¹

Set off factors have been suggested to be contributing to postoperative trismus. This article deals with this trismus as objective parameters for measurement. An investigation has been made to identify factors that influence the occurrence of severity of trismus.

In this study the peak level of trismus was noted on the first post-operative day and subsided by seven days but in some cases the trismus still in minor

degree while in most patients it was zero by day fourteen. This result is in line with the findings of Sandhu et al.¹²

In our observation, the age appears to have no significant correlation with the degree of postoperative trismus, an observation which is completely different from that of other authors' observations^{1, 6, 13} while the female is found to have a significant effect on trismus only on first post-operative week.

Regarding the indications of removal, it has been suggested by many authors that the presence symptoms at the time of removal must be considered to be a risk factor for postoperative complications.⁶ In the present study; we have failed to confirm this hypothesis.

Smoking^{14, 15} and contraceptives¹⁶ have been shown to have a deleterious effect on the oral cavity and have been associated with postoperative complications after oral surgery. In the Giovanni et al study,⁶ patients who smoke were found to have a higher risk for perceiving more severe postoperative trismus. This study fails to confirm the hypothesis that smoking and using oral contraceptives are a risk factor for severe postoperative trismus.

The angulations of impacted third molar inevitably has a significant effect on postoperative trismus extending till the 5th post-operative day, with a higher degree of trismus associated with distoangular and vertical type of impaction whereas Bui et al¹⁷ reported that mesioangular impactions were associated with more trismus

The class II and III position and in level B and C when compared with class I and in level A of impactions in addition to the visibility of inferior alveolar nerve in this study have been shown to be associated with a higher degree of trismus in all post-operative days ($p=0,000$). And this observation is in agreement with other studies^{7, 17, 18}

As a result of the severe angulations, lack of space and deeply seated wisdom a highly statistically significant difference in trismus was evaluated with moderate and very difficult surgical extraction in all post-operative days specially in the first post-operative day ($p=0,000$ - P.E.S.0.341). This is due to a significant degree of tissue trauma that causes an inflammatory reaction which later will produce trismus¹⁹⁻²²

In our series we have recorded greater trismus and statistically significant differences with triangular flap in first and second post-operative days. However, the results of Kirk et al²³ showed that the flap design did not adversely affect patients in terms of postoperative trismus. On the other hand, lingual flap retraction has high significant associations ($p=0,000$) with trismus in all the post-operative days and this observation is confirmed by other studies^{6, 18, 24}

The bone removal and tooth sectioning has a high significant correlation with the trismus in the first and second post-operative day with extended effect to the end of the 5th postoperative day because it produces a significant degree of trauma to the bony structures, potentially resulting in a significant inflammatory reaction^{18, 20, 24}

The result confirms that the overall length of the surgical procedures is shown to be a reliable measure of trismus, and this finding is asserted in many articles^{1, 18, 20, 25} which confirm that the association of duration of surgery and postoperative trismus was strongly and significantly correlated ($p=0,000$) in all postoperative times observation.

There was a lot of articles published on the relationship between the expertise of the surgeon and postoperative trismus^{6, 18, 25, 26} but our study have failed to show any relationship because all the cases done by the same surgeon.

CONCLUSION

As a summary of our result, we have found that the peak level of trismus was noted on the first post-operative day and then started to subside gradually. We have noticed that there is a lot of factors that affect the degree of post-operative trismus, the degree of difficulty of the surgical extraction and prolong surgical procedure were the main risk factors for the trismus in all post-operative days due to increase in the amount of tissue trauma

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Conflicts of interest

The author denies any conflicts of interest related to this study

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Table 1. Study variables

Variable		N(%)	Variable	N(%)
Indication for removal	Male	147(63.6)	Triangular flap	154 (66.6)
	Female	84(36.3)	Envelop flap	77 (33.3)
	Age mean	21.54±5.41	With lingual flap retraction	36 (15.5)
	Age Range	(17-29)	Without lingual flap retraction	195 (84.4)
	Pain	72 (31.1)	With bone removal	182 (78.7)
	Prophylactic	61 (26.4)	Without bone removal	49 (21.2)
	Orthodontic purpose	46 (19.9)	With tooth Sectioning	149 (64.5)
	Associated pathological lesion	28 (12.1)	Without tooth Sectioning	82 (35.4)
	Resorption of adjacent distal root of 2nd molar	24 (10.3)	Mean of operation duration	(22.7±14.12)
	Range of operation duration		Range of operation duration	(7.5-39 minutes)
Preoperative conditions	Smoker	159 (68.8)	<17 (minutes)	61 (26.48)
	Non smoker	72 (31.1)	18-25 (minutes)	120 (51.9)
	With Contraceptives	36(15.5)	>25 (minutes)	50 (21.6)
	Without contraceptives	195 (84.4)		
Radiographical Variables	Mesioangular	113 (48.9)	Horizontal	39 (16.8)
	Vertical	54 (23.3)	Destoangular	25(10.8)
	Class I	136 (58.8)	Single root	118 (51)
	Class II	79 (34.1)	Multiple roots	73 (31.6)
	Class III	16 (6.9)	Uncompleted roots	40 (17.3)
	Level A	124 (53.6)	Simple according to difficulties index	86 (37.2)
	Level B	81 (53)	Moderate according to difficulties index	117 (50.6)
	Level C	26 (11.2)	Difficult according to difficulties index	28 (12.1)

Table (2) Trismus (mm) in different post-operative times

	Preoperative value	1st Post-operative Day	2nd Post-operative Day	5st Post-operative Day	7th Post-operative Day
30-39 mm	179 (77.4)	152 (65.8)	173 (74.8)	178 (77)	179 (77.4)
40-49 mm	46 (19.9)	56 (24.2)	51 (6.4)	47 (20.3)	46 (19.9)
>50 mm	6(2.5)	23(9.9)	7(3)	6(2.5)	6(2.5)
Mean	38.36±4.67 (00)	2.29±5.60 (5.9 %)	2.07±5.17 (5.3 %)	0.35±1.06 (0.9 %)	0.07±0.34 (0.1 %)
Stander Error	0.37	0.44	0.41	0.08	0.03
Minimum	30	00	00	00	00
Maximum	53	32	28	6	2

Table (3) The relation between most statistics significant variables with the postoperative trismus in different post-operative times

Variable	1st P.O. Day		2nd P.O. Day		5stP.O.Day		7th P.O. Day	
	Sig.	P.E.S	Sig.	P.E.S.	Sig.	P.E.S.	Sig.	P.E.S.
Gender	0.223	-	0.251	-	0.032	0.029	0.161	-
					*	W		
Angulations	0.019	0.062	0.006	0.077	0.004	0.083	0.360	-
	*	W	**	W	**	W		
Width	0.000	0.164	0.000	0.177	0.000	0.180	0.000	0.195
	**	W	**	W	**	W	**	W
Depth	0.000	0.158	0.000	0.176	0.000	0.157	0.001	0.086
	**	W	**	W	**	W	**	W
Difficulty	0.000	0.233	0.000	0.257	0.000	0.241	0.000	0.235
	**	W	**	W	**	M	**	W
Flap Type	0.044	0.026	0.049	0.025	0.103	-	0.318	-
	*	W	*	W				
Lingual Flap Retraction	0.000	0.540	0.000	0.512	0.000	0.435	0.000	0.220
	**	W	**	W	**	W	**	W
Bone Removal	0.006	0.047	0.007	0.045	0.026	0.031	0.173	-
	**	W	**	W	*	W		
Tooth Sectioning	0.017	0.036	0.018	0.035	0.067	-	0.633	-
	*	W	*	W				
Operation Time	0.000	0.149	0.000	0.176	0.000	0.153	0.000	0.146
	**	W	**	W	**	W	**	W

Abbreviations: P.O., postoperative; Sig., Significant; P.E.S., Partial Eta Squared; W., weak; M., medium; *: Significant at (p-value < 0.05), **: Significant at (p-value< 0.01)

Table (4) Comparisons Test was applied to each of the independent variables which have a significant effect on postoperative trismus in different post-operative times

Variable		1st P.O. Day	2nd P.O. Day	5st P.O. Day	7th P.O. Day
Angulations					
Mesioangular	Horizontal	0.874	0.728	0.694	-
	Vertical	0.786	0.866	0.663	-
	Destoangular	0.003**	0.001**	0.001**	-
Horizontal	Vertical	0.710	0.663	0.948	-
	Destoangular	0.011*	0.006**	0.001**	-
Vertical	Destoangular	0.006**	0.003**	0.002**	-
Width					
I	II	0.343	0.405	0.680	1.000
	III	0.000**	0.000**	0.000**	0.000**
II	III	0.000**	0.000**	0.000**	0.000**
Depth					
A	B	0.063	0.035*	0.328	0.121
	C	0.000**	0.000**	0.000**	0.000**
B	C	0.000**	0.000**	0.000**	0.009**
Difficulty index					
Very Difficult	Moderate Difficulty	0.000**	0.000**	0.000**	0.000**
	Minimum Difficulty	0.000**	0.000**	0.000**	0.000**
Moderate Difficulty	Minimum Difficulty	0.689	0.574	0.689	1.000
Operation time					
<25	18-25	0.402	0.232	0.772	0.715
	>18	0.000**	0.000**	0.000**	0.000**
18-25	<25	0.000**	0.000**	0.000**	0.000**

Abbreviations: P.O., postoperative; *: Significant at (p-value < 0.05); **, , Significant at (p-value <0.01).