



Risk Factors for Less Common Postoperative Complications Following Surgical Extraction of Mandibular Third Molar: A Prospective Cohort Study

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Abstract

Background: The less common postoperative morbidity following third molar surgery such as inferior alveolar nerve paresthesia, lingual nerve paresthesia, adjacent tooth injury and post-operative bleeding is affected by a number of risk factors.

Material and methods: In this prospective randomized study 159 consecutive cases in which removal of impacted lower third molars in 107 outpatients were evaluated. Five groups of variables have been studied which are regarded as a potential factor for one or more than one complication after mandibular third removal

Results: The incidence of inferior alveolar nerve paresthesia, lingual nerve paresthesia, adjacent tooth injury and post-operative bleeding is addressed with location of the most significant risk factors.

Conclusions: It was found that the difficulty of surgical extraction and the operation time are the main high significant risk factors; sex and smoking aren't significant factors for any complication. The oldest age group has a little statistics significant differences.

Key words: Paresthesia; adjacent tooth injury and post-operative bleeding.

Introduction

The common approach to the treatment of the impacted mandibular third molar is surgical removal⁽¹⁾. The removal of lower third molars regarded as the most common oral operation, in which the postoperative course can be complicated⁽²⁻⁶⁾. The reasons for extracting these teeth include a lot of etiological factors⁽⁷⁾.

Many studies have addressed the postoperative complications of this operation⁽⁸⁻¹⁸⁾. Factors affecting postoperative morbidity could be patient factors, tooth related factors and operative factors. Patient factors include age, sex, size or build, ethnic background, smoking, contraceptives and oral hygiene^(10, 12). Tooth related factors include existing

infection(pericoronitis), type of impaction, depth of impaction, relationship to inferior alveolar nerve, density of surrounding bone and associated pathology like cyst or neoplasm^(12,13). The operative factors include the use of drugs, type and extent of incision, wound closure technique, and duration of operation^(14,15).and the surgeon's experience⁽¹⁶⁻¹⁸⁾

In this prospective study, the incidence of four less postoperative complications associated with surgical extraction of impacted mandibular third molars will be evaluated and the risk factors for these complications will be determined.

Materials and Methods

Data Sampling and Criteria

The present prospective cohort study which s investigated 159 consecutive cases of removal of impacted lower third molars in 107 outpatients with the mean age of (25.54 ± 3.75) years and range of (16-31) years was performed by two members of the Dental Department of AIYarmouk University College between October 1, 2009 and December 31, 2010. 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 and local anesthesia alone is used. The exclusion criteria included the lingual splits technique and female patients who are pregnant or lactating

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 and the side

(Right/Left).Age is classified into three groups(19-22), (23-26) and (27-31) years

2. Indication for removal included pain, prophylactic, resorption of adjacent distal root of second molar, orthodontic purpose, associated pathological lesion and atypical facial pain.
3. Preoperative conditions variables included smoking, oral contraceptive and pericoronitis.
4. Radiographical variables in which the Pell and Gregory¹⁹ and Winter²⁰ radio graphical classifications are used to document the position of the impacted mandibular third molars. The numbers of roots are assessed then these classifications are used to predict the surgical difficulty and classified into: simple, moderate and difficult.
5. Operative-specific variables included type of flap (envelop or triangular), lingual flap retraction, bone removal, tooth sectioning, visibility of inferior alveolar nerve after extraction, intraoperative bleeding, the surgeon (both right-handed operators) and the operation time, which is with the mean of 27.41±12.44 minutes and range of 8-53 minutes and is classified into three group (<21),(21-40) and (>40) minutes.

Surgical Technique

All surgical procedures were performed in the same clinic with similar equipment by one of two surgeons. Both surgeons had the same experience and work with the same principles; the surgical field and all the surgical material are sterile, the 5th year dental student were used as a surgical assistant in all the cases. One lower third molar extracted in each operation with the protocol that include local anesthesia, 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 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. Patients have been contacted by telephone 48 hours after the surgery and have been asked about their initial postoperative condition. All patients have been reviewed 7 days postoperatively to have their sutures removed and to check surgical site. They have been called again 2 weeks later to check whether other problems have arisen. The types and frequency of surgical complications were recorded as follows:

Paresthesia is defined as any postoperative change in sensitivity of the tissues innervated by the trigeminal nerve (evaluated both subjectively and objectively tingling or numbness sensation of the tongue or lip, using light touch and a needle). The presence or absence of sensory alteration was confirmed by the response to probing using a sharp dental probe and the

opposite blunt end in a random manner. The sensation elicited by pricking the tongue, the mucosa, the lip, and the skin depended to a considerable extent on the strength of the stimulus and varied from light touch to pressure or pain. Patients with altered sensation are followed regularly weekly for 1-5 months. All patients had only paresthesia; none had anesthesia.

Adjacent tooth injury is defined as any injury to the distal root of lower seven or damage to the restoration.

Post operative bleeding is defined as bleeding beyond that expected from the extraction or continued bleeding beyond the postoperative window for clot formation (6–12 hours).Hemorrhage is controlled using local measures.

Statistic analysis

The data obtained were statistically analyzed by SPSS (SPSS for Windows, version 13, SPSS Inc., Chicago, IL, USA) using the chi-square test(X^2). Is used to investigate whether one or more of the given variables had a significant effect on postoperative complications according to each factor independently . The probability (P) was also calculated using the chi-square test (X^2). The level of significance was set at (P) less than .01or .05.

Results

(Table 2) The incidence Postoperative complications after the surgical extraction of mandibular third molar

(Table 3) The numbers of postoperative visits until patients who have complications are symptom-free

The resulting data showed that there is no statistics significant differences between patient variables, Indication for removal variables and preoperative conditions with these

postoperative complications except for Adjacent tooth injury with an old ages individuals and post operative bleeding in Atypical facial pain group.

Table 4 shows that the most effective radiographical variables and operative specific variables on postoperative complications. The other factors haven't any statistics significant differences on the postoperative complications.

Risk factors for the complication

- 1- Inferior alveolar nerve paresthesia: Four factors have significantly affected the development of Inferior alveolar nerve paresthesia: Depth ($P < .05$), difficulty of surgical extraction ($P < .05$), bone removal ($P < .01$) and Inferior alveolar nerve visibility ($P < .05$).
- 2- lingual nerve paresthesia: Three factors have been found to significantly affect the postoperative lingual nerve paresthesia, difficulty of surgical extraction ($P < .05$), lingual flap retraction ($P < .01$) and Inferior alveolar nerve visibility ($P < .05$).
- 3- Adjacent tooth injury: it is significantly associated with three factors: The age of the patient ($P < .001$), number of roots ($P < .001$) and operation time ($P < .01$).
- 4- Post operative bleeding: Six factors are significantly associated with the development of Post operative bleeding: Atypical facial pain ($P < .05$), depth ($P < .01$), difficulty of surgical extraction ($P < .01$), Inferior alveolar nerve visibility ($P < .01$), Intraoperative bleeding ($P < .01$) and operation time ($P < .01$).

Discussion

Several studies have been written about the relationships between the postoperative morbidity after surgical removal of lower third molars and preoperative risk factors.⁽²¹⁻²⁶⁾ Most of the studies concentrate on group variables or more without estimation of all the other potential factors before and during the operation or they were retrospective, subject to selection bias, or poorly controlled for confounding variables. This frequently leads to significant underestimation of the incidence of surgical morbidity.⁽²⁷⁾

The aims of this prospective study is to address the incidence of specific postoperative complication and locate the most significant risk factor, so five group of predictive variables have been evaluated with twenty four subgroups and forty eight divisions regarded as a potential factor for more than one complication after mandibular third removal in order to offer a preventive or management strategy.

Based on our results and on the total number of mandibular teeth removed we have found the overall incidence of postoperative complication rate is high (9.2 %) compared with previously reported rates, which have ranged from (2.6%) to (30.9 %).⁽²⁷⁻³⁰⁾ this is because our study evaluates four complications, where as the other authors evaluate maximally two or three complications only.

In this study (1.8%) of cases have Inferior alveolar nerve paresthesia which is a distressing complication for the patient. Although this is lower than what has been reported in several previous studies which is from (0.4%)⁽¹³⁾ to (8.4%)⁽¹⁷⁾

Black⁽³¹⁾, Miura et al.⁽³²⁾ have reported that the rate of inferior alveolar nerve impairment was significantly associated with age, but

none of these statements was supported by the findings in the present study. In this study four factors are found to be statistically significant: depth, difficulties, bone removal and Inferior alveolar nerve visibility. It is associated primarily with the complete bony removal which was the most significant factor and this line with Kipp et al⁽³³⁾, Wofford and Miller⁽³⁴⁾ who stated that the use of burs and the removal of bone were significantly related to the incidence of postoperative paresthesia. Carmichael and McGowan⁽³⁵⁾ have found that dysesthesia of the inferior alveolar nerve occurs more often if the tooth is horizontally impacted and less often in those that are vertically impacted and this is not supported in our study.

We have observed that (1.2%) of cases complain of Lingual nerve paresthesia, while in previous studies, the incidence of damage to the lingual nerve during lower third molar surgery has been reported to vary from (0.2%)⁽³⁶⁾ to (23%)⁽³⁷⁾

Kiesselbach and Chamberlain⁽³⁸⁾ and Miloro et al⁽³⁹⁾ have found the lingual nerve to be above the bony alveolar crest in some cases. Such variations may be predisposed to lingual nerve injury. In the present study Lingual nerve paresthesia is significantly affected by difficulty of surgical extraction, lingual flap retraction and inferior alveolar nerve visibility. The statistics confirm that the lingual flap retraction is the highly significant risk factors for Paresthesia and this is in agreement with Robinson and Smith⁽⁴⁰⁾ who have concluded that avoidance of lingual retraction reduces the incidence of temporary lingual nerve disturbance and does not increase the incidence of permanent damage. They have suggested that lingual retraction should be avoided in most cases. Age and sex do not have any effect on paresthesia and this is

opposite to the conclusion of Blondeau⁽³⁰⁾ who say that, the important factors are the patient's sex and age while Brann et al⁽⁴¹⁾ did not support age as a risk factor

We have noticed also that (1.8%) of cases get adjacent tooth injury which was with large restorations or carious lesions that are always at risk of fracture or damage during elevation. Three factors are regarded as risk factor, the age of the patient especially older age, number of roots and operation time. All these three factors are regarded as a highly significant factor. It is generally accepted that the deeply impacted third molars in older patients will affect the adjacent tooth^(41, 42)

Post operatively we found that (4.46%) of cases had Post operative bleeding. The literatures are reported Post operative bleeding to occur in the range of (1%) to (6%) after lower third molar surgery^(38,43) In this study Six risk factors are significantly associated with the development of Post operative bleeding: Atypical facial pain, depth, difficulty of surgical extraction, Inferior alveolar nerve visibility, Intraoperative bleeding and operation time. These results are in agreement with many authors^(11,13,44) It is also more commonly reported in the literatures that Post operative bleeding is more frequent in older patients, probably because of vascular fragility and less effective coagulation mechanisms^(11,61) It is also reported in literatures that men are 60% more likely to suffer from excessive bleeding than women; possibly because of the higher incidence of contraceptive use in women and the positive effect of oral contraceptives on coagulation^(11, 16) We could not support any of above statements in our study

Conclusion

This prospective research is an evaluation of the rate of postoperative complications (Inferior alveolar nerve paresthesia, . lingual nerve paresthesia , Adjacent tooth injury and Post operative bleeding) associated with surgical extraction of impacted mandibular third molars with the Post operative bleeding as the most frequent complication.

Age, sex and smoking are not significant risk factors for any complication, except for Adjacent tooth injury with an old ages individuals and post operative bleeding in Atypical facial pain group has little significant.

Radiographical and operative-specific variables are the main high significant risk factors for the post operative complications. The results of this study show that increased numbers of complications occur in patients who have high difficulty of surgical extraction and long operation time.

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Table (1): Study variables

Variable	N.	%	Variable	No.	%		
Patient variables							
Gender	Male	73	68.2	Teeth in male	103	64.8	
	Female	34	31.8	Teeth in Female	56	35.2	
Age	19-22 years	46	28.9	Teeth in Right	84	52.8	
	23-26 years	76	47.8	Teeth in Left	75	47.2	
	27-31 years	37	23.3	Age Range (16-31) Age Mean(24.54±3.26)			
Indication for removal			Preoperative conditions variables				
Pain	53	33.3	Smoking habit	Yes	91	57.2	
Prophylactic	44	27.7		No	68	42.8	
Resorption of adjacent distal root of 2 nd molar	22	13.8	Contraceptives	Yes	13	8.2	
				No	146	91.8	
Orthodontic purpose	17	10.7	Pericoronitis	Yes	38	23.9	
Associated pathological lesion	14	8.8		No	121	76.1	
Atypical facial pain	9	5.7					
Radiographical variables							
Angulations	Mesioangular	71	44.7	Vertical	29	18.2	
	Horizontal	36	22.6	Destoangular	23	14.5	
Width	I	57	35.8	III	28	17.6	
	II	74	46.5				
Depth	A	57	35.8	C	19	11.9	
	B	83	52.2				
Number of roots	Multiple	87	54.7	Uncompleted	15	9.4	
	Single	57	35.8				
Difficulties	Difficult	24	15.1	Simple	37	23.3	
	Moderate	98	61.6				
Operative-specific variables							
Flap type	Triangular	138	86.8	Lingual flap retraction	Yes	21	13.2
	Envelop	21	13.2		No	138	86.8
Bone removal	With	124	78	Tooth Sectioning	With	117	73.6
	Without	35	22		Without	42	26.4
I.A.N. visibility	Yes	14	8.8	Intra-operative bleeding	Yes	7	4.4
	No	145	91.2		No	152	95.6
Operation time	<21 (minutes)	41	25.8	Range (8-53minutes) Mean (27.41±12.44)			
	21-40 (minutes)	87	54.7				
	>40 (minutes)	31	19.5				
Surgeons	Surgeon 1	84	52.8	Surgeon 2	75	47.2	

Abbreviations: IAN, inferior alveolar nerve; N., total number; %, percentage.

Table (2): The postoperative complications

Postoperative complications	Yes	%	No	%
I.A.N. paresthesia	3	1.8	156	98.1
L.N .Paresthesia	2	1.2	157	98.7
Adjacent tooth injury	3	1.8	156	98.1
P.O. bleeding	7	4.4	152	95.5
Total	15	9.2	144	90.8

Abbreviations: IAN, inferior alveolar nerve; LN, lingual nerve; p.o., post-operative.

Table (3): Number of postoperative visits

Postoperative complications	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Total
I.A.N. paresthesia (week)	-	-	-	-	-	1	-	-	-	-	-	-	-	1	2
L.N. Paresthesia (week)	-	-	-	1	-	-	-	1	-	-	-	-	1	-	3

Abbreviations: IAN, inferior alveolar nerve; LN, lingual nerve.

Table (4): The relation between most effective radiographical variables and operative-specific variables with the postoperative complications

Category	Total	I.A.N. paresthesia	L.N. paresthesia	Adjacent tooth injury	Post-operative bleeding
Radiographical variables					
Depth	P value	0.011* S.S.	0.396 N.S.	0.303 N.S.	0.000 S.S.
Number of Root	P value	0.282 N.S.	0.118 N.S.	0.002 S.S.	0.556 N.S.
Difficulties	P value	0.039* S.S.	0.003 S.S.	0.189 N.S.	0.005 S.S.
Operative-specific					
Lingual flap retraction	P value	0.299 N.S.	0.000 S.S.	0.495 N.S.	0.219 N.S.
Bone Removal	P value	0.001 S.S.	0.450 N.S.	0.353 N.S.	0.151 N.S.
I.A.N. visibility	P value	0.000 S.S.	0.658 N.S.	0.130 N.S.	0.000 S.S.
Intra operative bleeding	P value	0.707 N.S.	0.760 N.S.	0.707 N.S.	0.000 S.S.
Operation Time	P value	0.473 N.S.	0.104 N.S.	0.473 N.S.	0.002 S.S.

Abbreviations: IAN, inferior alveolar nerve; LN, lingual nerve; p.o., post-operative; N.S., no significant differences; S.S., statistic differences ($P < .01$); S.S.*, statistic differences ($P < .05$).