



Original Article

บทวิทย์ำการ

Relations of the tooth position and the operation time to the complications after surgical removal of impacted molars

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Abstract

Objectives To explore the relations of the positions of impacted mandibular third molar and the operation time to the complications after surgical removal of the impaction.

Materials and methods Before surgery, all biostatistic data of the patients and radiographic assessment of the impacted tooth were recorded. From 84 healthy patients, 98 impacted teeth were surgically removed by the dental students in the fifth or the sixth year under a careful supervision of one oral and maxillofacial surgeon. The starting time was recorded at the commencement of an incision and the completion time when the gauze being bitten by the patient. Uniformly, all patients were instructed with post-surgical care and prescribed with an analgesic drug. During each visit of an everyday-follow-up for 1 week, their surgical wounds were inspected and a subjective investigation for complications, if any, was performed. Stitch removal was done on the seventh visit.

Results The overall complication rate was 56.12%. The observed complications were traumatic ulcer (24.49%), trismus (14.29%), occlusal trauma (8.16%), haemorrhage (4.08%), dry socket (4.08%), and ecchymosis (1.02%). Mesioangular and distoangular impaction were associated with high probabilities in an induction of complications. Impacted teeth with Class I position possessed as high the probability as those with Class II. A surgical time over 60 minutes tended to increase the number and types of complications.

Conclusion The avoidable post-surgical complications may be the result of an operator's inadequate carefulness, despite an easy position of the impaction. A longer surgical time plays an important role in the addition of complication number and types.

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Key words: impacted molar; oral surgery; post-operative complication

Introduction

Impacted mandibular third molars cause a painful symptom due to their eruption force, dental carious lesions and periodontal diseases of the adjacent second molars, and, in some cases, interferences during mastication. They need a surgical removal and are most frequent in the 20- to 35-year-old group.¹ Severe complications are more frequently found after removal of the impacted mandibular third molars than the impacted maxillary third molars.^{2,3}

Post-surgical complications are related to the dental conditions, that is, position, angulation, and depth of the tooth, pericoronitis.⁴⁻⁷ Patient-related factors are also linked to post-operative complications. Older patients are at a higher risk than younger patients.⁸ An oral surgeon with less experience, a prolonged operating time, a lingual-split technique, and a tight suture tend to increase the risk of post-operative complications.^{4-7,9-14}

All post-surgical complications can hamper patients from their daily functions for a period of time. Pre-surgical removal of any impacted tooth, information provided to the patient concerning the complications must be clarified and based on scientific evidence. A written informed consent should also be obtained to secure the patient's acknowledgement. Hence, it was the aim of this study to investigate the relations of the positions of the impacted mandibular third molars and the operation time to the complications after surgical removal of the impaction.

Materials and methods

The research protocol had been reviewed by the Ethics Committee for Human Research of Naresuan University (NU) and was approved with a certificate number 45 02 01 0006.

This study was carried out at NU's Dental Hospital between September and December 2002. Partici-

pants were individuals with no systemic diseases. A tooth with pericoronitis was excluded from this study. After a detailed explanation of the study and the surgical processes, informed written consent from participants was obtained. However, all inclusion criteria must be met and were as follows:

1. No antibiotic administration prior to or on the surgical date.
2. Removal of the impacted tooth needed both an assessing incision and a closure of the incision.
3. Post-surgical need of an antibiotics prescription must not be indicated.

There were 84 healthy patients aged 20.23 ± 3.06 years (mean \pm standard deviation) participated in the study. They had either one impacted tooth or both impactions removed surgically. Seventy of them (83.33%) had one impacted tooth and 14 (16.67%) had both impactions removed. In patients whose both impactions were removed, the surgery was performed on separate occasions with at least four weeks between them. A total of 98 impacted mandibular third molars were available for analyses.

Pre-operative procedures

Pre-operative data were shown in Table 1. Other biostatistic data, chief complaint, medical history, past dental history of the patients were also recorded.

A radiographic image of the impacted tooth was taken by a paralleling technique using a dental periapical film size 2 (Kodak[®]; Eastman Kodak Company, New York, USA) and a standard X-ray machine (Gendex[®] model 46-158800G4; Gendex Corporation, Illinois, USA). Radiographic evaluation of the impacted tooth was performed by the first author and either of the three co-authors. Each impaction was subjected to all radiographic analyses of its angulation and relationship with anterior border of ramus of mandible.

Table 1 Pre-operative data

Variables		Category	
Operation side	(n=98)	Right	(n=48; 48.98%)
		Left	(n=50; 51.02%)
Gender	(n=98)	Male	(n=30; 30.61%)
		Female	(n=68; 69.39%)
Age in years	(n=98)	16.0-20.9	(n=66; 67.35%)
		21.0-24.9	(n=24; 24.49%)
		25.0-30.9	(n=7; 7.14%)
		31.0-34.9	(n=1; 1.02%)
Radiographic findings	(n=98)	Tooth angulation	
		1. Mesioangular	(n=69; 70.41%)
		2. Distoangular	(n=3; 3.06%)
		3. Horizontal	(n=11; 11.22%)
		4. Vertical	(n=15; 15.31%)
		Relationship with anterior border of ramus of mandible	
		1. Class I	(n=33; 33.67%)
		2. Class II	(n=65; 66.33%)
		3. Class III	(n=0; 0%)

Operative procedures

Under a careful supervision of one oral and maxillofacial surgeon, all surgical processes were similarly performed by the fifth or the sixth year dental students. By the use of 2% mepivacaine with epinephrine 1:100,000, inferior alveolar nerve, lingual nerve, and long buccal nerve were locally anaesthetized.

The starting time was recorded and an incision was then performed, originating from external oblique ridge. It was either ended at the distobuccal line angle of the second molar or extended to the distobuccal line angle of the first molar if the impacted tooth was clinically invisible. All incision lines were on the bone and followed the tooth sulcus. Post-elevation of the periosteum, bone surrounding impacted tooth was

removed with a steel round bur under a copious irrigation. In some cases, the tooth was split by a tungsten fissure bur and a straight elevator. The tooth was then removed and the alveolus was inspected, curetted for granulation tissues, if any. The surgical wound was then irrigated with normal saline solution. Flap approximation was performed and sutured with 3-0 black silk. A gauze pack was pressed against the surgical site. The completion time of the operation was recorded.

Post-operative procedures

The patients were asked to bite on the gauze for 60 minutes and post-operative instructions were uniformly explained to the patient. Fifteen tablets of

400 milligram ibuprofen (Ibuprofen 400 FC®; T.O. Chemicals Ltd., Bangkok, Thailand) were prescribed to each patient.

The appointment for an everyday-follow-up was made during one week post-surgery, and their sutures were removed on the seventh visit. During each visit, their surgical sites were inspected and the patients were verbally inquired about painful symptom, swelling condition, and haemorrhage. In addition, post-surgical conditions of traumatic ulcer, trismus, occlusal trauma, haemorrhage, dry socket, ecchymosis, and paresthesia were subjectively investigated.

Results

The impacted mandibular third molars undergone surgical removal processes in this study were 48 (48.98%)

on the right side and 50 (51.02%) on the left (Table 1). The most common type was the mesioangular impaction (70.41%), followed by vertical (15.31%) and horizontal angulations (11.22%), respectively (Table 2). The distoangular impaction was the least frequent (3.06%). According to the classification described by Pell and Gregory, the impacted teeth with Class II (66.33%) were more than those with Class I (33.67%). No record of Class III impaction was available in this study.

Table 3 shows that 55 (56.12%) of IM developed post-operative complications and traumatic ulcer possessed the highest number (24.49%). It was followed by trismus (14.29%), occlusal trauma (8.16%), haemorrhage (4.08%), dry socket (4.08%), and ecchymosis (1.02%), respectively.

Table 2 Number (and percentage) of each impaction type observed among the impacted mandibular third molars undergone a surgical removal

Impaction type	Mesioangular	Distoangular	Horizontal	Vertical	Total
Class I	25 (25.51)	3 (3.06)	0 (0)	5 (5.10)	33 (33.67)
Class II	44 (44.90)	0 (0)	11 (11.22)	10 (10.20)	65 (66.33)
Total	69 (70.41)	3 (3.06)	11 (11.22)	15 (15.31)	98 (100)

Table 3 Complications observed after surgical removal of mandibular third molars

Complication	N	Percentage relating to all removed teeth	Percentage relating to all complications
Traumatic ulcer	24	24.49	43.64
Trismus	14	14.29	25.45
Occlusal trauma	8	8.16	14.55
Haemorrhage	4	4.08	7.27
Dry socket	4	4.08	7.27
Ecchymosis	1	1.02	1.82
Total	55	56.12	100

Impaction type (according to classification of Pell and Gregory) and relations to complications

(Table 4)

After surgical removal of the impaction, the probabilities of mesioangular and distoangular impaction types to induce complications were higher than those of horizontal and vertical impactions.

In the mesioangular impaction, the record of post-operative traumatic ulcer was approximately twice as much as trismus. This tendency was also detected when it was compared to all remaining five complications, that is, occlusal trauma, haemorrhage, dry socket and ecchymosis. In the distoangular impaction, only traumatic ulcer and trismus were observed and their occurrence probability was equal to each other. In the horizontal impaction, the ulcer was most frequent.

It was followed by trismus and occlusal trauma, both of which were equal in their occurrence probability. In the vertical impaction, dry socket was more in its number and higher in its ratios than traumatic ulcer, occlusal trauma and haemorrhage.

Class I and II impactions caused a relatively equal probability for an induction of complications. Among all complications observed in Class I, traumatic ulcer possessed the highest probability. It was followed by an equal value of trismus and occlusal trauma, and, subsequently, by that of haemorrhage and dry socket. When compared to other complications seen in Class II, the highest probability was observed in traumatic ulcer, followed by trismus. Although the rest complications were also detected, they possessed relatively lower occurrence probability values.

Table 4 Number of surgical complications after removal of impacted mandibular third molars in relation to the impaction type. Decimal values in each parenthesis represent the occurrence probability in each complication type and are calculated from the total number of teeth in each category. Also see Table 1 for the number of teeth in each category.

Complication	Angulation-related impaction				Class-related impaction	
	Mesioangular	Distoangular	Horizontal	Vertical	Class I	Class II
Traumatic ulcer	20 (0.29)	1 (0.33)	2 (0.18)	1 (0.07)	10 (0.30)	14 (0.22)
Trismus	12 (0.17)	1 (0.33)	1 (0.09)	0 (0)	4 (0.12)	10 (0.15)
Occlusal trauma	6 (0.09)	0 (0)	1 (0.09)	1 (0.07)	4 (0.12)	4 (0.06)
Haemorrhage	3 (0.04)	0 (0)	0 (0)	1 (0.07)	1 (0.03)	3 (0.05)
Dry socket	2 (0.03)	0 (0)	0 (0)	2 (0.13)	1 (0.03)	3 (0.05)
Ecchymosis	1 (0.01)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.02)
Total	44 (0.64)	2 (0.67)	4 (0.36)	5 (0.33)	20 (0.61)	35 (0.54)

Surgical time and its relation to complications

(Table 5)

It was found that the longer the surgical time was, the more the complications were developed. The probability of complication occurrence was relatively low (less than 0.10) when the operation time was less

than 60 minutes, whereas it became higher (more than 0.10) when the time was over 60 minutes.

Only one complication (occlusal trauma) was seen in the group where the surgical time was within 30 minutes. Two of them (traumatic ulcer and trismus) were developed in those with 31-60 minutes of surgical time.

More complications were then seen in those with a surgical time of 61–120 minutes and over, respectively.

Traumatic ulcer and trismus were commonly found in the groups where surgical time was more than 60 minutes. Traumatic ulcer mostly appeared in those with a surgical time between 61–120 minutes, while most of the trismus was observed in the group with 91–120 minutes.

Occlusal trauma was not seen in the groups whose surgical time was between 31–90 minutes. It was found

when the surgical time was either less than 30 minutes or more than 90 minutes.

Haemorrhage, dry socket and ecchymosis were unobservable in the cases where surgical time was less than 60 minutes. However, each of them tended to gradually appear as the surgical time was prolonged. In this study, ecchymosis was found only one case where the surgical time was more than 120 minutes.

Table 5 Number of the complications observed after surgical removal of mandibular third molars in relation to the surgical time (minutes). Decimal values in each parenthesis represent the occurrence probability in each complication type and are calculated from the total number of teeth undergone surgical processes (n=98).

Surgical time Complication	Surgical time					Total
	1–30	31–60	61–90	91–120	121–150	
Traumatic ulcer	0 (0)	5 (0.05)	8 (0.08)	7 (0.07)	4 (0.04)	24 (0.24)
Trismus	0 (0)	3 (0.03)	3 (0.03)	6 (0.06)	2 (0.02)	14 (0.14)
Occlusal trauma	1 (0.01)	0 (0)	0 (0)	4 (0.04)	3 (0.03)	8 (0.08)
Haemorrhage	0 (0)	0 (0)	1 (0.01)	0 (0)	3 (0.03)	4 (0.04)
Dry socket	0 (0)	0 (0)	1 (0.01)	1 (0.01)	2 (0.02)	4 (0.04)
Ecchymosis	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.01)	1 (0.01)
Total	1 (0.01)	8 (0.08)	13 (0.13)	18 (0.18)	15 (0.15)	55 (0.56)

Discussion

In order to decrease the bias of the obtained results, post-operative pain was not included in the study due to the fact that it is interrelated with other objective symptoms as for example pain and traumatic ulcer or dry socket. Additionally, 14 patients had both impacted mandibular third molars removed surgically, but in different visits, some parts of the obtained data then dealt with interdependent cases. This importance should be kept in mind for any subjective answers on pain. The data from all cases were treated independently because of the differences in surgical time and

the individuality of each tooth-related factor, that is, the surgeon, the radiograph, and the tooth-position.

Regarding the angulation, mesioangular impaction was the most frequently seen position, followed by vertical, horizontal and distoangular types. Furthermore, the number of impaction with Class II position was twice as much as that of Class I. It has been shown in Singapore Chinese that mesioangular impaction was the most common and 80% of all impacted third molars were partially buried in bone.¹⁵ Our results also agreed with those in other current investigations,^{16,17} indicating that most of the patients with

impacted teeth possessed a narrow eruption space between the distal aspect of its adjacent second molar and anterior border of ramus of mandible.

Various complications in association with post-surgical removal of impaction have been reported. The fatal types of which included fascial space abscess,¹⁸ subcutaneous emphysema,^{19,20} pneumomediastinum,¹⁹ abscess-forming mediastinitis,²¹ brain abscess and cellulitis.²² Current reports on moderate types of complications were available, the examples of which were fracture of mandible^{23,24} and injury to inferior alveolar nerve or lingual nerve.^{25,26} In addition, post-surgical removal of mandibular impactions was documented to commonly cause painful symptoms, swelling conditions, restriction of mandibular movement, trismus, and alveolar osteitis.²⁷ Even in a developed country, secondary infection has been revealed to be the most frequent complication after surgery.²⁸ A document in Thai patients undergoing surgical removal of their mandibular third molars showed that post-surgical complications were dry socket, haemorrhage, infection, and dysesthesia.²⁹ In this study, it was disclosed that the complications included traumatic ulcer, trismus, occlusal trauma, haemorrhage, dry socket, and ecchymosis. The discrepancies between his and our findings remain to be clarified. However, it is attributable to the difference in operators. We confined the operators to be NU's dental students in the fifth or the sixth year under a supervision of an oral and maxillofacial surgeon with experience, while he carried out a global record from students in the sixth year, postgraduate students, and the Faculty members in the Department of Oral and Maxillofacial surgery, Chulalongkorn University.

In this study, mesioangular and distoangular impactions resulted in almost twice the probabilities in an induction of complications when compared with horizontally or vertically positioned molars. Class I

possessed as high the occurrence probability as Class II. Complications were more frequent observable when the tooth was deeply embedded.²⁸ In addition, the position of impacted tooth were reported to associate with an increased risk for complications.³⁰ No matter how the impacted molars were categorized in our study, the most frequent complication was traumatic ulcer, followed by trismus and occlusal trauma, the cause of which might have been the operators' carelessness. Taken together into considerations, the position of the tooth might play a role in an induction of the number, but not the type, of complications.

Concerning the surgical time, 46 out of 55 (83.64%) of the operations that caused complications were longer than 60 minutes. There was a tendency that a longer operation time led to a higher number and more types of complications. When the time was extended over 90 minutes, almost all types of complications in this study were observable and their number in each category was also higher than the surgery whose time was shorter. This might lead us to conclude that surgical time contributed to both the number and the types of complications. Nonetheless, these observations did not correlate with a recently released record, where all surgical processes were performed by either oral surgeons or general dentists with experience in oral surgery and 90% of their operation time were 25 minutes or less.⁸ A number of reports claimed no difference in the mean complication rate arising from surgery performed by those with or without experiences.^{6,31} In disagreement with such reports, a record on more frequently seen complications by the operators with less experience was revealed.²⁸ Hence, these clinical points need further investigations.

After surgical removal of the impactions, most of the patients developed the pain symptoms during the first four post-surgical days and later the complica-

tions.³² The operator should bear in his or her mind that while the impacted tooth position or surgical time cannot be altered directly, they may be modified indirectly, resulting in a potential decrease for post-operative complications.

Conclusion

The avoidable post-surgical complications may be the result of an operator's inadequate carefulness, despite an easy position of the impacted molars. A longer surgical time plays an important role in the addition of complication number and types.

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ความสัมพันธ์ระหว่างตำแหน่งของฟันและเวลาที่ใช้ในการผ่าตัด กับอาการแทรกซ้อนที่เกิดขึ้นภายหลังการผ่าตัดฟันกรามคุด

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บทคัดย่อ

วัตถุประสงค์ เพื่อหาความสัมพันธ์ระหว่างตำแหน่งของฟันกรามซี่ที่สามซึ่งคุดในขากรรไกรล่างและเวลาที่ใช้ในการผ่าตัด กับอาการแทรกซ้อนที่เกิดขึ้นภายหลังการผ่าตัดนำฟันออก

วัสดุและวิธีการ บันทึกข้อมูลด้านชีวิตสถิติของผู้ป่วยและประเมินภาพรังสีของฟันคุดก่อนการทำศัลยกรรม มีฟันจำนวน 98 ซี่ (จากผู้ป่วย 84 คน) ถูกผ่าตัดนำออกในการศึกษาครั้งนี้โดยนิสิตทันตแพทย์ชั้นปีที่ 5 และ 6 ภายใต้การดูแลอย่างใกล้ชิดโดยทันตแพทย์เฉพาะทางด้านศัลยศาสตร์ช่องปากและแม็กซิลโลเฟเชียล เวลาเริ่มต้นนับเมื่อเริ่มจรดมีดผ่าตัด และเวลาที่สิ้นสุดกระบวนการนั้น บันทึกเมื่อผู้ป่วยกัดผ้าก๊อชแล้ว ผู้ป่วยทุกคนได้รับคำแนะนำสำหรับการปฏิบัติตัวหลังการถอนฟัน รวมทั้งได้รับยาแก้ปวดเหมือนกัน หลังจากนั้นนัดผู้ป่วยมารับการตรวจแผลผ่าตัดและอาการแทรกซ้อนที่อาจเกิดขึ้นทุกวันตลอด 1 สัปดาห์ และตัดไหมออกในการนัดครั้งที่ 7

ผลการศึกษา อัตราการเกิดอาการแทรกซ้อนเท่ากับร้อยละ 56.12 อาการแทรกซ้อนที่ตรวจพบได้แก่ แผลเปื่อยเหตุบาดเจ็บ (ร้อยละ 24.49) อาการกลัมน้ำเนื้อมัดเคี้ยวเกร็ง (ร้อยละ 14.29) การบาดเจ็บเหตุสบฟัน (ร้อยละ 8.16) ภาวะเลือดออก (ร้อยละ 4.08) กระดูกงอกฟันอักเสบ (ร้อยละ 4.08) และเลือดออกใต้ผิว (ร้อยละ 1.02) ฟันกรามล่างซี่ที่สามซึ่งคุดโดยเอียงไปทางด้านใกล้กลางและด้านไกลกลางมีโอกาสที่จะทำให้เกิดอาการแทรกซ้อนได้สูง ตำแหน่งประเภทที่ 1 และ 3 ของฟันคุดมีโอกาสที่จะทำให้เกิดอาการแทรกซ้อนได้สูงใกล้เคียงกัน ระยะเวลาของการผ่าตัดที่นานกว่า 60 นาทีนั้น มีแนวโน้มที่จะเพิ่มจำนวนและชนิดของอาการแทรกซ้อน

สรุป ถึงแม้ว่าฟันกรามซี่ที่สามซึ่งคุดในขากรรไกรล่างจะมีตำแหน่งที่ง่ายสำหรับการทำศัลยกรรมก็ตาม อาการแทรกซ้อนซึ่งสามารถป้องกันได้นั้น อาจเป็นผลจากความระมัดระวังที่ไม่เพียงพอของทันตแพทย์ผู้ทำการผ่าตัด ระยะเวลาที่นานขึ้นของการผ่าตัดมีบทบาทสำคัญ ในการเพิ่มจำนวนและชนิดของอาการแทรกซ้อน

(ว.ทันต. จุฬฯ 2548;28:211-20)

คำสำคัญ: ฟันกรามคุด; ศัลยศาสตร์ช่องปาก; อาการแทรกซ้อนหลังการผ่าตัด