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Original Article

Incidence of Trismus in Transalveolar Extraction of Lower Third Molar

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Abstract

Background: Conventional mandibular third molar removal produces tissue trauma that induces an inflammatory reaction, leading to postoperative sequelae, the most common ones being trismus which influences the patient's quality of life in the postoperative period. Identifying the factors determining trismus after mandibular third molar extraction helps us to evaluate and correlate the incidence of trismus with morphological and surgical factors that are associated with its incidence in the postoperative period. **Methodology:** Patients referred to our institution for surgical removal of their impacted lower third molar between November 2014 and February 2015 were the participants of the study. Type of impaction, indication, and level of difficulty based on Pedersen criteria were obtained. Postoperative pain, swelling, and mouth opening (MO) limitations were evaluated at postoperative day (POD) 0, POD1, POD3, POD5, and POD7 and were analyzed. $P < 0.05$ was considered statistically significant. **Result and Conclusion:** In this study, out of fifty patients, only nine patients had experienced limited MO during postoperative period when the duration of procedure exceeded 30 min. However, it occurred as cumulative of pericoronitis and tooth sectioning done. The postoperative trismus was more significant in disto-angular impaction ($P < 0.05$) due to postoperative sequelae, swelling and pain.

Keywords: *Pain, third molar, trismus*

Introduction

The surgical removal of impacted mandibular third molar is one of the most commonly performed minor oral surgical procedures in maxillofacial surgery.[1] Common postoperative sequelae of conventional third mandibular removal are pain, trismus, and swelling, which influence the patient's quality of life in the postoperative period.[2] Trismus (Greek - *trismos*) is defined as prolonged tetanic spasm of masticatory muscles of jaw. Like edema, the transient jaw stiffness usually reaches its peak on the 2nd day and resolves by the end of the 1st week. It is diagnosed from clinical examination of the maximal interincisal distance (MID) <40–45 mm caused by contracture and not by obstructive joint impingement.[3]

The factors contributing to trismus are: (1) Low-grade infection postadministration of local anesthetic agents (Kitay *et al.,* 1991). (2) Multiple needle penetrations correlate with a greater incidence of postinjection trismus, especially if the barbed needle, and the most commonly involved muscle is medial pterygoid during inferior alveolar nerve (IAN) block (Hajjar *et al*., 1994). (3) Elevation of flap beyond the external oblique ridge (Farish *et al.,* 2007). (4) At times, the patient hurts his/her own tongue or cheek under the effect of anesthesia resulting in reflex trismus.[4]

In the past, several studies were conducted to identify the various morphological and surgical factors associated with trismus. Trismus being one of the most common and most frequented postoperative sequelae was underwent/experienced by patients.

In the present study, our aim is to identify the factors determining the trismus after mandibular third molar extraction.

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Methodology

A randomized prospective clinical study was carried out in the department of oral and maxillofacial surgery at our institution on fifty patients who underwent surgical removal of impacted mandibular third molar teeth.

Patient selection

The patient were enrolled for the study consecutively as and when they reported. All the patients were informed about the study and consent was obtained. A thorough clinical and radiological analysis was carried out in all the selected patients. The impacted tooth were assessed by Pedersen's index and Winter's lines.

Inclusion criteria

Patients with the American Society of Anesthesiologists (ASA) grade I with impacted mandibular third molar teeth with normal hematological values were included in the study.

Exclusion criteria

- Patients with ASA grades II, III, and IV
- Patients with extraoral swelling and cellulitis
- Patients with oral submucous fibrosis, radiation fibrosis, and temporomandibular joint ankylosis.

Surgical procedure

Intraoral preparation was done with povidone-iodine solution. Anesthesia was secured with 2% lignocaine hydrochloride with 1:2,00,000 adrenaline through classical IAN block plus infiltration of mucosa of retromolar trigone.

A standard ward's incision or ward's incision with distal extension was placed, the mucoperiosteal flap was reflected and the bone was exposed. Bone removal was done by guttering technique with a round bur on the buccal and distal aspects of the tooth, depending on the type of impacted tooth. Odontectomy was performed whenever necessary to facilitate the tooth removal. Tooth was delivered from the socket by an elevator. Sharp bony edges were smoothened with bone files and socket was irrigated with povidine-iodine solution and saline. Complete hemostasis was achieved before wound closure. The wound was closed with 3-0 silk suture and the patient was given postoperative instructions. All patients were under antibiotic coverage for 5 days.

Assessment of pain

It was assessed using universal pain assessment tool.

Assessment of mouth opening

MID was measured with a ruler by placing alongside the teeth. The follow-up was carried out on the 1st, 3rd, and 7th postoperative days (PODs) (Garcia *et al*. - Joms-1997).

Assessment of swelling

Clinical measurement of cheek swelling was carried out using a tape measure. Tape measurements were performed preoperatively, and on 1st, 3rd, and 7th PODs to record swelling. Measurements were made of the distances from the:

- Lateral corner of the eye to the angle of the mandible
- From the tragus to the outer corner of the mouth
- From the tragus to the pogonion (Schutze-Mosagau *et al*. - Joms-1995).

Results

In this study, the persistence reduction in mouth opening (MO) postoperatively was found in all types of impaction associated with pericoronitis [Table 1]. All patients experienced intermittent reduction of MO during the postoperative course, which regained on POD7. The greater reduction of MO as noticed on POD1 and POD2 is due to the inflammatory tissue reaction and the pain perceived. Disto-angular impaction associated with pericoronitis had least MO on postoperative period or days as compared to its counterparts. Inspite of gradual improvement in MO (41.8 mm) during the postoperative course, there was postoperative persistent trismus on POD7. This could be attributed to severity of pericoronitis preoperatively. Wards incision and tooth sectioning experienced more amount of trismus as compared to its counterparts.

Pain and degree of swelling were greater on days 1 and 2. Later, there was reduction of pain and swelling, but pain persisted in one patient on day 7.

For statistical analysis, paired *t*-test [Table 2] was carried out to find the transient reduction in MO, pain experience, and postoperative swelling, following transalveolar extraction of mandibular third molar.

It was found that 90% of patients had a highly significant decrease in MO on immediate postoperative period ($P = 0.0002$). On the POD1 and POD2, a decrease in MO ($P < 0.0001$) was found which was very highly significant. The MO gradually improved from POD5 and returned to normal MO on POD7 in 80% of cases and 20% had persistent decrease in MO when compared to preoperative MO.

The mean pre- and post-operative MO (MID) was highest in vertical impaction (49 mm) and least in disto-angular (40 mm) impaction. The decrease in MO was due to experience of pain.

The experience of pain [Table 3] was statistically significant on POD0 ($P = 0.5$) and very highly significant on POD1 and POD2 ($P < 0.0001$). Thereafter, a decrease in pain was observed on POD3 and POD5 which is

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Table 1: Mouth opening

Type of condition	Mouth opening (mm)																							
	Mesio-angular							Horizontal							Vertical						Disto-angular					
	Preoperative	POD0	POD1	POD3	POD5	POD7	Preoperative	POD0	POD 1	POD3	POD5	POD7	Preoperative	POD0	POD 1	POD3	POD5	POD7	PRE- OP	POD 0	POD1	POD3	POD5	POD7
Partially erupted	48	45	32	34	38	47	49	46	30	32	38	46	50	49	34	38	45	50	41	39	29	30	36	40
Pericoronitis	47	44	32	33	36	45	48	45	31	30	34	46	50	48	32	38	43	48	40	38	28	30	32	36

POD: Postoperative day

statistically significant (P = 0.05). On POD7, the pain was nil in 90% of patients that is very highly statistically significant ($P < 0.0001$).

The swelling [Table 4] was significant on POD0 and gradually decreased on POD3 (P = 0.0003). A very highly significant increase of swelling was noticed on POD1 and POD2 ($P < 0.0001$) and decreased on POD7 ($P < 0.0001$).

Patients' outcome of third molar surgery (health-related quality of life)

Table 5 summarizes the extent to which the outcomes of surgery interfered with patient's ability to chew, MO, sleep, talk, and carry out daily routine activities. For the first 2 days, most of the patients experienced "lots" or "quite a bit" of interference in MO and chewing. Talking was limited "lots" and "quite a bit" on immediate POD and POD1. Sleeping was interfered or minimum on immediate POD and POD1. Performance of daily routine was limited "lots" or "quite a bit" by between 22% and 6% and it had affected on the first 2 days.

Out of the fifty patients, seven patients had decreased MO postoperatively as compared to preoperatively, when duration of surgery was beyond 30 min. However, it occurs as cumulative of pericoronitis and tooth sectioning done.

Thus, in our study, we conclude that, among the different types of third molar impaction, disto-angular-impacted mandibular third molar associated with pericoronitis experienced the higher degree of pain, swelling, and trismus, as compared with vertical type of impaction. As the spatial inclination favouring the deep periodontal pocket leading to food impaction in the distal part of the pocket, and sulcular trauma while tooth removal would tip the delicate balance in the pathogen and host response.

Whereas in patients with partially erupted horizontal impacted third molar, the patient experiences trismus postoperatively on surgical removal of third molar, as it requires more amount of bone guttering or ostectomy and tissue manipulation for tooth removal, when compared to its counterparts.

All patients in our study experienced peak reduction of MO during the first and second PODs, which is due to the inflammatory tissue reaction and the pain perceived. Out of the fifty patients, 43 of them gradually regained the MO from POD5 and returned to their preoperative baseline MO on POD7. The remaining seven patients experienced persistent reduction in MO till POD7, because of the severity of pericoronitis associated with impacted third molar.

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Table 2: Paired *t*-test - mouth opening

	Paired difference					*t*	df	Significant (two tailed)
	Mean	SD	SEM	95% CI of difference				
				Upper	Lower			
Preoperative MO-POD0 MO	1.923	2.296	−0.285	−2.850	−0.996	−4.270	24	0.0002
Preoperative MO-POD1 MO	15.65	7.434	0.345	−18.657	−12.651	−10.736	24	<0.0001
Preoperative MO-POD2 MO	13.28	10.922	0.296	−15.950	−7.127	−5.387	24	<0.0001
Preoperative MO-POD3 MO	9.96	10.477	0.278	−12.655	−4.191	−4.099	24	0.0004
Preoperative MO-POD5 MO	6.96	10.718	0.310	−9.753	−1.094	−2.580	24	0.012
Preoperative MO-POD7 MO	2.92	9.687	0.387	−5.297	2.528	−0.729	24	0.0

SD: Standard deviation, SEM: Standard error of mean, CI: Confidence interval, POD: Postoperative day, MO: Mouth opening

Table 3: Paired *t*-test - pain index

	Paired difference					*t*	df	Significant (two tailed)
	Mean	SD	SEM	95% CI of difference				
				Upper	Lower			
Preoperative PI-POD0 PI	0.23	0.652	0.028	−0.494	−0.032	−1.806	24	0.0512
Preoperative PI-POD1 PI	2.23	0.862	0.023	2.579	1.882	13.182	24	<0.0001
Preoperative PI-POD2 PI	1.69	1.134	0.041	1.157	2.073	7.263	24	<0.0001
Preoperative PI-POD3 PI	1.39	0.384	0.033	−0.0124	0.782	1.995	24	0.0510
Preoperative PI-POD5 PI	−0.23	0.651	0.021	−0.494	0.032	−1.806	24	0.0512
Preoperative PI-POD7 PI	−1.53	−1.538	0.034	−1.123	−1.954	−7.625	24	<0.0001

SD: Standard deviation, CI: Confidence interval, PI: Povidine-iodine, POD: Postoperative day

Table 4: Paired *t*-test - swelling

	Paired difference					*t*	df	Significant (two tailed)
	Mean	SD	SE	95% CI of difference				
				Upper	Lower			
Preoperative S-POD0 S	−0.671	0.734	0.076	0.897	0.303	4.166	24	0.0003
Preoperative S-POD1 S	−1.671	1.236	0.091	2.161	1.163	6.854	24	<0.0001
Preoperative S-POD2 S	−1.573	1.561	0.131	2.060	1.064	6.458	24	<0.0001
Preoperative S-POD3 S	−0.922	1.098	0.089	1.359	0.472	4.250	24	0.0003
Preoperative S-POD5 S	0.243	0.968	0.084	0.1448	−0.637	−1.297	24	0.0020
Preoperative S-POD7 S	1.043	0.821	0.081	−1.374	−0.711	−6.575	24	<0.0001

SD: Standard deviation, SE: Standard error, CI: Confidence interval, POD: Postoperative day, S: Swelling

Discussion

Teeth that fail to attain a functional position may be pathological and should be considered for removal which is common in oral surgical practice. The surgical removal causes an acute inflammation with intense discomfort as well as pain, trismus, and swelling during the postoperative period.

The surgical technique for removal differs from patient to patient depending on the type of impaction. The type of impaction is an anatomical factor that determines the point of purchase (point of application of an elevator) and the extraction movements necessary to deliver a tooth during surgery,[5] which gives a prediction of the difficulty of extraction. Trismus constitutes an important immediate postoperative complication of surgical removal of impacted tooth, which is caused by the edema and swelling associated with surgical trauma.

There are many contributing factors for trismus like, where mandibular shelf is not well developed, a buccal approach to third molar region interferes with the lowest part of the temporalis tendon, i.e., the part of tendon has to be sectioned to be able to remove the buccal and distal bone covering of the molar. Moreover, during retraction of buccal flaps, a downward and/or buccal traction with retractor may lacerate the periosteum in the flap or extend the base of flap beyond the external oblique ridge, leading to increase in pain, swelling, and trismus. When any muscle is damaged, a pain reflex is stimulated. This condition is called "muscle guarding," which results when muscle fibers engender pain and when they are stretched. This pain causes the muscles to contract, resulting in loss or range of motion.

Multiple pricks during infiltration of the local anesthetic can lead to inflammation in this region, leading to trismus,

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Table 5: Patient's outcome of third molar surgery (health related quality of life)

Patient's complaint	Amount of limitation	Days-post surgery					
		D0	D1	D2	D3	D5	D7
Chew the food	Lots	30	22	04	02	02	02
	Quite a bit	08	08	10	02	02	-
	Some	05	10	08	12	04	02
	A little	04	04	06	14	06	01
	None	03	06	08	11	14	24
	Not applicable	-	-	14	09	22	21
Open the mouth wide	Lots	22	18	19	04	-	-
	Quite a bit	08	08	17	02	02	02
	Some	08	14	04	08	-	-
	A little	08	06	03	10	18	08
	None	04	02	02	10	24	20
	Not applicable	-	02	05	16	06	20
Talk/ conversation	Lots	12	08	06	-	-	-
	Quite a bit	12	10	08	04	04	-
	Some	10	10	10	10	04	-
	A little	10	12	12	12	20	10
	None	04	04	12	12	10	14
	Not applicable	02	06	02	12	12	26
Sleep	Lots	14	10	06	02	02	02
	Quite a bit	06	12	10	06	02	-
	Some	10	04	04	04	02	-
	A little	08	08	09	08	04	06
	None	06	02	11	20	26	06
	Not applicable	06	14	10	10	14	36
Perform daily activity	Lots	12	08	04	02	04	02
	Quite a bit	04	06	06	06	02	-
	Some	06	06	04	-	-	-
	A little	14	18	08	06	10	06
	None	08	04	12	20	20	30
	Not applicable	06	08	16	16	14	12

which was explained by Brooke.[6] Apart from this, the volume of the LA solution injected into this space can lead to the stretching of the medial pterygoid which may initiate this spasmodic contraction. Malamed[4] explained that the multiple needle pricks do not cause trismus, unless the needle tip accidentally comes in contact with the periosteum get barbed. Thus, barbed needle tip tears the muscle fibers of medial pterygoid on retrieval, which leads to muscle spasm and thus results in trismus.

Ten Bosch *et al*.[7] and van Gool *et al*.[8] found that trismus developed more slowly than swelling, reaching a maximum after 2–3 days. In our study, the factors such as pain and swelling developed simultaneously and it contributed together to result in trismus. Although the MO steadily improved in 43 patients by POD5, still in 7 patients, reduction in MO was present, and it did not return to the baseline MO by the end of the 7-day observation period, which may be attributed to patients' preoperative condition of pericoronitis.

Pedersen *et al*.[9] explained the strong interrelation between postoperative pain and trismus. They indicate pain as the main reason for reduced MO after removal of impacted mandibular third molars. As in our study also, the MO reduced on immediate POD and it was at the peak on POD1 and POD2, due to acute intense pain experienced by the patients during initial postoperative course.

Postoperative swelling is a common event after surgical removal of impacted third molar and may affect, only for few days, the social life of the patient. The above parameters (health-related quality of life, activity tolerance scale, and verbal descriptor scale) had help us in assessing the patients' outcomes of surgical removal of impacted third molar. Based on the outcome, in the future, it would help the clinician to adapt a systematic evaluation and modify the surgical technique based on the type of impaction and preoperative condition of impacted third molar.

Activity tolerance scale and verbal descriptor scale were used to assess the outcome of third molar surgery. Out of the 50 patients, in 26 patients, the pain interfered with concentration of work and in ten patients with performing the task on post operative day 0 and in 14 patients on post operative 1. The pain was within tolerable level on POD3 and POD5.Out of the 50 patients, 47 of them reported to have no pain on post operative day7.

Conclusion

From our study, we infer that trismus is multifactorial in nature, the amount of MO varied with individual patients depending on preoperative condition of the impacted lower third molar. Severe pain and swelling are mainly associated with preoperative variables of an impacted tooth such as angulations, depth, space available, and position in relation to external oblique ridge. Intraoperative variables such as amount of LA administered, number of needle pricks, type of incision and mucoperiosteal flap elevation, and type of tooth removal.

Removal of an impacted lower third molar invariably causes some degree of pain, swelling, and trismus during postoperative period which is intermittent in nature and would vary with individuals. The reduction of MO resolves within 7–10 days after surgical procedure with administration of antibiotics and analgesics. Thus, the postoperative trismus following third molar removal can be minimized by administration of antibiotics and analgesics preoperatively in case of pericoronitis and by performing minimally invasive surgery in case of partially erupted tooth.

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Conflicts of interest

There are no conflicts of interest.

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