



Comparative Evaluation of Two Different Flap Designs and Postoperative Outcome in the Surgical Removal of Impacted Mandibular Third Molar

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ABSTRACT

Aim: The aim of this study is to compare triangular and envelope flap designs and the postoperative outcome in the surgical removal of impacted mandibular third molar.

Materials and methods: A total of 50 participants were assessed clinically and were divided randomly into two groups. Group I (participants operated by triangular flap) and group II (participants operated by envelope flap), with 25 participants each between the age group of 20 and 30 years. Patient satisfaction was assessed subjectively using a graded scale from very satisfied to very unsatisfied. The degree of pain was recorded for 7 days with reference to predefined values on visual analog scale (VAS). Trismus was evaluated on the day 3, day 5, and day 7 of the postoperative period in millimeters. Quantitative data were analyzed by unpaired t-test and qualitative data were by Fischer's exact test.

Results: The mean overall age is 25.5 years. There was no statistically significant difference between the study groups with respect to age. There was no significant association between the patient satisfaction and flap type ($p = 0.684$). A significant difference between the study groups on 4th, 5th, and 6th days with respect to pain was observed, wherein fewer subjects operated with triangular flap reported pain. A highly significant difference in mouth opening was observed, with triangular flap group participants having a higher mouth opening than envelope flap subjects on day 7.

Conclusion: The present study indicated that participants operated by triangular flap had a better mouth opening postoperatively compared with envelope flap participants, whereas there were no significant differences in patient satisfaction and pain scores at the end of the 7th day after third molar surgery.

Clinical significance: Flap design is a significant factor in the surgical removal of impacted third molar, and it influences the severity of complications. Furthermore, it is important for allowing optimal visibility and access to the impacted tooth and also for subsequent healing of the surgically created defect.

Keywords: Flap design, Impacted, Incision, Mandibular third molar, Postoperative outcome.

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INTRODUCTION

One of the most frequently performed minor oral surgical procedures that require a thorough understanding of the surgical principles is the surgical removal of impacted third molar. Pain, trismus, swelling, and wound dehiscence are the most common postoperative complaints that influence the patients' quality of life in the week following surgery.¹ These postoperative complications are affected by intraoral as well as extraoral suture and flap techniques.²

One important factor that influences the severity of these complications is flap design.³ It is important for allowing optimal visibility and access as well as for subsequent healing of the surgically created defect. Hence, design of a flap becomes a compromise between perioperative and postoperative considerations.⁴

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Incisions are placed to gain access to the surgical site for adequate accessibility and proper visibility of the surgical field. Several studies have been conducted to study the effect of impacted third molar extraction and different flap techniques on periodontal health distal to the adjacent second molar, with conflicting results.⁵

Various authors have found various effective designs for the raising of a mucoperiosteal flap to expose an impacted lower third molar. The presence of various important anatomical structures in the adjacent area around the surgical site has led to the designing of incisions ranging from envelope (Koener's) incision, triangular (Ward's) incision, and its modification, L-shaped incision, bayonet-shaped incision, comma incision, and "S"-shaped incision.⁶

Hence, to obtain access to the surgical site and the overlying bone to be removed, the most appropriate flap design must be chosen. This also facilitates proper placement and stabilization of retractors and instruments for the removal of the impacted tooth. However, regarding attention to the soft tissue, i.e., involved in the surgical removal of impacted third molar tooth, very less importance has been given.⁷

Even though various types of flap designs have been suggested in the literature over the years,^{2,8} very few studies have been conducted comparing flap designs and evaluating their respective postoperative complaints. Hence, the present study was carried out to compare the two different flap designs and the postoperative outcome.

MATERIALS AND METHODS

The present comparative study comprised 50 participants between the age group of 20 and 30 years presenting to the Department of Oral and Maxillofacial Surgery, Government Dental College, Thiruvananthapuram, India. Ethical clearance was obtained from the Institution and

informed consent was obtained from each participant after explaining the procedure.

Patients without any history of medical illness or taking any medication that could influence the surgical procedure or postoperative wound healing, nonsmokers, and participants with healthy dental and periodontal status were included in the study.

A total of 50 participants were assessed clinically and were divided randomly into two groups, group I (participants operated by triangular flap) and group II (participants operated by envelope flap), with 25 participants each.

A millimeter scale was used to measure the preoperative maximum mouth opening from the incisal edge of the upper central incisor to the incisal edge of the lower central incisors.

All the individuals underwent surgical extraction of impacted mandibular third molars under 2% lignocaine with 1:200,000 adrenaline with inferior alveolar, lingual, and long buccal nerve block administered.

For the envelope flap, a sulcular incision was placed from the first mandibular molar to the second mandibular molar, following which a distal incision along the mandibular ramus was placed (Fig. 1).

For the triangular flap (Fig. 2), the incision was placed distally from the mandibular ramus to the distobuccal aspect of the second molar. This was followed by a sulcular incision that started near the mesiobuccal edge of second molar extending to its distal surface, and a relieving incision from the distobuccal aspect of the second molar, without incising the interdental papilla, at an oblique angle curving forward into the mandibular vestibule. Bone was removed using round bur under thorough irrigation with sterile normal saline.

All individuals received amoxicillin 500 mg thrice a day and diclofenac sodium 50 mg thrice a day for 3 days postoperatively. Postoperative instructions were given, and the sutures were removed on the 7th day. Patient



Fig. 1: Envelope flap incision



Fig. 2: Triangular flap incision

satisfaction was assessed subjectively using a graded scale from very satisfied to very unsatisfied.

The degree of pain was recorded for 7 days with reference to predefined values on VAS. Trismus was evaluated on the day 3, day 5, and day 7 of the postoperative period in millimeters.

Results of continuous data are depicted as mean ± standard deviation (SD; Min–Max), and results of categorical measurements are shown as number (%). Significance was assessed at a level of significance of 5%, with 95% confidence interval. Unpaired *t*-test was used for analysis of quantitative data, and Fischer exact test was used for analysis of qualitative data.

RESULTS

Table 1 shows the group-wise distribution of study participants according to mean age. The mean overall age is 25.5 years. There was no statistically significant difference between both the study groups with respect to age.

Table 1: Group-wise distribution of study participants according to mean age

Study group	Mean age in years	t-test	
		p-value	t-value
Group I (triangular flap)	26.24	0.075 NS	1.830
Group II (envelope flap)	24.68		
Overall	25.5		

NS: Nonsignificant

As seen in Table 2, there was a distribution of 24 males and 26 females among the total 50 participants. Triangular flap group consisted of 13 males and 12 females, whereas envelope flap group had 11 males and 14 females.

Table 3 depicts the overview of the study groups according to grade of patient satisfaction. There was no significant association between the patient satisfaction and flap type (*p* = 0.684).

Table 4 shows the valuation of pain (VAS) between study groups. There was a significant difference between the study groups on the 4th, 5th, and 6th days with respect to pain, wherein fewer subjects operated with triangular flap reported pain.

Table 2: Distribution of study participants according to gender

Gender	Group I (triangular flap)	Group II (envelope flap)	Total
Males	13	11	24
Females	12	14	26
Total	25	25	50

Table 3: Comparison of patients' satisfaction of the procedure

Patient satisfaction grade	Group I (triangular flap) (n = 25)	Group II (envelope flap) (n = 25)	Chi-square test
Very satisfied	11	14	$\chi^2 = 0.760$ <i>p</i> = 0.684 NS
Fairly satisfied	11	9	
Fairly unsatisfied	3	2	
Very unsatisfied	0	0	

p > 0.05; NS: Nonsignificant

Table 4: Evaluation of pain (VAS) between study groups

Duration and groups	No pain	Slight pain	Mild pain	Severe pain	Very severe pain	Chi-square test	p-value and significance
Day 1							
Triangular flap	0	10	11	2	2	$\chi^2 = 2.548$	<i>p</i> = 0.467 NS
Envelope flap	0	11	13	1	0		
Day 2							
Triangular flap	0	10	12	3	0	$\chi^2 = 2.391$	<i>p</i> = 0.302 NS
Envelope flap	0	7	17	1	0		
Day 3							
Triangular flap	0	10	12	3	0	$\chi^2 = 2.391$	<i>p</i> = 0.302 NS
Envelope flap	0	7	17	1	0		
Day 4							
Triangular flap	4	21	0	0	0	$\chi^2 = 6.900$	<i>p</i> = 0.032 S
Envelope flap	1	19	5	0	0		
Day 5							
Triangular flap	4	21	0	0	0	$\chi^2 = 5.824$	<i>p</i> = 0.05 S
Envelope flap	1	20	4	0	0		
Day 6							
Triangular flap	4	21	0	0	0	$\chi^2 = 5.824$	<i>p</i> = 0.05 S
Envelope flap	1	20	4	0	0		
Day 7							
Triangular flap	23	2	0	0	0	$\chi^2 = 0.758$	<i>p</i> = 0.667 NS
Envelope flap	21	4	0	0	0		

S: Significant; NS: Nonsignificant

Table 5: Comparison of mean scores of mouth opening between study groups

Duration	Groups	Mean \pm SD	t-value	p-value and significance
Preoperative	Triangular flap	40.960 (2.3670)	-1.206	0.235 NS
	Envelope flap	41.620 (1.3714)		
Day 3	Triangular flap	32.460 (2.4235)	-0.636	0.528 NS
	Envelope flap	32.880 (2.2420)		
Day 5	Triangular flap	34.720 (1.2997)	-0.606	0.547 NS
	Envelope flap	34.920 (1.0173)		
Day 7	Triangular flap	39.860 (2.1385)	2.437	0.020 HS
	Envelope flap	38.720 (0.9474)		

p > 0.05; HS: Highly significant; NS: Non-significant

As shown in Table 5, the mean score of mouth opening between the two groups was found to be nonsignificant preoperatively, as well as on day 3 and day 5. On day 7, the difference in mouth opening was highly significant with triangular flap group participants having a higher mouth opening than envelope flap participants.

DISCUSSION

The surgical removal of impacted third molar is one of the most commonly conducted procedures in oral surgery.⁹ Impacted teeth are frequent among patients with discrepancy of dental arch size along with underdevelopment of mandibular arch.⁸ Pain, trismus, and facial swelling are the most common complications after surgical removal of the third molar teeth, due to inflammation.¹⁰

Several different flap techniques have been developed and compared to reduce complications or improve surgical access.¹¹ They are broadly grouped under triangular (vertical flap) and envelope flap.¹⁰ The present study was conducted to compare two different flap design techniques and the postoperative outcome in the removal of a mandibular impacted third molar. The patient satisfaction, pain, and mouth opening among study participants of both the groups were evaluated.

In this study, there was no significant association between the patient satisfaction among both the triangular flap and envelope flap participants, indicating that patient satisfaction is most likely also dependent on nonsurgical factors, other than flap type alone. According to Balaguer-Martí et al,¹² patient satisfaction also depended on the efficiency of the surgeon and the clarity of the clinical information that was provided about the procedure. Fewer subjects operated with triangular flap reported pain on 4th, 5th, and 6th days postoperatively, but the VAS scores were not significantly different at the end of 7th day. This finding is similar to the study by Kirk et al,¹³ who found no statistically significant difference between the two types of flap designs with respect to severity of postoperative pain.

With regard to mouth opening, there was a significantly better mouth opening among the triangular flap group participants by the 7th day postoperatively. This is in contrast with the findings of a study conducted by Sandhu et al¹⁴ and Kirk et al,¹³ who found that there was no statistically significant difference in the mouth opening among participants operated by modified triangular and envelope flap.

Our study was conducted for a duration of 7 days, whereas depending on the type of impaction, the postoperative recovery could vary. Furthermore, nonclinical factors that could affect the quality of life of patients were not under the purview of this study. Further studies should be conducted in this direction to further validate the results obtained.

CONCLUSION

The findings of the present study indicated that participants operated by triangular flap had a better mouth opening postoperatively compared with envelope flap participants, whereas there were no significant differences in patient satisfaction and pain scores at the end of the 7th day after third molar surgery.

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