

ORIGINAL ARTICLE

Comparative Study of two Flap Designs on Postoperative Sequelae after Removal of Impacted Mandibular Third Molar

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ABSTRACT

Objective: The purpose of current study was to have comparison between the postoperative outcomes of triangular (wards) flap versus an envelope flap after surgical extraction of impacted mandibular third molar.

Methods: Current study was a double-blinded randomized controlled trial conducted at the Department of Oral & Maxillofacial surgery, Fatima Memorial Hospital, Lahore. Sixty patients were randomly recruited in two groups with random number table. Both groups consisted of 30 patients each. Among the patients of Group A, envelope flap was used for surgical access whereas patients of Group B received triangular flap for surgical access. Both Groups were followed on 2nd and 7th day postoperatively for pain status and trismus.

Results: Mean±SD of pain score at postoperative day 7th for group A was 23.47±6.75 and for group B it was 24.03±10.5 which was statistically insignificant ($p>0.05$). The difficulty index was found to have statistically significant ($P<0.05$) on 7th postoperative day pain. On the 7th postoperative day group A (envelope flap) had a mouth opening mean of 41.03mm and group B (triangular flap) which had a mean of 40.47mm which was statistically insignificant ($p>0.05$). The difficulty index was found to have statistically significant effect ($P<0.05$) on 7th postoperative day

Conclusion: The study concluded that there was no statistically significant difference between the two flap designs on postoperative pain and trismus while the difficulty of impaction was found to have statistically significant effect on postoperative pain and trismus

Keywords: envelope flap, triangular flap, trismus

INTRODUCTION

The most commonly found impacted tooth is mandibular third molar and its removal is a common surgical procedure in the oral cavity.^{1, 2} Most common age group involved in impacted mandibular third molar was 3rd decade of life and was more common in female gender.³ Genetic and environmental factors are thought to be the main cause of impaction of these teeth.^{2, 4} The tooth can be affected by nearby teeth, thick, coarse bones or excessive soft tissue. Inadequate space, abnormal eruption pattern and late eruption sequences all predispose the mandibular third molar with oral pain associated with pathological conditions such as: pericoronitis, and caries. The impacted mandibular third molars also cause resorption of second molar roots, periodontal pathology, cysts and tumors of mandible, lower arch crowding, TMJ disorders and neuralgia.⁵

The mandibular third molar may attain a series of patterns and positions in the mandible. Radiographic examinations help the clinician to classify these teeth according to the classification systems developed for the purpose. Such classifications aid in record keeping and clinical audit, communication between colleagues, treatment planning and even when formulating an index of difficulty when extracting these teeth.⁶

Various postoperative complications have been attributed to surgical extraction of impacted mandibular wisdom teeth.⁷ Trismus, swelling and pain are a few common post-extraction complaints that affect the patient's overall health after surgery. Pain is the most common complication reported by patients during follow up appointments. This is followed closely by swelling and trismus.⁸

Removal of these teeth involves creation of flap followed by osteotomy.⁹ Raising a mucoperiosteal flap to uncover the underlying tooth is a foremost reason of surgical trauma. Therefore minimizing soft tissue damage during creation of flap has been reported to decrease post-operative pain, swelling and trismus.^{2, 8, 10}

The basis of a soft tissue flap is to provide maximum access with minimal soft tissue trauma. Incisions should provide adequate blood supply and good access for instrumentation, minimal soft tissue trauma and allow for anatomical flap reconstruction. The incision must ensure full thickness surgical flap without traumatizing the nearby structures.^{5, 11}

Different designs of soft tissue flap to expose the underlying third molars have been reported by various authors ranging from envelop, triangular (wards), L shaped, bayonet shape, comma shape, and "S" incision.^{1, 5, 12} Triangular and envelope flaps are the most commonly preferred designs.^{5, 13}

Effects of various flap modifications on postsurgical swelling, pain and trismus have been evaluated by different investigators with conflicting results. Envelope flap has been associated with less postoperative swelling ($P<0.025$) and trismus ($P<0.014$) in one study outcome.² No significant differences were found between the two flap designs regarding postoperative pain and swelling in another study outcome.^{13, 11} The mean postoperative trismus on day 2 in envelope flap technique was 3.56+ 1.01 and triangular flap technique was 3.62+0.97, and day 7 envelope flap technique was 4.29+0.80 and triangular flap was 4.24+0.80, and postop pain at day 2 was 1.45+ 0.32 and 1.20+0.30; and at day 7 it was 7.75+3.69 and 8.69+4.01 of envelope flap and triangular flap respectively.² In light of these conflicting results in the literature and in exploring the best method for surgical extraction of 3rd molars is of great importance. The choice of using a specific flap type is closely associated to the surgeon preference as well as the level of extraction complexity of impacted tooth. However, when there is an availability of various flaps, the results of this study could be helpful for the surgeons to have better selection of biomaterial by which patient encounter with least level of pain and may experience better healing process.

MATERIALS AND METHODS

Research design in which this study could be catered was double blinded randomized controlled trial which was conducted at the outpatient Department of Oral & Maxillofacial Surgery, Fatima Memorial Hospital, Lahore. The duration of study was from January-June 2018. Consent form was get signed by every participants after getting the approval from ethical review committee of the institution. A total 60 patients were included using non-probability consecutive sampling technique. The sample size was calculated using online Open-Epi sample size calculator, divided in to 2 groups of 30 each with 95% of confidence level and 80% power of study taking expected mean score at day 2 of envelope flap was 1.45+0.32 and triangular flap as 1.20+0.30.

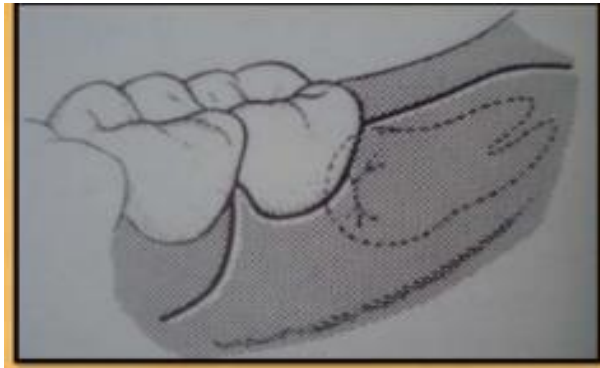
Inclusion Criteria:

1. Patients with impacted mandibular third molars with difficulty index 4-10 based on Pederson scale.
2. Age: 18-30 years
3. Gender: both male and female
4. Asymptomatic third molar

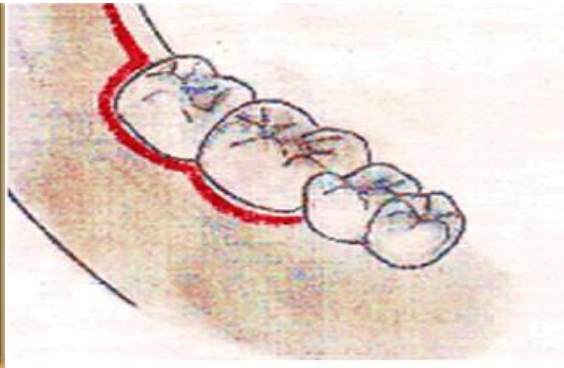
Exclusion Criteria:

1. Severely compromised patients based on medical history
2. Pregnant and lactating females
3. Smokers
4. Patients on medications that influence the surgical procedure or postoperative wound healing

Patients were randomly divided into 2 groups namely group A (30 Patients) and group B (30 patients) by using lottery method. Group A involved an envelope flap with was a crevicular incision extending distally along the ramus from the mesial aspect of 1st or 2nd molar while in Group B the triangular flap was an incision extending along the mandibular ramus from the distobuccal of the lower second molar, and vertical release was along the distobuccal of the lower second molar, without incising the interdental papilla, descending at a minor oblique curve anteriorly into the mandibular vestibule.



Triangular flap (modified ward's incision)



Envelope flap

A resident surgeon performed the operation on all patients using a standard procedure. Local Anesthesia was injected using a standard inferior dental nerve block and long buccal nerve block using a 2% Lidocaine hydrochloride containing adrenaline 1:100,000. The designated flap was raised using blade no 15. Hemostasis achieved. Round bur on a straight handpiece was used to remove the bone around the tooth under continuous 0.9% normal saline irrigation. The crown or roots were divided as needed. The divided portions of the tooth were luxated using dental elevators and extracted. The flap was sutured with silk 3.0 after complete extraction of the tooth and thorough irrigation with 0.9% normal saline. A small gauze pack was placed on the site and postsurgical instructions were given. Tablet ibuprofen 400mg three times daily for 5days and tablet Augmentin 1g twice daily for 5 days were given postoperatively. The suture was removed 7th postoperative day.

The outcome variables of both treatment modalities in terms of pain and trismus on the 2nd and 7th postoperative days were measured as per operational definitions. All this information was recorded on a predesigned proforma attached and the results were compared.

Collected data was entered and analyzed using SPSS version 25.0 and presented in the form of frequency and percentage. Demographic variables i.e. gender was presented as percentages and frequencies. Mean and standard deviation were calculated for age, BMI, pain and trismus. Independent t-test was used to compare the outcomes in terms of postoperative pain and trismus after application of two different flap designs. P value <0.05 was considered significant.

RESULTS

There were sixty patients included in the study and divided two groups; group A (an envelope flap) and group B (triangular flap). Each group comprised 30 patients. The mean age of group A was 22.17±2.437years and of group B was 21.73±2.69. The majority of patients was in the age of 18-30 years. There were 13 males (43.3%) and 17 females (56.7%) in group A. While in group B, 12

males (40%) and 18 females (60%). None of the presented with wound infection or impaired healing.

Patients in both groups presented with same scores of minimum pain preoperatively while group A and B had a preoperative maximum pain scores of 72 and 56 respectively. Also tendency of pain reduction over postoperative period was same with group A patients consistently reported less amount of pain scores as compared to group B. Mean±SD of pain score at postoperative day 7th for group A was 23.47±6.75 and for group B it was 24.03±10.5

Independent T-test was applied to pain scores of Group A and B patients, no statistically significant difference was found between the two groups. However, the difficulty index was found to have statistically significant effect (P<0.05) on 7th postsurgical day pain.

Table 1: Comparison of both groups in terms of Pain

Pain	Group	N	Mean	t	Sig.
Pain (preoperative)	A	30	29.90±17.34	0.836	0.406
	B	30	26.57±13.24		
Pain at 2 nd postop day	A	30	35.27±13.65	1.908	0.061
	B	30	41.57±11.87		
Pain at 7 th postop day	A	30	23.47±6.75	0.364	0.805
	B	30	24.30±10.51		

Table 2: Comparison of both groups in terms of trismus

Trismus	Group	N	Mean	t	Sig.
Trismus (preoperative)	A	30	44.33±3.15	0.483	0.631
	B	30	44.73±3.26		
Trismus at 2 nd postop day	A	30	33.27±3.64	1.707	0.094
	B	30	31.63±3.80		
Trismus at 7 th postop day	A	30	41.03±2.75	0.868	0.384
	B	30	40.47±2.22		

Groups A and B had mean preoperative mouth opening of 44.33mm and 44.73mm respectively. On 2nd postoperative day group A had a mouth opening mean of 33.27mm which was better than group B which had a mean of 31.63mm. On the 7th postoperative day group A (envelope flap) had a mouth opening

mean of 41.03mm which was slightly better than group B (triangular flap) which had a mean of 40.47mm. Independent t-test was applied to trismus scores of Group A and B patients, which showed no significant difference among group A and group B.

The difficulty index was found to have statistically significant effect ($P < 0.05$) on 7th postoperative trismus.

Table 3: Comparison of Pain score according to Difficulty index

Pain	Difficulty index	N	Mean	P-Value
Pain (preoperative)	Moderately difficult	42	28.90	0.610
	Very difficult	18	26.67	
Pain at 2 nd postop day	Moderately difficult	42	38.43	0.992
	Very difficult	18	38.39	
Pain at 7 th postop day	Moderately difficult	42	21.62	0.021
	Very difficult	18	28.72	

Table 4: Stratification of Trismus scores according to Difficulty index

	Pain Difficulty index	N	Mean	P-Value
Trismus (preoperative)	Moderately difficult	42	44.17	0.211
	Very difficult	18	45.39	
Trismus at 2 nd postop day	Moderately difficult	42	31.83	0.055
	Very difficult	18	33.89	
Trismus at 7 th postop day	Moderately difficult	42	41.21	0.038
	Very difficult	18	39.67	

DISCUSSION

The purpose of the study was to determine if the postoperative pain and trismus after third molar surgery was influenced by flap design. This study observed statistically differences in the levels of pain and trismus between the two flap designs. Further stratification was done in terms of easy, moderately difficult and very difficult cases.

Pain depends on the size of flap elevation and the extent of osteotomy. No statistically significant differences were found between the two types of flaps used in terms of second postoperative pain and 7th postoperative pain in current study. Borgonovo et al in a study reported that there was no differences found among used flap types, conversely, in case of raise of a less traumatic flap, the quantity of analgesics consumed was lower.¹⁴ Another study reported the impact of design of flap used on post-op course.¹⁵ The pain and wound breakdown were significantly greater in the case of envelope flap on first postoperative day, compared to the other group ($P < 0.05$).¹⁵ Erdogan et al carried out a prospective double blind randomized trial on twenty patients with impacted third molars to compare the envelope flap and triangular flap with respect to postoperative discomfort.¹⁶ Envelope flap had lower VAS score, while no significant difference was reported for pain.¹⁶ Kirk et al noted no statistically significant difference between flap designs in terms of postsurgical pain recorded using a VAS in 32 patients with third molars bilaterally impacted and removed using an envelope flap for one side, and a triangular flap for the other.¹³ Koyuncu et al studied the effect of flap design on dry socket and other complications after impacted third molar extraction in eighty patients. Envelope flap had a higher frequency of dry socket, but it was statistically insignificant.¹⁷ Dolanmaz et al found insignificant difference between the envelope and modified triangular flaps with regards to postsurgical pain after impacted third molar extraction evaluated until day 7 with verbal rating scale.¹¹

Present study shows that the severity of trismus is not affected by one flap design over the other. Findings of some authors agree with our result, Sandhu et al reported statistically insignificant difference in postoperative trismus $P > .05$ after comparing two flap designs for the surgical extraction of the mandibular impacted third molar.¹⁸ Erdogan et al in their randomized trial on twenty patients with bilaterally impacted lower third molars reported no significant difference for trismus when comparing the envelope flap on one side and a triangular flap on the other.¹⁹ Other studies differ from ours with respect to trismus after various surgical techniques. Shevel et al reported maximum mouth opening in case of a small atraumatic soft tissue flap more

than when a larger flap was raised.²⁰ Nageshwar compared a small comma incision technique with a standard technique using conventional envelope flap.²¹ Patients were randomized into two groups with fifty patients each. Subjects in one group underwent surgical extraction of the impacted third molar with the conservative technique whereas the patients in the second group underwent extraction with the standard method.²¹ Comma flap incision had significantly better postoperative mouth opening than those who had envelope flap.²¹

Garcia et al conducted a study in 218 patients requiring extraction of mandibular third molars.²¹ Patients were distributed into three groups: Flap was not reflected in the first group, full thickness flap was elevated in the second group, flap was raised along with osteotomy in the third group.²² Trismus was assessed by measuring the interincisal mouth opening pre and postoperatively.²² The difference in mouth opening was not significant in the first group, while the second and third groups had significant difference.²² Borgonovo et al evaluated the postoperative discomfort i.e. trismus, swelling and pain after surgical extraction of mandibular third molar using three types of flap. Trismus was significantly reduced on patients who had an envelope flap used during removal of impacted third molar ($P < .05$).²

In our study BMI did not have statistically significant effect on postoperative outcome. Thiago et al studied the association of BMI and postsurgical outcome in third molar surgery.²³ 160 surgical extractions of impacted mandibular third molar were done in 80 patients. 27.5% of the patients was overweight ($BMI > 25 \text{ kg/m}^2$) and insignificant relationship was found between this factor and postoperative edema, trismus and pain.²³ Whereas, lesser BMI (< 18.5) was present in 13.75% of the patients, pain scores were higher in these patients at 12 and 24 hrs.²³ Akidiri et al studied the effect of demographic history of the patients and spatial angulation of the tooth in estimating the surgical complexity of impacted mandibular third molar and reported that the BMI had insignificant impact on surgical complexity.²⁴

Preoperative difficulty index had statistically significant effect on pain and trismus in the 7th postoperative day ($P < 0.05$). Yuasaa and Sugiura studied the association between preoperative variables and postoperative sequelae in third molar surgery.²⁴ 140 patients were included in the study in whom 153 consecutive open extractions of mandibular third molars were done.²⁴ Severe pain was significantly associated with preoperative difficulty index ($P = 0.01$). Average pain also significantly correlated with preoperative difficulty index ($P = 0.02$).²⁴ Lucia et al studied the role of surgical difficulty in postoperative pain after removal of mandibular third molars. 157 mandibular third molar extractions were carried out in prospective study of 139 patients. Procedural complexity was measured after surgical extraction using a 4-class scale. Postoperative pain was significantly correlated with surgical difficulty.²⁵

CONCLUSION

In this study, the two groups were assessed for postoperative pain and trismus and there was no statistically significant difference between the two groups while the difficulty of impaction was found to have statistically significant effect on postoperative pain and trismus. BMI was found to have no statistically significant effect on postoperative outcome.

Thus the choice of a particular type of flap depends on surgeon's preference and the complexity of the surgical removal of the impacted tooth and doesn't seem to have a long term effect on the healing of tissues. The surgeon should clinically and radiographically assess the designing of incision and mucoperiosteal flap in order to prevent a wide area of bone exposure. The limitations of the study were patient follow up with some of the patients not coming back thus not included in the study. Future study should be done if any other flap design other than these two could have better outcome such as lingual located flap.

REFERENCES

1. Z. H. Baqain, A. Al-Shafii, A. A. Hamdan, F. A. Sawair Flap design and mandibular third molar surgery: a split mouth randomized clinical study nt. J. Oral Maxillofac. Surg. 2012; 41: 1020–1024
2. Borgonovo AE, Giussani A, Grossi GB, et al. Evaluation of postoperative discomfort after impacted mandibular third molar surgery using three different types of flap. Quintessence Int 2014;45(4):319–30
3. Khan A. Impacted mandibular third molars: pattern of presentation and postoperative complications. Pakistan Oral & Dental Journal. 2010 Dec 1;30(2).
4. Karaka I, Simsek S, Uger D. Review of flap design influence on the health of the periodontium after mandibular third molar surgery. Oral surg Oral med Oral pathol Oral radiol, 2007; 104:18-23
5. Adarsh Desai et.al. Comparison of two incision designs for surgical removal of impacted mandibular third molar: A randomized comparative clinical study Contemporary Clinical Dentistry Apr- Jun 2014;5(2)
6. Stephanie J. Drew, DMD Best Practices for Management of Pain, Swelling, Nausea, and Vomiting in Dentoalveolar Surgery. Oral Maxillofacial Surg Clin N Am, 2015;27(3), 393–404
7. Banu Özveri Koyuncu, Mert Zeytinoğlu, Erdoğan Çetingül. Comparison of 2 different flap techniques in the surgical removal of bilateral impacted mandibular third molars Turk J Med Sci (2013) 43: 891-898
8. Roode GJ, Butow K. An alternative surgical flap design for impacted third molars: a comparison of two different surgical techniques. SADJ 2010, 65: 246, 248–51
9. Monaco G, Doprile G, Tavernese L. Mandibular third molar removal in young patients: An evaluation of 2 different flap designs. J Oral maxillofac surg, 2009; 67:15-21
10. Martin RD, oldest recorded case of impacted wisdom teeth. Br Dent J 2006; 200: 308-11
11. Dogan Dolanmaz, DDS, PhD,a Alparslan Esen, DDS, PhD,b Kubilay Isik, DDS, PhD,c and Celal Candirli, DDS, PhD Effect of 2 flap designs on postoperative pain and swelling after impacted third molar surgery Oral Surg Oral Med Oral Pathol Oral Radiol 2013;116:e244-e246
12. Ranjeet Bodh MDS, Anshul Jain The flap design of third molar surgery: An overview International Journal of Medical and Health Research Volume 1; Issue 3; October 2015; Page No. 32-35
13. Kirk DG, Tong DC, Love RM. Influence of two different flap design on incidence of pain, swelling, trismus, and alveolar osteitis in the week following third molar surgery. Oral surg Oral med Oral pathol Oral radiol Endod, 2007;104:e1-e6
14. Carter K, Worthington S. Predictors of third molar impaction: a systematic review and meta-analysis. Journal of dental research. 2016 Mar;95(3):267-76.
15. Juodzbalys G, Daugela P. Mandibular third molar impaction: review of literature and a proposal of a classification. Journal of oral & maxillofacial research. 2013 Apr;4(2).
16. Erdogan O, Tatlı U, Ustün Y, Damlar I. Influence of two different flap designs on the sequelae of mandibular third molar surgery. Oral Maxillofac Surg 2011;15:147–152
17. Koyuncu BO, Cetingül E. Short-term clinical outcomes of two different flap techniques in impacted mandibular third molar surgery. Oral Surg Oral Med Oral Pathol Oral Radiol 2013;116:e179–184
18. Sandhu A, Sandhu S, Kaur T. Comparison of two different flap designs in the surgical removal of bilateral impacted mandibular third molars. Int J Oral Maxillofac Surg 2010;39:1091–1096.
19. Erdogan O, Tatlı U, Ustün Y, Damlar I. Influence of two different flap designs on the sequelae of mandibular third molar surgery. Oral Maxillofac Surg 2011;15:147–152
20. Kumar MS, Aysha S. Angulations of impacted mandibular third molar: a radiographic study in Saveetha Dental College. J Pharm Sci Res. 2015;7:981-3
21. Malik NA. Text book of oral and maxillofacial surgery. New Delhi: Jay pee brothers medical publisher; 2008
22. Campbell JH. Pathology associated with the third molar. Oral and Maxillofacial Surgery Clinics. 2013 Feb 1;25(1):1-0
23. Gelesko S, Blakey GH, Partrick M, et al. Comparison of periodontal inflammatory disease in young adults with and without pericoronitis involving mandibular third molars. J Oral Maxillofac Surg 2009;67:134–9.
24. Ness GM, Peterson LJ. Impacted teeth. In: Miloro M, editor. Peterson's principles of oral and maxillofacial surgery, vol. 1, 3rd edition. Hamilton (New Zealand): BC Decker; 2012, 141
25. Rafetto LK. Managing impacted third molars. Oral and Maxillofacial Surgery Clinics. 2015 Aug 1;27(3):363-71