

## Original Research Article

# Comparison of buccal based triangular flap and lingual based triangular flap on postoperative course after impacted mandibular third molar surgery: a prospective randomized controlled study

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**Abstract – Introduction:** The present study is to compare the buccal based triangular flap with lingual based triangular flap on postoperative pain, swelling and trismus after mandibular third molar surgery. **Materials and methods:** This study comprised of 100 patients, of which, 50 patients underwent buccal based triangular flap technique and 50 patients underwent lingual based triangular flap. The patients in both the groups were evaluated for pain, swelling and trismus on 1st, 3rd and 7th postoperative days. The wound healing was assessed on the 7th postoperative day. The obtained data's were statistically analyzed using SPSS software. **Results:** Patients in lingual based triangular flap group had less pain on all three postoperative days ( $P < 0.001$ ). While, the amount of swelling was less on the 3rd postoperative day ( $P < 0.05$ ) and the degree of trismus was less on 1st and 3rd postoperative days ( $P < 0.05$ ). The patients in buccal based triangular flap group showed statistical significance for swelling on 1st and 7th postoperative days ( $P < 0.05$ ) and for trismus on 7th postoperative day ( $P < 0.05$ ). 2 Patients reported with tissue dehiscence in lingual based triangular flap group. In buccal based triangular flap group, 7 patients presented with wound gaping and 2 patients developed dry socket. **Conclusion:** Lingual based triangular flap was found to be superior and effective flap design in controlling pain, swelling and trismus with reduced postoperative complications when compared to buccal based triangular flap.

## Introduction

Mandibular third molar surgeries traditionally exhibit complications such as pain, swelling and trismus postoperatively. The prevalence of postoperative complications after mandibular third molar removal accounts to 6.9% [1]. In order to reduce such drawbacks, standard approaches are supplemented with analgesics, use of drains, modifications in suturing technique and the use of innovative flap designs have an influencing effect on the postoperative sequel [2]. The present study has advocated the use of buccal and lingual based triangular flap in mandibular third molar removal. Any flap types must adhere to the ideal requisite of flap design by placing the surgical incision on the sound bone.

In buccal based triangular flap design, the buccal flap is approximated within the extracted socket which may disrupt the formation of clot causing pain, dry socket and delayed wound healing postoperatively. Whereas, in lingual based

triangular flap design, the incision is laid on the anterior mandible away from the extracted socket thereby reducing the postoperative complications after third molar surgery [2,3].

The aim of this study is to compare the effective nature of lingual based triangular flap and buccal based triangular flap on postoperative pain, swelling and trismus after mandibular third molar surgery.

## Methods

### Study design/enrollment

This prospective study was performed on 100 patients who reported to the department of oral surgery for surgical removal of impacted mandibular third molar. The study entailed based on the consort statement guidelines 2010. This study was performed in line with the principles of the Declaration of Helsinki and approval was granted by the ethical board members of RYA Cosmo Foundation, EC/RYA/005. Written informed consent was obtained from all the patients included in the study. Patient inclusions were: unilateral impacted

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**Fig. 1.** Surgical incision for buccal based triangular flap.



**Fig. 2.** Surgical exposure of buccal based triangular flap technique.

mandibular third molar, difficulty index- 3 to 5, ASA category I. Exclusion criteria were: bilateral impacted mandibular third molar, difficulty index > 5, ASA category II, III, IV, patients allergic to medications, lactating and pregnant mothers, patients with systemic diseases.

#### Sample size determination

A pilot study was performed on 10 patients to determine the sample size for the present study. Based on the results of a pilot study, with an effect size of 0.32,  $\alpha$  error 0.05 and power 95%, the sample size was estimated to be 100 patients.

#### Randomization

Simple randomization was used to randomly assign the patients to either of the groups through a lottery method.

#### Blinding

Double blinding was done. The investigator and the patients were unaware of the flap designs implemented in the present study.

#### Groups

Out of 100 patients in the present study, 50 patients underwent buccal based triangular flap technique and 50 patients underwent lingual based triangular flap technique. Extractions of carious teeth or tooth indicated for removal were not performed during the study.

#### Flap designs

##### Buccal based triangular flap

A vertical incision was placed in the mesiobuccal gingiva of mandibular second molar. The incision was then carried along the sulcus of the gingiva and extended distal to mandibular second molar at 45 degrees along the distobuccal line angle to the ramus of mandible (Figs. 1 and 2).



**Fig. 3.** Surgical incision for lingual based triangular flap.

#### Lingual based triangular flap

A vertical incision was placed distal to the mandibular second molar and extended along the vestibular sulcus. The vestibular incision was then made and extended along the vestibule posterosuperiorly reaching the ramus of mandible (Figs. 3 and 4).

#### Surgical procedure

The surgical removal of impacted mandibular third molar was performed by the same oral surgeon. The inferior alveolar nerve block was administered with 2% lidocaine hydrochloride,



Fig. 4. Surgical exposure of lingual based triangular flap technique.

1 in 80,000 concentration of adrenaline. Incision and flap designs were performed based on the patients allocated in each group. Mesio Buccal and distal bone guttering was performed using 702 bur and the tooth was sectioned/removed completely, luxated and delivered through elevators and forceps. The mucoperiosteal flap was then freshened and the socket was sealed through primary closure. Adequate hemostasis was achieved. Postoperative instructions were given and all the patients were prescribed with Capsule Amoxicillin 500 mg 3 times daily for 3 days and Tablet Diclofenac 50mg twice daily for 3 days.

**Method of assessment**

The patients were evaluated for pain, swelling, and trismus by the same investigator on first, third, and the seventh postoperative day. The pain was evaluated using a 10-cm visual analogue scale (VAS). Facial swelling was determined by measuring the distances of three anatomical landmarks in millimeters: the distance from the outer canthus of the eye to the angle of mandible determines S1, distance from the tragus of the ear to the corner of mouth determines S2, and distance from the tragus of ear to the soft tissue pogonion determines S3. The average of all three landmarks S1 + S2 + S3 was recorded as the amount of swelling (S). The average preoperative value

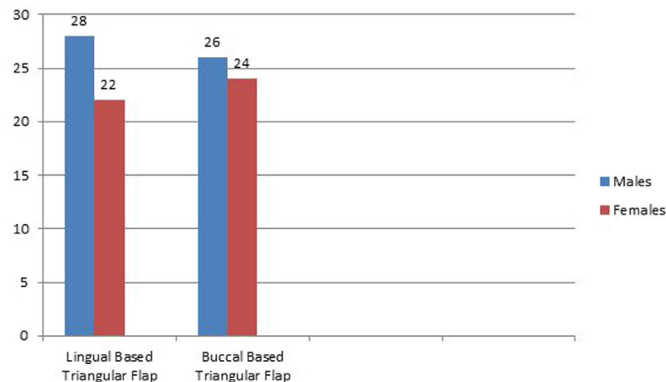


Fig. 5. Gender distribution between buccal based triangular flap and lingual based triangular flap.

for swelling was 12.5 mm. Mouth opening was determined using a string from incisal edges of the maxillary and mandibular central incisors in millimeters. The average preoperative value of mouth opening was 35 mm. Wound healing was assessed on the 7th postoperative day.

**Statistical analysis**

The data obtained between both the groups were prepared in a standard proforma by the investigator and further calculated using SPSS software, 14.0 version, Chicago, USA. Descriptive statistical variables were analyzed through ANOVA test. P value less than 0.05 were considered significant for the present study.

**Results**

The present study included 100 patients who reported for the removal of mandibular third molar. Among 100 patients, 54 patients were male (28 in lingual based triangular flap and 26 in buccal based triangular flap groups) and 46 patients were females (22 in lingual based triangular flap and 24 in buccal based triangular flap groups) with an average age of 32 years (Fig. 5). The data obtained from the present study were statistically analyzed by ANOVA test using SPSS software (Tab. I, Figs. 6–8).

**Comparison of postoperative parameters between groups**  
Lingual based triangular flap group

The severity of pain was less on all three postoperative days (P < 0.001). The amount of swelling was significantly reduced on the 3rd postoperative day (P < 0.05) and the degree of trismus was significantly less on 1st and 3rd postoperative days (P < 0.05).

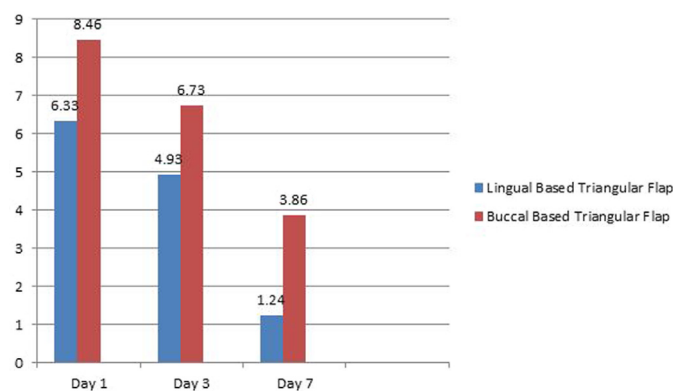
Buccal based triangular flap group

The amount of swelling was significantly less on 1st and 7th postoperative days (P < 0.05). The degree of trismus was significantly less on 7th postoperative day (P < 0.05).

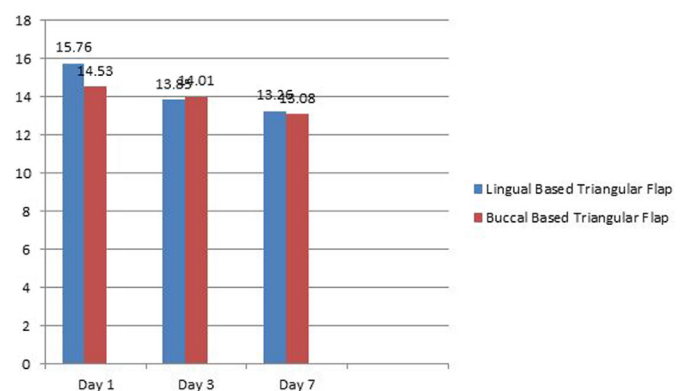
**Table 1.** ANOVA test of significance for postoperative parameters pain, swelling and mouth opening with mean, standard deviation (SD) and *P* value for Lingual based triangular flap group and Buccal based triangular flap group on 1st, 3rd and 7th postoperative days.

Postoperative days	Pain (vas)			Swelling (mm)			Mouth opening (mm)		
	Mean	SD	<i>P</i> value	Mean	SD	<i>P</i> value	Mean	SD	<i>P</i> value
Day 1									
Lingual	6.33	0.74	0.00*	15.76	0.83	0.31	26.26	5.0	0.03*
Buccal	8.46	1.68	0.64	14.53	1.09	0.04*	22.93	3.15	1.02
Day 3									
Lingual	4.93	1.22	0.00*	13.85	0.86	0.02*	32.86	6.16	0.01*
Buccal	6.73	1.43	1.32	14.01	0.78	1.69	29.0	2.86	0.24
Day 7									
Lingual	1.24	0.70	0.00*	13.26	0.82	0.07	34.42	5.94	0.12
Buccal	3.86	1.17	0.78	13.08	0.88	0.04*	36.57	2.92	0.02*

\*Represent significant *P* value.



**Fig. 6.** The average pain scores (vas) between buccal based triangular flap and lingual based triangular flap.



**Fig. 7.** The average scores for swelling (mm) between buccal based triangular flap and lingual based triangular flap.

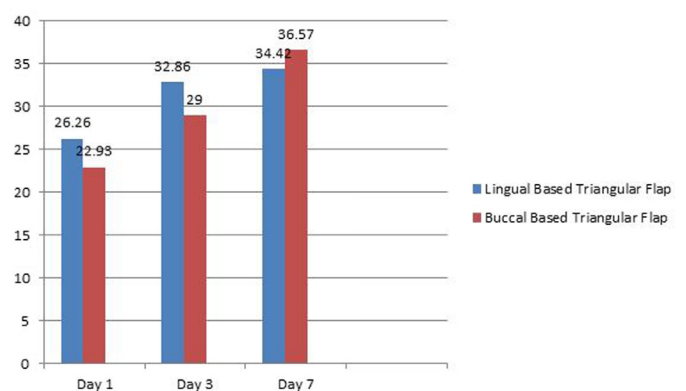
**Wound healing**

In lingual based triangular flap group, 2 patients reported with tissue dehiscence. In buccal based triangular flap group, 7 patients presented with wound gaping and 2 patients developed dry socket.

**Discussion**

The purpose of this study was to compare two different flap designs, namely buccal based triangular flap and lingual based triangular flap techniques on postoperative pain, swelling and trismus after mandibular third molar surgery.

Flap designs are predominantly considered as a key factor in the occurrence of postoperative morbidities. Except a few flap designs (comma shaped flap, tongue shaped flap, lingual based triangular flap) the incision line for numerous flap types are not placed on the natural bone during removal of mandibular third molar [4]. Nageshwar [5], compared comma shaped flap with modified envelope flap and Kumar *et al.* [6] compared comma shaped flap with triangular flap. The authors have emphasized



**Fig. 8.** The average scores for mouth opening (mm) between buccal based triangular flap and lingual based triangular flap.

that patients in comma shaped flap group had less pain, swelling and trismus after mandibular third molar removal. However, Nageshwar [5] found statistical insignificant results for swelling and trismus postoperatively.

The current study evaluated parameters such as pain, swelling and trismus between buccal based triangular flap and lingual based triangular flap groups on 1st, 3rd and 7th postoperative days. The patients included in lingual based triangular flap group had less pain on all three postoperative days when compared to buccal based triangular flap group which showed a statistical significance of  $P < 0.001$ . The above results had a similar association with Hassan *et al.* [7] and Rai *et al.* [8]. While, the findings of Yolcu *et al.* [9] and Yuvar *et al.* [10], declared that patients in lingual based triangular flap experienced greater pain when compared to buccal based triangular flap group. The author also emphasized that, the increased pain may be due to the utility in the size of the lingual based triangular flap is larger than the buccal based triangular flap.

The amount of swelling in lingual based triangular based flap group reduced only on the 3<sup>rd</sup> postoperative day ( $P < 0.05$ ) and patients in buccal based triangular flap group encountered less swelling on 1st and 7th postoperative days ( $P < 0.05$ ). Hassan *et al.* [7] and Said *et al.* [2] illustrated that the facial swelling was drastically reduced in lingual based triangular flap group, but the results obtained were statistically insignificant. While, Menziletoglu *et al.* [11] found that buccal based triangular flap group had less swelling when compared to lingual based triangular flap group. The authors have also suggested that, the retraction of the lingual based triangular flap was tedious and the visibility of the surgical site was not adequate. Hence, this might have led to the traumatic elevation of the flap causing high postoperative complications [10].

The degree of trismus was markedly decreased in lingual based triangular flap group on 1st and 3rd postoperative days ( $P < 0.05$ ) and patients in buccal based triangular flap group showed reduction in the amount of trismus on 7th postoperative day ( $P < 0.05$ ). Menziletoglu *et al.* [11] found that patients included in the buccal based triangular flap showed reduction in trismus when compared to lingual based triangular flap. Said *et al.* [2] and Yolcu *et al.* [9] determined that the amount of trismus was less in lingual based triangular flap, but the results of their study were statistically insignificant.

Bello *et al.* [12] reported that the surgical intervention time has an influencing effect on the postoperative complications. The inflammatory mediators are greatly released when the operation time is increased. Hassan *et al.* [7] proclaimed that the total surgical intervention time was elongated in lingual based triangular flap group. This is because, the author required more time in suturing the lingual based triangular flap than buccal based triangular flap. Controversies still exist in English literature with respect to the healing nature of extracted socket after third molar removal. In a lingual based triangular flap, the flap is sutured away from the socket, hence the incidence of tissue dehiscence is minimised. In buccal based triangular flap, the flap is sutured over the extracted socket which is broken down after a few days and healing occurs through secondary intention [13,14].

In the current study, 2 patients in lingual based triangular flap reported with tissue dehiscence which had a positive

correlation with Yolcu *et al.* [9] where the dehiscence located on the sound bone and not over the extracted socket. In buccal based triangular flap group, 7 patients presented with wound gaping and 2 patients developed dry socket. The above findings had a similar association with Said *et al.* [2] where the patients included in their study showed a higher incidence of wound dehiscence and dry socket in buccal based triangular flap group.

## Conclusion

The present study compared lingual based triangular flap with buccal based triangular flap on postoperative parameters such as pain, swelling and trismus on 1st, 3rd and 7th postoperative days. The results of our study conclude that:

- The lingual based triangular flap group was found to be superior when compared to buccal based triangular flap group as the patients overall had less pain, swelling and trismus after mandibular third molar surgery.
- The patients included in lingual based triangular flap group had minimal postoperative complications when compared to buccal based triangular flap group, because the incision and suturing of the lingual based triangular flap was placed on the natural bone while the buccal based triangular flap was placed over the extracted socket.

## Author contributions

The conception of study design, material preparation, data collection and analysis, manuscript writing and the final manuscript approval was performed by Dr. Balamurugan Rajendran.

## Conflict of interest

The author declare that they have no conflict of interest with the present study.

## Funding

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## Competing interests

The authors have no relevant financial or non-financial interests to disclose.

## Ethical approval

This study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by the Ethics Committee of RYA Cosmo Foundation (EC/RYA/005).

## Consent to participate

Informed consent was obtained from all individual participants included in the study.

## Consent to publish

The authors affirm that human research participants provided informed consent for publication of the images in [Figures 1–4](#).

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