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Comparison of buccal flap Vs flapless procedure for removal of partially impacted mandibular third molars: A Prospective study

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ABSTRACT

Different surgical techniques have been suggested for removal of third molars. In these techniques, surgical removal of mandibular third molars has required creation of a flap and performance of ostectomy. Different techniques have different limitations about pain, trismus, and swelling. Another most important complication that an oral surgeon faces is periodontal pocket formation on the distal of mandibular 2nd molar and subsequent cementum exposure following removal of partially erupted or impacted 3rd molars. Present study was conducted to comparatively evaluate the effect of flap and flapless extraction of partially impacted bilateral mandibular third molar for postoperative pain, swelling, trismus and pocket depth distal to second molar by the careful surgical planning and execution. Different parameters were assessed and statistically analyzed. Results suggested that Flapless procedures had better results ($p<0.05$) in terms of pain, swelling, trismus, and pocket depth distal to second molar when compared to procedure with creation of Flap. The open healing of the surgical wound after removal of impacted third molars produces less post-operative swelling and pain than occurs with closed healing, by hermetically suturing the socket. So the technique can be recommended and exaggerated in routine clinical practices.

INTRODUCTION

Third molars are the most common impacted teeth in oral cavity. Approximately 90% of the population with approximately 33% having at least one impacted third molar probably because of both genetic and environmental factors [1]. An impacted tooth can cause the patient from mild to serious problems if it remains in the unerupted state. However, every impacted tooth may not cause a problem of clinical significance, but each tooth does have that potential. Vast information has been collected based on extensive clinical experience and clinical studies from which indications for removal of impacted teeth have been formulated. For some indications, there is lack of evidence-based data gained from long-term prospective longitudinal studies [2]. However, surgical removal of impacted 3rd molars is one of the most frequently performed surgical procedure to treat pathosis caused by impacted teeth, such as pericoronitis, periodontal defect in the distal aspect of the second molar, caries of third or second molars, different types of cyst and odontogenic tumors, and neurogenic pain. The procedure requires sound understanding of surgical principles along with patient management skills. It must be performed properly to allow expeditious and atraumatic removal of teeth embedded in a relatively inaccessible part of the oral cavity. Though it is a minor surgical procedure its relation to adjacent soft tissues, vital teeth and neurovascular bundle makes it a complex procedure.

Different surgical techniques for removal of third molars have been suggested in literature. In these techniques, surgical removal of mandibular third molars has required creation of a flap and performance of ostectomy [3]. Surgical removal of mandibular third molar is generally followed by complaints from the patient about pain, trismus, and swelling. The duration of the surgery, incision and the reflection of the mucoperiosteal flap have been shown to affect the intensity and frequency of postoperative complaints [4,5]. Pain and swelling are mostly related to the incision and the reflection of a mucoperiosteal flap and the duration of the procedure, that probably results from the prolonged manipulation of the open wound because tooth sectioning and removal of bone do not influence pain and swelling [6]. Another most important complication that an oral surgeon faces is periodontal pocket formation on the distal of mandibular 2nd molar and subsequent cementum exposure following removal of partially erupted or impacted 3rd molars [7,8,9].

This study was aimed to comparatively evaluate the effect of flap and flapless extraction of partially impacted bilateral mandibular third molar in reducing postoperative pain, swelling, trismus and pocket depth distal to second molar for patient benefit from the careful surgical planning and execution.

Aims and Objectives:

1. To compare the extraction of partially impacted mandibular third molar with or without buccal flap.
2. To compare pain, swelling, trismus, time taken for surgery, and to measure pocket depth distal to second molar.

MATERIALS AND METHODS

The present study was conducted in ten patients of both sexes aged between 18-40 years who required bilateral surgical removal of their impacted mandibular third molars under local anesthesia were included in the study.

Inclusion Criteria:

1. Patients should be of age between 18-40 years.
2. Patients should be healthy ambulatory in ASA class I.
3. Subjects ready to give written consent and willing to participate in the study.
4. Patients undergoing extractions of bilateral impacted lower third molars, of which the tooth undergoing flapless extraction should full fill the following criteria:

The impacted tooth should be mesioangular, horizontal, or partially covered by soft tissue, radiographically the distal surface of the crown should be completely anterior to the anterior border of the mandibular rami and the occlusal surface of the impacted molar should be at the level or nearly level with the occlusal plane of the second molar.

Exclusion Criteria:

1. Patients with systemic diseases, pregnancy and breast-feeding or on any other medicinal therapy will be excluded from this study.
2. Patients with swelling, inflammation or infection in the area of operation.

Only the individuals completing the above criteria were selected for the study. A detailed case history of the patient was obtained and routine records for the purpose of diagnosis and treatment planning along with intraoral periapical/panaromic radiographs were obtained for all the patients. Informed written consent was taken from all the patients prior to treatment. The patients undergoing surgery were divided into 2 groups:

GROUP I (CONTROL): Surgical removal of lower third molar by raising a buccal flap.
GROUP II (TEST): Surgical removal of lower third molar without raising a buccal flap.

Surgical removal of lower third molar was done without raising a buccal flap on in one side and the removal of lower third molar on contralateral side by raising a buccal flap 2-4 weeks later.

Parameters:

- ***Swelling*:** To measure the extent of swelling, preoperatively and postoperatively measurements were taken by marking on lowest attached part of ear lobules and corner of mouth. Postoperative measurements were done on 2nd and 7th days.

The preoperative and postoperative measurements were made in closed mouth position. Using a measuring calibrated scale to follow the contour of the face, linear distances were noted.

- ***Pain*:** It was measured using a visual analogue scale.
- ***Trismus*:** Inter-incisal distance was measured in millimeters with the help of a calibrated scale between left maxillary and mandibular central incisors when the mouth of the patient was completely open. In the absence of any of these two teeth, adjacent teeth were taken into consideration
- ***Pocket Depth*:** A calibrated periodontal probe was placed on the distal surface of second molar and was inserted into the alveolar mucosa till the tip of the probe reached the alveolar bone distal to second molar, and the readings were noted at 1st month and 2nd month postoperatively.

The Details were recorded pre-operatively and intra-operatively in a prescribed Performa are: 1) The tooth to be removed. 2) Type of impaction. 3) Pre-operative facial contour measurement in cm. 4) Inter incisal distance in mm. 5) Duration of surgery:

a) For group I: Incision to suturing
b) For group II: Tooth sectioning to tooth elevation

A pre-structured Performa is used to collect relevant informations like parameters, investigations and post-operative drugs given to individual patient.

Operative Technique:

After routine blood and radiographic investigations, the patients were taken up for surgery. Aseptic conditions achieved with povidine-iodine solution and draping procedure was carried out. Intraoral preparation was done with povidine-iodine solution and normal saline irrigation was done. In both the groups, anesthesia was secured with 2% Lignocaine hydrochloride with 1:80000 adrenaline (Lignox, Warren pharmaceuticals) with inferior alveolar nerve block, lingual nerve block and long buccal nerve block and surgical removal of the impacted third molar in group I and group II was done at different appointments of same patient.

For Group I: Incision, reflection of flap, bone guttering and tooth elevation:

The triangular incision was used, the incision started from an imaginary point from apex of mesial root of second molar passes upwards extended up to the distobuccal angle of the second molar at the gingival margin for a distance of 1-2 cm. The incision then carried along the gingival crevice of the third molar extending up to the exposed distal surface of the tooth. The mucoperiosteal flap was reflected to expose the tooth and bone with Howarth elevator. Bone was removed with a round bur and a straight fissure bur (RPM - Rotation per minute 35,000) under constant irrigation of normal saline to create a 'gutter' along the buccal side and distal surface of the tooth. Coupland or Cryer elevator was used to deliver the tooth. In cases where tooth sectioning was required it was done with a straight fissure bur, longitudinally along the long axis of tooth and tooth removed in two fragments using Coupland or Cryer's elevator.

For Group II: Tooth sectioning and tooth elevation

In cases for this group after achieving adequate anesthesia, tooth were sectioned longitudinally using round bur and a straight fissure bur (RPM-Rotation per minute 35,000) under constant irrigation of normal saline, tooth was not sectioned completely with rotary bur but a thin plate of enamel was left behind which was then fractured using Coupland elevator, this was done to prevent accidental injury to lingual nerve while splitting tooth longitudinally and removed in two pieces.

Debridement and Closure:

The tooth follicle attached to the socket and remnants of bone were removed. Sharp bony edges were smoothened by bone file and socket was irrigated with normal saline. For **group I** the flap was approximated and the wound was sutured with 3 simple interrupted sutures using 3-0 non absorbable black braided silk and for **group II** approximation of the margins was achieved with digital pressure. A pressure pack was given to attain haemostasis. Post-operative instructions and follow up was advised. Patients were recalled on 2nd day, 7th day, 1st month and 2nd month postoperatively and measurements recorded every time. The sutures were removed for group I patients on the 7th post-operative day. All the patients were given oral Amoxycilline 500 mg and oral Metronidazole 400 mg 8 hourly for 5 days and analgesic Ibuprofen 400 mg 8 hourly for three days).

Post-operative assessment:

Pain, swelling and mouth opening were recorded on second and seventh post-operative days. Facial swelling was determined by recording facial contour post-operatively and comparing it with pre-surgical baseline measurements. Pain was recorded objectively using Visual Analogue Scale (VAS) and was graded 1 to 10, depending upon the pain experienced by the patient on second and seventh post-operative days.

Postoperative mouth opening (inter-incisal distance) on second and seventh post-operative days were recorded in millimeters by using Calibrated scale compared to the mouth opening recorded preoperatively. Pocket depth distal to second molar was recorded at 1 month and 2nd month postoperatively using calibrated periodontal probe, UNC-15
The data thus obtained was tabulated and subjected to statistical analysis.

RESULTS

Table 1 and Illustration 1: A total of 10 subjects of both genders aged between 18-40 years who required bilateral surgical removal of their impacted mandibular third molars under local anesthesia were included in the study. It was a split mouth study. The same individual belonged to both Group I (Control): surgical removal of lower third molar by raising a buccal flap and Group II (Test): Surgical removal of lower third molar without raising a buccal flap. Hence, 10 (50%) belonged to group I and 10 (50%) belonged to group II. The Surgical removal of lower third molar without raising a buccal flap was selected randomly and on other site removal of lower third molar by raising a buccal flap was done on second appointment usually 2-4 weeks later.

Table 1: Distribution of Impacted sites of Individuals among groups

S.no.	GROUPS	**Surgical removal of lower third molar**	TOTAL	
			No. of samples	Percentage
1	**GROUP I (CONTROL)**	By raising a buccal flap	10	50
2	**GROUP II (TEST)**	Without raising a buccal flap	10	50
	TOTAL		20	100

Graph 1:

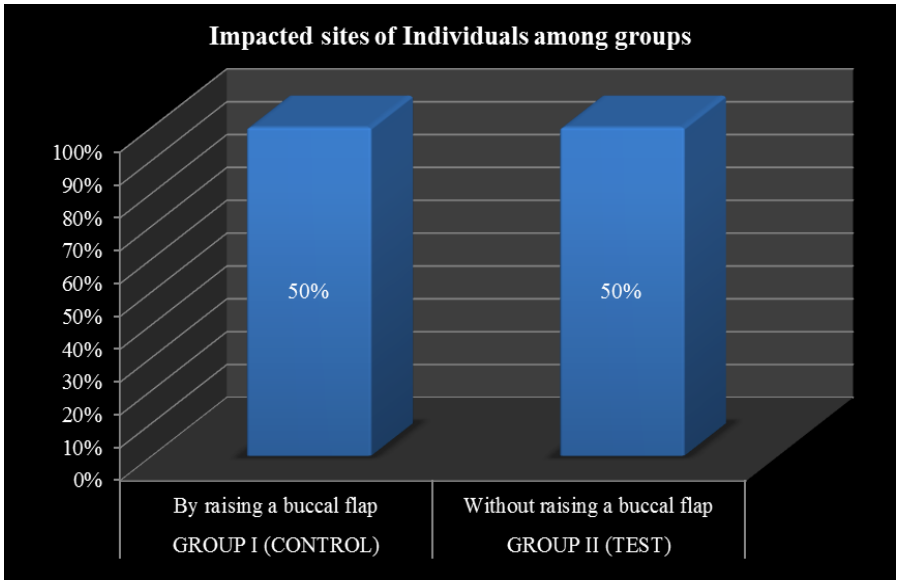


Table 2 and Illustration 2: A total of 10 subjects were included in study. Out of which 5 (50%) subjects belonged to 18-24 years and 5(50%) subjects belonged to 25 years and above age group.

Table 2: Age wise distribution of study population

Age Group (in years)	**Group I/ Group II**	
	Number of patients	Percentage
18-24	5	50
25 and above	5	50
Total	10	100

Graph 2:

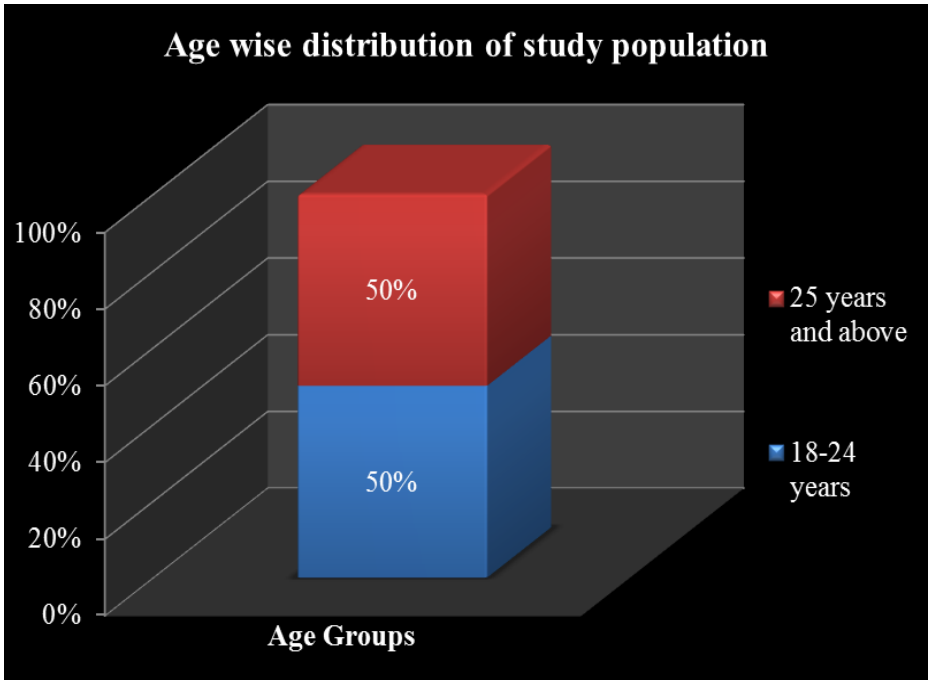


Table 3 and Illustration 3: A total of 10 subjects were included in study. Out of which 7 (70%) subjects were males and 3 (30%) subjects were females.

Table 3: Gender wise distribution of study population

Gender	**Group I/ Group II**	
	Number of patients	Percentage
Males	7	70
Females	3	30
Total	10	100

GRAPH 3:

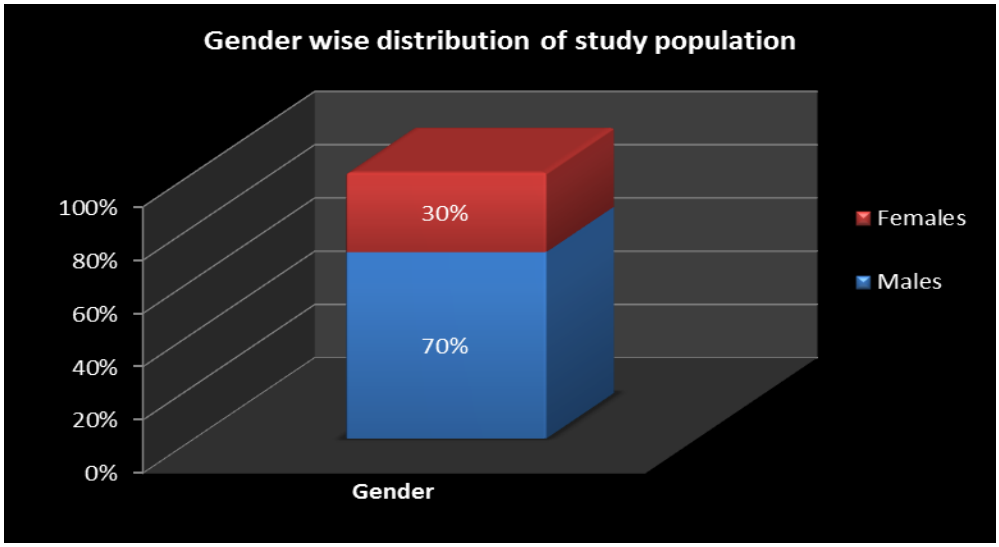


Table 4 and Illustration 4: The distribution of subjects according to Site of surgery among the two groups was compared using the chi-square test. It was found to be statistically significant.

Table 4: Distribution of study population based on Site of surgery

Etiology	GROUP I (CONTROL)		GROUP II (TEST)	
	Number of subjects	Percentage	Number of subjects	Percentage
Left	6	60	4	40
Right	4	40	6	60
Chi square value	40, 1			
p[a] value	0.00*			

[a]Chi square Test, * Significance of relationship at p < 0.05

GRAPH 4:

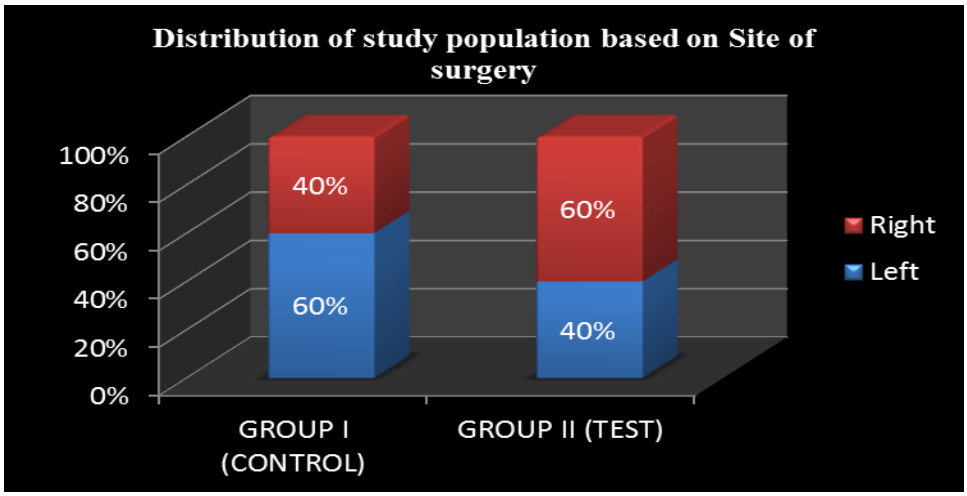


Table 5 and Illustration 5: The mean (SD) for Duration of Duration of surgery (In Minutes) was compared in the two groups using Paired 't' Test. For Group I, the mean for Duration of surgery was 22.2 (3.22) min and For Group II, the mean for Duration of surgery was 14.8 (1.22) min. The findings were found to be significant with Group II taking *statistically significant* less time for Duration of surgery as compared to Group I.

Table 5: Mean and standard deviation of Duration of surgery (In minutes) in two groups

Duration of surgery in Minute (in minutes)		
	GROUP I (CONTROL)	**GROUP II (TEST)**
Mean	22.2	14.8
Standard Deviation (SD)	3.22	1.22
t value	8.367	
p [a] value	0.00*	

[a] **Paired 't' Test, * Significance of relationship at p < 0.05**

Graph 5:

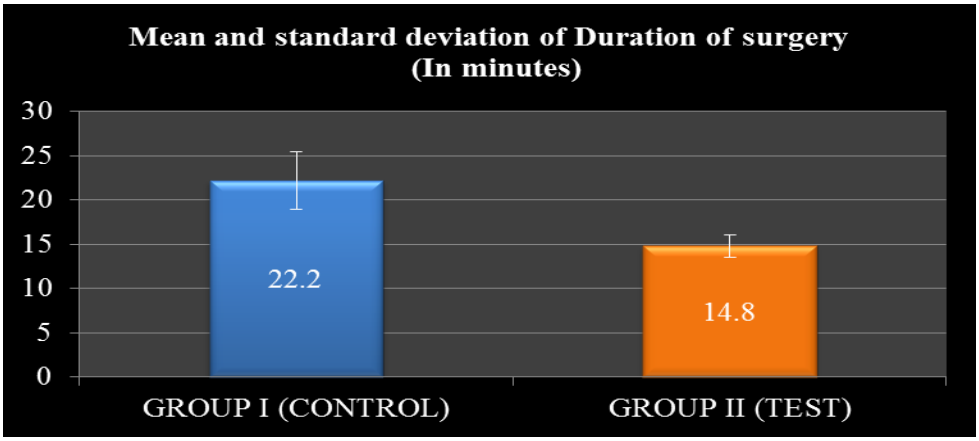


Table 6 and Illustration 6: The Mean and standard deviation for Pre-operative Swelling (facial contour in cm) was compared in the two groups using Paired 't' Test. For Group I, the mean for Pre-operative Swelling (facial contour) was 9.96 (0.83) and For Group II, the mean for Pre-operative Swelling (facial contour) was 10.7 (0.80). The findings were not found to be significant.

Pre-operative Swelling (facial contour)

Table 6: Mean and standard deviation of Pre-operative Swelling (facial contour in cm) in two groups

	GROUP I (CONTROL)	**GROUP II (TEST)**
Mean	9.96	10.7
Standard Deviation	0.83	.80
t value	-1.877	
p[a] value	.09	

[a] **Paired 't' Test, * Significance of relationship at p < 0.05**

Graph 6:

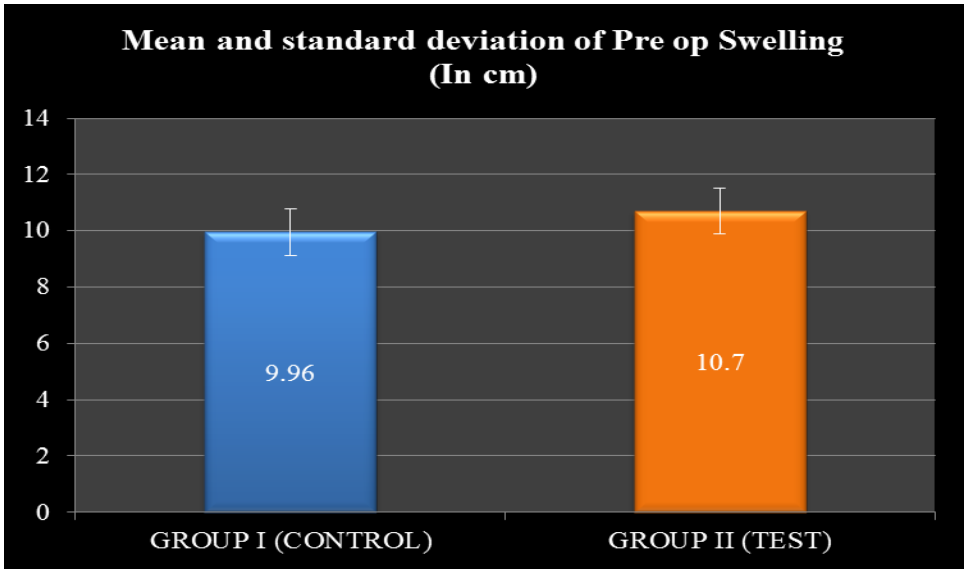


Table 7 and Illustration 7**:** The Mean and standard deviation for Pre-operative Mouth Opening (In mm) was compared in the two groups using Paired't' Test. For Group I, the mean for Pre-operative Mouth Opening was 44.5 (6.11) mm and For Group II, the mean for Pre-operative Mouth Opening (In mm) was 44.4 (6.09). The findings were not found to be significant.

Table 7: Mean and standard deviation of Pre-Operative Mouth Opening (In mm) in two groups

	GROUP I (CONTROL)	GROUP II (TEST)
Mean	44.5	44.4
Standard Deviation	6.11	6.09
t value	1.000	
p[a] value	.34	

[a] **Paired 't' Test, * Significance of relationship at p < 0.05**

GRAPH 7:

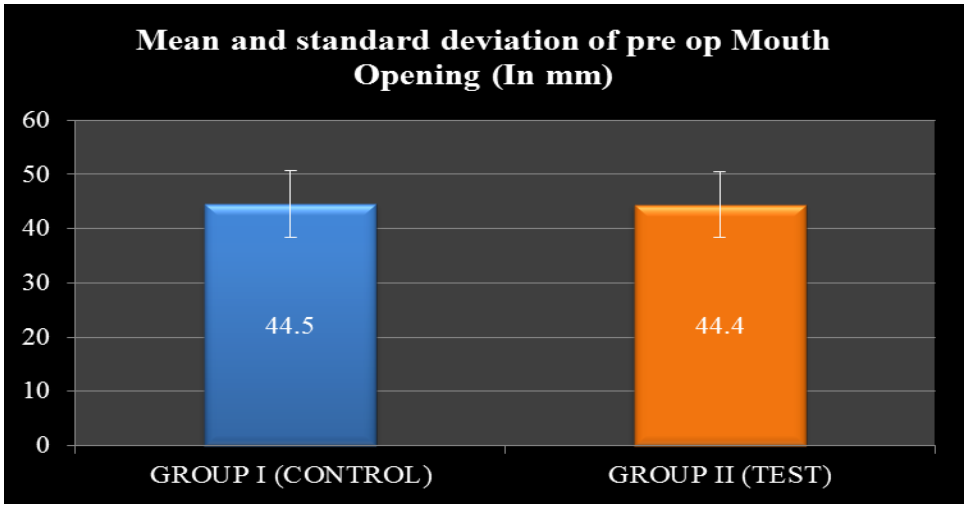


Table 8 and Illustration 8: The Mean for Presence of pain was found to be 5.3 (0.94) in Group I and 1.5 (1.08) in Group II. It was compared using Paired 't' Test and this difference was found to be statistically significant. Group II subjects reported less pain as compared to Group I.

POST- OPERATIVE ASSESSMENT- 2nd day
PAIN – VISUAL ANALOGUE SCALE

Table 8: Mean and standard deviation of pain in two groups

	GROUP I (CONTROL)	GROUP II (TEST)
Mean	5.3	1.5
Standard Deviation	0.94	1.08
t value	8.143,9	
p[a] value	.00*	

[a] **Paired 't' Test, * Significance of relationship at p < 0.05**

GRAPH 8:

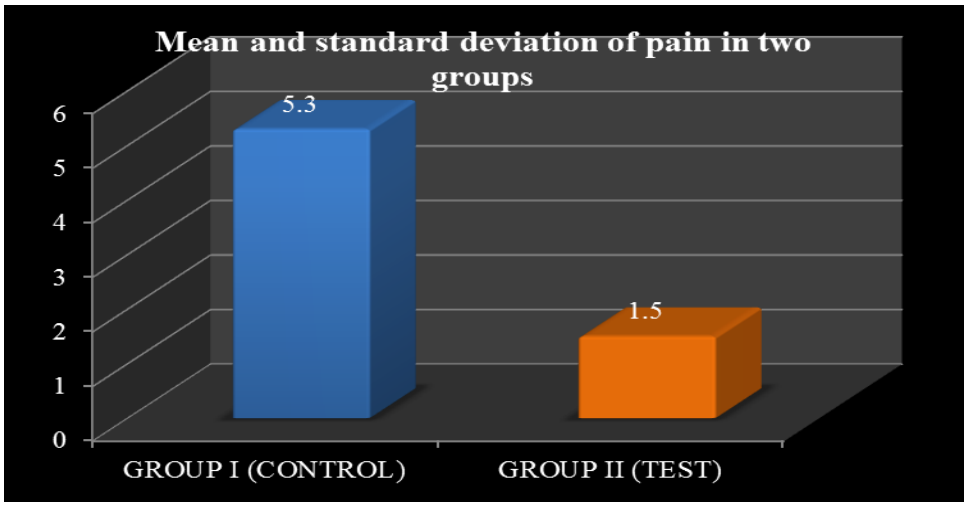


Table 9 and Illustration 9: The Mean and standard deviation for Post-operative Swelling (facial contour in cm) was compared in two groups using Paired 't' Test. For Group I, the mean for Post-operative Swelling (facial contour) was 10.41 (0.80) and For Group II, the mean for Pre-operative Swelling (facial contour) was 10.08 (0.81). The findings were found to be statistically significant. Group II subjects reported less post-operative swelling as compared to Group I.

Post-Operative Swelling (facial contour)

Table 9: Mean and standard deviation of Post-Operative Swelling (facial contourin cm) in two groups

	GROUP I (CONTROL)	GROUP II (TEST)
Mean	10.41	10.08
Standard Deviation	0.80	.81
t value	3.414,9	
p[a] value	.00*	

[a] **Paired 't' Test, * Significance of relationship at p < 0.05**

GRAPH 9:

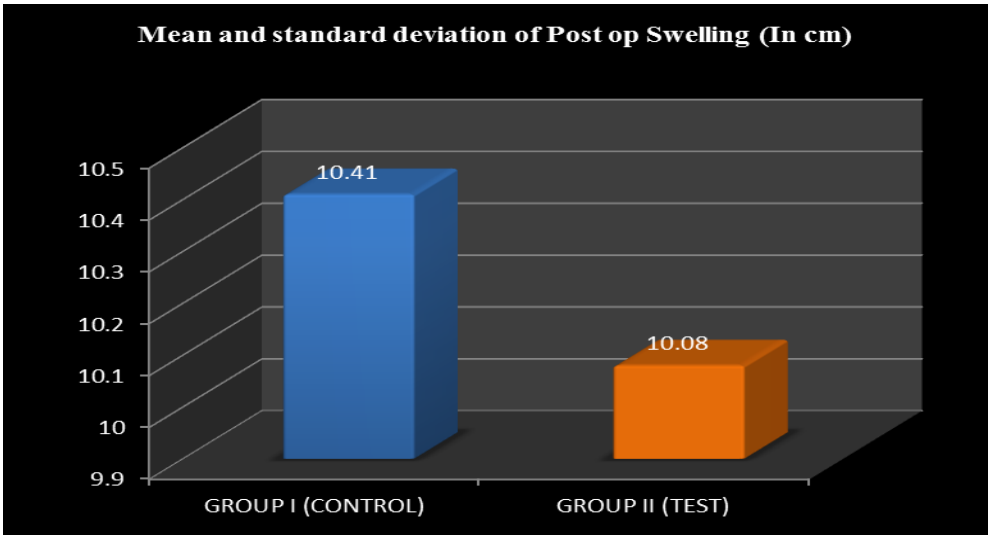


Table 10 and Illustration 10: The Mean and standard deviation for Pre-operative Mouth Opening (In mm) was compared in two groups using Paired 't' Test. For Group I, the mean for Pre-operative Mouth Opening was 32.7 (6.41) mm and For Group II, the mean for Pre- operative Mouth Opening (In mm) was 41.0 (5.31). The findings were found to be statistically significant. Group II subjects had more post- operative mouth opening as compared to Group I.

Post-Operative Mouth opening

Table 10: Mean and standard deviation of Post-operative Mouth Opening (In mm) in two groups

Etiology	**GROUP I (CONTROL)**	**GROUP II (TEST)**
Mean	32.7	41.0
Standard Deviation	6.41	5.31
t value	-6.223,9	
p[a] value	.00*	

[a] **Paired 't' Test, * Significance of relationship at p < 0.05**

GRAPH 10:

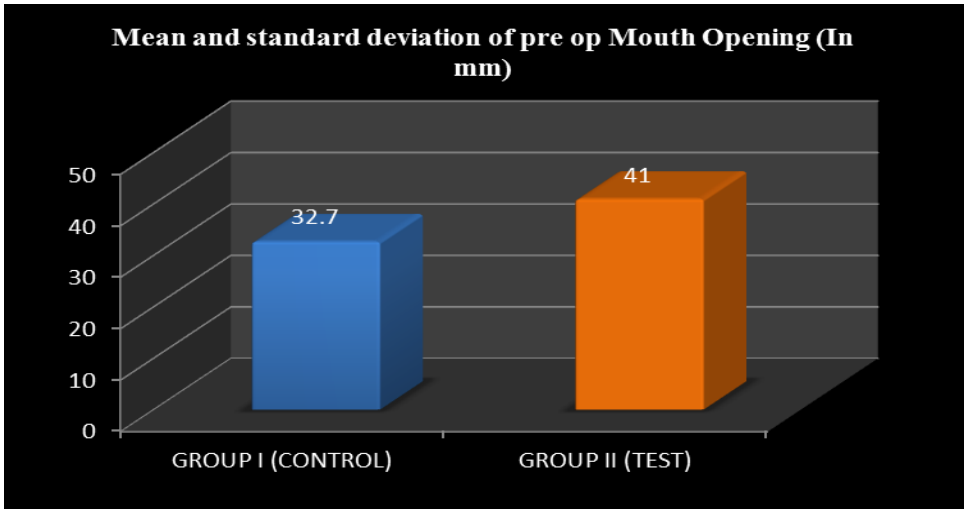


Table 11 and Illustration 11: The Mean for Presence of pain was found to be 1.4 (0.84) in Group I and 0.0 (0.0) in Group II. It was compared using Paired 't' Test and this difference was found to be statistically significant. Group II subjects reported less pain as compared to Group I.

POST OPERATIVE ASSESSMENT- 7th day
PAIN – VISUAL ANALOGUE SCALE

Table 11: Mean and standard deviation of pain in two groups

	GROUP I (CONTROL)	GROUP II (TEST)
Mean	1.4	0.0
Standard Deviation	0.84	0.0
t value	5.25,9	
p[a] value	.00*	

[a] **Paired 't' Test, * Significance of relationship at p < 0.05**

GRAPH 11:

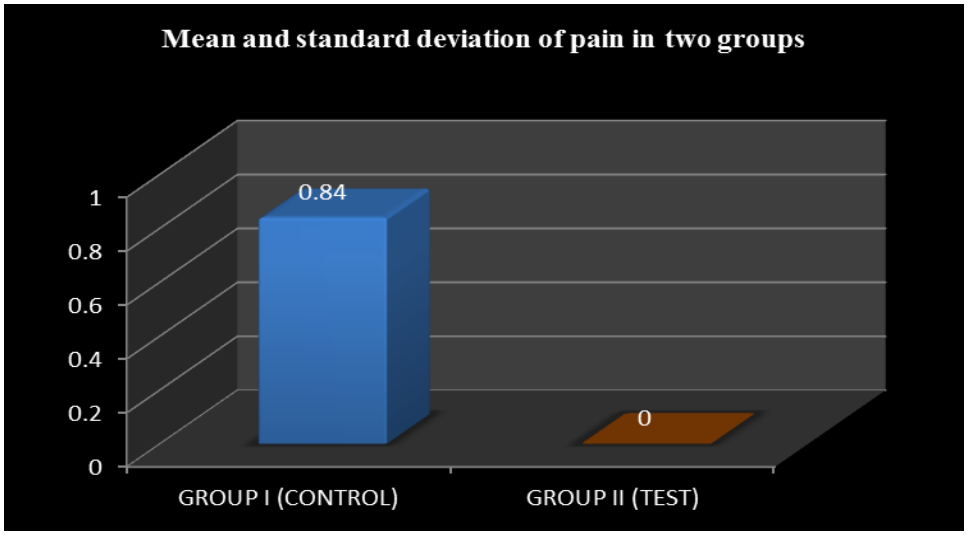


Table 12 and Illustration 12: The Mean and standard deviation for Post- operative swelling (facial contour in cm) was compared in the two groups using Paired 't' Test. For Group I, the mean for Post-operative Swelling (facial contour) was 9.99 (0.26) and For Group II, the mean for Pre-op Swelling (facial contour) was 9.66 (0.27). The findings were not found to be significant.

Post-Operative Swelling (facial contour)

Table 12: Mean and standard deviation of Post-operative Swelling (facial contour in cm) in two groups

	GROUP I (CONTROL)	GROUP II (TEST)
Mean	9.99	9.66
Standard Deviation	0.25	.27
t value	1.394,9	
p[a] value	.19	

[a] **Paired 't' Test, * Significance of relationship at p < 0.05**

GRAPH 12:

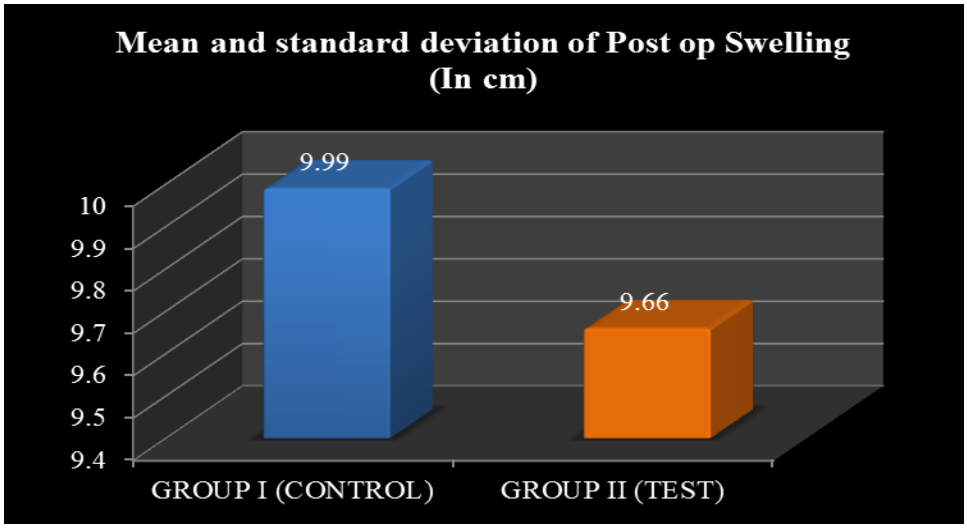


Table 13 and Illustration 13: The Mean and standard deviation for Pre-operative Mouth Opening (In mm) was compared in the two groups using Paired't' Test. For Group I, the mean for Pre-operative Mouth Opening was 40.3 (5.7) mm and For Group II, the mean for Pre-operative Mouth Opening (In mm) was 44.4 (6). The findings were found to be statistically significant. Group II subjects had more post-operative mouth opening as compared to group1.

Post-operative Mouth opening

Table 13: Mean and standard deviation of Post-operative Mouth Opening (In mm) in two groups

Etiology	**GROUP I (CONTROL)**	**GROUP II (TEST)**
Mean	40.3	44.4
Standard Deviation	5.7	6.0
t value	-3.231,9	
p[a] value	.01*	

[a] **Paired 't' Test, * Significance of relationship at p < 0.05**

GRAPH 13:

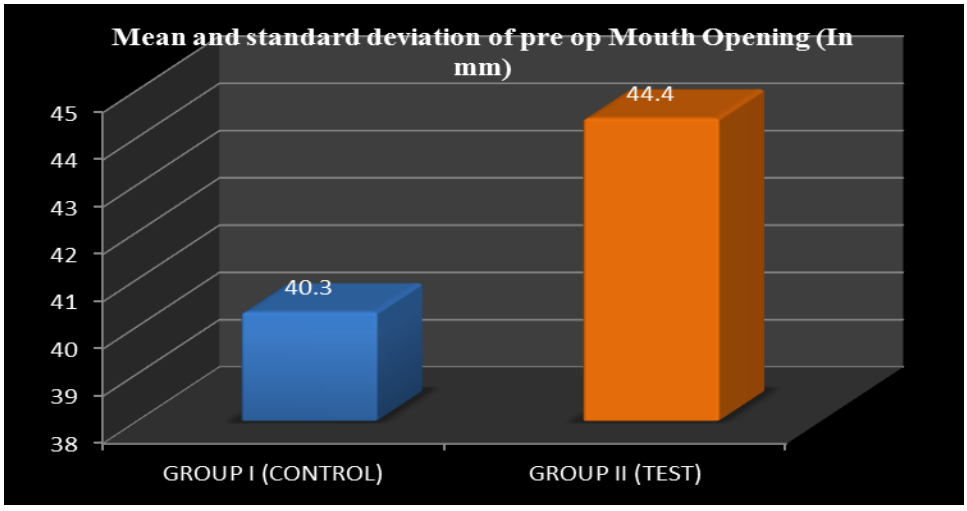


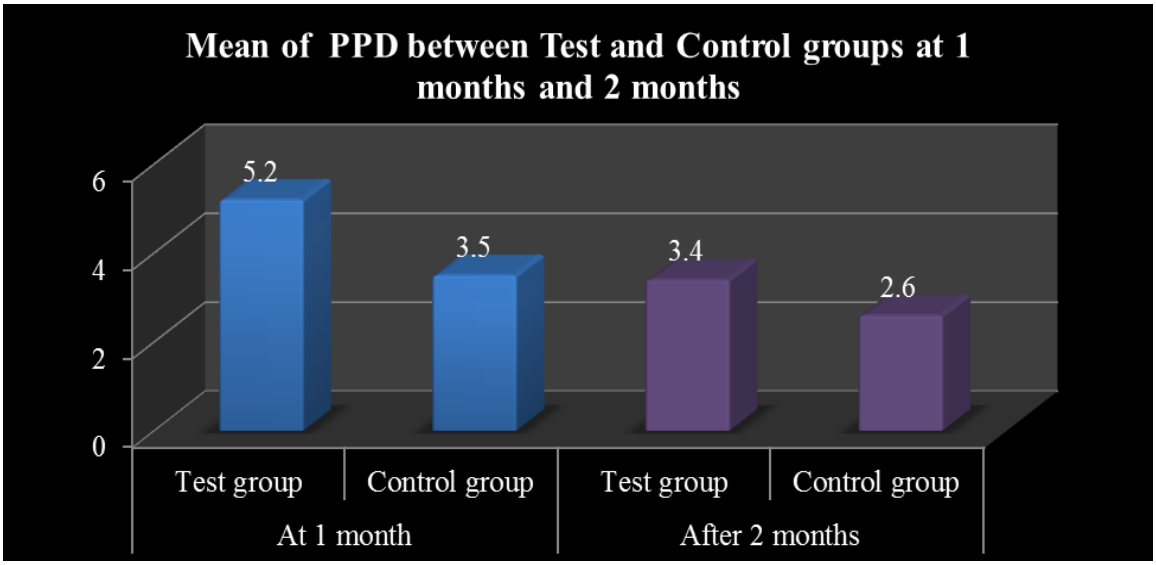
Table 14 and Illustration 14: shows, the mean Periodontal Probing Depth at 1 month for the test group was found to be 5.2 (1.03) and for control group was found to be 3.5 (0.52). A comparison for Periodontal Probing Depth was done using Paired't' test between the two groups. This difference reached the level of significance for Test and Control groups at 1 month.

PERIODONTAL PROBING DEPTH

Table 14: Comparison of Mean and Standard deviation (SD) of Periodontal Probing Depth between Test and Control groups at 1 months and 2 months.

Periodontal Probing Depth		Mean	Std. Deviation	t-test value	df	p-value
At 1 month	Test group	5.2	1.03	4.295[a]	9	0.00*
	Control group	3.5	0.52			
After 2 months	Test group	3.4	0.69	4.00[a]	9	0.00*
	Control group	2.60	0.51			
	[a]Paired test, *Significance of relationship at p < 0.05					

GRAPH 14:



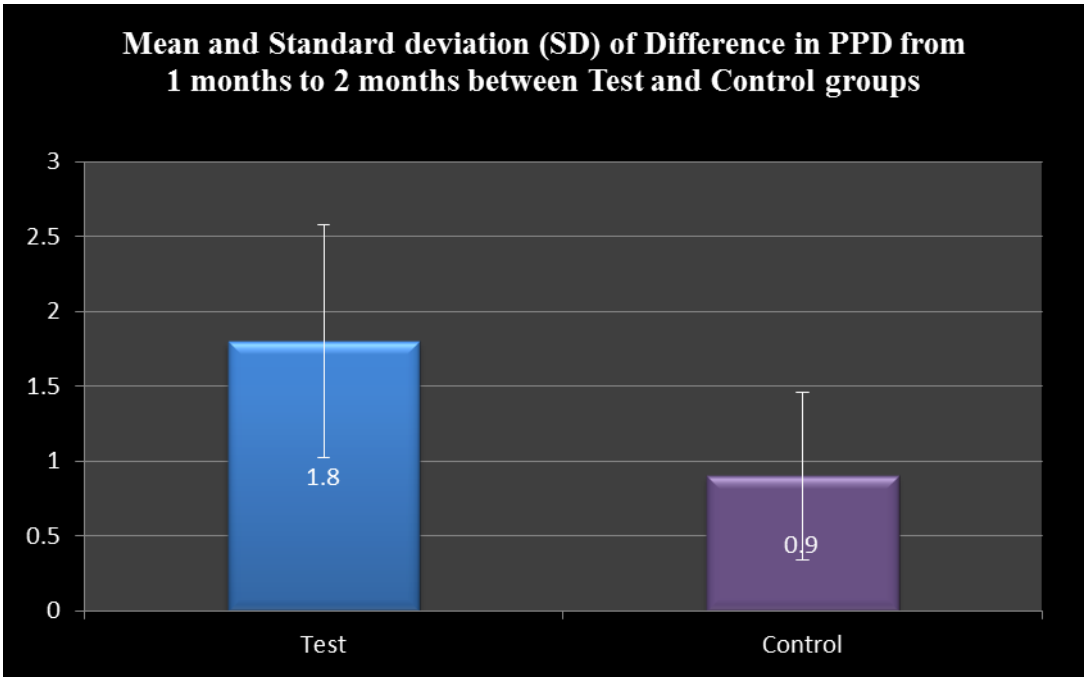
The mean Periodontal Probing Depth after 2 months for the test group was found to be 3.4 (0.69) and for control group was found to be 2.60 (0.51). A comparison for Periodontal Probing Depth was done using Paired't' test between the two groups after 2 months. This difference reached the level of significance for Test and Control groups at 2 months

Table 15 and Figure 15: shows, the mean of Difference in Periodontal Probing Depth from 1 months and 2 months between Test and Control groups for the test group was found to be 1.80 (0.78) and for control group was found to be 0.90 (0.56). A comparison for Periodontal Probing Depth was done using Paired't' test. This difference for the mean of Difference in Periodontal Probing Depth from 1 month to 2 months between Test and Control groups was *found to be statistically significant.*

Table 15: Comparison of Mean and Standard deviation (SD) of Difference in Periodontal Probing Depth from 1 months to 2 months between Test and Control groups

Difference in PPD from 1 months to 2 months	Mean	Std. Deviation	t-test value	Df	p-value
Test	1.80	0.78	2.586[a]	9	0.02*
Control	0.90	0.56			
[a]Paired test, *Significance of relationship at p < 0.05					

GRAPH 15:



DISCUSSION

Impacted third molar surgery is a common dental procedure that requires a sound understanding of surgical principles and patient management skills, and often the removal of impacted lower third molar involves trauma to the soft and hard tissues due to preparation and retraction of a mucoperiosteal flap and the removal of bone, which is frequently followed by edema of varying degree, pain, trismus and at times delayed healing [11].

Incision and flap design in any surgical procedure is based on time-tested principles. The incisions used to expose impacted mandibular third molars that have been described in textbooks and various studies can be broadly grouped under triangular (vertical) and envelope types. As far as possible, the incision shouldn't lie over prospective bony defects or cut across the major muscle or tendon insertions. However, the distal leg of the incisions conventionally made to access impacted mandibular third molars comes close to or even cuts across the insertion of the temporalis tendon. This could be responsible, at least in part, for the occurrence of complications like pain, swelling, trismus and compromised periodontal health status of preceding second molar [12].

In 1936, Rehrmann proposed a flap repositioning technique to secure healing by first intention after the extraction of lower third molars. With this approach, a complete wound sealing was achieved, and contamination from the oral cavity was avoided. However, in recent years, some authors have suggested that primary closure of the wound prevents drainage of the latter thereby worsening the postoperative pain and the swelling [13].

The method, in which room is provided for the evacuation of the inflammatory exudates, will obviously result in less pain, swelling, and trismus. The published data have described several methods of achieving partial closure, including excision of mucosa immediately distal to the second molar to create a window, which serves as an outlet for the inflammatory exudates. Other methods have included a combination of mucosa excision and placement of drains, incorporation of drains that could be in the form of gauze or rubber, and a "sutureless" technique in which no form of suturing is performed. These methods are associated with one or more limitations [14, 34].

It seems that tight closure over a large bony socket or defect does not facilitate drainage and oral hygiene. Suturing may create one way valve that allows food debris to enter the socket but not easily escape. This leads to local infection, inflammation, edema, clot necrosis, alveolar osteitis and pain. Avoiding suture closure in this area is not illogical when one considers that the treatment for alveolar osteitis is irrigation, debridement, and dry socket dressing to create a constant opening. A small flap left open may actually facilitate drainage, improve hygiene and reduce the risk of postoperative

complication [14]. Recently Waite and Cherala have reported very good results after 1280 surgical extractions of mandibular third molars involving the raising of a small conservative flap that is passively repositioned without suturing [35]. The main drawback that was noted by Osunde following sutureless closure was delayed healing of the surgical site [15].

All three phenomena (pain, swelling, and trismus) may reflect the formation of prostaglandins and other mediators of pain and swelling from membrane phospholipids released as a result of surgery. It thus seems reasonable that the severity of pain, swelling, and trismus should be related to the "aggressiveness" of the surgery [36].

As flap elevation is one of the major factors influencing the severity of the complications, the present study was conducted to compare the effect of flap and flapless extraction of partially impacted mandibular third molar in reducing postoperative pain, swelling, trismus and pocket depth distal to second molar, for which 10 patient with bilateral symmetrically impacted mandibular third molar were included.

In each patient preoperative clinical evaluation and preoperative radiographs were taken to evaluate the nature of impaction. Surgical removal of bilateral impacted mandibular third molar was carried out under aseptic condition. The subjects were randomly allotted to Group I (control: By raising a buccal flap) and Group II (test: Without raising a buccal flap). Patients were evaluated for **pain, swelling and trismus** on 2^{nd} and 7^{th} postoperative day and pocket depth distal to second molar on 1^{st} and 2^{th} postoperative month.

Duration of surgery is not much discussed in literatures though it is one of the most important factors leading to postoperative complications like pain, swelling and trismus, though few studies have shown correlation between pain, swelling, and trismus with that of duration of surgery [4].

In the present study Group I- 22.2 (3.22) min., showed significantly higher duration of surgery as compared to Group II- 14.8 (1.22) min., which might have affected postoperative complication.

Pain assessment is not a onetime phenomenon. The most widely used scales are visual, verbal and numerical or some combination of all three forms. In the present study the amount of pain experienced by the patient was recorded using visual analog scale (0-10). The measurements were subjected for statistical analysis.

In the present study the scores of Visual analogue scale at 2^{nd} and 7^{th} postoperative day, For Group II was 1.5 (1.08) 5.3 (0.94 and 0.0 (0.0) respectively. For group I, the findings were 5.3 (0.94) and 1.4 (0.84) respectively. For both the visits VAS scores were significantly higher for Group II, p value (<0.05). These findings are in accordance with the results reported by various authors in their respective studies [3,16].

According to Jose M S Bielsa[13] pain and swelling were greater when the surgical wound healed by first intention. Holland and Hindle[37] reported more pain and swelling in those cases where primary closure was carried out. However, after one month the surgical wound showed a better appearance in these patients than in those where closure and healing by second intention was carried out.

Quantitative assessment of swelling represents a major difficulty. Post-surgical facial edema is difficult to quantify accurately, since it requires a three-dimensional measurement with an irregular, convex surface and can manifest itself internally as well as externally [18]. Over the years, numerous researchers have tried various techniques in an effort to objectively measure edema, most of which are indirect assessment of the altered contours of skin surface. Measurement tools mentioned in the literature have included Visual Analogue Scale, trismus recordings, standardized stereo-radiographic or photographic measurements, computerized tomography, linear measurement, varnier-calipers to measure cheek-girth, modified face-bow devices, ultrasonography, facial plethysmographs or various other means of taking direct facial measurements [38]. No technique has been proved to be superior or more accurate in analyzing swelling; hence for the practicality of low-cost and equally reliable technique, we have used linear measurements technique based on designated facial point to assess the swelling.

In terms of postoperative **swelling** there was a statistically significant difference between two groups on 2^{nd} and 7^{th} post-operative day. Group II-10.8 (0.81) showed significantly less post operative swelling as compared to group I-10.41 (0.80), at 2^{nd}post operative day. Whereas, at 7^{th} post-operative day, the findings were not significant but Group II-9.66 (0.27) showed less post- operative swelling as compared to group I-9.99 (0.25). The results of the present study fall in line with that of other studies [3,4,19]. These findings again emphasize that swelling is because of reflection of mucoperiosteal flap and duration of surgery,

Trismus or prolonged tetanic spasm of the jaw muscles was described by Rowe as a protective reflex, mediated by the feedback mechanism of the orthogenetic reflex. This limits mouth opening in an attempt to prevent additional trauma or pain, for instance after third molar surgery. Once the cause is eliminated trismus disappears [39]. Trismus after mandibular third molar surgery is usually caused by inflammation of the masticatory muscles or by transecting through the fibers of temporalis muscle while giving a distal release incision, leading to spasm secondary to the raising of a mucoperiosteal flap.

In the present study, significant difference in **mouth opening** at 2nd and 7th postoperative day was observed. At 2nd post operative day Group II-41.0 (5.31) showed significantly more post-operative mouth opening as compared to group I-32.7 (6.41). At 7th post-operative day, the findings were also significant with Group II-44.4 (6) showing more post- operative mouth opening as compared to group I-40.3 (5.7).

As it has been studied earlier that trismus can be a result of reflection of mucoperiosteal flap, pain and duration of surgery [4,12,21]. The findings of the present study can be correlated and conclusion can be drawn that trismus would be because of group I rather than group II.

Even the interrelation between trismus and pain has also been explored several times in the past; therefore, it was expected that mouth opening after removal of impacted mandibular third molars is painful and consequently avoided to its full extent. The hypothesis has been confirmed by an electromyographic study where it was concluded that restricted mandibular movement after this operation reflects a voluntary act in order to avoid pain [40].

Groove and Moore in 1970 concluded that flap design was a factor in determining the periodontal status of the second molar. In particular they found that the flap design which left an intact gingival collar on the distal surface of the second molar produced the greatest reduction in pocket depth [42]. Woolf et al in 1978 reported that an increased second molar depth was related to osteotomy.

In the present study the difference in pocket depth between group I and group II was statistically significant at 1st and 2th postoperative month, with mean probing depth for group I was 5.2 (1.03) and 3.4 (0.69) at 1st and 2th postoperative month respectively, and mean probing depth for group II was 3.5 (0.52) and 2.26 (0.51) at 1st and 2th postoperative month respectively. Kim et al also reported that, at 1 month after surgery, the mean probing depth was 6.2 (2.2) mm in the flap group and 3.1 (1.2) mm in the flapless group. The difference was statistically significant. At 3 months after surgery, the difference in the probing depth between the 2 groups was still significant. In the present study the same results were obtained at 2nd month also. They reinforce the statement that this occurs due to raising a flap and performing osteotomy distal to second molar in group I.

One of the limitations of the present study was the less number of patients in the study. Secondly the different angulations of impacted third molars should have been included in the study to further explore these parameters.

CONCLUSION

In the present study group II (trial) i.e. without raising flap, had better results ($p<0.05$) in terms of pain, swelling, trismus, and pocket depth distal to second molar when compared to group I (control) i.e. with flap raised group. The open healing of the surgical wound after removal of impacted third molars produces less post-operative swelling and pain than occurs with closed healing, by hermetically suturing the socket.

The present study has shown that the use of a flapless procedure to remove partially impacted mesioangular or horizontal third molars has significantly decreased postoperative pain, swelling, and pocket depth when compared with procedure by raising a flap. These findings support the clinical use of flapless extraction when the distal surface of the crown is completely anterior to the anterior border of the mandibular ramus and the occlusal surface of the impacted tooth is level or nearly level with the occlusal plane of the second molar. However, we recommend additional studies with larger sample size to draw the more definitive conclusion.

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