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Dr. Nithin K Sharma
Department of OMFS, Vyas
Dental College, Jodhpur,
Rajasthan, India

Dr. Shilpa RH
Department of OMFS Navodaya
Dental College, Raichur,
Karnataka, India

Dr. Anuradha Navaneetham
Department of OMFS,
Ambedkar Dental College,
Bangalore, Karnataka, India

Dr. Sachin K Sharma
Department of Community
Medicine, USM KLE IMP,
Belagavi, Karnataka, India

Original Research Article

A comparative study for the removal of partially impacted mandibular third molars with or without a buccal flap: A prospective study

Dr. Nithin K Sharma, Dr. Shilpa RH, Dr. Anuradha Navaneetham and Dr. Sachin K Sharma

Abstract

Aims & Objectives: The aim of this study is to compare flap versus flapless surgery for the removal of partially impacted mandibular third molars and to evaluate the merits and demerits of the surgical removal of partially impacted mandibular third molars with and without buccal flap in terms of operating time, postoperative pain, swelling and pocket depth distal to second molar and to compare clinically the healing by primary and secondary intention.

Materials & Methods: A prospective, randomized, split-mouth designed study was conducted on 15 medically healthy patients [30 mandibular 3rd molars] between the age group of 18-40 years with bilaterally symmetrical, partially impacted mandibular third molars were the study sample. All the patients underwent bilateral extraction of partially impacted mandibular third molars with flapless technique on one side and buccal flap technique on the other side. Both techniques were compared in terms of pain, swelling, trismus, pocket depth distal to 2nd molar and operating time at immediate postoperative, 1st day, 2nd day, 7th day, 1st month and 2nd month postoperative. Results: Statistically significant difference was obtained flapless and buccal flap techniques in terms of pain, swelling, trismus, pocket depth distal to 2nd molar and operating time. The mean pain, swelling, pocket depth distal to 2nd molar and operating time were all found to be higher in buccal flap technique compared to flapless technique.

Conclusion: Flapless technique can be used frequently for removal of partially impacted mandibular third molars so that, the postoperative sequelae that cause distress to the patient and affect the patient's quality of life after surgery can be avoided.

Key Words: Flapless, Buccal flap, partially impacted

Introduction

Third molars are the most commonly impacted teeth in the oral cavity, with 33% of the population having atleast one tooth impacted [1]. It is probably the result of both genetic and environmental factors [2, 3]. Surgical removal of third molars is one of the most frequently performed procedures in the oral and maxillofacial practice to prevent or to treat a variety of pathoses originating from impacted teeth [4, 5]. Removal of such teeth requires sound understanding of the surgical principles along with patient management skills. Though it is a minor surgical procedure its relation to the adjacent teeth, soft tissues and neurovascular bundle makes it a complex procedure [6].

The mandibular third molars are often associated with diverse range of problems such as pericoronitis, periodontal defects in the distal aspect of the second molar, caries of the third or second molars, different types of cysts/odontogenic tumors and neurogenic pain. Other criteria that justify third molar removal are orthodontic and prosthodontic or restorative considerations and preventive or prophylactic removal [7].

Surgical removal of impacted third molars involves the manipulation of both soft and hard tissues, so it is usually associated with a number of postoperative complications [8, 9]. Therefore, reducing the incidence of these complications becomes imperative, which is possible only with a thorough knowledge of the various factors affecting them. One of the factors influencing the postoperative outcome following third molar surgery is the incision and the flap design [10]. Flap design is important not only to allow optimal visibility and access to the impacted tooth but also for subsequent healing of the surgically created defect [11]. Hence flapless technique can play an important role in avoiding the complications arising from elevation of flap as well as bone osteotomy.

Correspondence
Dr. Shilpa RH
Department of OMFS Navodaya
Dental College, Raichur,
Karnataka, India

Materials & Methods

A prospective, randomized and split-mouth designed study was conducted on medically healthy patients 15 patients [30 mandibular 3rd molars] between the age group of 18-50 years with bilaterally

Method of collection of data

An OPG and IOPA's were taken for each patient. Baseline data regarding swelling, pain, mouth opening the patients were observed pre-operatively (baseline) and postoperatively and treated by the same surgeon.

Pre-operative and post-operative parameters assessed: Pain (using LIKERT SCALE from 0-5) Swelling, Trismus, Periodontal pocket distal to second molar Intra-operative parameters operating time.

All the parameters, except for the intra-operative parameter of operating time, were evaluated at immediate post-operative and later at intervals of 1st day, 2nd day and 7th day. Pocket depth distal to 2nd molar was further evaluated at 1 and 2 months post-operatively. Mouth opening was measured using

a measuring tape and, hence trismus also was evaluated. Pain was evaluated using a 6-point Likert Scale ranging from 0-5; where 0 indicates 'no pain' and 5 indicates 'intolerable pain'. The evaluation of the facial swelling was performed using a measuring tape at the following reference points. 1) Tragus of ear 2) Outer canthus of the eye 3) Ala of the nose 4) Angle of the mouth 5) Gonion 6) Pogonion. Gonion was taken as the base point. Measurements were made from the following points to the base point in millimeters: A = Gonion to Tragus of ear B = Gonion to Outer canthus of the eye C = Gonion to Ala of the nose D = Gonion to Angle of the mouth E = Gonion to Pogonion The total swelling was summed as A + B + C + D + E. This measurement was carried out twice and the average was noted [12].

Periodontal pocket distal to 2nd molar was measured using a UNC-15 probe. Primary and secondary healing was clinically evaluated after examination of the surgical sites bilaterally for hemostasis, wound gaping, alveolar osteitis, infection and other clinical parameters mentioned above.



Preoperative photos

IOPA 38

IOPA 48



OPG



Pre operative measurement of swelling and periodontal pocket depth

Surgical procedure

Skin preparation was done using betadine solution. Oral cavity was rinsed using betadine mouth gargle solution. Local Anesthesia 2% Xylocaine with adrenaline (1:80,000) was administered. Bilateral inferior alveolar nerve block, lingual nerve block and long buccal nerve block was given. The allotment of the right and left side third molars to flapless and buccal flap group was decided by lottery method to avoid the

selection bias.

Buccal flap technique

In this technique the incision performed was Ward's or Modified Ward' s incision according to the bone exposure required. Incision was placed using a No.15 BP blade. A mucoperiosteal flap was raised and bone surrounding the partially impacted third molar will be exposed. Bone

ostectomy under saline irrigation was performed using 702, 703 stainless steel straight fissure bur using a micromotor handpiece and the bone on buccal and distal aspect of the impacted third molar covering was removed. The tooth sectioning was then carried out using the bur, from the buccal aspect to the lingual aspect and sectioning is terminated just before perforating the lingual wall of the tooth. The tooth was

then split using a coupland elevator and the tooth fragments were removed. The socket was rinsed with saline and betadine solution and the flap was repositioned using 3-0black braided silk.

Buccal flap technique



Ward's Incision Bone Ostectomy Tooth Fragments Flap Repositioning Suturing

Flapless technique

In this technique no mucoperiosteal flap was raised, thus avoiding exposure of the alveolar bone. Marginal gingiva encircling the tooth is reflected using periosteal elevator. The gingiva was then held with the flat end of the periosteal elevator. Tooth sectioning was carried out using 702, 703 bur same as in the first technique and the fragments were removed. The socket was rinsed with saline and betadine solution. Suturing was not done in this technique and was left to heal by secondary intention. The duration of each operation was noted and the interval between the initial flap incision (tooth sectioning in the flapless group) and the final suturing was noted. After the surgical procedure, patients will be

prescribed for 5 days with the following medications: Cap Amoxicillin 500mg TID, Tab Metronidazole 400mg TID, Diclofenac 50mg + Paracetamol 500mg TID to be taken orally. Postoperative instructions will be given to the patient in his/her own language and all the parameters will be recorded immediate post operatively and patient will be recalled for follow up. Follow up will be done for immediate post-operative, 1st day, 2nd day and 7th day for the following clinical parameters except for periodontal pocket distal to second molar which will be measured at 1 month and 3 month follow up interval

Flapless Technique



Tooth Sectioning Tooth Fragments Socket



Intraoral 1st Month Post-Operative 48 38 Pocket Depth

Results

In the present split mouth study, a total number of 15 patients in the age group of 18-40 years with a mean age of 26.26 years [SD ± 9]. The distribution of the study population according to the angulation of the partially impacted

mandibular third molar showed maximum cases 66.6% (n=10) of mesioangular impaction whereas only 33.3% (n=5) were horizontal impaction.

1. Pain

Table 1: Comparison of Pain in Flapless Versus Buccal Flap Techniques

Time Interval	Technique	Mean	Std dev	SE of Mean	Mean difference	Z	P-Value
Pre Op	Flapless	2.93	1.83	0.47	2.267	-3.166	0.002*
	Buccal Flap	0.67	1.40	0.36			
Immediate Post Op	Flapless	1.00	0.65	0.17	-1.200	-3.981	<0.001*
	Buccal Flap	2.20	0.56	0.14			
1st day	Flapless	0.20	0.41	0.11	-3.000	-4.886	<0.001*
	Buccal Flap	3.20	0.94	0.24			
2nd day	Flapless	0.20	0.41	0.11	-2.733	-4.862	<0.001*
	Buccal Flap	2.93	0.88	0.23			
7th day	Flapless	0.00	0.00	0.00	-1.267	-4.261	<0.001*
	Buccal Flap	1.27	0.80	0.21			

Denotes significant difference

2. Swelling

Table 2: Comparison of Swelling in Flapless Versus Buccal Flap Techniques

Time Interval	Technique	Mean	StdDev	SE of Mean	Mean Difference	t	P-Value
Pre Op	Flapless	461.07	35.26	9.10	-2.067	-0.164	0.871
	Buccal Flap	463.13	33.84	8.74			
Immediate Post Op	Flapless	462.73	34.72	8.96	-6.600	-0.519	0.618
	Buccal Flap	469.33	34.96	9.03			
1st day	Flapless	472.20	36.23	9.35	-37.667	-2.821	0.009*
	Buccal Flap	509.87	36.90	9.53			
2nd day	Flapless	467.40	38.66	9.98	-33.267	-2.280	0.030*
	Buccal Flap	500.67	41.21	10.64			
7th day	Flapless	461.87	35.37	9.13	-11.200	-0.871	0.391
	Buccal Flap	473.07	35.07	9.06			

denotes significant difference

3. Periodontal Pocket Depth distal to 3rd molar

Table 3: Comparison of Pocket Depth in Flapless Versus Buccal Flap Techniques

Time Interval	Technique	Mean	StdDev	SE of Mean	Mean Difference	Z	P-Value
Pre Op	Flapless	4.33	1.54	0.40	-0.400	-0.476	0.634
	Buccal Flap	4.73	1.98	0.51			
1 Month	Flapless	5.93	1.53	0.40	-1.667	-2.718	0.007*
	Buccal Flap	7.60	1.88	0.49			
2 Months	Flapless	4.53	1.55	0.40	-2.133	-2.986	0.003*
	Buccal Flap	6.67	1.91	0.49			

*denotes significant difference

4. Trismus

Table 4: Distribution of the Study Sample According To Trismus

Trismus	Present		Absent		Total
	N	%	N	%	
Pre Op	1	7%	14	93%	15
Immediate Post Op	4	27%	11	73%	15
1st day	15	100%	0	0%	15
2nd day	15	100%	0	0%	15
7th day	1	7%	14	93%	15

5. Operating time

Table 5: Comparison of Operating Time between the Two Techniques

Technique	Mean	Std dev	SE of mean	Mean difference	Z	P-Value
Flapless	12.93	4.61	1.19	-10.267	-3.244	0.001*
Buccal Flap	23.20	13.94	3.60			

*denotes significant difference

Discussion

Surgical removal of mandibular third molars is the most frequently performed procedure in Oral and Maxillofacial Surgery [13, 14]. Therefore, minimizing postoperative morbidity has a significant impact medically, legally and economically [15]. Third molar surgery is associated with a variety of complications. The various complications are due to the tooth positioning, the technique employed and the level of apprehension of the patient. Thus, the factor of employing the technique of buccal flap as compared to flapless was assessed considering the most frequently reported side effects; pain, swelling and trismus [14, 15]. Thus, the present study was undertaken to compare and evaluate the merits and demerits of the surgical removal of partially impacted mandibular third molars with and without a buccal flap. And also compare clinically the healing by primary and secondary intention. The instruments used and the methodology applied were relevant and suitable to achieve the aims and objectives of the study. The study design employed was a clinical trial using split-mouth technique. A split-mouth designed study was used because it allowed for intra-individual comparison and the assessment of two techniques for the removal of partially impacted mandibular third molars. It avoids the confounding

that can be caused due to subject variation in terms of age, gender as they have a significant impact on healing rate and perception of pain. Because of its ability to limit bias this technique has been widely used in the study of third molar surgeries. Thus the research design included the feature that each subject served as his or her own control and this feature limited the variance that would have existed in a larger group. Accordingly, this aspect of the design enhanced the power of the statistical tests to detect true differences in the treatment effects [17].

As both the extractions were done simultaneously at the same time, the subject(patient) and the observer are in a better position to compare both the techniques in terms of the extent of swelling and severity of pain because, these are the chief indicators of patient comfort during the postoperative period after third molar surgery [18]. Partially impacted mesioangular or horizontal third molars only, were used to compare the flapless and the buccal flap techniques. These teeth were amiable for both procedures since the distal surfaces of the crowns were completely anterior to the anterior border of the mandibular rami and the occlusal surfaces of the impacted teeth were in level or nearly level with the occlusal planes of the second molars. These conditions provided sufficient accessibility to section the teeth into two portions. Further, it was determined that the best method to section the teeth was to start at the buccal groove and work toward the furcation of the roots using a straight fissure bur, because the bur removes the bone rapidly and sections teeth quickly when used in a lateral direction. When the sectioning was completed, it was possible to remove the tooth without flap elevation [7].

The degree of surgical difficulty increases as the depth of the impacted tooth increases. As the tooth becomes less accessible and it becomes more difficult to section the tooth, the overall difficulty of the operation increases substantially. As a result, our prerequisite for performing flapless extraction was that the occlusal surface of the impacted tooth was level or nearly level with the occlusal plane of the second molar. Additional studies are needed to determine the best technique for deeply impacted third molars [7].

Reference points, with gonion as the base point, were used pre and postoperatively for facial measurements and measure swelling. Evaluation of facial swelling resulting from surgical procedures has proven to be the most problematic quantitative assessment. Swelling involves a three dimensional volumetric change at the tissue and cellular level. Methods used to evaluate swelling include photographic analysis, modified face bowl, linear measurements, subjective assessments [19, 20]. The practicality of a low-cost reliable technique made linear measurements a feasible choice. Postoperative swelling after removal of impacted mandibular third molars has been attributed to the reflection of the mucoperiosteum [21, 22]. Gool *et al.* reported that maximum swelling occurred between 24 to 48 hrs postoperatively. It has been reported that the eruption status and angulation of impacted mandibular third molars also influences the postoperative swelling²¹. McGregor and Addy reported that partially erupted mandibular third molars produce greater swelling than fully bony impactions²³. Gool *et al.* reported an increase in postoperative swelling from vertical, mesioangular, distoangular to horizontally impacted mandibular third molars [21].

Trismus and pain are not as troublesome to assess as facial swelling but assessment relies heavily on patient cooperation and interpretation. Thus pain was determined by patients rating of discomfort on a 6 point likert scale. Gool *et al.* and Suarez-Cunheiro attributed pain following third molar

surgery to the incision and reflection of the periosteum rather than flap design [21, 22]. In this study, pain was significantly greater in buccal flap technique as compared to flapless technique. The effect of angulation of impacted mandibular third molars on postoperative pain has been studied. Gool *et al.* reported least pain after the removal of vertically impacted mandibular third molar, which increased sequentially in mesioangular, distoangular and aberrant mandibular third molars [24].

Operating time was found to be significantly lower in case in flap less technique as compared to the buccal flap technique. Kim *et al.* and Pederson stated that increased duration of surgery was associated with significantly higher pain scores on days 1 and 7. Operating factor might be an important factor to be considered in case of less cooperative patients or with those who cannot open their mouths fully for longer time due to anatomical reasons [25]. Hence, flapless method of extraction for partially impacted mandibular third molars can be a very useful tool in such cases.

When the flapless technique was used, the patients had a low incidence of postoperative complications and experienced minimal disruption of their quality of life after third molar surgery. Shevel *et al.* found that when a small incision with minimal reflection of the mucoperiosteum was made, the postoperative pain and swelling were significantly less than when a larger incision with a standard flap was used. Also, a flapless procedure facilitated faster extraction, and hence a shorter operative time, than the flap procedure [7].

Regarding the periodontal health of the adjacent molar, Peng *et al.* demonstrated that mandibular third molar may compromise periodontal health on the distal surface of mandibular second molar [26]. In a retrospective study, Kugelberg *et al.* found that 2 years after lower third molar surgery, 43.3% of the patients had a probing depth of 7 mm or more and 32.1% had intra bony defects of 4 mm or more on the distal aspect of the adjacent second molar [27]. Woolf *et al.* reported that an increased second molar pocket depth was related to ostectomy [28]. The increased pocket depth in the flap procedure might have been a result of the surgical technique used, because the flap technique can damage the bone distal to the second molar. Quee *et al.* and Schofield *et al.*, who also reported no differences in periodontal healing related to flap design. Other studies have reported that exposure of the alveolar bone to the buccal cavity, even without surgical procedures, causes bone resorption (Adalberto luiz rosa *et al.* 2002) [29].

The shortcomings of this study, which affected the ability to generalize the findings were small sample size, root morphology, no standardized swelling and periodontal pocket measurement methods and inadequate postoperative follow up period [24].

The root morphology of the erupted tooth has a major influence on the degree of difficulty of a closed extraction and it also plays a role in the success of removing a partially impacted third molar using a flapless procedure. The possibility of the root tip fracture during extraction is increased for severely curved roots. In the present study, the success rate of flapless extraction was 90%. The main reason for failure was fracture of the root tips. Hence it is recommended that the radiographic examination of the apex area of the tooth carefully to assess the presence of small, abnormal, and sharply hooked roots, because these are the indications that the root can fracture [7].

It is also possible that the observations of the present study were made during a period in which periodontal healing was

not yet complete and that better results would occur after a longer observation period. Literature reveals that the initial regeneration of the connective tissue attachment was formed 3 months postoperatively [25].

Conclusion

The use of a flapless procedure to remove partially impacted mesioangular or horizontal third molars significantly decreased postoperative pain, swelling, and pocket depth compared with a flap procedure. And also the time taken for the flapless technique was also very less compared to buccal flap technique. 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. We also found that there are no postoperative sequelae that cause distress to the patient and affect the patient's quality of life after surgery. Additional studies with larger patient numbers are required to confirm the findings reported in the present study.

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