



A MINIMALLY INVASIVE TECHNIQUE FOR EXTRACTION OF IMPACTED MANDIBULAR THIRD MOLAR WITH LUXATORS: A PROSPECTIVE STUDY

Dental Science

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ABSTRACT

Purpose: A new minimally technique was used for surgical extraction of mandibular third molar to minimize the intra and post operative complications associated with traditional technique (buccal guttering).

Patients & Methods: A prospective cohort study was conducted on 50 patients who required surgical removal of bilateral impacted mandibular third molar such as class I and Class II, Position A and position B according to Pell and Gregory Classification. Among them, one side was operated with new minimal invasive technique (Group A) and the other side by conventional technique (Group B) on the same visit under the local anesthesia. Baseline measurements were obtained preoperatively on either side before starting the procedure. Intraoperative complications such as hemorrhage, damage to adjacent vital structure, length of surgical time, and accessibility during the procedure and post operative complications such as pain, trismus, swelling, and dry socket on 1st, 3rd, 5th and 7th post operative day were evaluated.

Result: A vast difference between the two groups in the study variables is noticed. There was a significant reduction in the operating time and hemorrhage intra-operatively and pain, swelling, trismus and dry socket post operatively in the Group A on post operative checkup ($P < 0.05$) 'T' test.

Conclusion: The result of this study suggest that the new technique (minimal invasive) can be used for minimizing the complication associated with conventional technique in most of the partially erupted impacted teeth such as class I and Class II, Position A and position B impacted mandibular third molar according to Pell and Gregory Classification.

KEYWORDS

Minimal invasive, Hemorrhage, Operating time, Pain, Swelling, Trismus, Impacted third molar.

INTRODUCTION:

In the permanent dentition; the third molar is the last tooth to erupt and so it may readily become either impacted or displaced if there is insufficient space to erupt in the oral cavity. Thus the removal of impacted mandibular third molar is one of the most important and frequently performed surgical procedure by Oral and maxillofacial surgery practitioner. Reasons for the extraction of mandibular third molars are assigned to different causes, ie, pericoronitis¹, eruption problems², orthodontics³, dental caries, distal cervical caries in the second molar, unfavorable orientation, unlikely to erupt and to prevent future problems^{4,5}. In traditional technique, removal of an impacted mandibular third molar tooth includes flap development, bone removal, luxation, sectioning of the tooth, extraction of tooth and closure^{1,2,6}. Many modifications in the removal have been proposed early for minimizing the complications associated with the Traditional technique such as lingual split-bone technique^{2,7}, removal of a tooth during the formation stage² and recently the use of piezosurgery^{8,9}, cryotherapy¹⁰ and lasers^{11,12}. Apart from the surgical modifications even various other techniques has been implemented intra-operatively and postoperatively for this purpose. Intra-operatively to protection the lingual nerve from getting damage; the lingual flap is reflection with periosteal elevator¹³, modifications in the flap design to reduce the postoperative swelling^{14,15,16}. Whereas Post-operatively using drains for decreasing the swelling^{17,18}, intralesional & IV corticosteroid injections to decrease pain¹⁹, antibiotics²⁰ and analgesics²¹ to decrease pain and infection. We understood that various modifications have been used both intra and postoperatively for reducing the complications associated with the removal of an impacted mandibular third molar. Removal of impacted teeth with minimal soft and hard tissue manipulation can reduce most of the intra and post operative complications. So, we advocated a minimally invasive technique for removal of impacted mandibular teeth in which only tooth sectioning

is done by avoiding the flap elevation and bone guttering in selective cases.

MATERIALS AND METHODS: STUDY DESIGN

The authors designed a prospective cohort study carried out at the Department of Oral and Maxillofacial Surgery from April 2012 to June 2014. This study was conducted on 50 patients: 1) who needed removal of two nearly identical impacted mandibular third molars, 2) They were divided into two groups; Group A (study group) on one side is operated with minimally invasive technique and Group B (control group) on other side operated with the Traditional technique, 3) level of difficulty of impacted tooth was graded based on Pell & Gregory (relation of impacted tooth with ramus, adjacent tooth and depth of the tooth) and winters classification (reveals the orientation of impacted third molar with the 2nd molar), 4) Radiographic assessment was done preoperatively by both Intra Oral Periapical Radiograph (IOPA) and Orthopantomogram (OPG), 5) Post Operative Day (PODs) follow up was done on 1,3,5 and 7th day and were evaluated for variables of post-operative complications.

Inclusion criteria:

1. Patients who requires extraction of bilaterally identical impacted mandibular third molar which come under class I or class II, Position A or B third molars (according to Pell & Gregory classification) and partially erupted in oral cavity.

Exclusion criteria:

1. Age of less than 18 or age more than 50.
2. Patients with acute inflammation surrounding the impacted tooth.
3. Any systemic disorders causing delayed wound healing.
4. Severely dilacerated roots.

5. Any pathology associated with the tooth other than dental caries.
6. Complete bony impactions where guttering of bone is unavoidable.
7. Patients who were allergic to or had a history of adverse effects with test drugs, amoxicillin.
8. Patients with long-term use of medications that would obscure assessment of the inflammatory response.
9. Pregnant or lactating women.
10. Patients who were unwilling to undergo data collection procedures.

STUDY VARIABLES:

The study was carried to evaluate following variables: 1) Intra-operatively: duration of surgery, hemorrhage, damage to adjacent teeth and vital structures (Table1). 2) Post-operatively: Pain, Trismus, Swelling and dry socket on 1, 3, 5 and 7 PODs day (Table 2).

Table 1: Method of data analysis for Intra Operative complication

Variable	Data analysis
Duration of surgery	The surgical procedure was timed from the first incision made to the last suture placed
Hemorrhage	Weighting the complete blood collected from suction after the procedure
Damage to adjacent teeth	Examination of the adjacent tooth after the procedure
Vital structures (nerve injury)	knowing the recovery of sensory during the postoperative follow-up

Table 2: Method of data analysis for Post Operative complication

Variable	Data analysis
Pain	Visual analog scale was used to assess the postoperative pain on a scale of 1-10
Swelling	Measured in 2 dimensions using a measuring tape i) from the tip of the tragus to angle of the mouth, ii) lateral canthus of the eye to angle of mandible, and were compared with measurements in the same dimensions preoperatively.
Trismus	Width of mouth opening(maximum interincisal distance)
Dry socket	Examination of wound healing with partial or total disintegrated blood clot within the alveolar socket.

SURGICAL PROCEDURE:

Preoperative Care:

At least 1 week before surgery, all patients underwent professional tooth cleaning to decrease the bacterial load. They also received antibiotic prophylaxis (amoxicillin 2 g in tablet form) 1 hour before surgery. All patients rinsed for 1 minute with a 0.12% chlorhexidine mouth rinse immediately before surgery.

Intra operative:

All the patients were operated by the same surgeon on the same visit. 2% LA 1:80000 Lignocaine with adrenaline is been used. Amount of injection used in the study was standardized to get the better accurate result during the surgical procedure to evaluate the intra-operative finding without bias. 1ml inferior alveolar nerve, 0.8 ml lingual nerve block and 0.5 long buccal nerve block.

In Group A: A minimally invasive technique was used in which incision for the flap is been avoided and accessibility was again just by detaching the mucosa from teeth. Bone guttering is also avoided, only sectioning of the tooth and luxators are used for the luxation of the tooth for breaking the Periodontal Ligament (PDL) attachment. The sectioning of the tooth and point of application of luxators is been explained in the illustration diagrams.(Fig 1-5)

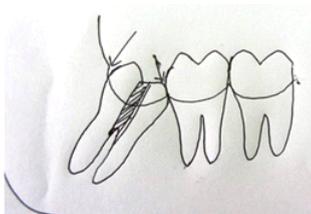


Fig 1: Liberal sectioning and arrows indicating point of application of luxator.

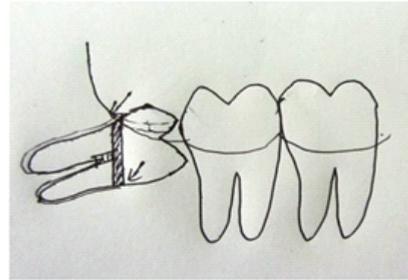


Fig 2: Horizontally impacted teeth can be removed in 2/3 pieces based after liberal sectioning and luxation.

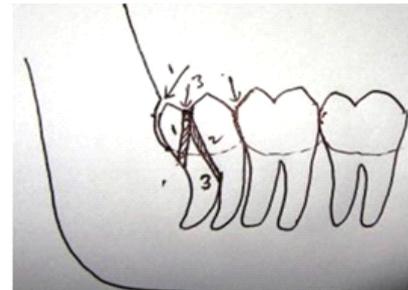


Fig 3: Shows careful sectioning and luxator application for removal of a distoangular impacted wisdom tooth.

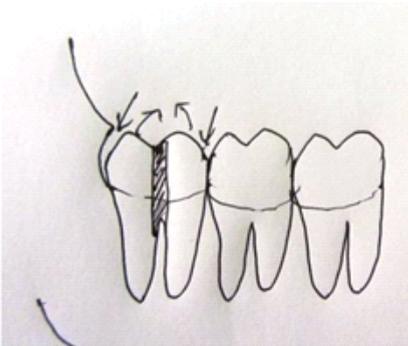


Fig 4: Direct sectioning of tooth and luxator application.

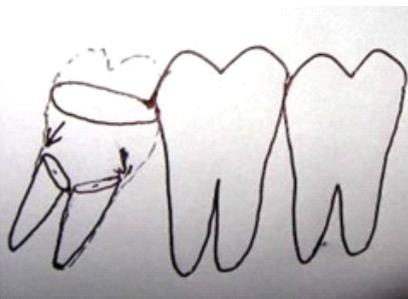


Fig 5: Point of application of luxator for root stumps.

In Group B: Traditional technique, surgery began with a Standard wards incision made from the distal surface of the mandibular second molar extending to the distal part of the mandibular third molar with mesial and distal relieving incisions. The trapezoid flap was then raised with a Howarth periosteal elevator. The flap was carefully protected and retracted with an Austin retractor. A gutter was then made at the buccal aspect of the tooth until the level of the cemento enamel junction was reached with a round surgical bur. The tooth was sectioned (if necessary) with a straight fissure surgical bur and removed. The rough bony margin was smoothed with bone file, and the surgical site was irrigated with normal saline solution. Hemostasis was achieved before closure. The flap was re-approximated and sutured with 3'0 black silk unresorbable suture. The mesial relieving incision was left unsutured. Suture removal was done on 7th post operative day.

DATA COLLECTION

Assessments were made preoperatively and on postoperative days (PODs) 1, 3, 5, and 7. Preoperative baseline facial measurements were taken and width of mouth opening was measured immediately before surgery. Facial swelling measurements were taken as the sum of the length of 2 lines along the predetermined facial reference points from the outer corner of the eye to the angle of the mandible and from the tragus of the ear to the corner of the mouth. Facial measurements were performed with a tape measure. The percentage of facial swelling was then calculated based on the difference between baseline measurements and measurements taken on all study days. Trismus was measured as the change in the width of mouth opening (maximum interincisal distance) between preoperatively and PODs 1, 3, 5, and 7. This distance was measured with a metal ruler. Pain was evaluated and recorded on PODs 1, 3, 5, and 7 by use of a 10-cm-long visual analog scale (VAS). Wound healing was evaluated for dry socket on PODs 3, 5 and 7. The amount of analgesics consumed throughout the same period also was recorded. The state of wound healing was assessed on POD 7.

RESULTS

Intraoperative observations are data analyzed in Table 3. Patients felt more pressure on Group-A side compared to Group-B side due to use of luxators during the procedure. (Table 3)

Postoperative observations are data analyzed in Table 4. Overall patients were satisfied by Group-A minimally invasive technique compared with Group-B conventional technique by the end of postoperative follow-up. (Table 4)

Table 3: Intra operative finding

	Group A	Group B
Length of surgical time	9.3 mins	16.7 min
Bleeding	No requirement of additional measures to arrest bleeding	9 cases needed bone wax to control bleeding from bone and 3 gelform
Accessibility	42 cases good, 7 cases reasonably good & in 1 case it is poor	All cases had good access
Damage to vital structures	No damage to adjacent structures	3 cases paresthesia which resolved in 45 days.
Patients satisfaction	More than 86% felt comfortable among the group	Only 8% felt comfortable among the group

Table 4: Post operative findings:

Criteria		Pre - op	Post op-1 st	Post op-3 rd	Post op-5 th	Post op-7 th
Swelling (in millimeter)	Group A	—	2.1 x 2.4	2.08 x 2.37	1.97 x 1.88	1.07 x 1.02
	Group B	—	5.2 x 5.1	5.08 x 5.07	4.56 x 4.34	3.9 x 3.78
Pain (Visual Analog Scale)	Group A	—	1.9	1.6	1.3	0.9
	Group B	—	3.8	3.1	2.7	2.1
Dry socket (no. of patients)	Group A	—	—	—	3 cases	—
	Group B	—	—	—	19 cases	—
Trismus (No. of patients)	No	NE	NE	18	NE	NE
	Mild			23		
	Moderate			9		
	Severe			0		
(evaluated only on third post-op day)	No	NE	NE	4	NE	NE
	Mild			12		
	Moderate			19		
	Severe			5		

NE: Not Evaluated

DISCUSSION

During removal of an impacted mandibular third molar, some untoward side effects and complications arise due to surgical trauma to soft tissues and bone are inevitable as a part of gaining access to

remove the wisdom tooth. Some of these complications include intraoperatively hemorrhage, damage to adjacent teeth and vital structures by burs and elevators; post-operatively pain, swelling, trismus and dry socket. Pain, swelling, trismus and dry socket are undoubtedly a major disadvantage. Although such postoperative complications are not unique to third molar surgery, their occurrence in the orofacial area of the human body has physical, psychological and aesthetic ramifications that can be of a considerable degree. In fact, the adverse effects of this surgery on quality of life have been reported to show a 3-fold increase in patients who experience pain, swelling or trismus²². Every effort should be made to minimize these complications by proper preoperative evaluation, gentle soft tissue manipulation, copious irrigation during bone removal^{23,24}. Most of these complications are directly proportional to the quantity of surgical trauma subjected to hard and soft tissues during the procedure. Minimizing the soft^{16,15} and hard^{7,24} tissue manipulation may eventually lead to less trauma to the mucoperiosteum and bone around the wisdom tooth. In our study, we concentrated on this aspect to minimize the intra and postoperative complications for extraction of mandibular third molar by this new technique.

Intraoperative complications have been minimized to the larger extent in Group A compared with Group B. In group A, there were no cases of hemorrhage were has in Group B 12 cases reported with hemorrhage. Among them, in 9 cases the hemorrhage was from bone and required bone wax to stop bleeding and remaining three cases bleeding was from soft tissue which was arrested by using Gelform. This bleeding was due to bone guttering and flap rising in group B which was avoided in group A. Because of the same reason the length of the surgical time has been reduced to more than 50% compared with Group B which will minimize the postoperative complications and increase the comfort levels of the patients both during and postoperative period of surgical extraction of third molars. In Group A, for the inexperienced surgeons, it is difficult to perceive the depth up to which the tooth sectioning has to be done. This correlates with the finding of Pippi R²⁵. This can be prevented by careful preoperative intraoral periapical film to get an approximate idea for tooth sectioning. An important factor in minimally invasive procedures is bone-tooth sectioning perception through which damage to adjacent structures can be prevented according to LiD et al²⁶ that there are different cutting modes for different impactions which will reduce the operating time and postoperative pain. In our study Group B, three cases were reported with transient paresthesia which resolved in 45 days postoperatively. But in Group A, none of the cases reported with paresthesia. During the procedure in Group A, patient complaints of pressure on an application of luxators has indicated by the Siegel SC²⁴ were as in Group B it was very minimal on application of elevators indicated by Koerner KR¹. But by the end of the procedure patient felt more comfortable in Group A due to reduced operating time. Which correlates with Aznar- Arasa L et al²⁷.

Postoperatively complications such as pain, swelling, trismus, and overall patients satisfaction have been evaluated. Intensity of the pain is reduced in the Group A due to minimal trauma to soft (Borgonovo AE¹³) and hard tissue (Steel B⁷). In Group A, there was a significant reduction in mean pain intensity scores at the 1st (P = 0.00), 3rd (P = 0.00) and 5th (P = 0.00) 7th (P = 0.00) postoperative days compared to group B side (Graph. 1). In Group A, Swelling was reduced to 60% compared with that of Group B side (Graph 2). There was a significant reduction in the swelling due to avoiding flap elevation, bone guttering and allowing the wound to heal by primary intention. Cerqueira PR¹⁸ and Saglam AA²⁸ concluded that usage of drains after third molar surgical extraction there was a significant reduction of the swelling. According to this the extracted socket lift for healing with secondary intention will act like an open drain. Almost all patients came with reduced mouth opening as postoperative edema in Group B operated site. Patients were relatively comfortable and masticatory muscles were non-tender on palpation in Group A side (Graph 3). Whereas Group B side found to be tender and causing the trismus on the 3rd postoperative day.

In Group A side, dry socket was reduced compared with Group B side. The reason for the decreased rate of dry socket is not known properly but the reason might be because of minimal trauma to soft and hard tissue. Due to which maintenance of oral prophylaxis at the surgical site was good. All the patients with dry socket cases were effectively treated with zinc oxide eugenol pack and analgesics suggested by Bouloux GF et al²⁹. In our study, we evaluated the overall satisfaction of the patient at the last postoperative follow-up. They were more

comfortable on group A side compared with Group B side due to decreased intra and post complications. According to studies of De Brabander EC¹⁷ and Carrasco- Labra A³⁰ primary and secondary closure after the surgery in third molar extraction has no effect on postoperative complication.

In our study, an effort to minimize the trauma to mucoperiosteum and bone was made by a new method in which incisions were avoided, minimum mucoperiosteal reflection, no bone removal was done (at the expense of sacrificing the tooth to be removed by liberal sectioning) and also the periodontal ligament was severed with luxators to mobilize the impacted tooth or tooth fragments before delivery. Advantages include less intraoperative hemorrhage, no damage to vital structures preserving valuable bone, reduced postoperative edema, pain and reduced chances of dry socket occurrence and thereby improved overall satisfaction of the patient. However there are certain limitations to this procedure which include complete bony impactions, severely dilacerated roots, ankylosed teeth and loss of access to the tooth because of reduced mouth opening. As many impacted wisdom teeth are present in partially erupted state with no bone covering the crown portion, we feel this technique will be beneficial in minimizing intraoperative and postoperative complications. Our study included a small group of 50 patients. Studies with larger sample size should be carried out to evaluate the advantages of this minimally invasive wisdom tooth surgery. This technique is really helpful in treating partially erupted mandibular third molar and anxiety patients.

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