Original Article - Prospective Study

# An Assessment of Factors Influencing the Difficulty in Third Molar Surgery

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## Abstract

**Background and Objectives:** Surgical removal of a mandibular impacted third molar is one among the most common oral surgical procedures. The objective of this study was to assess and identify risk indicators influencing extended operation time in relation to the surgical removal of mesioangular impacted mandibular third molar, position A, Class I and to evaluate the incidence of postoperative swelling, trismus, and pain. **Materials and Methods:** A prospective cohort was implemented and the patients who presented for mandibular third molar removal which were impacted in position A, Class I were enlisted for the study. During 1 year between July 2014 and June 2015, a total of 40 patients were enrolled in the study. The evaluation of patient variables and radiographic variables was done preoperatively. Depending on the duration of time taken for an operation, patients were divided into three groups: Group I, Group II, and Group III. Postoperative complications such as swelling, trismus, and pain were assessed in each of the patients. **Statistical Analysis:** The statistical analysis was done among the groups using Chi-square test, and ANOVA. **Results:** Among the six variables studied in this study including patient variables and radiographic variables, maximum interincisal opening, external oblique ridge, and root morphology were found to be dependent factors which influence the operating time. Moreover, other variables such as the crown root width ratio and the number of roots were independent factors. Swelling, trismus, and pain were statistically significant among groups and were directly related to operating time. **Conclusion:** We consider that the outcome of surgical removal of mandibular impacted third molar, position A, Class I depends significantly on relevant patients characteristics and radiographic variables which should be evaluated preoperatively as they are predetermined factors to avoid postoperative morbidity.

**Keywords:** Indicators of difficulty, mesioangular impaction, pain, swelling

## Introduction

Surgical removal of mandibular third molars accounts for a large volume of cases in contemporary oral surgical practice and requires much planning and surgical skill, during both preoperative diagnosis and postoperative management.[1] Although the overall complication rate is low and most complications are minor; this procedure is so common that the population morbidity of complications may be significant.[2] It is important that a paradigm for factors associated with third molar extraction difficulty be developed to serve patients more effectively, to plan operations, and to educate students and residents.[1] Wharfe, Winters lines, and Pell and Gregory classification are the well-known classification systems for estimating the difficulty of removal of the third molar based on radiological evaluation of dentition.[3-5] With time, several other authors observed that the difficulty during the surgery cannot be assessed preoperatively but has to be done intraoperatively.[6] It has been suggested that patient factors also have an important impact on increasing difficulty of third molar surgery. With the speculation that the patient factors play a role in the complexity of the procedure, this study was undertaken with the aim of assessing patient, radiographic factors that may predict the difficulty of mandibular third molar extraction and to evaluate postoperative pain, trismus, and swelling.

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## Materials and Methods

To actualize the study aims, a prospective cohort was implemented, and the patients who presented for mandibular third molar removal which were impacted in position A, Class I[5] were enlisted for the study. Patients in the age group of 19–28 years were explained about the study and only those who gave their consent to participate were included. Patients with impacted mandibular third molar other than mesioangular in position A, Class I and Patients with impacted mandibular third molars with periapical pathology were excluded. During 1 year between July 2014 and June 2015, a total of 40 patients were enrolled in the study. The predictor variables considered were divided into patient variables and radiographic variables with the patient variables being maximal interincisal opening, and cheek flexibility and the radiographic variables being, position of the external oblique ridge, crown root width ratio, number of roots, and root morphology, all of which were assessed preoperatively. Cheek flexibility was measured as the distance, in millimeters, from the maxillary incisal midline to the mouth mirror used for the retraction of cheek [Figure 1]. The maximum interincisal opening (MIO) was recorded with calipers as the distance from the upper incisal edge to the lower incisal edge [Figure 2]. The intraoral periapical radiograph of each patient was traced and the radiographic variables mentioned above were assessed for each case [Figures 3 and 4].

All extractions were performed by the same surgeon, under local anesthesia using 2% lignocaine with an adrenaline concentration of 1:80,000. The procedure employed for all the patients was similar. This included a standard Terrance Ward's incision, reflection of mucoperiosteal flap and buccal bone guttering by bur technique with copious irrigation using sterile normal saline [Figures 5 and 6]. The outcome variable was the difficulty of the extraction as estimated by the time taken for the procedure, which was recorded as the time taken from the initial incision to the placement of the last suture and was measured using the same digital clock, by the same individual for each case. Depending on the duration of time taken for the procedure, patients are divided into three groups: Group I: Operating time < 15 min, Group II: Operating time 15–30 min, and Group III: Operating time more than 30 min.

At the end of the procedure, each patient received a prescription of prophylactic oral antibiotics namely; amoxicillin-clavulanate 650 mg 12 hourly and metronidazole 400 mg 8 hourly for 5 days. They were also given an analgesic prescription of diclofenac sodium tablets 50 mg 12 hourly for 3 days.

The postoperative swelling and trismus and pain were measured on the first, third, and seventh postoperative days. For the measurement of postoperative swelling, the distance from the tragus to the pogonion on the chin, from the tragus to the commissure of the lip on the ipsilateral side and the distance from the lateral canthus of the eye to the angle of mandible on the same side was measured using a flexible measuring tape preoperatively [Figures 7-9]. This was compared with the measurement on the follow-up days. The MIO was compared with the preoperative value to evaluate trismus. For the assessment of pain experienced by the patient, the visual analog scale (VAS) sheet was given to each of the patients who were explained about it, which was for convenience categorized as 0: no pain; 1–3: mild pain; 4–6: moderate pain; and 7–10: severe pain.

### Statistical analysis

The statistical analysis was done among the groups using Chi-square test, and ANOVA. Significant variables among the risk indicators which have an influence over operating time were determined using *P* value and *F* value.

## Results

The majority of the patients (65.5%) fell into the category of Group II with the mean operating time of 16.8 min [Figure 1]. The MIO is statistically significant among the groups, leading to the inference that the operating time is dependent on the MIO of the patient [Graph 1]. The other patient variable, cheek flexibility is also found to be statistically significant among groups with the patients with the minimum flexibility of the cheek observed among the patients in Group III [Graph 2]. The comparison of pre- and post-operative mouth opening in the patients is also statistically significant among the groups with the patients under Group III having a comparatively restricted opening of the mouth inferring that the increased operating time may have an effect on trismus [Graph 3]. The postoperative swelling is found to be statistically significant among the groups [Graph 4]. The sum of pain intensity among the groups according to VAS scores was significant between Groups II and III and Groups I and III with no significant difference of scores between Groups I and II [Graph 5]. The statistical evaluation of the radiographic variables such as the position of the external oblique ridge, crown root width ratio, the number of roots, and root morphology inferred that the position of the external oblique ridge and the root morphology are factors that may affect the operating time while the crown root width ratio and number of roots are independent factors with respect to operating time [Tables 1-4].

## Discussion

The assessment of difficulty of third molar surgery is fundamental to forming an optimal treatment plan to minimize complications. The surgical removal of mandibular third molars is a subject of debate because of varying degree of difficulty of the operation and researchers have related operative difficulty of impacted molars to attendant inflammatory complications of the procedure and the resulting morbidity.[7] A compilation of both clinical and radiological information is necessary to make an intelligent estimate of the time required to remove a tooth.[6] Historically, there have been various efforts at determining a reliable model for this assessment. Although many have been postulated, none could be said to be universally acceptable. The first attempt to create a model

**Figure 1:** Measurement of cheek flexibility

**Figure 2:** Measurement of interincisal opening

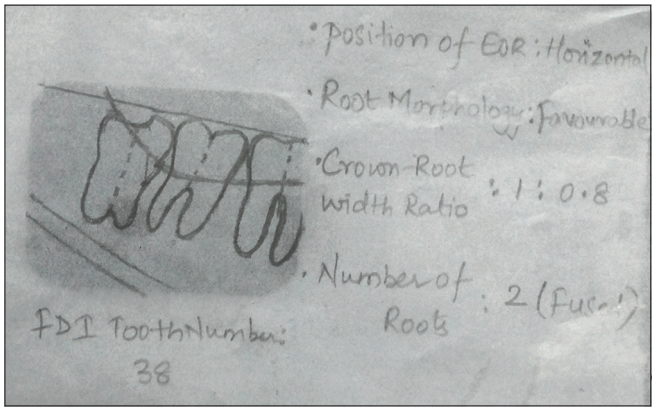



**Figure 3:** Preoperative assessment of intraoral periapical radiograph 1

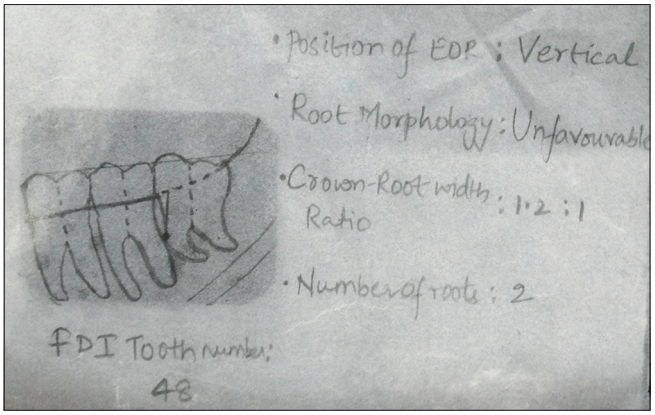



**Figure 4:** Preoperative assessment of intraoral periapical radiograph 2

**Figure 5:** Reflection of mucoperiosteal flap after terrance ward incision

**Figure 6:** Bone trough prepared

**Figure 7:** Measurement of cheek swelling

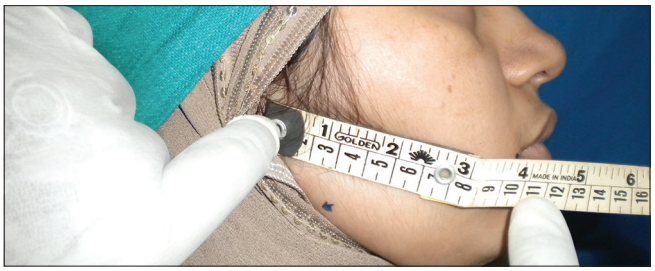
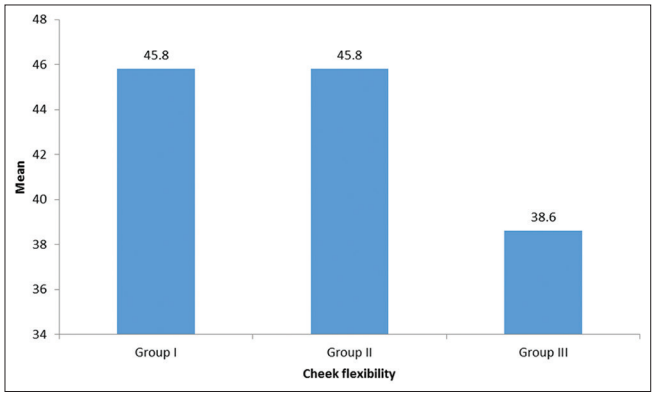


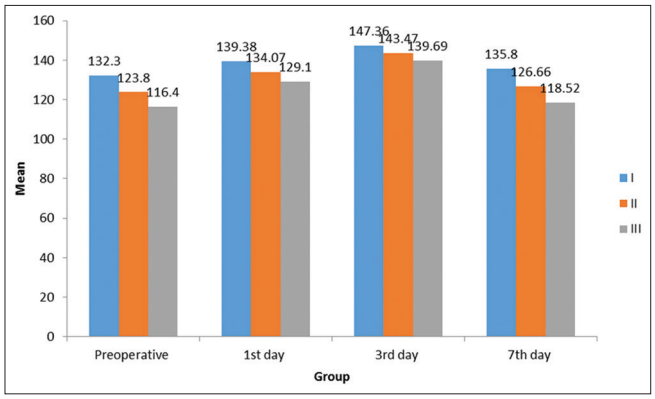
**Figure 8:** Measurement of cheek swelling markings

of this nature was by Macgregor, in 1976. Other prominent proposed models are Winter's, Pell and Gregory's, Pederson's, and the Wharfe (Winter's classification, height of the mandible, angulation of the second molar, root shape and morphology, follicle development, exit path) classification/scoring systems. These adopted quantitative scores for each of the parameters

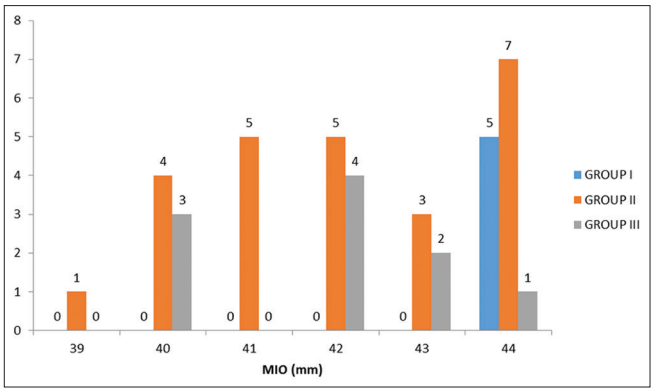
**Figure 9:** Markings for cheek swelling



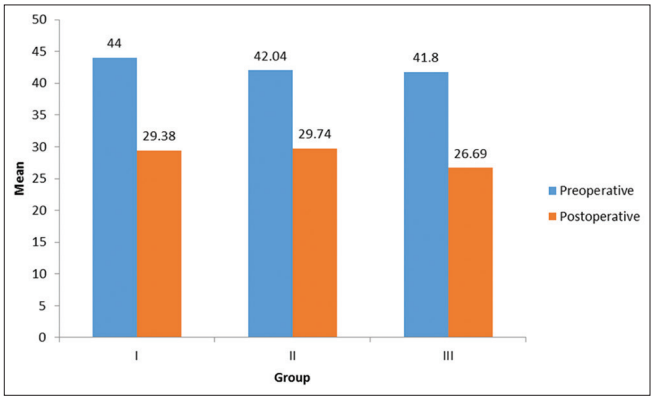

**Graph 2:** Preoperative cheek flexibility



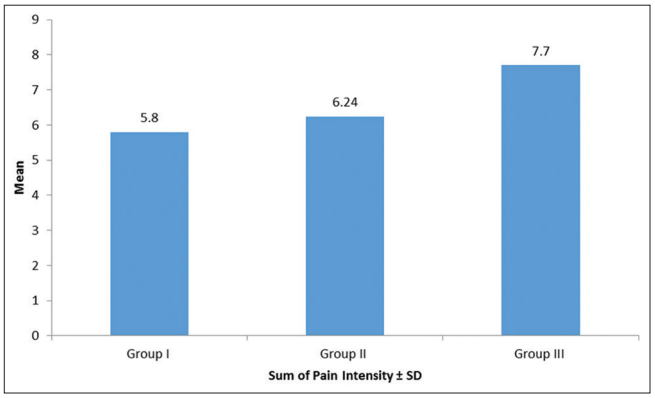

**Graph 4:** Postoperative swelling in different groups of patients




**Graph 1:** Preoperative interincisal distance




**Graph 3:** Effect of operating time on trismus




**Graph 5:** The mean pain intensity in different groups

and difficulty was estimated based on the total radiographic scoring of the impacted tooth.[8] The purpose of this study was to identify risk factors associated with the difficulty of mandibular third molar extractions. With the premise that the duration of the operation acts as an envoy for the extraction difficulty, a set of identifiable variables that could serve as predictors of mandibular third molar extraction difficulty were identified and assessed.

The mean operating time to remove the mandibular third molars was 16.8 ± 5 min. This is similar to the findings of Obimakinde *et al*. who observed the mean operating time of 17.92 ± 5.11.[7] Renton *et al*. stated that mouth opening has an impact over the difficulty of surgical removal of third molars and increases the operating time thereby increasing the postoperative complications such as swelling and trismus.[6] In this study, operating time is dependent on mouth opening, and also on the amount of trismus seen during postoperative days. de Boer *et al*. studied trismus in patients undergoing surgical removal of impacted third molar and reported that surgical procedure has an impact over trismus, especially sectioning and alveolotomy.[9] Chiapasco *et al*. reported 0.3% as trismus incidence rate.[10] In this study, we found trismus to be significant among the three groups.

Renton *et al*., Susarla and Dodson studied cheek flexibility of patients preoperatively as the study variable for surgical removal of impacted third molar and stated that cheek flexibility has an influence on operating time.[1,6] In our study, we found that cheek flexibility was significant among groups with the mean cheek flexibility in Group III

**Table 1: Relationship between position of external oblique ridge and time taken for surgery**

| External oblique ridge | Group I | Group II | Group III |
|---|---|---|---|
| Horizontal | 4 | 21 | 3 |
| Vertical | 1 | 4 | 7 |

Inference: Operating time is dependent on external oblique ridge. $\chi^2$=10.62, *P*=0.05

**Table 2: Relationship between crown-root width ratio of tooth and time taken for surgery**

| Crown root ratio | Group I | Group II | Group III |
|---|---|---|---|
| 1:2 | - | 5 | 6 |
| 2:1 | 5 | 18 | 4 |
| 1:1 | - | 2 | - |

Inference: Operating time is independent of crown root width ratio. $\chi^2$=9.25, *P*=0.05

**Table 3: Influence of number of roots of tooth on the time taken for surgery**

| Number of roots | Group I | Group II | Group III |
|---|---|---|---|
| 2 | 3 | 17 | 6 |
| 3 | 2 | 8 | 4 |

Inference: Operating time is independent of number of roots. $\chi^2$=0.32, *P*=0.05

**Table 4: Influence of root morphology on operating time**

| Root morphology | Group I | Group II | Group III |
|---|---|---|---|
| Favorable | 5 | 20 | 3 |
| Unfavorable | - | 5 | 7 |

Inference: Operating time is dependent on root morphology. $\chi^2$=11.11, *P*=0.05

being less as compared to others, which shows clearly that cheek flexibility has an influence over operating time. Bui studied swelling as postoperative complication in relation to third molar extraction, reported 1.4% of incidence among 583 patients.[2] de Boer *et al*. attributed the swelling to the sectioning procedure.[9] In our study, Swelling was significant among the groups. The surgical removal of impacted third molars can result in considerable pain, swelling and dysfunction. The factors contributing to this squeal are complex, but many of the contributing factors are related to the inflammatory process initiated by surgical trauma. Meticulous surgical techniques will minimize this process but will not prevent it.[11] In our study, we have evaluated the incidence of postoperative pain using VAS, which had a significant difference between the groups, in the immediate postoperative period and the subsequent follow-up days. This can be explained by the inflammatory postoperative response which may be responsible for higher VAS scores during the first 24 h after surgery.[7] The inflammatory response and consequent pain seemed to be higher in patients in whom the procedure took a longer duration. Yuasa *et al.* studied external oblique ridge on 44 patients undergoing surgical removal of the third molar and reported it to be a significant variable in relation to the difficulty of extraction and operating time.[12] In our study, we found the radiographic variable external oblique ridge as the dependent variable with the position of the external oblique ridge, horizontal or vertical having an impact over operating time. The crown root width ratio of the third molar was reported as a significant variable in relation to difficulty of extraction.[12] However, in our study, we found crown root width ratio as independent factor in relation to operating time. Benediktsdóttir *et al*. studied on the number of roots present in relation to the impacted third molar as a preoperative risk indicator with a tooth with more than 2 roots having an impact over operating time.[13] In our study, we found number of roots of the third molar as an independent factor in relation to operating time having no significant influence. Several authors in literature have studied root morphology as the radiographic variable in relation to surgical removal of the third molar and reported that favorable and nonfavorable root morphology has an influence over extended operating time and increases the difficulty of extraction.[1,6,13,14] In this study, results show that the root morphology of third molar is a dependent variable on operating time.

## Conclusion

Through this study, it can be inferred that the outcome of surgical removal of mandibular impacted third molar in position A, Class I depends significantly on variables, namely, mouth opening, cheek flexibility, root morphology, and external oblique ridge. Crown root width ratio and number of roots act as independent variables. Extended operation time has an impact over postoperative complications such as swelling, trismus, and pain experienced by patients. It is thus recommended to evaluate relevant patient variables and radiographic variables preoperatively as they are factors that indicate probable difficulty in the removal of mandibular third molars and may help to avoid postoperative morbidity.

### Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Nil.

### Conflicts of interest

There are no conflicts of interest.

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