



Evaluation of demographic and radiological risk factors for assessment of difficulty in surgical removal of impacted mandibular third molar – A prospective study.

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ABSTRACT

The extraction of impacted third molars is among the most common surgical procedures carried out in the field of Oral and Maxillofacial Surgery. Both the patient and dentist must therefore have scientific evidence-based information concerning the estimated level of surgical difficulty of every case to consider in referring cases of impacted third molars for specialists' handling. We have undertaken a study in which demographic and radiological variables were considered together to evaluate the risk factors for surgical difficulty in a cohort of 100 impacted mandibular third molars. There were 13 variables evaluated for surgical difficulty. Total surgical time intervention was noted at the end of each surgery. Each variable was analysed with total surgical time intervention with univariate and multiple linear regression. Out of 13 variables, 9 were found statistically significant. The most significant predictors for surgical difficulty were Body Mass Index, Depth of impacted tooth and Retromolar space. No postoperative complications were reported. **Keywords:** *Impacted, Third Molar, Surgical difficulty, radiographic factors, demographic factors.*

INTRODUCTION

The extraction of third molars is among the most common surgical procedures (*Renton et al., 2001*) and is a corner stone in the field of oral and maxillofacial surgery. Third molar impaction is a very important condition in oral surgery, in view of its frequency and the possible development of clinical manifestations of variable severity at local, regional, and systemic levels (*Marqués et al., 2008*). The extraction of third molars accounts for 50% of the cost of all oral surgical procedures (*Susarla & Dodson, 2005*). A large number of them can be performed in a non-hospital environment, which reduces cost but does not increase patient risk.

Correct diagnosis allows the dental professional to select the management approach best suited to each individual case. In spite of the diversified demands of practice, many dental surgeons will still need to face the problem of removal of impacted mandibular third molars (*Gbotolorun et al., 2007*). Both the patient and dentist must therefore have scientific evidence-based information concerning the estimated level of surgical difficulty of every case to consider in referring cases of impacted third molars for specialists' handling. Historically, there have been various efforts at determining a reliable model for difficulty assessment. Although many have been postulated, none could be said to be universally impeccable. There is an abundance of literature devoted to variables affecting extraction difficulty, pharmacologic therapies associated with removal, and postoperative complication rates.

Severe complications are more frequently found after removal of mandibular third molars than maxillary third molars (*Benediktsdottir et al., 2004*). The most severe complication after removal of mandibular third molars is injury to the inferior alveolar

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nerve or the lingual nerve. Although these complications are rather uncommon (0.1% to 17.0%) and most of them are transient and unpleasant for the patient (Benediktsdottir et al., 2004). Major risk factors for inferior alveolar nerve damage are older age of the patient, ostectomy of the bone distal to the third molar, a close radiographical relationship between the roots of the third molar and the mandibular canal, and deflection of the mandibular canal (Benediktsdottir et al., 2004). Anatomical factors such as lingual angulation of the third molar, surgical procedures such as retraction of the lingual flap, vertical tooth sectioning, older age, and the surgeon's inexperience have been found to increase the risk of temporary lingual nerve damage (Renton et al., 2001; Bataineh, 2001; Gulicher & Gerlach., 2001).

Postoperative complications in some studies have been found to be related to extended operation time. Other studies have linked tooth-related factors to postoperative complications such as mesio-horizonal position of the tooth, deep impaction, and pericoronitis. In addition, patient-related factors such as older age, female gender, and use of oral contraceptives and tobacco have caused an increased risk of postoperative complications (Grossi et al., 2007). Finally, inexperience of the surgeon, the lingual split technique and tight suturing have shown to increase the risk of postoperative complications (Bataineh., 2001). Although the main focus in postoperative complication studies was on nerve damage, other complications are also relevant as they can distress the patient for a period of time after the operation. The risk for postoperative complications must therefore be clear to the patient before the operation, and written informed consent should be obtained before removal of third molars to secure the patient's acknowledgement. Information gathered during the operation should also be explained to the patient.

Surgery of the lower third molar significantly influences patient quality of life and environment, fundamentally during the first 3 days of the postoperative period (Bonnin et al., 2006).

In this study demographic and radiological variables were evaluated for surgical difficulty in 100 cases of surgical removal impacted mandibular third molars.

MATERIALS AND METHODS

This is a prospective study, designed to evaluate the demographic and radiographic factors contributing to surgical difficulty in removal of impacted mandibular third molars. The study was conducted for a period of 2 years.

A cohort of 100 patients was selected from the outpatient department who were referred for extraction of mandibular third molar to the Department of Oral & Maxillofacial Surgery. Patients were randomly selected irrespective of their age, sex, cas-

te, creed and religion. The study protocol was approved by the local Committee of Ethics and Maharashtra University of Health Sciences. Informed written consent from patients was obtained before they were included in this study. In patients, where 2 molars were removed, it was done on separate occasions with a time interval of more than 20 days.

Criteria for selection

The sample for the study was selected considering the following criteria.

1. Patients fit to undergo local anaesthesia without any contraindication.
2. Patients not having any systemic problems.
3. Mandibular third molar that was to be removed was either fully or partially impacted in bone, which meant that there would be a need for bone removal during the operation.

Assessment of the cases was done pre-operatively on the basis of the following observations.

1. Case history and clinical examination.
2. Radiographic interpretation.
3. Laboratory investigations.

Variables

The surgery can be influenced in various ways by the general state of health of the patient. A careful case history was therefore recorded. A detailed case history form showing pre, intra and post-operative assessment was used for every patient to keep the proper records.

For radiographic interpretation an intraoral periapical radiograph was taken along with a grid with bisecting angle technique for impacted mandibular third molar. All the radiographic parameters were recorded on the case history by an independent individual of Oral and Maxillofacial Surgery Department.

Routine laboratory investigations including bleeding time, clotting time, complete haemogram with platelet count and blood sugar were done in every patient. Patients were assigned to the randomly selected surgeon from the Professors, Readers, Lecturers and Post Graduate students. No prophylactic analgesics or antibiotics were prescribed to the patient.

Procedure

For local anaesthesia, all patients received 2% lignocaine with 1:80000 adrenaline as an inferior alveolar nerve block supplemented with lingual nerve block and buccal infiltration (Benediktsdottir et al., 2004). The time of surgery was considered, from the time when incision was placed to the placement of

last suture (Renton et al., 2001). A stop watch was used to note the total surgical time intervention (Gbotolorun et al., 2007). A modified Ward incision was used. After mucoperiosteal flap elevation, bone surrounding the third molar was removed with a round bur in a straight handpiece using a copious amount of saline irrigation. In the majority of cases, the third molar was split using a straight fissure bur as the routine technique (Benediktsdottir et al., 2004). The tooth was then carefully removed. The alveolus was inspected and curetted for granulation tissue followed by copious irrigation with saline. Closure was accomplished with 3/0 black silk sutures. A gauze pack was pressed against the surgical site and the patient instructed to bite upon this for one hour. The time of completion of the surgical procedure was noted. The patient was given the usual postoperative instructions and guidelines. All the patients who underwent surgery for removal of impacted mandibular third molar were kept on follow up and were recalled to assess healing and complications.

Statistical analysis

Data was coded and analysed in STATA version 10.4 (StataCorp, USA). Univariate analysis was performed where descriptive statistics like Mean and SD or frequency and percentage were calculated. Multiple linear regression analysis was used to assess relationship between continuous outcome (Surgical Time) with a set of predictors.

RESULTS

A total of 100 impacted mandibular third molars were removed surgically under local anaesthesia. Postoperative complications were not reported in any case in our study. Demographic and radiological factors were evaluated with total time of surgical intervention.

Out of 100 impacted teeth, 20% were operated for >60 minutes, 63% for 30-60 minutes, and 17% for <30 minutes. Mean operation time was 48.46 ±16.69 minutes for entire cohort who underwent the surgery.

Nine variables were found to be statistically significant: Age ($p=0.045$), BMI ($p<0.001$), Impaction State ($p=0.001$), Angulation ($p<0.001$), Depth of impacted tooth ($p=0.010$), Curvature of roots ($p=0.033$), Contact with second molar ($p=0.001$), Root periodontal space interface ($p=0.028$), Depth from point of elevation ($p=0.024$).

Multiple linear regression was applied with surgical difficulty as the outcome variable and 9 significant variables as the predictors. The most significant variables were found to be BMI ($p=0.000$), Depth of impacted tooth ($p=0.003$) and retromolar space ($p=0.037$).

DISCUSSION

Previous assessment models were based on dental factors recorded on preoperative x-rays (Renton et al., 2001; Benediktsdottir et al., 2004; Yuasa et al., 2002; Santamaria & Arteagoitia, 1997; Garcia et al., 2000). Three imaginary lines to determine the depth of the mandibular third molars in bone have been described earlier. This method is taught to most undergraduate students, but is reported to be used little in practice (Renton et al., 2001). Pell & Gregory (1933) described an alternative method, but it also has recently been found to be an unreliable method of determining surgical difficulty (Garcia et al., 2000). Other studies included the intraoperative variables for surgical difficulty (Renton et al., 2001; Pell & Gregory, 1933; Susarla & Dodson, 2005; Akadiri & Obiechina, 2009).

Age and BMI are the demographic risk factors found significant for increased surgical time intervention thus increasing the difficulty of surgical removal of impacted mandibular third molars. Renton et al. (2001), Benediktsdottir et al. (2004), and Gbotolorun et al. (2007) found the same demographic variables significant for surgical difficulty. Akadiri & Obiechina (2009) suggested only age as the demographic variable responsible for surgical difficulty. On the contrary, Susarla & Dodson (2004) stated that demographic variables have minimal influence on surgical difficulty of impacted mandibular third molars. Impaction state i.e fully impacted teeth (22%) required >30 minutes, is the risk factor for increased operation time found in the present study similar to the findings of Renton et al. (2001). Benediktsdottir et al. (2004) stated that fully impacted molars have increased risk of postoperative infection.

Angulation of the impacted mandibular molars was classified by Winter (1926). Horizontal (22%) followed by mesioangular (24%) impacted mandibular molars showed significant increase in time (>30 minutes) in the present study. The same factor was stated to be significant factor for surgical difficulty by Renton et al. (2001) and Akadiri & Obiechina (2009). Depth of impacted tooth was classified by Pell & Gregory (1933) who is widely accepted. Level C impacted tooth 19% have shown significance in extended operation time with >30 minutes in this study. Same factor was found significant by Santamaria & Arteagoitia (1997), Yuasa et al. (2002), and Akadiri & Obiechina (2009). Akadiri et al. (2006) stated depth of impaction as the single most significant factor for surgical difficulty in impacted mandibular third molars. Curvature of roots is the only root morphology found as a significant risk factor in surgical difficulty in this present study similar to that of Renton et al. (2001), Gbotolorun et al. (2007) and Akadiri & Obiechina (2009).

Yuasa et al. (2002) stated bulbosity of roots as the significant risk factor for surgical difficulty. Contact with second molar in this study especially root and crown contact relationship (9%)

with >60 minutes of surgical time intervention was evaluated as a significant factor, as previously stated by *Santamaria & Arteagoitia (1997)*. Root periodontal space interface in the present study was found to be significant irrespective of the condition of periodontal space as previously reported in the study of *Gbotolorun et al. (2007)*. *Santamaria & Arteagoitia (1997)* stated that width of periodontal space was a significant factor. Depth from point of elevation was taken as radiological variable to be evaluated for surgical difficulty as stated previously by *Ward (1953)* as the single most significant risk factor for surgical difficulty. In the present study 14% cases required >60 minutes for surgery and so was found to be responsible for surgical difficulty, as also supported in the past studies by *Renton et al. (2001)* and *Gbotolorun et al. (2007)*.

Age and gender were reported as significant variables for delayed clinical recovery by *Phillips et al. (2003)* and gender for severe post-operative discomfort by *Grossi et al. (2007)*. *Yuasa & Sugiura (2004)* found that age was not significant for post-operative pain. Gonial angle was assessed for surgical difficulty by *Sánchez-Torres et al. (2019)* but proved insignificant.

Some study's limitations must be considered: Intraoperative factors were not evaluated for surgical difficulty; post-operative sequelae like swelling and reduced mouth opening were not considered in the present study; random selection of an independent examiner who would not operate on cases selected in the study will be difficult in practical situation; other imaging techniques like Computed Tomography were not used, which could have helped in evaluation of other parameters in the study; complications not related to surgical procedure were not considered in this study; and position of impacted mandibular third molars in three dimensions like lingually tilted, crown present buccal to second molar, etc. was not considered which could have contributed in surgical difficulty and complications.

CONCLUSION

Age, BMI, Impaction state, Angulation of impaction, Depth of impacted tooth, Curvature of root, Contact with second molar, Root periodontal space interface, Depth of point of elevation were found to significantly affect the surgical difficulty in removal of impacted mandibular third molar. Further studies should be performed on larger cohort to evaluate the role of other risk factors and their magnitude of effect on surgical difficulty.

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