Original Article

Role of Patients' Demographic Characteristics and Spatial Orientation in Predicting Operative Difficulty of Impacted Mandibular Third Molar

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Abstract

Background: The influence of patient factors such as age, sex, weight, body mass index (BMI) and spatial orientation on operative difficulty of impacted mandibular third molar (M3) surgery is a subject of controversy in the literature. **Aim:** To assess the risk indicators of operative difficulty of mandibular third molar surgery at our institution. **Subjects and Methods:** A descriptive cross-sectional study involving patients that presented for wisdom tooth extraction between January 2010 and December 2011. The correlation between patients' factors such as age, sex, weight, height, BMI, radiographic spatial relationship of the impacted tooth and operation time was determined with Spearman's rank correlation coefficient. Statistically significant variables were selected for multiple regression analysis to determine which factors contribute most to operative difficulty of M3. *P* value was set at 0.05. Statistical analysis used SPSS 17.0. **Results:** Only patients' age and radiographic spatial relationship showed a statistically significant correlation with operation time ($P = 0.038$ and 0.008, respectively). Linear regression analysis of patients' age and angulation of M3 showed that both contribute 44.8% risk of increased operation time (regression coefficient = 0.448), with M3 angulation contributing more significantly to increase in operation time ($P = 0.001$) than increasing age of the patient ($P = 0.005$). **Conclusions:** Findings from this study have shown that increasing age of the patient and the angulation of M3 impaction increases the risk of operative difficulty of the impacted M3 significantly.

Keywords: Impacted mandibular third molar, Operation time, Surgical difficulty

Introduction

The wisdom tooth, also known as the mandibular third molar (M3), is the most commonly impacted tooth in the mouth, and is closely followed by the maxillary third molar, maxillary canine and mandibular canine.[1-3] Its extraction, being the most common dentoalveolar surgery performed by Oral Surgeons, is often associated with a varying degree of difficulty, which may be related to a number of pre-operative variables.[4-6] The degree of difficulty of impacted mandibular third molar removal has also been linked to post-operative inflammatory sequelae and other morbidities that may result from the procedure.[6,7]

The duration of operation of M3 has been regarded as the gold standard in measurement of operative difficulty, and hence a predictor of post-operative morbidity.[8-10] Operation time has been related to patients' factors such as age, gender and weight on the one hand and radiographic factors like angulation of M3 on the other hand.[9,11-15] While most authors agree on the correlation between radiographic factors such as M3 angulation, depth of impaction and number of roots/curvature,[11-15] controversy exists in the literature about the correlation between patient factors and the actualduration of surgery.[12,14-16] Different studies have examined the influence of patient factors such as age, sex, weight, total body surface area and anxiety on duration of M3 surgery; yet, there is a wide variation in their findings.

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Thus, information regarding estimated operation time, post-operative pain and other complications must be thorough and based on scientific knowledge. This will help the general dental practitioner to appropriately triage cases of M3 impaction for referral to the oral surgeon. There is dearth of literature on the correlation between patients' factors and perceived operative difficulty of impacted M3 among Nigerians and hence it is difficult to draw comparison with the foreign literature. The aim of the present study was to assess the role of patients' demographic variables and third molar spatial orientation on operative difficulty of impacted mandibular third molar at our institution.

Subjects and Methods

This study is a descriptive clinical study that was carried out at the Oral and Maxillofacial Surgery Clinic of Ekiti State University Teaching Hospital, Ado-Ekiti, Nigeria. Patients that presented for wisdom tooth excision between January 2010 and December 2011 were recruited into the study. Patients were duly informed about the study, and only those who consented to participate were included. Pregnant women and those who refused to partake in the study after being duly informed were excluded. Those with co-existing jaw lesion such as dentigerous cyst and malignant lesions were also excluded. Ethical approval for the study was obtained from our institutions ethical committee prior to commencement of the work.

Demography, body weight, height and body mass index (BMI) of each patient was recorded on individual proforma. A standard periapical radiograph of the impacted wisdom tooth was used to determine the angulation of the impacted mandibular third molar according to winter's classification as modified by Quek *et al*.[2] All extractions were done under local anesthesia using two catridges of 1.8 mL 2% xylocaine (adrenaline concentration of 1:80,000). Similar surgical modality was employed for all patients, which included a three-sided mucoperiosteal flap and buccal guttering bur technique with continuous irrigation using sterile normal saline.

The operation time was used as a measure of operative difficulty, and it included the period from the beginning of incision to the placement of the last suture. The operation time was recorded with a stop watch by a calibrated assistant. The operation was classified as slightly difficult (10-20 min), moderately difficult (20.01-30 min) and very difficult (30.01 min and above). 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.

Data analysis

Data analysis was done with Statistical Package for Social Science (SPSS version 17.0, Chicago Illinois, USA). Mean age and BMI of the patients were determined. Spearman's correlation test was used to determine the patient factors with significant correlation to operation time. The results of these tests were compared and only those factors with $P < 0.05$ were selected for multiple regressions, with operation time as the dependent variable. The level of significance was set at a P value less than 0.05.

Results

A total of 109 patients were seen during the study period, and only 86 patients who consented to participate in the study were enrolled. The mean age of the patients was 27.67 years (SD 7.19) (range 19-56 years), while the male to female ratio was 1:1.15.

The relationship between surgical difficulty and spatial relationship of the impacted teeth is shown in [Figure 1]. Majority of the mesioangular and vertical impactions were slightly difficult. The distoangular and horizontal impactions were more than either mesioangular or vertical impactions in the very difficult group of extractions.

Operation time ranged from 11.05 to 34.10 min, with the mean being 17.92 min (SD 5.11). Analysis of correlation between operation time and patient factors (age, sex, weight, height, BMI and wisdom tooth angulation) with Spearman correlation coefficient [Table 1] showed that only age of the patient and angulation of the impacted wisdom tooth have a statistically significant correlation with operation time ($P = 0.038$ and 0.008, respectively). Linear regression analysis of patients' age and angulation of M3 [Table 2] showed that both contribute 44.8% risk of increased operation time (regression coefficient = 0.448). Mandibular third molar angulation contributes more significantly to increased operation time ($P = 0.001$) than increasing age of the patient ($P = 0.005$) [Table 3].

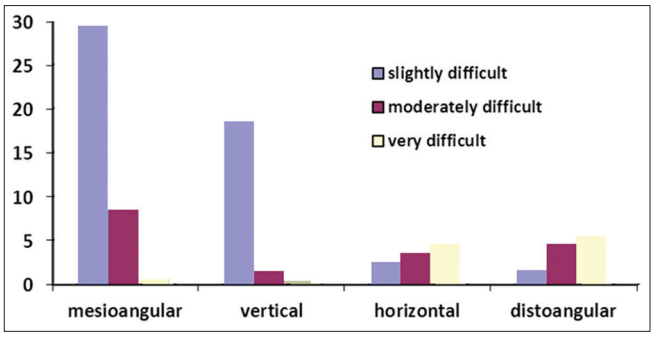

Figure 1: Mandibular third molar spatial relationship and operation time. Majority of the mesioangular and vertical type of impactions were slightly difficult ($n = 30$ and 19, respectively). More of the very difficult extractions were seen in the horizontal and distoangular varieties

Table 1: Correlation between patients' factors and surgical difficulty

Correlations (Spearman's rho)	Surgical difficulty
Age	
Correlation coefficient	0.224
Sig. (2-tailed)	0.038*
Weight	
Correlation coefficient	0.091
Sig. (2-tailed)	0.089
Height	
Correlation coefficient	0.148
Sig. (2-tailed)	0.067
Body mass index	
Correlation coefficient	0.163
Sig. (2-tailed)	0.064
Sex	
Correlation coefficient	0.020
Sig. (2-tailed)	0.853
M3 angulation	
Correlation coefficient	0.283
Sig. (2-tailed)	0.008*

NB: *Significant variables

Table 2: Regression model summary

Model summary				
Model	**R**	**R square**	**Adjusted R square**	**Std. error of the estimate**
1	0.448[a]	0.201	0.182	4.621

[a]Predictors: (Constant), angulation, age

Table 3: Regression coefficient

Coefficients[a]					
Model	**Unstandardized Coefficients**		**Standardized coefficients**	***t***	**Sig.**
	B	**Std. error**	**Beta**		
1 (Constant)	9.200	2.182		4.217	<0.001
Age	0.199	0.070	0.280	2.857	0.005
Angulation	1.600	0.453	0.346	3.531	0.001

[a]Dependent variable: Time

Discussion

Information to be given to patients regarding operative difficulty of M3 must be scientific and thorough.[6] Dental surgeons are still faced with the dilemma of explanations regarding operation time, associated risk factors of operative difficulty and attendant post-operative morbidity. There is no consensus of opinion regarding patient factors that are contributory to operative difficulty of M3 surgery, and the present study is an attempt to compare our findings with previous reports in the literature.

The duration of surgery is generally regarded as the gold standard for measurement of intraoperative difficulty in mandibular third molar surgery.[17,18] The mean duration of surgery in this study (17.9 (5.11) min) and range of 11.05-34.10 min are comparable to some previous reports of cases performed under similar conditions, i.e., using the bur technique under local anesthesia.[9,14,17] Varying mean operation times have been reported by different authors, ranging from 7.74 min to 105 min.[14,16,17,19] Factors that may account for this variation include surgeon's experience, types of anesthetic technique, speed and sharpness of the bone cutting instrument and overall state of facilities employed.[14,17] In the present study, all surgeries were performed by the same surgeon under similar conditions for all subjects.

Patient factors that were found to correlate significantly with increased operation time were age and degree of angulation of the impacted third molar tooth. The study by Gbotolorun *et al*.,[9] also found age as a significant contributory factor to difficulty of M3 surgery. However, Akadiri *et al*.,[15] did not find any significant correlation between age and surgical difficulty. A foreign report by Renton *et al*.,[14] showed that patient's age is relevant for predicting difficulty of third molar surgery. Contrary to their findings, Susarla and Dodson[16] reported that age is not statistically associated with operative time, while angulations of impacted teeth and sex were statistically significant patient factors in this regard. The fact that older patients tend to have more dense cortical bone, which may increase bone cutting time, can be a reason why age has a significant correlation with surgical difficulty in the present study.

Gender is another patient factor that has been examined as a predictor of difficulty of impacted third molar surgery. The present study did not reveal any statistically significant correlation between sex and operation time. This is in agreement with the other studies cited.[9,12,14,15] However, the study by Susarla and Dodson[16] showed a statistically significant correlation between sex and difficulty of impacted mandibular third molar operation.

Contrary to the findings of Gbotolorun *et al*.,[9] body weight and BMI did not have a statistically significant correlation with duration of surgery in our series. In addition to body weight, Akadiri *et al*.,[15] also examined body surface area, and found a statistically significant correlation between the two variables and operation time. In agreement with our finding, the study by Susarla and Dodson did not find any significant correlation between patient's weight and duration of surgery. No clear explanation could be adduced for the contribution of weight to surgical difficulty. Body weight is a function of body size and bone density, and it may be difficult to conclude that large weight is entirely due to bigger or thicker bone. A fat or obese patient tends to have full and thick cheeks, which may reduce access during third molar surgery thus prolonging operation time. Perhaps, culture and demographic differences between the populations studied may be responsible for the variation in findings of different authors.

The present study corroborated other authors' assertion that spatial orientations of impacted tooth have been known to

influence difficulty of extraction.[9,11,16,17,19-21] However, Renton *et al*.,[14] did notagree that spatial orientation of the tooth is a factor that may influence surgical difficulty; instead, they identified bony impactions as a factor that affects difficulty, which is reasonable as it is generally known that impactions against soft tissues can be easily relieved by mere excision of the overlying tissue. Isolated soft tissue impactions were not involved in the present study. Traditionally, radiographic variables such as the depth of impaction, spatial orientation (i.e., angulations), ramus relationship and root morphology have been recognized as factors that may affect the difficulty of third molar surgery.[17,19]

The regression coefficient of 44.8 observed in this study, although lower than 50, showed that patients' age and spatial orientation contributed nearly half of the risk indicators for a difficult impacted mandibular third molar operation. The relative weakness in the model coefficient may be as a result of the relatively lower sample population employed in this study. Perhaps, a study involving a larger sample size may show a stronger regression coefficient.

Conclusion

Findings from this study have shown that increasing age of the patient and the angulation of M3 impaction increases the risk of operative difficulty of the impacted M3 significantly. However, gender and patient's weight did not appear to have a significant correlation with operation time.

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