

Article

EVALUATION OF DEMOGRAPHIC, RADIOLOGICAL AND INTRAOPERATIVE FACTORS FOR ASSESSMENT OF POSTOPERATIVE PAIN AND COMPLICATIONS IN SURGICAL REMOVAL OF IMPACTED MANDIBULAR THIRD MOLAR – A PROSPECTIVE STUDY

**Evaluación de factores demográficos, radiológicos e
intraoperatorios para la evaluación del dolor postoperatorio y
las complicaciones en la extracción quirúrgica del tercer molar
mandibular impactado: un estudio prospectivo**

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SUMMARY

Third molars usually erupt within the age of 17 – 21 years. Usually, due to the evolution of human jaws, the size is decreasing leading to the impacted tooth. An impacted tooth may lead to external resorption of the adjacent tooth, trismus, infection, etc. Many studies have been reported in the literature for evaluating the surgical difficulty and postoperative complications secondary to impacted third molars. This study includes a sample of 100 subjects evaluated for the surgical difficulty and postoperative complications. Various demographic, radiological, and intraoperative factors were evaluated which may lead to postoperative complications. Factors responsible for postoperative sequelae were also evaluated with complications. Postoperative pain after 4 hours and 7 days was assessed to mark the factors commonly responsible. Pain at 7th postoperative day was significant involving factors like fully impacted, horizontal impaction, level C, no/very little retromolar space, and root contact. Postoperative complications were not reported in this study.

Keywords: The impacted third molar, surgical difficulty, postoperative complication, postoperative sequelae.

1. Introduction

According to Laskin, an embedded or impacted tooth is the tooth, that has failed to erupt completely or partially in its normal position in the dental arch and its eruption potential has been lost. Due to the evolution of human jaws, the size of jaws has reduced leading to the incidence of impacted third molars. Mostly these are the last teeth to erupt in the oral cavity in 17 to 21 years of age with prevalence in the range of 16.7% to 68.6%. (Khanal et al. 2014)

Several classifications of impacted third molars have been described in the literature. Winter suggested a classification for the angulation of impacted third molar concerning the long axis of the adjacent second molar. Pell and Gregory classified the depth of the impacted tooth in two categories: The first identifies the position of the impacted tooth in relation to the second molar, while the second category relates the impacted third molar to the ascending ramus of the mandible. Killey and Kay classified the state of the eruption of impacted third molars into erupted, partly erupted and unerupted. (Bali, Bali, and Sharma 2012)

Such an embedded tooth tends to cause discomfort which can further lead to recurrent pericoronitis, pain, infection, or caries.

There are several previous studies to evaluate the surgical difficulty in the extraction of impacted mandibular third molars but most of these studies were based only on dental factors evaluated by radiologic assessment. (Gbotolorun, 2007) In the literature, several other authors observed that the difficulty during the surgery cannot be assessed preoperatively but can be done more precisely during the surgery. Some studies evaluate intraoperative factors that increase the surgical difficulty during the removal of the impacted mandibular third molar. The duration of the operation has been related to factors such as the severity of impaction and tooth position and the experience of the surgeon involved. Postoperative complications in some studies have been found to extend the operation time (Benediktsdóttir et al., 2004) A large volume of cases in contemporary oral surgical practice is the surgical removal of impacted mandibular third molars which require proper planning and surgical skills in perioperative management. (Tenglikar et al. 2019)

The most common complications following third molar surgery are nerve damage, dry socket, pain, swelling, trismus, infection, and hemorrhage. Pain, trismus, and swelling are the postoperative sequelae after this procedure and the incidence of both inferior alveolar and lingual nerve damage is high and may be permanent. Other complications are oro-antral fistula, buccal fat herniations,

and iatrogenic damage to the adjacent second molar and iatrogenic mandibular fracture. (Od, Bd, and Go 2019)

This study aimed to assess demographic, radiological, and intraoperative risk factors that increased the surgical difficulty and may consequently lead to post-operative complications.

2. Materials and methods

This is a prospective study involving 100 patients. The local Ethical Committee of the institute approved the study. Informed written consent from patients was obtained before the surgical procedure. A cohort of 100 patients was selected from the OPD who were referred for extraction of the impacted mandibular third molar to the department of Oral & Maxillofacial Surgery.

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

1. Patients fit to undergo local anesthesia 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 suggests that there would be a need for bone removal during the operation.

3. Exclusion criteria

1. Medically compromised patient.
2. Only soft tissue impacted mandibular third molars.

The assessment was done pre-operatively based on the following observations.

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

Proper records were maintained for interpretation of data and future references. Patients were draped and prepared under all aseptic protocol. Professors, Readers, Lecturers and Post Graduate students were assigned patients randomly. Local anesthesia lignocaine with adrenaline (1:80,000) was administered with Inferior alveolar nerve block, Lingual nerve block and Longbuccal nerve block. Ward I and ward II incision were given depending upon the type of impaction for access. Bone cutting was done to expose the tooth and sectioning was done based on the requirement. The tooth was removed and the socket was irrigated. Wound closure was done using 3-0 vicryl suture. The duration of the surgery was recorded and pre-operative surgical difficulty and actual surgical difficulty encountered during surgery were assessed. The intensity of pain was measured on 4th hours and 7th postoperative day after extraction and any complications if reported were recorded. No prophylactic analgesic or antibiotic were prescribed to the patients.

4. Statistical analysis

Data were coded and analyzed 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 the relationship between continuous outcomes (Surgical Time) with a set of predictors.

5. Result

This study consisted of 100 patients indicated for surgical removal of the impacted mandibular third molar. The age of subjects involved ranges from 17 to 31 years.

The pain at 4 hours postoperatively was found to be statistically significant. Moderate pain is significantly higher at 4th postoperative day with factors i.e. impaction state (P=0.04) (Table I), angulation (Table II), retromolar space(P>0.05) (Table III), root inferior alveolar canal relationship(P<0.05) (Table IV), root periodontal space interface (P=0.035) (Table V) and total surgical time intervention (P=0.0019) (Table VI).

Pain on the 7th postoperative day after extraction was found to be statistically significant. Variables found significant for pain on 7th postoperative day was impaction state(P=0.016) (Table VII), angulation(P=0.0479) (Table VIII), Depth(P=0.0053) (Table IX), retromolar space(P=0.038) (Table X) and root inferior alveolar canal relationship(P=0.00)(Table XI).

Out of these significant variables for 4hours and 7th day postoperative pain, 4 variables were found to be common i.e. impaction state, angulation, retromolar space, and root inferior alveolar canal relationship.

Postoperative complications were not reported in this study.

Table I:
Impaction State by VAS at 4 hours.

Impaction State		VAS 4 Hrs			Total
		Mild	Moderate	Severe	
Fully impacted	Number	6	14	2	22
	%Impaction State	27.3%	63.6%	9.1%	100.0%
Semi-impacted	Number	40	37	1	78
	%Impaction State	51.3%	47.4%	1.3%	100.0%
Total	Number	46	51	3	100
	%Impaction State	46.0%	51.0%	3.0%	100.0%

Table II:
Angulation of impaction by VAS at 4 hours.

Angulation of Impaction		VAS 4 Hrs			Total
		Mild	Moderate	Severe	
Vertical	Number	15	10	1	26
	%	57.7%	38.5%	3.8%	100.0%
Mesioangular	Number	13	17	0	30
	%	43.3%	56.7%	.0%	100.0%

Angulation of Impaction		VAS 4 Hrs			Total
		Mild	Moderate	Severe	
Distoangular	Number	13	8	0	21
	%	61.9%	38.1%	.0%	100.0%
Horizontal	Number	5	15	2	22
	%	22.7%	68.2%	9.1%	100.0%
Total	Number	46	50	3	99
	%	46.5%	50.5%	3.0%	100.0%

Table III:

Retromolar space by VAS at 4 hours.

Retromolar space		VAS 4 Hrs			Total
		Mild	Moderate	Severe	
Sufficient space	Number	24	23	3	50
	%Retromolar space	48.0%	46.0%	6.0%	100.0%
Reduced	Number	20	17	0	37
	%Retromolar space	54.1%	45.9%	.0%	100.0%
no / very little	Number	2	11	0	13
	%Retromolar space	15.4%	84.6%	.0%	100.0%
Total	Number	46	51	3	100
	%Retromolar space	46.0%	51.0%	3.0%	100.0%

Table IV:

Root inferior alveolar canal relation by VAS at 4 hours.

Root inferior alveolar canal		VAS 4 Hrs			Total
		Mild	Moderate	Severe	
>2mm	Number	13	6	1	20
	%Root inferior	65.0%	30.0%	5.0%	100.0%
<2mm	Number	26	16	0	42
	%Root inferior	61.9%	38.1%	.0%	100.0%
0mm	Number	7	29	2	38
	%Root inferior	18.4%	76.3%	5.3%	100.0%
Total	Number	46	51	3	100
	%Root inferior	46.0%	51.0%	3.0%	100.0%

Table V:

Root periodontal space interface by VAS at 4 hours.

Root periodontal		VAS 4 Hrs			Total
		Mild	Moderate	Severe	
Clear	Number	28	24	0	52
	%Root periodontal space interface	53.8%	46.2%	.0%	100.0%

Root periodontal		VAS 4 Hrs			Total
		Mild	Moderate	Severe	
Some clear	Number	17	20	2	39
	%Root periodontal space interface	43.6%	51.3%	5.1%	100.0%
Sclerosed	Number	1	7	1	9
	%Root periodontal space interface	11.1%	77.8%	11.1%	100.0%
Total	Number	46	51	3	100
	%Root periodontal space interface	46.0%	51.0%	3.0%	100.0%

Table VI:

Total surgical time by VAS at 4 hours.

Total surgical time (min)		VAS 4 Hrs			Total
		Mild	Moderate	Severe	
0-30	Count	10	6	1	17
	% within Total surgical time (min)	58.8%	35.3%	5.9%	100.0%
31-60	Count	33	30	0	63
	% within Total surgical time (min)	52.4%	47.6%	.0%	100.0%
> 60	Count	3	15	2	20
	% within Total surgical time (min)	15.0%	75.0%	10.0%	100.0%
Total	Count	46	51	3	100
	% within Total surgical time (min)	46.0%	51.0%	3.0%	100.0%

Table VII:

Impaction State by VAS at 7th day.

Impaction State		VAS 7 TH DAY			Total
		No Pain	Mild	Moderate	
Fully impacted	Number	6	16	0	22
	%Impaction State	27.3%	72.7%	.0%	100.0%
Semi-impacted	Number	44	33	1	78
	%Impaction State	56.4%	42.3%	1.3%	100.0%
Total	Number	50	49	1	100
	%Impaction State	50.0%	49.0%	1.0%	100.0%

Table VIII:
Angulation of impaction by VAS at 7th day.

Angulation of impaction		VAS 7 TH DAY			Total
		No Pain	Mild	Moderate	
Vertical	Number	16	9	1	26
	%Angulation of impaction	61.5%	34.6%	3.8%	100.0%
Mesioangular	Number	12	18	0	30
	%Angulation of impaction	40.0%	60.0%	.0%	100.0%
Distoangular	Number	15	6	0	21
	%Angulation of impaction	71.4%	28.6%	.0%	100.0%
Horizontal	Number	7	15	0	22
	%Angulation of impaction	31.8%	68.2%	.0%	100.0%
Total	Number	50	48	1	99
	%Angulation of impaction	50.5%	48.5%	1.0%	100.0%

Table IX:
Depth of impacted tooth by VAS at 7th day.

Depth of impacted tooth		VAS 7 TH DAY			Total
		No Pain	Mild	Moderate	
Level A	Number	27	21	1	49
	%Depth of impacted tooth	55.1%	42.9%	2.0%	100.0%
Level B	Number	19	13	0	32
	%Depth of impacted tooth	59.4%	40.6%	.0%	100.0%
Level C	Number	4	15	0	19
	%Depth of impacted tooth	21.1%	78.9%	.0%	100.0%
Total	Number	50	49	1	100
	%Depth of impacted tooth	50.0%	49.0%	1.0%	100.0%

Table X:
Retromolar space by VAS at 7th day.

Retromolar space		VAS 7 TH DAY			Total
		No Pain	Mild	Moderate	
Sufficient space	Number	26	24	0	50
	%Retromolar space	52.0%	48.0%	.0%	100.0%

Retromolar space		VAS 7 TH DAY			Total
		No Pain	Mild	Moderate	
Reduced	Number	21	16	0	37
	%Retromolar space	56.8%	43.2%	.0%	100.0%
no / very little	Number	3	9	1	13
	%Retromolar space	23.1%	69.2%	7.7%	100.0%
Total	Number	50	49	1	100
	%Retromolar space	50.0%	49.0%	1.0%	100.0%

Table XI:

Root inferior alveolar canal relation by VAS at 7th day

Root inferior		VAS 7 TH DAY			Total
		No Pain	Mild	Moderate	
>2mm	Number	15	5	0	20
	%Root inferior	75.0%	25.0%	.0%	100.0%
<2mm	Number	29	13	0	42
	%Root inferior	69.0%	31.0%	.0%	100.0%
0mm	Number	6	31	1	38
	%Root inferior	15.8%	81.6%	2.6%	100.0%
Total	Number	50	49	1	100
	%Root inferior	50.0%	49.0%	1.0%	100.0%

6. Discussion

Many studies have been published in the literature for factors leading to postoperative pain and complications.

A study by Khanal et al., in 2014 reported that post-operative complications like swelling and trismus were associated with increased difficulty index. According to Khanal et al incidence of swelling and trismus increases with increased difficulty index (Khanal et al., 2014). Tenglikar et al. study, maximum interincisal opening, external oblique ridge, and root morphology were found to be dependent factors that influence the operating time. According to this study operating time is directly related to swelling, trismus, and pain (Tenglikar et al, 2019). Giovanni et al., in 2007 conducted a study to identify the risk factors for severe discomfort after mandibular third molar surgery and to assess the validity of the postoperative symptom severity scale. The results suggested a strong correlation between the severity of symptoms with trismus ($r = 0.54$) and pain ($r = 0.42$) (Grossi, 2007).

Benediktsdóttir et al., 2004 identified risk indicators for extended operation time and postoperative complications after removal of impacted mandibular third molars and concluded that older patients were at higher risk for extended operation time than younger patients. If the nerve was visible during surgery there was a higher risk of a high VAS score. The study by Hidemichi in 2004 considered that the short-term outcomes of third molar operations (swelling and pain) differ depending on the patient's characteristics (age and sex) and preoperative index of difficulty. They concluded that the

amount of facial swelling varied depending on age and sex. Also, severe pain was associated with depth and preoperative index of difficulty (Yuasa & Sugiura, 2004).

At Nigerian Teaching Hospital in 2019, a study was done by Osunde et al and they concluded that age of the patient, cigarette smoking, and oral contraceptive are some of the factors affecting outcome in third molar surgery and may lead to complication. (Od, Bd and Go, 2019) Ahuja et al in 2017 concluded that extraction performed at a younger age is more successful than in older age. Females are more prone to dry socket due to the use of contraceptives (Ahuja et al., 2017). On the contrary oral contraceptives and operation time were not identified as risk factors that lead to complications (Grossi, 2007).

A study by Mandibular et al., whose aim of the study was to find the incidence of postoperative complications affecting the quality of life were pain, edema, trismus, and paresthesia. On the 7th postoperative day, they noted the relationship between petechiae, ecchymosis, infection, edema, hemorrhage, trismus, paresthesia, alveolitis, mandibular fracture, and the number of the extracted teeth. The infection and petechiae (0.8%) were the rarest complications, while edema (77.7%) was common. (Atalay et al., 2014)

A study by Kulkarni et al in 2015 and Goel et al in 2019 demonstrates that preoperative radiological factors and variables such as patient parameters and surgeon's parameters should be evaluated. Also, it was observed that increased age, gender predisposition, unfavorable root pattern, depth of impaction, close relationship to the inferior alveolar nerve, BMI, impaction state, angulation, contact with the second molar, root periodontal space interface, depth from point of elevation increased the operative time which was statistically significant. (Kulkarni et al., 2015)

A study by sukegawa et al in 2019 aimed to identify the predilection site of postoperative infection after third molar extraction surgery and risk factors associated with postoperative infection. They concluded that postoperative infection occurs mainly in the mandible and that in the maxilla is very rare. The risk of postoperative infection in the mandible was found to be related to the depth of inclusion and intraoperative hemostatic treatment (Sukegawa et al., 2019).

7. Conclusion

In this study, the results suggested that postoperative complications were not related to demographic, radiological, and intraoperative variables. On contrary, few of these variables lead to pain on the 4th hour and 7th day postoperatively. This result contradicted the findings of other studies in the literature. We concluded that studies should be performed to evaluate the factors for postoperative complications in impacted third molar surgery with larger sample size.

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RESUMEN

Los terceros molares suelen erupcionar entre los 17 y los 21 años de edad. Por lo general, debido a la evolución de las mandíbulas humanas, el tamaño disminuye, lo que conduce al diente impactado. Un diente impactado puede conducir a la reabsorción externa del diente adyacente, trismo, infección, etc. Se han reportado muchos estudios en la literatura para evaluar la dificultad quirúrgica y las complicaciones postoperatorias secundarias a terceros molares impactados. Este estudio incluye una muestra de 100 sujetos evaluados por la dificultad quirúrgica y las complicaciones postoperatorias. Se evaluaron diversos factores demográficos, radiológicos e intraoperatorios que pueden conducir a complicaciones postoperatorias. También se evaluaron los factores responsables de las secuelas postoperatorias con las complicaciones. Se evaluó el dolor postoperatorio después de 4 horas y 7 días para marcar los factores comúnmente responsables. El dolor al séptimo día postoperatorio fue significativo e involucró factores como impacto total, impactación horizontal, nivel C, espacio retromolar nulo o muy pequeño y contacto con la raíz. En este estudio no se informaron complicaciones posoperatorias.

Palabras clave: tercer molar impactado; dificultad quirúrgica; complicación postoperatoria; secuelas postoperatorias.
