Prevalência das Complicações em Cirurgia de Terceiros Molares Inferiores: Um Estudo transversal

Prevalencia de complicaciones en cirugía de terceros molares inferiores: un estudio transversal
Prevalence of Complications in Inferior Third Molar Surgery: A Cross-Sectional Study

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RESUMO

Introdução: A extração de terceiros molares é um dos procedimentos mais comuns realizados pelos cirurgiões bucomaxilofaciais e as potenciais complicações dessa intervenção estão bem documentadas. **Objetivo**: O objetivo deste estudo é encontrar as associações entre essas complicações e variáveis relacionadas aos dentes ou aos pacientes e, assim, ajudar os cirurgiões a predizê-las e preveni-las. **Métodos**: Nosso estudo avalia a prevalência de complicações em exodontias de terceiros molares inferiores utilizando uma amostra populacional brasileira em um período de 10 anos para estabelecer a probabilidade dessas complicações e sua associação com variáveis como idade, sexo e posição do dente na arcada. As mesmas variáveis foram usadas em relação a pericoronarite prévia. Trata-se de um estudo observacional retrospectivo transversal, seguindo as diretrizes STROBE. **Resultados e Conclusões**: Mil e nove pacientes tiveram 1.822 terceiros molares extraídos, sem associação detectada entre condições sistêmicas e complicações, embora esses pacientes com complicações sistêmicas tenham 1,9 vezes mais chances de ter pericoronarite. A pericoronarite foi mais prevalente em pacientes saudáveis, com classificação A e III de Pell & Gregory e posição distoangular. Esses achados corroboram a literatura atual ao comparar a classificação de Pell e Gregory e a maior prevalência de complicações. **Palavras-chave:** Terceiros molares; cirurgia oral; complicações intra-operatórias; complicações pós-operatórias; pericoronarite; mandíbula.

RESUMEN

Introducción: La extracción de terceros molares es uno de los procedimientos más comunes realizados por los cirujanos orales y maxilofaciales y las posibles complicaciones de esta intervención están bien documentadas. **Objetivo**: El objetivo de este estudio es encontrar las asociaciones entre estas complicaciones y variables relacionadas con dientes o pacientes y así ayudar a los cirujanos a predecirlas y prevenirlas. **Métodos**: Nuestro estudio evalúa la prevalencia de complicaciones en extracciones de terceros molares inferiores utilizando una muestra de población brasileña durante un período de 10 años para establecer la probabilidad de estas complicaciones y su asociación con variables como la edad, el sexo y la posición de los dientes en el arco. Las mismas variables se utilizaron para determinar pericoronitis previa. Se trata de un estudio observacional, transversal, retrospectivo, siguiendo las directrices STROBE. **Resultados y Conclusiones**: A mil nueve pacientes se les extrajeron 1.822 terceros molares, no detectándose asociación entre condiciones sistémicas y complicaciones, aunque estos pacientes tenían 1,9 veces más probabilidad de tener pericoronitis. La pericoronitis fue más prevalente en pacientes sanos, con clasificación A y III de Pell & Gregory y posición distoangular. Estos hallazgos corroboran la literatura actual al comparar la clasificación de Pell y Gregory y la mayor prevalencia de complicaciones.

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ABSTRACT

Introduction: Extraction of third molars is one the most common procedures carried out by Oral and Maxillofacial Surgeons and the potential complications of such intervention are well-documented. **Purpose**: The objective of this study is to find the associations between these complications and variables related either to the teeth or the patients and thus help surgeons to predict and prevent them. **Methods**: Our study evaluate the prevalence of complications in extractions of the lower third molars using a Brazilian population sample over a period of 10 years to establish the probability of these complications and their association with variables such as age, sex and tooth position in the arch. The same variables were used to determine previous pericoronitis. This is a retrospective cross-sectional observational study, following the STROBE guidelines. **Results and Conclusions**: One thousand and nine patients had 1,822 third molars extracted, with no associations detected between systemic conditions and complications, although these patients are 1.9 times more likely to have pericoronitis. Pericoronitis was more prevalent in healthy patients, with Pell & Gregory classification A and III and distoangular position. These findings corroborate the current literature when comparing Pell and Gregory classification and the higher prevalence of complications. **Keywords:** Third molar; oral surgery; intraoperative complications; postoperative complications; pericoronitis; mandible.

INTRODUCTION

Extraction of third molars (M3) is a common procedure carried out by maxillofacial surgeons and it may cause pain, edema and other dysfunctions[1]. Impaction of the lower M3 has been reported to be between 9.5% and 39%, which is much higher than the impaction of the upper M3 [1].

Potential complications may occur both during and after the surgery, such as hemorrhage, alveolitis, paresthesia, local infections or infections that may invade facial spaces, jaw fractures, periodontal problems or fractures in adjacent teeth along with displacement of teeth for other anatomical spaces. The surgical removal of M3 is often associated with postoperative pain, swelling and trismus. These are expected and generally transient reactions[1].

Studies have shown that the rate of these postoperative complications and the risk of permanent sequelae from extraction of M3 increases with age.

Therefore, prophylactic extraction of these teeth before the age of 25 is often recommended[1].

Epidemiological studies are essential as they provide information to health professionals about a range of conditions which helps to prevent and treat them.

Prevention remains the most effective approach to control these complications and it should be conducted with a careful evaluation of the patient. This involves clinical and radiographic examination, a proper classification of the tooth to be extracted, adequate preoperative planning and a meticulous execution of the surgical procedure. The surgeon's expertise and the use of instruments and surgical techniques are also key factors for a successful intervention. With proper planning, it is possible to predict accidents[2].

This study showed the prevalence of complications in extractions of lower third molars in a Brazilian population sample over a period of 10 years and established their probability related to variables such as age, systemic problems relevant to surgery, tooth position in the arch and history of pericoronitis. We start from the hypothesis 0 (H0) that there is no association between the independent variables and the complications of these surgical procedures.

MATERIALS AND METHODS

Ethics committee approval was obtained (registration number 3.280.952) and the study was carried out in accordance with the current standards recommended for the reporting of observational studies in epidemiology (STROBE statement)[3].

a) Study's design:

Retrospective cross-sectional observational study

b) Sample, inclusion and exclusion criteria:

This study was composed of a simple random sample and it was conducted between 2008 and 2018. The inclusion criteria was patients who had third molar extractions at a Dental Specialties Center The exclusion criteria adopted were: teeth associated with cysts or tumors, teeth in individuals using anti-resorptive medications and/or smokers/ex-smokers.

c) Surgical procedure

The surgical procedures were performed by the same surgeon under local anesthesia over a period of 10 years. All procedures were performed using antibiotic prophylactic therapy prior to the procedure. The antibiotic was not maintained in the postoperative period. In

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association with the antibiotics, a non-steroidal anti-inflammatory (ibuprofen) was maintained in the postoperative period together with a analgesic drug (acetaminophen). Patients with pericoronitis were treated with antibiotics for 7 days and their surgery were performed in absence of clinical signs and symptoms. The surgical technique used varied according to the position of each tooth. All the osteotomies and tooth sections were made using high rotation burs.

d) Data measurement

All data were obtained from medical records by one operator. A second operator processed and revised those data to avoid measurement bias.

The collected data were: (1) from the patient: sex, age, systemic problems relevant to the surgery; (2) from the tooth: position in the arch according to Winter's classification, tooth position in the arch according to Pell & Gregory classification and history of pericoronitis, all independent variables. Information was also collected regarding the presence of intra and postoperative complications related to the procedure (dependent variables).

The teeth were classified by their position in the arch through their radiographic image and clinical examination. Winter classification for standardization and reproducibility was used with the adaptation proposed by Quek et al in 20032 where the degree of tooth inclination in relation to the second molar is measured to establish its position in order to avoid measurement bias. The same procedure was adopted for the Pell & Gregory classification, which was used in its original form.

Complications were classified as operative when they happened during or immediately after the extraction, or postoperative when they became apparent one or more days after operation.

e) Statistical analysis

Initially, a descriptive analysis of the data was performed. Inferential analysis was performed. The variables (1) intraoperative complications, (2) postoperative complications and (3) previous pericoronitis, which were related to the other variables using the Chi-square test with a 95% confidence interval and a standard deviation of 0.5 and a degree of freedom of 1. Likewise, these three variables were assessed for risk using the OR (Odds Ratio) with a 95% confidence interval. The statistical package used for this analysis was IBM SPSS 20.

RESULTS

The sample comprised patients from 11 to 80 years old (mean of age 26,8 years) with 467 males (43,28%) and 612 (56,72%) females. A total of 1822 lower M3 in 1079 individuals were analyzed. These teeth were classified according to Winter's and Pell & Gregory's classification as described in tables 1.

Table 1 - Distribution of third molars in the sample according to Winter's and Pell & Gregory's classification

	Number	Percentage
Winter's Classification		
Vertical position	935	51,32
Mesial angulation	481	26,41
Horizontal position	229	12,57
Distal angulation	177	9,7
Pell & Gregory's Classification		
Class I	219	12,02
Class II	1553	85,24
Class III	50	2,74
According to the level of impaction		
A	1321	72,50
B	462	25,36
C	39	2,14

In the studied sample (1079 patients), 82 patients (7,5%) had a systemic disease under treatment. All these individuals had their systemic conditions under control during the perioperative and postoperative period.

Several complications were described in the medical records, corresponding to 8,5% of all procedures and from this total, 4,7% occurred in the intraoperative period and 3,8% happened in the postoperative period (Table 2). In this study, we detected 907 (49.78%) teeth with a report of previous pericoronitis.

Table 2 - Incidence of complications

Intraoperative complications		
Complication	Number	Percentage
Root fractures	56	3,07
Apical third fractures	11	0,61
Crown fractures	5	0,27
Alveolar bleeding	7	0,38
Lingual cortical fractures	2	0,11
Oral bleeding	2	0,11
Deglution	1	0,05
Displacement of the apical third to the submandibular space	1	0,05
Postoperative complications		
Complication	Number	Percentage
Infections	34	1,86
Lingual nerve paresthesia	13	0,71
Inferior alveolar nerve paresthesia	9	0,49
Alveolitis	8	0,44
TMJ dislocation	2	0,11
Hemorrhage	1	0,05
Lip paresthesia	1	0,05

3.1. Pericoronitis

We found an association between the prevalence of pericoronitis and age (p=0.000, df=3) and systemic problems (p=0.024, df=1) of the operated individuals (TABLE 3). Individuals over 26 years of age had more pericoronitis. (OR=1.952, p=0.024) (TABLE 4).

Table 3 - Association between age and complications in lower third molar teeth

Complication	until 20		21 - 25		26 - 30		31 ou mais		p-value
	N	%	N	%	N	%	N	%	
Intraoperative	11	2,7	35	6,4	18	4,3	29	6,6	0,021
Postoperative	9	2,2	22	4,0	19	4,5	13	3,0	0,236
Pericoronitis	143	34,6	308	56,4	248	58,8	205	46,8	0,000

p-value = chi-square test with 3 degrees of freedom

Table 4 - Odd Risk between age and complications in lower third molar teeth

Complication	until 25 years		26 years or more		Odd	p-value
	N	%	N	%		
Intraoperative	46	4,8	47	5,5	1,147	
					0,756 – 1,742	0,518
Postoperative	31	3,2	32	3,7	1,157	
					0,700 – 1,913	0,570
Pericoronitis	451	47,0	453	52,7	1,254	
					1,043 – 1,508	0,016

OR (Odd Ratio) with a 95% confidence interval

The position in which the tooth is located was also associated with pericoronitis, according to both Winter classification (p=0.000, df=3) and Pell & Gregory classification (p=0.000, df= 2) (TABLE 5). According to Pell & Gregory classification, teeth that were classified as A, were 1.5 times more likely (p=0.000) than those classified as B and 2.5 times more likely (p=0.000) than those classified as C to have pericoronitis. There is a risk of 2.3 times (p=0.000) higher of pericoronitis with teeth in position II when compared to those classified as I (TABLE 6).

Table 5 - Association between Pell & Gregory Classification (I, II e III) and complications in lower third molar teeth

Complication	Class I		Class II		Class III		p-value
	N	%	N	%	N	%	
Intraoperative	14	6,3	77	5,0	1	2,0	0,416
Postoperative	1	0,5	59	3,8	9	18,0	0,000
Pericoronitis	71	32,1	813	52,4	23	46,0	0,000

p-value = chi-square test with 1 degree of freedom

Table 6 - Risk between Pell & Gregory Classification (I, II e III) and complications in lower third molar teeth

Complication	Class I		Class II		Odd	p-value
	N	%	N	%		
Postoperative	1	0,4	54	3,5	8,035	0,005
					1,106 – 58,372	
Pericoronitis	72	32,3	809	52,3	2,302	0,000
					1,709 – 3,101	
	Class I		Class III			
	N	%	N	%		
Postoperative	1	0,4	8	16,0	42,282	0,000
					5,153 – 346,992	
Pericoronitis	72	32,3	23	46	1,787	0,048
					0,958 – 3,331	
	Class II		Class III			
	N	%	N	%		
Postoperative	8	16,0	8	16,0	5,263	0,000
					2,357-11,752	
Pericoronitis	23	46,0	23	46,0	1,289	0,230
					0,732-2,267	

OR (Odd Ratio) with a 95% confidence interval

As for Winter's classification, we observed that teeth with distal angulation had the highest risk of pericoronitis (OR=1.76, p=0.006) when compared to teeth in horizontal position, which were 1.98 times (p=0.000) and 2.19 times (p=0.000) more likely to have pericoronitis than vertical and mesioangulated, respectively.

3.2. Intraoperative complications

Intraoperative complications were only related to age (p=0.021), as increased complications were observed in patients aged 26 years and over (TABLE 3).

3.3. Postoperative complications

When we evaluated the postoperative complications, we found that they were strongly associated with the position of the teeth (TABLE 5). In the Pell & Gregory classification, we observed that teeth classified as II and III are 8.75 (p=0.000) and 42.28 (p=0.000) more likely to present complications than those in position I, respectively (TABLE 6).

Regarding the position of these teeth in Winter classification, we found that teeth in the horizontal position were twice (OR=2.018, p=0.046) more likely to have postoperative complications than those in the vertical position.

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DISCUSSION

Epidemiological studies such as the one carried out, involving such number of individuals and relating these risks are rare and therefore important to be undertaken . Most studies follow different methodologies, making it difficult to compare the results obtained. Ethnic variability can lead to a range of variations, particularly in regard to the presence and position of third molars.

This happens for example when we evaluate the age variable. Chiapasco et al.(1995)4 have evaluated the prevalence of complications after lower third molar extraction in three different age groups and found that in the groups aged under 24 years, there were no significant differences in the number and type of complications. However, in the group over 25 there was a significant increase in postoperative complications. An association between age and intraoperative complications was found in this study and older patients had more pericoronitis. Neither of these two variables was analyzed by Chiapasco et al.4 nor by most of the literature.

According to Winter's classification, in this study, vertical teeth were more prevalent. This prevalence also differs from most studies found in the literature, which place mesioangulated teeth in general as more prevalent.2,5,7 Despite this, Pillai et al. (2014)6 have also found vertical mandibular third molars as the most frequent, followed by the mesioangulated ones, as in our study. These variations can be justified by the way the Winter classification is used. Some authors perform it visually. In the case of this study for standardization and reproducibility, the Winter classification was used with the adaptation proposed by Quek et al in 20032. But the study by Quek et al.2 differs from this one, which leads us to suggest that racial and ethnic patterns may play an important role in variations in the position of third molars.

The prevalence of intraoperative and postoperative complications resulting from lower third molar extractions was 8.5%. Studies similar to this one found complication rates of 8.4%, 9.8%, 10.4%, 11% and 18.9% 8. According to Bruce7 these values can vary from 4.6 to 21% for the extraction of lower third molars. This variation, according to the author, are always present due to different factors such as age, degree of difficulty in the surgery, surgeon's experience and whether the surgery is performed by one or more surgeons.

Age, as we have seen in the literature, has also been considered a significant variable in these complications. In the present study age was associated with more intraoperative complications (p=0.021).

If we consider the position of the tooth as a factor for the complexity of the surgical procedure, we found that most complications occur in M3 at class III position (p=0.000) and in teeth classified as horizontal, where the risk of postoperative complications is twice than those in the vertical position (OR=2.018, p=0.046).

Freudlsperger et al. (2012)9 have analyzed this issue using Pell & Gregory classification and the Winter classification. The teeth that they classified as moderate or difficult showed more postoperative inflammatory complications, i.e., alveolitis, local infection and abscess. According to the findings of this study, tooth position seems to be a risk factor for postoperative complications.

Pericoronitis is the most common acute problem associated with third molars and there are several predisposing factors. Given that recurrent pericoronitis is one of the main reasons for indicating lower third molar extraction, it is essential to understand its relationship with variables such as age, sex, position of the tooth in the arch and complications during and after third molar extraction.

In the present study, 907 (49.78%) mandibular M3 had a history of previous pericoronitis. In their systematic review in 2019, Galvão et al.10 have found a 28% prevalence of pericoronitis in the general population. Since this study was conducted in a service that only treats referenced patients, all patients who made up the sample of this research had indication for lower third molar extraction and cannot be considered a representative sample of the general population, and this may have inflated the prevalence of pericoronitis.

We found that there is an association between the prevalence of pericoronitis and age (p=0.000, df=3) and systemic problems (p=0.024, df=1). Individuals over 26 had more pericoronitis (OR=1.952, p=0.024).

The position of the lower third molar according to Pell & Gregory and Winter classification, played a significant role in the risk of pericoronitis. We found in the systematic review carried out by Galvão et al (2019)10 an increased risk of pericoronitis in lower third molars in position A (OR:7.13;CI:1.31–38.74,I2=93%). This is in line with the present study, as we observed a risk1.53 times higher in position A when compared to position B (p=0.000) and 2.52 times higher when compared to C (p=0.005). While in the present study we found a higher risk (OR=1.98) in teeth presenting distal angulation when compared to the vertical ones (p=0.000), in the review carried

out by Galvão et al (2019)10 teeth classified as verticals were at the highest risk. Furthermore, in the present study, teeth classified as class II had 2.3 times more risk of pericoronitis than class I (p=0.000) and 1.78 times more than class III. This finding seems logical, but it was not observed in the study conducted by Galvão et al. (2019)10 who did not mention any risk relationship regarding this classification. The difference between these two studies regarding the Winter and Pell & Gregory classifications may have occurred because not only those studies but all the literature present limitations regarding the classification of these teeth.

When evaluating the results obtained both for pericoronitis and for intra and postoperative complications in relation to teeth positions, it is important to be aware of these limitations. Most studies2, 9, including the present study, determine the position of third molars according to Winter's classification as: horizontal, mesioangular, vertical and distoangular. Although this classification is universally standardized, angulations are a continuous variable and, in this classification, they are treated as categorical variables. Large variations, for example, between the inclinations of mesioangular teeth can be found but they are not registered by this classification. In order to minimize this measurement bias, we adopted the Winter classification as recommended by Quek et al in 20032, who advocate that the measurement of the degrees of inclination of the tooth in relation to degree of the second molar should be performed in order to establish its proper position, but even so this evaluation was performed as a categorical variable.

In addition, the exclusion criteria adopted were: teeth associated with cysts or tumors, teeth in individuals using anti-resorptive medications and/or smokers/former smokers. These exclusion criteria were established with the intention of eliminating confusing factors from the sample. However, as this is a retrospective study, some potentially interfering factors such as alcoholism, diet, physical activity, educational level and access to basic health conditions, among others, could not be surveyed.

CONCLUSION

Based on the results obtained in this study and considering the listed limitations, our findings indicate that: 1. there is a relationship and increased risk of intraoperative complications in patients over 26 years of age; 2. Teeth classified as class II and III, according to Pell and Gregory classification, have more risk of postoperative complications and

3. There is more risk of pericoronitis in lower third molars in patients over 26 with teeth defined as A and class II in the Pell & Gregory classification and with distal angulation in the Winter classification.

These findings may help surgeons to determine better treatments for third molars that fit the characteristics described above. Prospective studies with more robust designs should be carried out to support these findings.

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