

# Association between intraoperative factors and postoperative complications in third molar surgery: An observational study.

Asociación entre factores intraoperatorios y complicaciones post quirúrgicas en cirugía de terceros molares: Un estudio observacional.

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**Abstract:** **Objective:** The main objective of this study was to establish the association between risk factors and complications after oral surgery. **Material and Methods:** A cohort study was developed between April of 2017 and March of 2018 through a register of patients admitted with buccal surgery indication at the San Borja Arriarán hospital, Chile. **Results:** The incidence of post-surgical complications was 5.8%, with alveolitis being the most frequent. In the bivariate analysis, surgical difficulty was the only intraoperative variable that presented a significant association with the development of post-surgical complications ( $p < 0.05$ ). In the multivariate analysis, no associations were found between intraoperative variables and the development of complications. **Conclusion:** The concentration of highly complex procedures in professionals with a high level of experience (maxillofacial surgeons) allows low post-surgical complication incidence and prevents intraoperative variables from generating a higher risk of post-surgical complications.

**Keywords:** oral surgery; postoperative complications; dry socket; third molar; risk factor; cohort studies.

**Resumen:** **Objetivo:** El objetivo principal de este estudio fue establecer la asociación entre factores intraoperatorios y complicaciones posteriores a cirugía de terceros molares. **Material y Métodos:** Estudio de cohorte realizado entre abril de 2017 a marzo de 2018 mediante un registro de pacientes ingresados con indicación de cirugía de terceros molares al hospital San Borja Arriarán, Chile. **Resultados:** La incidencia de complicaciones post quirúrgicas corresponde a un 5,8%, siendo la alveolitis la más frecuente. En el análisis bivariado, la dificultad quirúrgica fue la única variable intraoperatoria que presentó una asociación significativa con el desarrollo de complicaciones postquirúrgicas ( $p < 0,05$ ). En el análisis multivariado no se encontraron asociaciones entre las variables intraoperatorias y el desarrollo de complicaciones. **Conclusion:** La concentración de procedimientos de alta complejidad en los profesionales de alto nivel de experiencia (cirujanos maxilofaciales) permite que la incidencia de complicaciones sea baja y prevenir que las variables intraoperatorias generen un mayor riesgo de complicaciones post quirúrgicas.

**Palabras Clave:** cirugía bucal; complicaciones post-quirúrgicas; alveolitis; tercer molar; factor de riesgo; estudios de cohortes.

## INTRODUCTION.

Recent studies reveal that dental caries and periodontal disease are the most frequent oral pathologies in Chile and that they also increase steadily with age, reaching a prevalence of 100% in the adult population aged 65 to 74 years.<sup>1</sup>

This scenario indicates that dental extraction is a routine procedure within a dental practice, although epidemiological information in Chile is scarce. Despite being a routine procedure, patients have reported complications, ranging from 1% to 30.9%.<sup>2-7</sup>

The most frequent post-extraction complication is alveolitis,<sup>8-12</sup> which occurs with a frequency that varies from 1 to 30% of all dental extractions.<sup>2-6</sup> Numerous studies have tried to explain the etiology of this complication, which seems to be multifactorial. However, many of these have severe methodological and statistical design problems.

As a result, the results are contradictory and inconsistent<sup>13</sup> probably because they are based on individual opinions or series of cases or are carried out following a suboptimal and often irreproducible methodology.<sup>14</sup>

However, it has been described that the risk factors associated with alveolitis would be gender,<sup>2,15</sup> age,<sup>3,16</sup> location of the tooth,<sup>7</sup> with mandibular teeth being the most affected,<sup>2,17,18</sup> degree of dental impaction, dental inclusion, previous history of alveolitis,<sup>16</sup> traumatic extractions, systemic diseases,<sup>16,17</sup> smoking<sup>18</sup> and consuming alcohol.<sup>17</sup>

Complications resulting from dental extraction correspond to an outpatient dental emergency considered within the Explicit Health Guarantees, a Chilean national health program.<sup>19</sup> Although they are a pathology guaranteed by the state, their incidence in Chile is unknown, and there are no studies that determine the risk factors associated with them.

The complications after tooth extraction are wet socket, dry socket, hemorrhage, damage to neighboring anatomical structures, abscesses, facial cellulitis, and dislocations of the temporomandibular joint, among others.<sup>7-10</sup>

This research corresponds to a cohort study that aims to determine if there is an association between

intraoperative factors such as time and surgical difficulty and the experience of the operator with the development of post-surgical complications of patients older than twelve years in the unit of Maxillofacial surgery at the San Borja Arriarán Clinical Hospital with an indication of third molar surgery.

This study was carried out through the declaration of the STROBE initiative to prepare observational studies 20.

## MATERIALS AND METHODS.

During the twelve months of the study, 423 third molar surgery procedures that met the selection criteria were performed; 60 of them did not attend the control appointment or answer phone calls.

Therefore, these patients were excluded from the study, and the total number analyzed reached 363 patients undergoing third molar surgery who had a mean age of 23.8 years (standard deviation: 9.02). Table 1 describes the patients characteristics included in the sample.

The incidence of post-surgical complications was 5.8%. The most frequent complication was alveolitis (2.5%), followed by abscesses (1.9%). Table 2 details the types and incidence of post-surgical complications. The distribution of the procedures of high, moderate, and low complexity was not homogeneous.

Those of high complexity were performed mainly by maxillofacial surgeons and specialty residents, while the procedures of low complexity were performed mainly through dental surgeons.

Table 3 details the distribution of procedures of different complexity carried out by operators of different levels of experience.

Bivariate analysis showed a statistically significant association ( $p < 0.05$ ) between surgical difficulty and the development of post-surgical complications. Table 4 details the bivariate analysis of the different intraoperative variables.

Finally, the multivariate analysis details no statistically significant association between these and the development of post-surgical complications when considering all the intraoperative variables. Table 5 describes the results of the multivariate analysis

## RESULTS.

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**Table 1.** Demographic information of the patients included in this study.

Variables		No. of procedures/complications present	Incidence (%)
Sex	Female	262/15	5.7
	Male	102/6	5.9
Medical history	(+)	76/5	6.6
	(-)	287/16	5.6
Habits	Tobacco	96/6	6.3
	Alcohol	150/9	6
	Marijuana	45/1	2.2
	(-)	184/11	6
<b>Total</b>		<b>363/21</b>	<b>5.8</b>

**Table 2.** Type of post-surgical complications and their incidence.

Type of complication	Incidence (%)	Number of complications
Dry socket	2.5	9
Hemorrhage	1.1	4
Abscess	1.9	7
Paresthesia	0.3	7
<b>Total</b>	<b>5.8</b>	<b>21</b>

**Table 3.** Distribution of procedures in the different categories of experience and difficulty.

Surgical difficulty/Operator experience (n)	Mild (n)	Moderate (n)	High (n)	Total
Dental surgeon	49	19	28	96
Resident of specialty	17	34	90	141
Maxillofacial Surgeon	18	29	79	126
<b>Total</b>	<b>84</b>	<b>82</b>	<b>197</b>	<b>363</b>

**Table 4.** Bivariate analysis of the association of intraoperative variables and post-surgical complications.

Variable	p-value
Operator experience	0.49
Surgical difficulty	0.042*
Surgical time	0.15

\*: Significant value

**Table 5.** Multivariate analysis of intraoperative variables.

Variable	OR*	p-value	CI 95*
<b>Operator experience</b> (reference: dental surgeon)	Dental surgeon	0.75	0.27 – 2.04
	Resident of specialty	1.08	0.48 – 2.4
<b>Surgical difficulty</b> (reference: high)	Mild	0.94	0.32 – 2.68
	Moderate	0.29	0.08 – 1.01
<b>Surgical time</b>		1.01	0.27 – 1.04

CI95: Confidence interval 95%. OR: Odds Ratio.

## DISCUSSION.

The complications incidence in third molar surgery in this study reached 5.8%, which is within the wide range existing in the reports in the reference literature, as these fluctuate between 1% and 30%.<sup>2-7</sup>

Among the intraoperative variables considered, surgical difficulty was the only one that presented a significant association with the presence of complications in the bivariate analysis, being moderate difficulty and not a mild difficulty, a protective factor for the development of post-surgical complications compared to high difficulty.

This fact is explained by the distribution of the procedures in the different levels of operator's experience since those of moderate and high difficulty were performed mainly by maxillofacial surgeons and residents, while dental surgeons mostly performed low complexity procedures.

This did not show an association with post-surgical complications in any of the analyses about the surgical time. It is not described in the pertinent scientific publications that the risk of complications after third molar surgeries increases by increasing the surgical time.

The heterogeneous distribution of procedures of different levels of difficulty (where professionals with the highest level of experience assume the most complex procedures) explains that the chance of complications is low compared to that described in the literature and that no associations are also generated between operator-dependent intraoperative variables and post-surgical complications in multivariate analysis.

In Chile, oral surgery is carried out by professionals with different surgical experiences, both in the private and public spheres. Therefore, the maxillofacial surgery service of the San Borja Arriarán hospital represents an ideal for oral surgery development due to its members' professional skills. The relevance of this study is that it indicates that the distribution of procedures according to the experience level, where maxillofacial surgeons assume procedures of severe or moderate difficulty (such as those that require a flap, osteotomy, and/or odontosection), allows that the chance of post-surgical complications is low and that there is no association between intraoperative variables and the risk of complications.

This study presents several virtues, within which we can mention that it represents a specific population with the average socio-cultural characteristics of the Chilean population. Furthermore, it supports the implementation of public policies such as the GES program on Outpatient Dental Emergencies<sup>19</sup> using national data. Due to this, it is suggested to spread the results obtained with the dental community. Within the limitations of this study, we can mention that the percentage of complications is meager compared to the sample.

Due to this, the multivariate analysis does not allow the incorporation of more variables that could potentially constitute a risk or protective factor for the development of post-surgical complications in third molar surgery. Because this study was conducted in a tertiary care setting, further research is needed in the primary care setting, specifically in emergency services. In this way, it would be possible to elucidate how post-surgical complications behave in contexts other than a hospital maxillofacial surgery service.

## CONCLUSION.

The heterogeneous distribution of different levels of difficulty procedures, concentrating highly complex procedures in maxillofacial surgeons, allows the incidence of post-surgical complications to be low.

While maxillofacial surgeons perform high complexity procedures and low difficulty procedures are performed by dental surgeons, intraoperative variables are not associated with the development of post-surgical complications.

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## ANNEX 1.

Criteria for defining surgical site infection (SSI) The infection was produced within 30 days after the intervention. If the surgery includes the use of implants, plates, or screws, infection of the surgical site should be considered within a range of 12 months after surgery.

The wounds were considered infected when the patient presented at least one of the following characteristics:

- Purulent drainage from the incision.
- Isolation of pathogenic microorganisms in culture from fluid or tissue from the surgical site.
- Spontaneous dehiscence at the incision site or when it was deliberately opened by a surgeon in patients who manifested at least one of the following signs or symptoms:
  - i. Fever (over 38°C).
  - ii. Spontaneous pain or pain on palpation .
  - iii. Localized swelling.
  - iv. Erythema or heat.

**Conflict of interests:** The authors declare no conflict of interests.

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Poblete F: Collection/obtaining results; Data analysis and interpretation; Approval of manuscript final version.

Yanine N: Study conception and design; Critical revision of the manuscript; Approval of manuscript final version; Contribution of patients or study material.

Araya I: Data analysis and interpretation; Critical revision of the manuscript; Approval of manuscript final version; Statistical advice.

Cortés R: Critical revision of the manuscript; Approval of manuscript final version; Statistical advice.

Villanueva J: Study conception and design; Funding acquisition; Data analysis and interpretation; Drafting of the manuscript; Critical revision of the manuscript; Approval of manuscript final version.

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## REFERENCES.

1. Arteaga O, Urzúa I, Espinoza I, Muñoz A, Mendoza C. Prevalencia de caries y pérdida de dientes en población de 65 a 74 años de Santiago, Chile. *Rev.Clin Periodoncia Implantol Rehabil Oral.* 2009; 2(3):161-6. doi:10.1016/S0718-5391(09)70027-8
2. Nusair YM, Younis MH. Prevalence, clinical picture, and risk factors of dry socket in a Jordanian dental teaching center. *J Contemp Dent Pract.* 2007; 8(3):53-63.
3. Dolci E, Escoda GC, Arnabat J. La prevención de la alveolitis seca. *Rev Eur Odontostomatol.* 1992; 5:261-70. doi: 10.5005/jcdp-8-3-53
4. Bloomer CR. Alveolar osteitis prevention by immediate placement of medicated packing. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 2000; 90(3):282-84. doi: 10.1067/moe.2000.108919
5. Heasman PA, Jacobs DJ. A clinical investigation into the incidence of dry socket. *Br J Oral Maxillofac Surg.* 1984; 22(2):115-22. doi: 10.1016/0266-4356(84)90023-8
6. Tarakji B, Saleh LA, Umair A, Azzeghaiby SN, Hanouneh S. Systemic review of dry socket: aetiology, treatment, and prevention. *J Clin Diagn Res.* 2015; 9(4): ZE10. doi: 10.7860/JCDR/2015/12422.5840
7. Bui CH, Seldin EB, Dodson TB. Types, frequencies, and risk factors for complications after third molar extraction. *J Oral Maxillofac Surg.* 2003; 61(12):1379-89. doi: 10.1016/j.joms.2003.04.001
8. Jaafar N, Nor GM. The prevalence of post-extraction complications in an outpatient dental clinic in Kuala Lumpur Malaysia-a retrospective survey. *Singapore Dent J.* 2000; 23(1):24-8. doi: 10.1016/j.joms.2003.04.001
9. Figueiredo R, Valmaseda-Castellón E, Berini-Aytés L, Gay-Escoda C. Delayed-onset infections after lower third molar extraction: a case-control study. *J Oral Maxillofac Surg.* 2007; 65(1):97-102. doi: 10.1016/j.joms.2005.10.063.
10. Dyer TA. A five-year evaluation of an NHS dental practice-based specialist minor oral surgery service. *Community Dent Health.* 2013; 30(4):219-26. doi: 10.1922/CDH\_3255Dyer08.
11. Venkateshwar GP, Padhye MN, Khosla AR, Kakkar ST. Complications of exodontia: a retrospective study. *Indian J Dent Res.* 2011; 22(5):633-8. doi: 10.4103/0970-9290.93447.
12. Yengopal V, Mickenautsch S. Chlorhexidine for the prevention of alveolar osteitis. *Int J Oral Maxillofac Surg.* 2012; 41(10): 1253-64. doi: 10.1016/j.ijom.2012.04.017.
13. Kolokythas A, Olech E, Miloro M. Alveolar osteitis: a comprehensive review of concepts and controversies. *Int J Dent.* 2010; 2010:249073. doi: 10.1155/2010/249073.
14. Hedström L, Sjögren P. Effect estimates and methodological quality of randomized controlled trials about prevention of alveolar osteitis following tooth extraction: a systematic review. *OOOOE.* 2007; 103(1):8-15. doi: 10.1016/j.tripleo.2006.01.007.
15. Amaratunga N, Senaratne C. A clinical study of dry socket in Sri Lanka. *Br J Oral Maxillofac Surg.* 1988; 26(5):410-8. doi: 10.1016/0266-4356(88)90094-0
16. Chuang SK, Perrott DH, Susarla SM, Dodson TB. Age as a risk factor for third molar surgery complications. *J Oral Maxillofac Surg.* 2007; 65(9):1685-92. oi: 10.1016/j.joms.2007.04.019
17. Oginni F. Dry socket: A prospective study of prevalent risk factors in a Nigerian population. *J Oral Maxillofac Surg.* 2008; 66(11):2290-5. doi: 0.1016/j.joms.2008.01.063
18. Eshghpour M, Nejat AH. Dry socket following surgical removal of impacted third molar in an Iranian population: incidence and risk factors. *Niger J Clin Pract.* 2013; 16(4):496-500. doi: 10.4103/1119-3077.116897
19. Ministerio de Salud. Guía Clínica Urgencias Odontológicas Ambulatorias. 2ª Ed. Santiago: Minsal. 2011.
20. Von-Elm E. STROBE initiative. The strengthening the reporting of observational studies in epidemiology (STROBE) statement: guidelines for reporting observational studies. *Ann Intern Med.* 2007; 147:573-7. doi: 10.7326/0003-4819-147-8-200710160-00010
21. Poblete F, Dallaserra M, Yanine N, Araya I, Vergara C, Cortés R, Cristian Vergara C, Villanueva J. Incidencia de complicaciones post quirúrgicas en cirugía bucal. *Int J Inter Dent.* 2020; 13(1):13-6. doi: 10.4067/S2452-55882020000100013
22. Dallaserra M, Poblete F, Vergara C, Cortés R, Araya I, Yanine N, Villanueva J. Infectious postoperative complications in oral surgery. An observational study. *J Clin Exp Dent.* 2020 Jan 1;12(1):e65-e70. doi: 10.4317/medoral.55982. PMID: 31976046; PMCID: PMC6969960.
23. Mangram AJ, Horan TC, Pearson ML, Silver LC, Jarvis WR. Guideline for Prevention of Surgical Site Infection, 1999. Centers for Disease Control and Prevention (CDC) Hospital Infection Control Practices Advisory Committee. *Am J Infect Control.* 1999. Apr;27(2):97-132; quiz 133-4; discussion 96. PMID: 10196487.