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ORIGINAL ARTICLE

PREVALENCE OF POSTOPERATIVE COMPLICATIONS OF MANDIBULAR FRACTURES AT THE DR. GUSTAVO FRICKE HOSPITAL, CHILE: A SIX-YEAR STUDY

Prevalencia de complicaciones post quirúrgicas de fracturas mandibulares en el Hospital Dr. Gustavo Fricke, Chile, estudio de seis años

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ABSTRACT

Introduction: Postoperative complications following the resolution of mandibular fractures are a complex and significant challenge for hospital services. The characteristics of the lower third of the face, combined with individual patient factors can complicate treatment outcomes. A thorough understanding of the factors involved in these complications will allow health teams to implement preventive measures and optimize the allocation of resources. **Objective:** To describe the complications identified following surgical intervention for mandibular fractures at the Dr. Gustavo Fricke Hospital (HGF, for its acronym in Spanish) over a six-year follow-up period.

Materials and Methods: A retrospective descriptive study was conducted using anonymized data obtained from medical records of patients who underwent surgery over a period of 6 years.

Results: Among the total sample, 23 subjects experienced postoperative complications, corresponding to 15.65% of the total number of patients. The most prevalent complication was infection (38.71%), with a predominance observed in male patients with ages ranging between 20 and 39 years. Interpersonal violence was the primary etiology with the highest number of complications.

Conclusion: Postoperative complications accounted for 15.65%, with infection being the most common. Proportionately, women experienced complications at a higher rate than men. A greater incidence of complications was observed in young adults. Fracture complexity was shown to be a statistically significant factor for postoperative complications, with comminuted fractures posing the highest risk for complications.

Keywords: *Mandibular fractures; Jaw fractures; Comminuted fractures; Postoperative complications; Infections; Operative surgical procedure.*

RESUMEN

Introducción: Las complicaciones post quirúrgicas asociadas a la resolución de fracturas mandibulares, son un tema complejo y relevante para los servicios hospitalarios. Las características del tercio inferior y factores individuales de los pacientes, pueden complejizar el tratamiento. Un acabado conocimiento de los factores que intervienen en la presentación de estas complicaciones permitirá a los equipos de salud tomar medidas preventivas y destinar recursos. **Objetivo:** Describir las complicaciones posteriores a la intervención quirúrgica por fractura mandibular en el Hospital Dr. Gustavo Fricke (HGF) durante seis años de seguimiento.

Materiales y métodos: Se realizó un estudio descriptivo retrospectivo, con datos obtenidos desde una base de datos anonimizada con registros de fichas clínicas de pacientes intervenidos quirúrgicamente durante 6 años.

Resultado: Del total de la muestra, 23 sujetos presentaron complicaciones postoperatorias lo que corresponde a un 15,65% del total de pacientes. La complicación más prevalente fue infección con un 38,71%, con el predominio de pacientes de sexo masculino comprendidos en un rango etario entre los 20 y 39 años. La etiología que presentó mayor número de complicaciones fue agresión.

Conclusión: Las complicaciones post operatorias corresponden al 15,65% siendo principalmente infección. Proporcionalmente, las mujeres se complicaron en mayor porcentaje que los hombres. Se observó mayor número de complicaciones en adultos jóvenes. La complejidad de la fractura mostró ser una variable estadísticamente significativa para la presentación de complicaciones postoperatorias, siendo las fracturas conminutas las que tienen mayor riesgo de presentarlas.

Palabras Clave: *Fracturas mandibulares; Fracturas maxilomandibulares; Fracturas conminutas; Complicaciones posoperatorias; Infecciones; Procedimientos quirúrgicos operativos.*

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INTRODUCTION

Fractures affecting the mandibular bone represent a significant percentage of maxillofacial trauma.[1] In the treatment of these fractures, applying the surgical principles of open reduction and internal fixation is important to obtain favorable outcomes. This approach facilitates the recovery of functionality, prompt reintegration of patients into the workplace, and a reduction of the sequelae that may occur after this type of injuries.[1]

However, in polytraumatized patients, the resolution of the fracture may become a lower priority when stabilizing other life-threatening issues first is of vital importance.[2] Currently, open reduction and internal fixation has become the first choice of treatment.[3] This approach has increased success rates and allows for faster and more effective rehabilitation of the patient, contributing to reducing the percentage of complications.[3] This decrease can be attributed to new technologies in fixation and reduction, improved intra-hospital safety protocols, and the use of standardized antibiotic therapy. However, no patient is completely exempt from the risk of suffering some type of complication after a surgical intervention.

According to studies, in Latin America and Chile, complications following surgical resolution of mandibular fractures occur between 8% and 38% of cases.[4,5] These percentages are based on the small number of studies that address this topic at a national level. It should be noted that in the Valparaíso Region, no studies have documented the incidence of complications after surgical resolution of mandibular fractures.

The wide variety of presentations and types of postoperative complications makes it necessary to categorize them. Perez *et al.*,[1] classify them into 3 groups: anatomical, patient-associated, and fixation-associated. They also describe some factors related with them, such as: anatomical location, resolution time, and treatment performed. For health establishments, it is very important to identify and quantify the occurrence of postoperative complica-tions, because understanding their nature enables the implementation of measures to prevent their occurrence. In addition, it is useful to acquire the tools and knowledge needed to minimize the consequences that these can have in patients, which can often involve a significant financial cost.[6,7]

The objective of this study was to describe the complications arising after surgical interventions for mandibular fracture at the Dr. Gustavo Fricke Hospital (HGF) during a six-year follow-up period.

MATERIALS AND METHODS

A retrospective descriptive study was conducted that included patients who underwent surgery at the Dr. Gustavo Fricke Hospital (HGF) for mandibular fracture between 2014 and 2020. The presence of postoperative complications in these patients was analyzed. The study used the database of patients who underwent surgery for mandibular fracture, provided by the dentistry unit of the HGF. Only patients with mandibular fracture who underwent surgery in the main ward were included in this study. The database provided by the HGF was anonymized and contained information on the fracture and procedures performed on the patient.

Patients whose fracture was resolved non-surgi-cally were excluded from the study. The exclusion criteria also included: single, simple, non-displaced, and favorable fracture traits (fractures treated through maxillomandibular fixation). In addition, patients whose information was incomplete or not available at the time of the study were also excluded.

The presence of postoperative complications was analyzed as an independent variable in relation to the following dependent variables: sex, age,

prognosis, type of complications, etiological factor, location/area, fracture complexity, waiting time, hospitalization time, and type of complication.

Complications were defined as follows (with possibility of more than one complication occurring per patient): infection, failure of osteosynthesis material, non-union, ankylosis, nerve tissue damage, poor union, and wound dehiscence.

The data obtained were recorded and analyzed using Microsoft Excel, part of the Office 365® suite. The statistical analysis of the data was performed

Table 1. Type of postoperative complications after surgical resolution of mandibular fractures.

Postoperative complication	n (%)
Infection	12 (38.71)
Failure of osteosynthesis material	6 (19.35)
Wound dehiscence	5 (16.13)
Poor union	4 (12.9)
Nerve tissue damage	2 (6.45)
Ankylosis	1 (3.23)
Non-union of fragments	1 (3.23)
Total	**31 (100)**

Table 2. Sex/age distribution in patients with postoperative complications after surgical resolution of mandibular fractures.

	Values	n (%)	Postoperative complications (%)	
			YES	NO
Age	0-19	24 (16.32)	0 (0.00)	24 (19.35)
	20-39	73 (49.65)	13 (56.52)	60 (48.39)
	40-59	41 (27.89)	7 (30.44)	34 (27.42)
	60 ó +	9 (6.12)	3 (13.04)	6 (4.84)
	Total	**147 (100)**	**23 (100)**	**124 (100)**
Sex	Male	131 (89.11)	20 (86.95)	111 (89.52)
	Female	16 (10.88)	3 (13.04)	13 (10.48)
	Total	**147 (100)**	**23 (100)**	**124 (84.35)**

Table 3. Health insurance (healthcare system) and patients with postoperative complications.

Health insurance	Postoperative complications (%)
FONASA A	9 (39.13)
FONASA B	5 (21.74)
FONASA C	2 (8.69)
FONASA D	3 (13.04)
Others (CAPREDENA, DIPRECA, transitory FONASA, and ISAPRE)	4 (17.4)
Total	**23 (100)**

FONASA: Public healthcare system. **CAPREDENA:** Chilean Arm Forces Healthcare system. **DIPRECA:** Chilean Law Enforcement Healthcare system. **ISAPRE:** Private healthcare Insurance system.

Table 4. Etiological factor and patients with postoperative complications.

Etiology of fracture	Postoperative complications (%)
Interpersonal violence	12 (52.17)
Falls	4 (17.39)
Vehicle accidents	4 (17.39)
Other	2 (8.69)
Not reported	1 (4.35)
Total	**23 (100)**

Table 5. Fracture complexity and postoperative complications.

Fracture complexity		Postoperative complications (%)
Complex fracture	Comminuted fracture	5 (55.6)
	Segmental fracture	2 (22.3)
	Not specified	2 (22.3)
Total		**9 (100)**

Table 6. Days of hospitalization in patients with postoperative complications.

Days of hospitalization	Postoperative complications (%)
From 1 to 3 days	5 (43.47)
From 4 to 7 days	11 (26.08)
More than 7 days	7 (30.79)
Total	**23 (100)**

with the Stata® software (2018) using the Chi square test, Fisher's exact test, and Mann Whitney non-parametric test, depending on the behavior of the variables.

This study was supported by the head of the Dentistry Service of the Dr. Gustavo Fricke Hospital and approved on May 14, 2020, under resolution code PREG-10-19 by the ethics committee of the Faculty of Dentistry at Universidad de Valparaíso, Valparaíso Region, Chile.

RESULTS

Between January 2014 and June 2020, a total of 161 patients underwent surgery to treat mandibular fractures. Fourteen of these patients were excluded from the study because their clinical records were not available, they had duplicate records, or they did not meet the inclusion criteria. This resulted in a final sample of 147 patients.

Of the total sample, 23 subjects presented postoperative complications, accounting for 15.65% of the total number of patients studied. In addition, when analyzing the data obtained, it was noted that 1.36% of the patients did not

attend postoperative check-ups, so it is unknown whether they developed any complications after surgery.

Among the 23 patients who suffered complications after surgical resolution of mandibular fractures, 31 different complications were observed. The most frequent was infection (12 cases), followed by failure of osteosynthesis material, and wound dehiscence. The complications recorded in the study are detailed in Table 1.

There is a predominance of males among patients with postoperative complications, accounting for 86.95% of cases, with an average age of 40.86 years, mainly in the range of 20 to 39 years. When analyzing the proportional rate of complications, males had a rate of 15.2% and females of 18.7%. The frequency of complications by age and sex is detailed in Table 2.

In Chile, the public health insurance system (FONASA) is categorized into groups identified with letters according to income, with Group A being the patients with the least financial resources and Group D the ones with the most. When analyzing the patients according to their insurance group, those who experienced complications belonged to FONASA A (n=9) at 39.13%, while 21.74% (n=5) were users of FONASA B. This variable is detailed in Table 3.

The most prevalent etiology of mandibular fractures was interpersonal violence (47.62%). Among patients who experienced postoperative complications, 12 had suffered interpersonal violence, accounting for 52.17%. The distribution of etiological factors is detailed in Table 4.

The mandibular body was the area with the highest number of postoperative complications, totaling 10 cases, which represented 32.25% of all complications. This was followed by the mandibular angle, accounting for 29.03% (n=9). In third place, came parasymphysis, which represented 19.35% (n=6) of the total. With the same percentage, complications at the condyle and symphysis sites were found, accounting for 9.67% each. Lastly, fractures occurring in the ramus and coronoid process did not present any complications.

Of the total number of fractures studied, 31 postoperative complications were reported, of which 22 (70.97%) occurred in simple fractures and 9 (29.03%) in complex fractures. Among the fractures classified as complex that presented complications, 55.6% (n=5) corresponded to comminuted fractures, and 22.3% (n=2) were segmental fractures. This information is detailed in Table 5.

Regarding the waiting time before surgery, patients with complications waited an average of 61.6 hours, ranging from 1 to 269 hours. Among these patients, 43.47% (n=10) waited one day or less for treatment, 26.08% (n=6) waited between 25 and 72 hours, and 30.49% (n=7) waited 73 hours or more. The average hospitalization time of patients with complications was 7.78 days, with a minimum of 2 days and a maximum of 31. In addition, 47.82% of these patients were hospitalized for 4 to 7 days. The variables of waiting time before surgery and days of hospitalization are detailed in Table 6.

DISCUSSION

The significant impact of mandibular fractures and their postoperative complications on both the quality of life of patients and the resources of the public health system stresses the need to delve deeper into this line of research, aiming at a complete comprehension of the subject. Understanding factors such as frequency, form of presentation, and the origin of the most prevalent postoperative complications will provide professionals with better preparation to manage these

events more effectively. This knowledge can help prevent potential surgical reinterventions and reduce the patient's risk of presenting associated sequelae, which can be permanent in some cases. The resolution of mandibular fractures and their potential postoperative complications are therefore a topic of relevance for the healthcare teams, with the maxillofacial surgeon playing a crucial role in their resolution.

It is reported that fractures affecting the lower third of the face present a higher prevalence of complications than those affecting the middle and upper thirds.[8-10]

Currently, in Chile, there are few studies with characteristics comparable to the present research that describe the prevalence of postoperative complications and none of them has been conducted in the Valparaíso Region. This limits the possibility to compare findings with different realities within the country. A study conducted in 2002 at the Hospital del Trabajador, located in Santiago de Chile, with parameters similar to those studied in this research, found that 38.6% of the total number of operated patients experienced complications after surgery.[11] More recently, in 2015, another study conducted at the Hospital Mutual de Seguridad, also in Santiago, reported 8% of complications.[12] At an international level, a research carried out in a hospital in New Jersey, United States, found a postoperative complication rate of 17%, a percentage that is similar to the results of this study.[13]

The similarity between the present study and the one conducted in New Jersey could be primarily attributed to the comparable characteristics of the populations studied; both groups include a high proportion of patients from lower-income or low sociocultural strata.

The authors suggest that the difference in the results of the studies conducted in Chile may be explained by the context in which the fractures occurred. In these cases, the affected individuals were mainly patients who suffered accidents at their workplace. In addition, the time gap between studies may have influenced the outcomes. Over the years, the standardization of surgical protocols, the greater and better specialization of professionals, the improvements in public health policies, and better access to and dissemination of scientific evidence have contributed to the increased efficiency and effectiveness of surgical treatments.

The reviewed articles agree that the highest prevalence of mandibular fractures occurs in males.[5,14-16] In this study, males presented 15% of postoperative complications, while 18% of complications were recorded in females. The authors highlight this result, since, although women have a lower prevalence of fractures, they surpass males in the rate of postoperative complications when considering the total number of subjects by sex. This result invites further research to replicate and explain the reasons behind this percentage difference, as statistical tests applied in this research did not yield significant results.

Regarding the variable age, our results coincide with those reported in the literature. However, when quantifying complications, the age group with the highest number of complications was 60 years or older, accounting for 33% of affected patients.[1] In contrast, patients in the age range of 0 to 19 years, despite having a higher occurrence of mandibular fractures, did not present complications. These findings can be explained by a greater healing capacity at younger ages, which decreases with age. In addition, elderly patients have a greater presence of concomitant factors that contribute to complications, such as systemic pathologies, polypharmacy, and conditions that can affect their proper recovery. All these factors will disturb the healing process of soft and hard tissues, and may predispose patients to complications, such as infections.[17,18]

The majority of patients treated at the Dr. Gustavo Fricke Hospital are users of the public health system. A study conducted in England concluded that patients from lower socioeconomic strata are more likely to suffer facial fractures.[19] When analyzing the relationship between the types of health insurance and postoperative complications, it was observed that patients from the FONASA A Group represented almost 40% of the total number of patients with complications.

This could be due to the fact that individuals from low socioeconomic strata are associated with behaviors that favor the occurrence of said complications, such as noncompliance with postoperative instructions, failure to attend check-ups, and premature removal of the medical devices.[20]

The global trend in fractures suggests a clear predominance of etiologies related to interpersonal violence and vehicle accidents. However, there are variations associated with multiple factors depending on the country studied, such as the level of development, enforcement of traffic laws, and degree of urbanization, among others.[21–23]

In the present study, the highest percentage of complications were caused by aggression and violence from third parties. This can be explained by the higher prevalence of this etiology, both in this study and in others conducted in Chile, as well as the fact that the statistical analysis did not show any significant association with this variable.

In the present study group, the highest percentage of mandibular fractures occurred in the mandibular angle. This finding is consistent with both global and national trends, where the mandibular angle is generally the most frequently affected area.[1,15,24]

It was found that fractures of the body, angle, and parasymphysis, in descending order, were the areas that presented the highest number of complications, which is consistent with what is described in the literature.[25] Other authors report that fractures of the mandibular angle have the highest prevalence of complications, which could be associated with the local factors present in the area, complicating surgical management.[21]

The anatomical site between the angle and the body of the mandible is generally the one that shows the highest prevalence of postoperative complications. In the presence of a fracture, it is challenging to delimit the exact location of the fracture, as the angle and the body of the mandible are in very close anatomical proximity. In cases of complex fractures or significant damage, the boundaries of the fracture may be difficult to distinguish.

Regarding morphology, 50% of comminuted fractures presented associated complications. This finding is consistent with the results reported in the literature, since these fractures are the ones that account for greater tissue damage. Consequently, they require a more complex treatment, which could increase the prevalence of postoperative complications. The statistical significance of these variables highlights the need for greater effort in the management, resolution, and subsequent follow-up sessions of these fractures.[22,26]

Of the patients studied, 73% underwent surgery within 3 days, with no statistical significance between the occurrence of complications and the waiting time. This variable, according to the literature and clinical experience, is controversial, as there is no consensus that the waiting days in the hospital, before the intervention, are a factor linked to the development of postoperative complications.[26–28]

It should be noted that many times patients with mandibular fracture do not immediately seek emergency care, so it is difficult to define a precise timeline of the traumatic event. The trauma could

have occurred days before the consultation, and the patient may have ultimately waited even more days before undergoing surgery.

The results of the present study show that the average hospitalization time for patients treated for mandibular fracture is 7 days. Patients who underwent surgical resolution for mandibular fracture who experienced postoperative complications needed almost one additional day of hospitalization.[29] This period does not consider that these patients often required a second surgery because of complications that manifested later. In addition, this group of patients had to be hospitalized a second time, which is not considered within the average number of days of stay calculated in this research but certainly resulted in an extended hospital stay. These results suggest that the presence of complications leads to a longer hospital stay and, consequently, a greater expenditure of resources for these patients.[30]

CONCLUSION

Postoperative complications of mandibular fractures in the present study occurred in 15% of patients who under-went surgery, with infection being the most common complication. These complications did not show any gender prevalence but were more frequent among older adults. The complexity of the fracture was shown to be a statistically significant variable for the occurrence of postoperative complications, with comminuted fractures presenting the highest risk.

The present study provides valuable information that the scientific community can use to publish further studies aimed at determining whether any of these variables serves as a risk factor for the presence of postoperative complications. Such insights could help the implementation of preventive actions to decrease both the prevalence and the associated financial and human costs of postoperative complications.

CONFLICT OF INTERESTS

The authors declare that they have no conflict of interest.

ETHICS APPROVAL

The protocol for this study was approved on May 14, 2020, under the code PREG-10-19 by the Ethics Committee of the Faculty of Dentistry at Universidad de Valparaíso, Chile.

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AUTHORS' CONTRIBUTIONS

Marco Nasi Toso: Conceptualization, Data Curation, Methodology, Supervision.

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Ignacio Sanino Zavala: Data Curation, Resources, Writing-original draft, Writing-review and editing.

Juan Diaz González: Investigation, Resources, software, Writing-original draft, Writing-review and editing.

Rodrigo Quitral Argandola: Formal analysis, software, Writing-original draft, Writing-review and editing.

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