

CERVICOFACIAL INFECTIONS AT THE DR. CARLOS CISTERNAS HOSPITAL IN CALAMA, CHILE. A RETROSPECTIVE STUDY

Infecciones cervicofaciales en el Hospital Dr. Carlos Cisternas de Calama, Chile. Estudio retrospectivo.

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ABSTRACT

Introduction: Cervicofacial infections can invade superficial and deep anatomical planes of the head and neck. Their origin is multifactorial, and despite having a slow onset, they can lead to a sudden invasion of surrounding tissues, increasing morbidity and mortality. An effective diagnosis will impact the timely management of a maxillofacial infection.

Material and Methods: A review of 173 surgical protocols from Dr. Carlos Cisternas Hospital in Calama, Chile, on maxillofacial infections was conducted by two previously calibrated evaluators. Over a period from May 2018 to December 2023, variables such as year, gender, age, surgical procedure, type of approach, type of infection, origin, use of drainage, first surgery, or reoperation were analyzed.

Results: The most common cervicofacial infections in this study were deep cervical abscesses, submandibular abscesses, and multicompartmental head abscesses. Males were slightly more predominant; transfacial/cervicotomy approaches were the most used, and most infections had a nonspecific oropharyngeal origin.

Conclusions: Cervicofacial infections have a slow onset but can rapidly spread when the patient's systemic condition is compromised. The most prevalent were deep cervical abscesses, submandibular abscesses, and multicompartmental head abscesses, with a slightly higher prevalence in males. Treatment with empirical antibiotic therapy, combined with thorough surgical cleansing, had a positive effect on the management of cervicofacial infections.

Keywords: *Soft tissue infections; Abscess; Maxillo mandibular surgery; Postoperative complications; Retrospective studies; Public health.*

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RESUMEN

Introducción: Las infecciones cervicofaciales pueden invadir planos anatómicos superficiales y profundos de la cabeza y el cuello. Su origen es multifactorial y, a pesar de tener un inicio lento, pueden provocar una invasión repentina de los tejidos circundantes, aumentando la morbilidad y la mortalidad. Un diagnóstico eficaz repercute en el tratamiento oportuno de una infección maxilofacial.

Materiales y métodos: Dos evaluadores previamente calibrados realizaron una revisión de 173 protocolos quirúrgicos del Hospital Dr. Carlos Cisternas de Calama, Chile, sobre infecciones maxilofaciales. Durante el periodo comprendido entre mayo de 2018 y diciembre de 2023, se analizaron variables como el año, el sexo, la edad, el procedimiento quirúrgico, el tipo de abordaje, el tipo de infección, el origen, el uso de drenaje, si se trataba de la primera cirugía o de una reintervención.

Resultados: Las infecciones cervicofaciales más frecuentes en este estudio fueron los abscesos cervicales profundos, los abscesos submandibulares y los abscesos multicompartimentales de la cabeza. Los hombres presentaron una ligera predominancia. Los abordajes transfacial/cervicotomía fueron los más utilizados, y la mayoría de las infecciones presentaron un origen orofaríngeo inespecífico.

Conclusiones: Las infecciones cervicofaciales tienen un inicio lento, pero pueden propagarse rápidamente cuando el estado general del paciente se ve comprometido. Las más frecuentes fueron los abscesos cervicales profundos, los abscesos submandibulares y los abscesos cefálicos multicompartimentales, con una prevalencia ligeramente mayor en hombres. El tratamiento con antibioticoterapia empírica, combinado con una limpieza quirúrgica exhaustiva, resultó eficaz para el manejo de las infecciones cervicofaciales.

Palabras clave: *Infecciones de los tejidos blandos; Absceso; Cirugía maxilomandibular; Complicaciones posoperatorias; Estudios retrospectivos; Salud pública.*

INTRODUCTION

Cervicofacial infections can invade the superficial and deep anatomical structures/planes of the maxillofacial and cervical territory.¹ These infections may or may not have an odontogenic origin,¹ typically have a slow onset, and could spread rapidly to tissues if the patient is immunocompromised.³ This may place the patient at risk of a serious, potentially fatal outcome,⁴ warranting a thorough medical history and an accurate diagnosis, as the clinician's surgical judgment directly influences the morbidity and mortality associated with these complications.

Clinical symptoms include pain, erythema, and inflammation, which may be associated

with odynophagia, dysphagia, dyspnea, systemic compromise, functional limitation, trismus, fever, lymphadenopathy, and leukocytosis,⁵ depending on the affected area. On the other hand, among the most frequent complications are Ludwig's angina, necrotizing fasciitis, descending mediastinitis, airway obstruction, sepsis, cavernous sinus thrombophlebitis, bacterial pericarditis, Lemierre's syndrome, among others,^{6,7} which are severe diseases characterized by a significantly elevated mortality rate.⁴

Broad-spectrum antibiotic coverage is the first-line pharmacological tool of choice.⁸ Currently, extensive drainage along with surgical debridement, used as complementary therapy to antibiotics, is recognized as an

effective surgical option.⁹ Evidence shows that changing from an anaerobic to an aerobic bacterial environment presents improvements in the management of infections in the maxillofacial and cervical territory.¹⁰ As such, the objective of this retrospective and observational study was to determine the incidence and associated factors of abscesses and infections of the maxillofacial and cervical territory in patients at Dr. Carlos Cisternas Hospital in Calama, Chile.

MATERIALS AND METHODS

A retrospective, observational study was conducted by reviewing the surgical protocols of the maxillofacial surgery and traumatology team employed in the operating room, under general anesthesia, at Dr. Carlos Cisternas Hospital in Calama, Chile, from May 2018 to December 2023. A total of 964 surgical interventions were found, which once the pathology was confirmed by contrast-enhanced CT scan, surgical intervention was performed and complemented with a parenteral antibiotic regimen of ceftriaxone (1g every 12 hours) and clindamycin (600 mg every 6 or 8 hours).

Patients with a penicillin allergy received clindamycin alone. After completing 7 days of intravenous antibiotic therapy and upon evaluation of the patient's systemic condition, hospital discharge was indicated. Oral antibiotic therapy was prescribed upon discharge, with amoxicillin/clavulanic acid (875 mg/125mg every 12 hours for 10 days) being the most used, and azithromycin (500 mg every 8 hours for 7 days) prescribed for patients allergic to penicillin; once the filter was applied, according to the inclusion criteria, 173 surgeries were obtained, which were included for statistical analysis. The criteria used are presented below.

Inclusion criteria

Surgical interventions in which there is a bacterial infectious agent in any anatomical component of the maxillofacial and cervical area carried out in the period 2018-2023. The indication for surgical intervention was the identification of a well-defined collection on contrast-enhanced CT scan.

Exclusion criteria

Surgical interventions in which there was no bacterial infectious agent in the maxillofacial area, such as orthognathic surgeries, bone fractures, SARPE, biopsies, surgeries for impacted teeth, frenectomies, temporomandibular joint surgeries, implant surgeries, glossectomies, nasal packing, neurotomies, blepharoplasties, muscle resections.

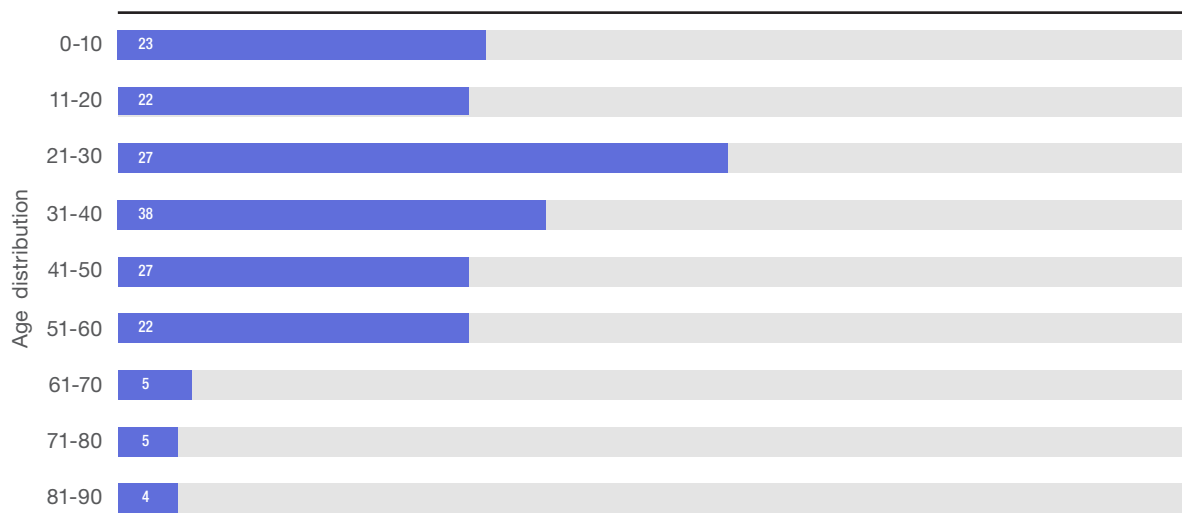
All conditions that did not represent a presumptive infectious diagnosis were excluded. Postoperative swellings were excluded based on white blood cell count and clinical examination.

The total sample consisted of 173 interventions, from which the following statistical data were obtained: Patient age, year of intervention, procedure performed, type of surgical approach, type of infection, utilization and type of postoperative drainage, origin of the infection, first surgery or patient reoperation.

The data were collected by two members of the research team, where 173 surgical operative protocols were reviewed, and any discrepancies in criteria were resolved by a third investigator. The data collected for qualitative and quantitative variables were analyzed using Excel and the SPSS program. This article adheres to the STROBE statement for observational studies.

Figure 1.

Age Distribution of the patients included in this study (n=173)



RESULTS

From the statistical analyses, a total of 173 surgical interventions for infections in the maxillofacial territory were obtained. The year with the highest number of surgeries was 2023 with 34.10%, followed by the year 2021 with 28.32%, and in third place by the year 2022 with 19.65%. In decreasing order, the years 2020, 2019, and 2018 followed with percentages of 9.82%, 6.35%, and 1.73% respectively.

Regarding age ranges, the minimum age was 1 year, and the maximum was 82 years, with a mean age of 34.6 years. The most affected population was in the 31-40 age range with 21.96%, followed by the age ranges between 21-30 and 41-50, both with a percentage of 15.60%, and in third place, 0-10 years with 13.29%. The distribution by gender of surgical interventions was slightly higher in males with 53.75% over females with a percentage of 46.24%, with an estimated ratio of 1.2:1, and the data are summarized in Table 1 and presented in Figure 1.

Among the symptoms presented by the 173 patients upon hospital admission, the most frequently reported findings, in descending order, were swelling (161 cases) in 93.06% of patients, followed by trismus (50 cases) in 28.90%. Third was leukocytosis (44 cases) at 25.43%, followed by odynophagia (41 cases) in 23.69%; dysphagia (31 cases) in 17.91%; fever (28 cases) in 16.18%; dental pain (21 cases) in 12.13%; neck stiffness (14 cases) in 8.09%; lymphadenopathy (13 cases) in 7.51%; ecchymosis (7 cases) in 4.04%; rhinorrhea (6 cases) in 3.46%; dyspnea (5 cases) in 2.89%; otalgia (4 cases) in 2.31%; and finally, headache (3 cases) in 1.73%. These results are summarized in Table 2.

Another variable analyzed was the presence of comorbidities among these patients. The most frequently observed comorbidity in this study was hypertension, identified in 16 patients (9.24%), followed by type 2 diabetes mellitus in 15 patients (8.76%). Third was hypothyroidism, reported in three patients (1.73%), followed by otitis, medication-re-lated

osteonecrosis of the jaw (MRONJ), rheumatoid arthritis, and autism spectrum disorder (ASD), each found in two patients (1.15%). Lastly, the following conditions were identified in one patient each (0.57%): psoriasis, arthritis, osteoarthritis, silicosis, dyslipidemia, trichotillomania, cardiomyopathy, polyneuropathy, congenital syphilis, asthma, epilepsy, and osteomyelitis. These findings are presented in Table 3.

On the other hand, the infections with the highest number of surgical interventions were deep cervical abscesses with a percentage of 17.91%, which are defined as abscesses in shared or unshared deep anatomical spaces of the neck. The results showed that the most prevalent secondary infection was submandibular abscess with 15.60%, and in third place, multicompartiment abscesses, defined as abscesses in common deep or superficial spaces of the head, with a percentage of 12.13%.

The following maxillofacial infections presented a significant number within the sample compared to the rest of the surgical interventions with a lower percentage, except for those previously presented with

higher prevalence: parotid abscesses and peritonsillar abscess, 9.24% each, and Ludwig's Angina with 5.20%, the rest of the maxillofacial infections are detailed in Table 4.

Another variable analyzed in surgical interventions was the origin of the infection: 15.60% of interventions had an odontogenic origin, and 84.39% were of unspecified type, all odontogenic infections were managed by removing the source tooth in combination with surgical debridement.

Of the total surgeries, Hemosuc® drainage was the most used with 35.83%, followed by Penrose with 8.67%; Thirdly, we identified open drainage without suturing the approach in 2.89% of cases, and finally, Jackson Pratt drainage with 1.73%. The remaining 50.86% were without drainage.

Postoperative drainage placement was determined according to the characteristics of the abscesses, with consideration given to size and extent. Drains were routinely used in cases involving large collections or infections with deep or multicompartimental involvement.¹¹

Table 1

Age Distribution of the patients included in this study (n=173)

Range (years)	Age Distribution	
	Frequency	Percentage (%)
0-10	23	13.29
11-20	22	12.71
21-30	27	15.60
31-40	38	21.96
41-50	27	15.60
51-60	22	12.71
61-70	5	2.89
71-80	5	2.89
81-90	4	2.31
Total	173	100

Table 2

Clinical Features at Hospital Admission (n=173)

Symptom	Age Distribution	
	Frequency	Percentage (%)
Swelling	161	93.06
Dyspnea	5	2.89
Dysphagia	31	17.91
Odynophagia	41	23.69
Fever	28	16.18
Trismus	50	28.90
Lymphadenopathy	13	7.51
Neck Stiffness	14	8.09
Leukocytosis	44	25.43
Ear Pain	4	2.31
Dental Pain	21	12.13
Headache	3	1.73
Rhinorrhea	6	3.46
Ecchymosis	7	4.04

Table 3

Comorbidities presented by the surgically treated patients (n=173)

Comorbidities	Frequency	Percentage (%)
Hypertension (HTN)	16	9.24
Psoriasis	1	0.57
Otitis	2	1.15
Type 2 Diabetes Mellitus (DM II)	15	8.67
Arthritis	1	0.57
Osteoarthritis	1	0.57
Silicosis	1	0.57
Medication-Related Osteonecrosis of the Jaw (MRONJ)	2	1.15
Dyslipidemia	1	0.57
Trichotillomania	1	0.57
Hypothyroidism	3	1.73
Rheumatoid Arthritis	2	1.15
Cardiomyopathy	1	0.57
Anemia	1	0.57
Polyneuropathy	1	0.57
Autism Spectrum Disorder (ASD)	2	1.15
Congenital Syphilis	1	0.57
Asthma	1	0.57
Epilepsy	1	0.57
Osteomyelitis	1	0.57

Table 4

Types of cervicofacial infections identified in this study (n=173)

Infection type	Frequency	Percentage (%)
Perimandibular Abscess	2	1.15
Submandibular Abscess	27	15.60
Ludwig's Angina	9	5.20
Multicompartmental Abscess	21	12.13
Abscessed Cyst	3	1.73
Subcutaneous Abscess	2	1.15
Parotid Abscess	16	9.24
Retromandibular Abscess	1	0.57
Genian Abscess	6	3.46
Retropharyngeal Abscess	5	2.89
Deep Neck Abscess	31	17.91
Orbital Abscess	7	4.04
Post operative Infection	1	0.57
Peritonsillar Abscess	16	9.24
Sinus Abscess	4	2.31
Preauricular Abscess	3	1.73
Submental Abscess	4	2.31

From all cases, 75.14% were single-intervention surgeries, and 24.85% were surgical reinterventions. Regarding the approaches used in surgeries, transfacial and cervicotomy approaches were the most used with 54.91%, followed by intraoral approach with 30.05%, and mixed approach was used in 15.02% of cases.

One death was reported due to hypoxia followed by cardiopulmonary arrest, with no possibility of resuscitation, occurring during anesthetic induction and before the patient reached the surgical stage under the Maxillofacial team at the Hospital.

DISCUSSION

The Dr. Carlos Cisternas Hospital, located in the Antofagasta region, in northern Chile, is a high complexity establishment (according to the guidelines of the Ministry of Health in Chile), where medical care is provided to the population of Calama and the surrounding area.

During the period from May 2018 to December 2023, 173 surgical interventions associated with maxillofacial infections were performed. The three most frequent maxillofacial infections in this retrospective study were, in decreasing order, deep cervical abscess, submandibular abscess, and multicompartmental head abscess, partially coinciding with the findings in the scientific literature, where submandibular abscess are

reported as the most prevalent abscess of maxillofacial infections.^{5,7}

Furthermore, males had a slight predominance compared to females, which has been previously described in the scientific literature.^{12,13} The age range most affected by maxillofacial infections was 31-40 years, a result that is consistent with the studies of Rastenienė *et al.*,¹⁴ but not with the results of Osman *et al.*,¹³ who reported that the age group most affected by maxillofacial infections tends to be between 20-29 years, followed by the age group between 30-39. This difference in results does not represent a significant discrepancy, and its variability lies in the social, cultural, and other population factors of the studied sample.

The maxillofacial surgery and traumatology team of Dr. Carlos Cisternas Hospital in Calama, Chile is the main surgical specialty responsible for resolving complex infectious conditions of the head and neck in the city. The diagnosis of maxillofacial infections and abscesses was justified by performing a contrast-enhanced computed tomography scan. This practice is supported by scientific evidence,^{15,16} which positions this examination as the gold standard diagnostic tool. Once the collection was determined, patients were referred to the operating room for surgical intervention.

The time between the identification of the collection and surgery was over 12 hours in mild cases, and less than 3 hours in cases where the airway was compromised, such as Ludwig's angina, retropharyngeal, parapharyngeal, perimandibular, or multi-compartmental head abscesses, or deep cervical abscesses.

The same urgency applied to cases involving vital structures, such as the optic nerve

in retrobulbar abscesses or the eyeball in postseptal palpebral or ocular abscesses.

Additionally, in the presence of severe airway limitations, induction is coordinated with the anesthesiology team to determine oral intubation using nasofibroscope with vigilant intubation or a diagnostic laryngoscopy to evaluate the glottis and adjacent structures before oral intubation. The surgical procedures carried out in the interventions were entirely surgical washouts, in which an approach to the collection was made, which was emptied and thoroughly washed with saline solution, followed by determining the relevance of external drainage.

This protocol is described in the scientific literature,¹⁷ based on the change from anaerobic to aerobic milieu. This presents better pharmacological management and progressive evolution,¹⁰ which was evidenced by the rate of surgical reintervention of patients, which was 24.85%. Additionally, the perioperative antibiotic management used in patients was mostly ceftriaxone 1g every 12 hours plus clindamycin 600mg every 6 or 8 hours intravenously, and it recorded good acceptance by the patients. The use of broad-spectrum antibiotics is supported by scientific evidence,¹² which is supported in the results of this retrospective study.

Regarding origin, 15.60% of cervicofacial infections in this study were of odontogenic source, results that differ from the scientific literature, where in the study by Ballesteros *et al.*,³ conducted in Brazil, 89.36% of infections had an odontogenic origin. Likewise, in a study by Escobar *et al.*,¹⁸ conducted in Mexico, 91.1% of infections had an odontogenic origin. The hospital admits patients who are systemically compromised. In recent years, it has been

evidenced that odontogenic infections can be resolved with timely antibiotic therapy, and their lethal complications have decreased drastically in the last 50 years.¹⁹ A total of 84.39% of cervicofacial infections did not have an odontogenic origin, which have a higher percentage of airway compromise compared to odontogenic infections.²⁰

Considering the above and considering other hospitals in Chile, Calama has the particularity of being at 2400 meters above sea level, with significant social and economic differences, with its population frequently suffering from bacterial oropharyngeal infections, mainly peritonsillar abscesses that lead to invasion of the lateral pharyngeal, parotid, and/or retropharyngeal space. Single parotid abscesses are also recorded, with no defined origin, especially in children and infants, hypothesized to be due to Stenon's duct obstruction.

The treatment of infections of odontogenic origin was complemented in all cases by the extraction of the involved tooth. On the other hand, infections of unspecified origin were treated with intravenous anti-biotic therapy for at least 7 days, followed by oral antibiotic therapy for 10 days after hospital discharge, mainly with amoxicillin/clavulanic acid 875/125 mg tablets. A total of 24.85% of surgeries corresponded to surgical reinterventions.

This is considered part of the team's evolution. Initially, minimal approaches were made, and greater emphasis was placed mainly on waiting times for antibiotics and drainage. Currently, extensive approaches are made, and in cases that warrant it, more than one surgical debridement is performed to change the bacterial milieu, resulting in better outcomes and shorter hospital stays. On the other hand, the hospital does not have a lab protocol to study anaerobes, so the team

must resort to empirical antibiotic therapy. This can increase the occurrence of antibiotic resistance in patients.

The literature expresses that incorrect prescription and self-medication by patients are predictors for more discouraging prognoses in a cervicofacial infection.¹⁶ In cases of surgical reinterventions, an antibiogram should be obtained, and a different antibiotic penicillin G and ampicillin should be used, due to the resistance that bacteria commonly present this drug, while clindamycin has shown good clinical results.^{10,21}

In Germany, in the study by Meinen *et al.*,²² 17% of the study population was reported to present resistance to clindamycin, and in the study by Maldonado-Tinajero *et al.*,²³ conducted in Mexico, in the ceftriaxone-clindamycin scheme, resistance was found in six patients in the case group and 15 patients in the control group, in a sample of 30 cases and 60 controls. Considering the above and projecting their results to the population studied, while waiting for the antibiotic susceptibility studies, a solid alternative considering the local reality of the resources of the public health institute in question, would be the use of vancomycin, ampicillin/sulbactam, or third-generation cephalosporins parenterally.

Among the limitations of the study, we found the absence of specific culture laboratory studies for anaerobes to be a constraint; However, in all cases a bacterial culture is performed. Infections of cutaneous origin usually correspond to *Staphylococcus aureus*, and occasionally *Streptococcus sp.* within the aerobic or facultative anaerobic group.

CONCLUSIONS

Cervicofacial infections can become highly complex pathologies, especially when the patient presents systemic compromise and/or airway involvement. The most prevalent infections in this study were deep cervical abscesses, submandibular abscesses, and multicompartamental head abscesses.

Males were slightly more predominant than females, and the most affected age range was between 31-40 years. The antibiotic regimen of ceftriaxone-clindamycin, combined with thorough surgical cleansing of the collection with saline solution, yielded good results in the management of maxillofacial infections.

CONFLICT OF INTERESTS

The authors declare that there are no conflicts of interest.

ETHICS APPROVAL

According to the institutional policy for retrospective studies, no formal authorization protocol was required, as the study involved no intervention. The study adhered to the STROBE statement and guidelines for observational studies.

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AUTHORS' CONTRIBUTIONS

Igor Miño Solís: Project administration, funding acquisition, formal analysis, conceptualization, data curation, writing (review and editing), research, methodology, resources, software, supervision, validation, and visualization.

Víctor Herrera-Barraza: Project administration, formal analysis, writing (review and editing), research, methodology, supervision, validation, and visualization.

Gabriela González Meléndez: Conceptualization, data curation, writing (review and editing), research, methodology, resources, writing (original draft), and validation.


Hayatt Silva Saavedra: Funding acquisition, conceptualization, writing (review and editing), research, methodology, resources, supervision, validation, and visualization.

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PEER REVIEW

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