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## CASE REPORT

# Odontogenic infection complicated by sepsis: A case report

# Infección odontogénica complicada con sepsis: el reporte de un caso

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**ABSTRACT**

**Case description:** female patient, 43 years old, admitted to the emergency department of the Hospital San Juan de Dios de Cali, on September 9, 2023, with signs suggestive of infection of odontogenic origin.
**Clinical findings:** moderate edema in the lower left facial third and zones I, II, and III of the left hemicollar, extraoral fistula, limitation of opening, swollen mucosa of tooth 35, with bloody-purulent exudate and associated alveolar bone exposure.
**Treatment:** intraoral drainage, accompanied by antibiotic and analgesic therapy, with intravenous clindamycin and dexamethasone, respectively.
**Result:** Resolution of the odontogenic infectious process.
**Conclusion:** antibiotic therapy with clindamycin or combined amoxicillin/clavulanate is a useful treatment alternative in dentoalveolar infections.

## CLINICAL RELEVANCE

The literature has demonstrated the powerful antimicrobial activity of penicillins against the main pathogens in orofacial odontogenic infections. Case reports such as this one corroborate once again that antibiotic therapy with clindamycin, or combined amoxicillin/clavulanate is a useful treatment alternative in dentoalveolar infections.

## INTRODUCTION

The definition of infection and sepsis has been variable over time, since the beginning of the use of these terms there have been multiple consensuses and debates about the most appropriate definition and its severity.[1] An infection is the harmful proliferation of one or several microorganisms (bacteria, viruses, fungi, and/or protozoa) in a host, and/or the set of signs and symptoms produced in that host by the dissemination and virulence of pathogenic or opportunistic germs.[2] In Colombia, the definition of sepsis proposed by the American College of Chest Physicians (ACCP) and the Society of Critical Care Medicine (SCCM) in 1992 was adopted and represents the systemic inflammatory response syndrome associated with an infection.[3]
Facial infections can be odontogenic and non-odontogenic. Odontogenic infection is the one that occurs most frequently in the orofacial region and has affected mankind for centuries, it varies from peripheral abscesses to superficial and deep infections that affect the head and neck,[4] these infections can have origin in the teeth or in the dental support structures, and are the result of pathologies such as extensive caries, pulp necrosis, dental fractures, periodontitis or pericoronitis. The most important symptoms and signs are pain, heat, redness and inflammation and in some cases the functions of mastication, phonation, swallowing and trismus may be affected.[5]

Most of these infections produce pus that drains through the oral cavity, however, it can spread to important structures such as: the maxillary sinus, sublingual, submandibular, infraorbital regions and, in more severe cases, involve the orbit, brain or mediastinum, through aponeurotic spaces via hematogenous, nervous, lymphatic and/or dissect specific anatomical spaces in the face and neck and drain extraorally. [5] In the English literature, the submandibular space is most frequently observed to be involved in multiple space infections, followed by the lateral pharyngeal space, buccal space and submental space.[6]
The main etiological microorganisms in facial infections of odontogenic origin are aerobic bacteria like *Streptococcus viridians*, *Staphylococcus aureus*, *Staphylococcus coagulasa*-negativo, y organismos de los géneros *Corynebacterium*,, *Klebsiella* y *Enterobacter*, *Pseudomonas aeruginosa*; o anaerobios como *Peptostreptococcus*, *Bacteroides*, *Fusobacterium*, *Prevotella* y *Porphyromonas*, among others. [2-7]
Identifying the microorganisms involved in infections and their antibiotic or antifungal sensitivity profile allows rationalizing treatments and improving prognosis.[4]

Bacterial identification should be performed by an experienced microbiologist to classify pathogenic organisms accurately if identified by culture, and another possible way today is to use rapid molecular detection tests using polymerase chain reaction or massive sequencing or metagenomics systems that are very expensive and not accessible to regular clinical services. There are several factors that alter the results of microbiological testing, including the use of antibiotics prior to admission, high doses of intravenous antibiotics prior to surgical drainage, inadequate specimen collection, and difficulty in culturing and identifying anaerobic organisms. [4]

The speed of spread of the infection of odontogenic origin depends mainly on the bacterial virulence, the immunity of the individual and the failure of diagnosis and timely treatment that together can increase the severity of the infection, because there is dissemination through the anatomical spaces of less resistance such as the bone cortices and muscle fasciae.[5]

The treatment of these infections depends on the structures involved, generally it starts with the drainage of the abscess and the empirical prescription of broad-spectrum antibiotics, and treat the cause of the infection with the most indicated therapy, which in some cases may be dental extraction. It is essential to consider medical consultation when the patient has a poorly controlled systemic disease, or a history of bacterial endocarditis and/or airway compromise.[7] The objective of this article is to present a case treated by the Oral and Maxillofacial Surgery Service at the San Juan de Dios Hospital in Cali in September 2023.

## DESCRIPTION OF THE CASE

The patient is a 43-year-old female with no relevant pathological history, who was admitted to the emergency department of the Hospital de San Juan de Dios on September 9, 2023 due to an increase in volume in the submandibular region (Figures 1, 2 and 3), associated with pain and spontaneous drainage of extraoral purulent material. As an important antecedent, he reports trauma at mandibular level with a blunt object that occurred approximately on August 25, 2023, and was initially managed in a high complexity hospital. On physical examination he presented moderate edema involving the lower left facial third and zones I, II and III of the left hemicollar, extraoral fistulous tract at the level of the ipsilateral mandibular body, without spontaneous drainage (Figure 4), at intraoral level there was evidence of limitation of opening, with an opening of 30 mm, and in tooth 35 (lower left premolar) there was retained dental root associated with mucosa with signs of inflammation, bloody-purulent exudate and exposure of the alveolar bone (Figure 5).

**Figure 1.** Frontal view, moderate edema can be seen in the lower left facial third.

**Figure 2.** Left lateral view shows fistulous tract in the left mandibular body area without active drainage.

**Figure 3.** Frontal view lower third.

**Figure 4.** Extraoral fistula.

**Figure 5.** Intraoral view, showing poor oral health, multiple caries and dental losses, alveolar ridge in quadrant 3 exposed with drainage of purulent material.

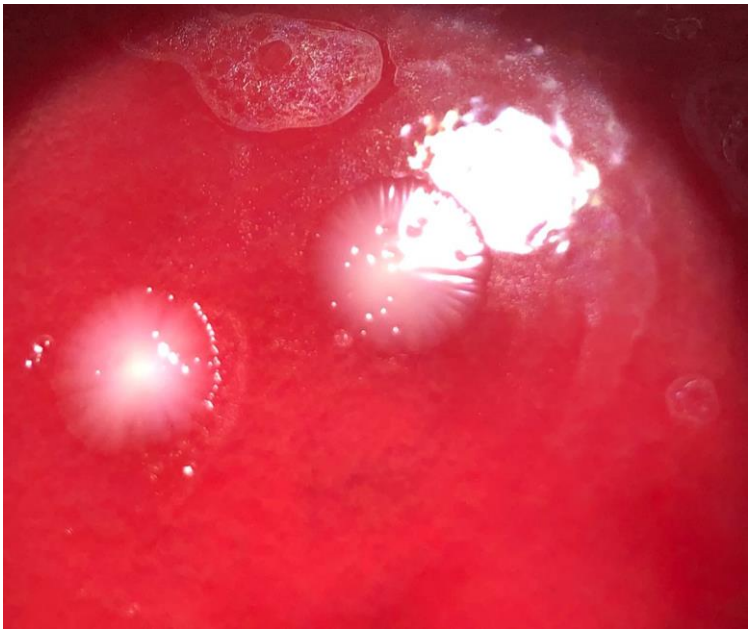

**Figure 6.** culture with the presence of anaerobic Streptococcus, sensitive to amoxicillin and clindamycin.

Initial emergency management consisted of intraoral drainage where approximately 3cc of seropurulent material was obtained, antibiotic and analgesic therapy was started as follows: Intravenous Clindamycin 600mg/4ml one every 8 hours for 7 days, Intravenous Dexamethasone 1mg/4ml one every 24 hours for 4 days, and subsequently a CT scan of the face was ordered showing a heterogeneous density area in the left mandibular body compatible with osteomyletic signs and perimandibular soft tissue involvement, Therefore, it was decided to perform hemimandibulectomy, bone curettage, lavage and debridement, exploration and mobilization of the dental nerve, and mandibular reconstruction with plate.

## DISCUSSION

Gilmore et al. reported that strict anaerobic resistance to penicillins ranges between 8.9 and 16%, depending on the gender involved.[8] Amoxicillin still shows a high level of activity against most oral anaerobes and other studies have shown that 90% of gram-positive cocci and 79% of gram-negative bacilli are susceptible to amoxicillin. The addition of beta-lactamase inhibitors, such as clavulanate, to broad-spectrum penicillins has expanded the antimicrobial spectrum of the parent agents to include many beta-lactamase-producing bacteria, including most beta-lactamase-producing anaerobes.[9,10]

In this case report, the isolated streptococcal strains were susceptible to amoxicillin/clavulanate; and as a result, it appears to be the most effective option in the treatment of dentoalveolar infection. Kuriyama et al. reported that Streptococcus viridans has a susceptibility rate of 77% to penicillin, 87% to clindamycin, 77% to erythromycin, and 92% to levofloxacin.

In conclusion, anaerobic Streptococcus, which are gram-positive anaerobic cocci, could be identified in this case of orofacial odontogenic infection. An antibiogram demonstrated that amoxicillin/clavulanate and clindamycin have powerful antimicrobial activity against the main pathogens in orofacial odontogenic infections, as useful alternatives for the treatment of dentoalveolar infection.

## FUNDING SOURCE

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## CONFLICT OF INTEREST

The author declares that he has no conflict of interest.

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In 1996, Mcbeth et. al. [15] reported values of 87% sensitivity and 86% specificity, concluding that IT findings have a strong correlation with pain on muscle palpation, indicating that IT shows promise as an objective tool for selecting normal subjects from subjects with TMD symptoms.
Subsequently between 1996 and 2012 no available studies were included that made use of IT in the diagnosis of TMD.

In 2013 Filho et. al. [6] reported highly variable and diffuse values of sensitivity ranging from 38.5% to 76.9%, and specificity ranging from 22.8% to 71.2%, thus concluding that infrared thermography of the masticatory muscles is not an accurate Instrument for the diagnosis of myogenic TMD.

In 2014 Rodriguez et. al. [17] and Haddad et. al. [13] evaluated thermography in the diagnosis of TMD, dividing the temperature shots into specific muscle regions as follows: In 2014 Rodriguez et. al. [17] evaluated the diagnostic ability of thermography comparing it with RDC/TMD in women, where they reported different values of sensitivity and specificity according to the muscle evaluated, in terms of sensitivity reported 33.5 % in left masseter, 41.8 % in right masseter, 42.6 % for left anterior temporal and 60.3 % for right anterior temporal muscle, in terms of specificity reported 67. 3 % in left masseter muscle, 55.8 % in right masseter, 48.4 % in left anterior temporalis and 41.8 % in right anterior temporalis muscle, concluding that none of the infrared thermography methods tested for the quantification of masseter and anterior temporalis muscles (area and extension analysis) agrees with the RDC/TMD for the diagnosis of myogenic TMD in women, i.e. it was not conclusive. In the same year Haddad et. al. [13] reported a sensitivity in masseter region of 70% and in anterior temporal region 80%, and a specificity in masseter region of 73% and in anterior temporal region of 62%, where he concluded that IT could be used as an aid in the complementary diagnosis of TMD.



Later in 2015 Krzysztof et. al. [14] performed different temperature measurements, one initial and one after a chewing test where he concluded a sensitivity of 44.3% before the chewing test and 46.4%, after

The results in females statistically more significant were the thermal increase between the relaxed state and the state of the subjects after chewing for four minutes for the temporal (AUC: 0.72) and TMJ (AUC: 0.76) while in men, all calculated parameters showed poor ability to discriminate joints with disorders from controls; the study concluded that thermography could be a potential tool in the diagnosis of female patients with temporomandibular disorders.

Finally the most recent controlled clinical study that making use of infrared thermography with the aim of diagnosing temporomandibular disorders was published in 2022, where de Lima E et. al. [10] with the aim of evaluating three machine learning (ML) attribute extraction methods: Semantic radiomic association and radiomic-semantic association in the detection of temporomandibular disorder (TMD) using infrared thermography (IT), to determine which ML classifier, KNN, SVM and MLP, is the most efficient for this purpose, where the control population was composed of 37 individuals, and the population with temporomandibular disorders was composed of 41 individuals, making use of the Fonseca index and RDC/TMD to categorize patients, where lateral projections were acquired with thermography of each patient, selecting the masseter and temporalis muscles for attribute extraction where three attribute extraction methods were evaluated radiomic, semantic and radiomic-semantic association, and subsequently KNN, SVM and MLP classification algorithms were evaluated and making use of Hopkins, Shapiro-Wilk, ANOVA and Tukey statistical tests to evaluate the data, the significance level was set at 5% ($p < 0.05$). In the study results the training and test accuracy values differed statistically for the radiomic-semantic association ($p = 0.003$). MLP differed from the other classifiers for the radiomic-semantic association ($p = 0.004$). The accuracy, precision and sensitivity values for semantic and radiomic-semantic association differed statistically from radiomic features ($p = 0.008$, $p = 0.016$and $p= 0.013$), concluding that the use of artificial intelligence combined with infrared thermography presents promising results for the detection of temporomandibular disorders.

**Table 3.** Summary of the general conclusions of each study regarding the use of infrared thermography and its diagnostic capacity in the diagnosis of temporomandibular disorders.

| STUDY | SENSIBILITY | SPECIFICITY |
|---|---|---|
| Barbosa y cols.<br>Dentomaxillofacial Radiology. 2019. | Does not report | Does not report |
| Canavan y cols.<br>Oral surgery, Oral medicine, Oral pathology, Oral Radiology, and Endodontology. 1995. | 92% | 85% |
| de Lima et al.<br>Dentomaxillofacial Radiology. 2022. | Does not report | Does not report |
| Filho et al.<br>Journal of Manipulative and Physiological Therapeutics. 2013 | Between 38,5% y el 76,9% | Between 22,8% y el 71,2%, |
| Gratt y cols.<br>Oral Surg Oral Med Oral Pathol. 1991. | 86% | 78%. |
| Gratt y cols.<br>Dentomaxillofacial. Radiol..1996 | Does not report | Does not report |
| Haddad et al.<br>Dentomaxillofacial Radiology. 2014. | Masseter region:70%<br>Anterior temporal region: 80% | Masseter region::<br>73%<br>Anterior temporal region: 62%,. |
| Krzysztof et al.<br>Medical Science Monitor. 2015. | 44.3%, before the chewing test, and 46.4%, after the chewing test | 95,5% |
| Mcbeth et al.<br>American Journal of Orthodontics and Dentofacial Orthopedics. 1996 | 87%. | 86%. |
| Rytivaara et al.<br>The Journal of Craniomandibular & Sleep Practice. 2021 | Does not report | Does not report |
| Rodriguez et al.<br>Journal of Bodywork Movement Therapies. 2014 | LM: left masseter: 33.5 %<br>RM: right masseter: 41.8 %<br>LT: left anterior temporal: 42.6 %<br>RT: anterior right temporal: 60.3 % | LM: left masseter:67.3 %<br>RM: right masseter: 55.8 %<br>LT: left anterior temporal: 48.4 %<br>RT: anterior right temporal: 41.8 % |

## DISCUSSION

Temperature changes have been considered signs of disease and have been quantified for centuries to evaluate them, a practice that was recorded in the year 400 BC where Hippocrates judged the temperature to assess patients affected by a disease.[18] where Hippocrates judged the temperature to assess patients affected by a disease,[18] which over the years has allowed some technological development of multiple tools whose objective is the quantification of body temperatures, in order to identify the different pathologies or states of health of individuals, such is the objective of the use of infrared thermography in medicine, which has been widely used in different pathologies since 1960 in pathologies such as arthritis,[19] multiple inflammatory and degenerative joint diseases,[20] proliferation and involution of infantile hemangiomas,[21] breast cancer,[22] hepatic fibrosis,[23] among many others, since it represents multiple advantages as it is a relatively inexpensive, non-ionizing and non-invasive technology, so that it has been evaluated in multiple studies whose objective is to measure its diagnostic capacity in temporomandibular joint disorders.

The first reported controlled clinical study was conducted by Gratt et al. [11] in 1991 where it was suggested that infrared thermography could be considered as a diagnostic aid in the evaluation of internal TMJ dysfunction, thus generating the first evidence of the use of this technology for the purpose of diagnosing temporomandibular disorders, This study evaluated the internal disorders of the TMJ and the study population was composed of 11 patients with internal disorder and 12 normal patients, which can be considered a low sample size of individuals

## CONCLUSIONS

Although most of the studies evaluated have concluded that thermography is a promising technology in the diagnosis of temporomandibular joint disorders, the literature is highly variable in terms of the reliability of the use of this instrument for the diagnosis of temporomandibular disorders, which is reflected in sensitivity and specificity values with widely marked differential ranges. This is due to the ability of thermography to capture temperatures on external surfaces while the disorders are generated under multiple surfaces and anatomical tissues, thus generating a possible limitation in their recording. Additionally, studies with larger sample sizes are required, with long-term evidence and measurements that obey standardized protocols avoiding factors that generate variability in the body temperature of individuals.

## DECLARATION OF CONFLICTS OF INTEREST

There is no conflict of interest in relation to this study.

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