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Case report

Odontogenic sinusitis and brain abscesses due to *Staphylococcus xylosus*: First case report

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Abstract. *Background and objective:* Odontogenic infections are potentially fatal infectious processes caused by caries, periodontal disease, or dental procedures. This study aims to identify CNS complications caused by periodontal disease or dental procedures. *Methods:* The present study presents the case of a 40-year-old diabetic patient on irregular oral hypoglycemic treatment who, 7 days after the extraction of the upper left first molar, began to present pain in the area of the dental procedure, erythema, edema of the hemiface, left proptosis and frontal headache, but remained afebrile at all times. He was admitted to the emergency department of the Almanzor Aguinaga Asenjo Hospital in Chiclayo, Peru, where different examinations and treatments were performed. *Results:* The patient presented tonic-clonic seizures; cranial tomography revealed sinus collections at maxillary, frontal, and left ethmoidal levels. In addition, there were brain abscesses in the frontal region of the same side. He received ceftriaxone associated with metronidazole, both intravenously in addition to surgical drainage of the abscesses. *Staphylococcus xylosus* was identified in samples obtained from the left maxillary sinusotomy; medical treatment was successful, but the patient was left with chronic osteomyelitis in the walls of the paranasal sinuses and orbit. *Conclusions:* This case highlights the importance of preventing or detecting suppurative complications in the central nervous system in diabetics or other immunosuppressed patients caused by periodontal disease or dental procedures. (www.actabiomedica.it)

Key words: odontogenic infections, sinusitis, brain abscess, *Staphylococcus xylosus*

Introduction

Odontogenic maxillary sinusitis occurs by the spread of infectious agents that, overcoming the natural barrier of the Schneiderian membrane, which lines the wall of the maxillary sinus, end up producing thickening and purulent deposits; it most frequently begins as periapical abscesses and periodontal disease (which includes gingivitis and periodontitis) and can advance to the rest of the structures of the face and skull generating potentially lethal suppurative infections (1). In general, odontogenic infections are the most frequent cause of infections at the level of deep myofascial planes of the head and neck, with infections or extractions of molar pieces causing 47.68% of all cases of odontogenic maxillary sinusitis. In comparison, the premolar causes 5.96% of cases, and the canines only 0.66% (2,3). These infections are generally benign and drain spontaneously. Anaerobic bacteria of the mouth and upper respiratory tract are the most frequent etiological agents of odontogenic sinusitis, highlighting methicillin-sensitive *Staphylococcus aureus, Streptococcus pneumoniae*, Peptostreptococcus, and Prevotella are responsible for 75% of odontogenic sinusitis, while only 10 to 15% are caused by methicillin-resistant *Staphylococcus aureus* (4,5). Brain abscesses are

extremely aggressive complications that usually begin with cerebritis and evolve to form collections, which if not treated adequately and promptly can cause high morbidity and mortality. Some cases are caused by odontogenic infections (6–8). These infections are generally localized and have relatively low mortality, but sometimes they become systemic infections causing sepsis, septic shock, and multiple organ failure requiring management in critical care units (9–17); therefore, continuous training of dental professionals in the recognition and timely treatment of sepsis of odontogenic origin is very important (12). The objective of this report is to present the first case of odontogenic sinusitis caused by *Staphylococcus xylosus* in a diabetic patient, considering that the prevalence of diabetes mellitus is increasing alarmingly in our population and it is very important that health personnel know the risk of performing procedures that could lead to serious complications, so adequate patient education and guidance are fundamental milestones in Public Health.

Case report

The case of a 40-year-old patient from Íllimo, Lambayeque in Peru, who worked as a laborer, is reported. He reported being diabetic for several years and taking oral hypoglycemic agents irregularly, he denied surgery and blood transfusions. He had been vaccinated against hepatitis B and was seronegative for HIV and syphilis; he denied allergies; he reported that he lived in an urban area and had drinking water and waste disposal services; he denied contact with people who suffer or have suffered from tuberculosis, or travel to areas of the mountains or jungle. His father suffers from insulin-dependent diabetes mellitus, and two maternal aunts receive treatment for high blood pressure. In his house, there is only one dog that is under permanent veterinary supervision. One week before admission, he underwent extraction of the upper left first molar. Three days after the dental procedure, he reported pain in the extraction area and in the left maxillary region, subsequently ipsilateral orbital pain, and intense left frontoparietal headache. Family members noted the appearance of erythema in the malar area, the patient denied having had a fever at any time since the reported process began. On the day of his admission to the Emergency Service, he arrived in a postictal state (confusion after seizures). An accompanying family member reported that the patient had had approximately 10 generalized seizures before arriving at the hospital. On physical examination, he was drowsy (diazepam had been administered to control the seizures), had eyelid edema and left proptosis, erythema, and left maxillary edema. Initially, he was hemodynamically stable, afebrile, hydrated, and slightly disoriented. There was no respiratory distress, jaundice, or lymphadenopathy. Anterior rhinoscopy of the left nasal cavity revealed purulent secretion and dry, hard, yellowish-green mucus at the level of the middle meatus. It was decided to send this secretion for culture, but it was negative for common germs. Regarding the clinical laboratory, the admission blood count showed 14,030 leukocytes per uL, hemoglobin 14 g/dl, 4,800,000 erythrocytes per uL, and 317,000 platelets per uL. The leukocyte count was 1% fused, 94% segmented, and 5% lymphocytes. Blood glucose (not fasting) 246 mg/dl. A cranial CT scan was performed and the following findings were defined: In the left frontal region, three hypodense images of 22 mm, 15 mm, and 10 mm with annular contrast enhancement, confluent, associated with vasogenic edema, midline deviation (10 mm) and compression of the ipsilateral frontal horn (see Figure 1). Collections were detected in the left maxillary sinus (see Figure 2). CT scans of the chest and abdomen were also performed and no masses or collections were found.

The patient was under the care of Neurosurgery, and through consultations was evaluated by Infectious Disease Medicine, Otorhinolaryngology, and Head and Neck Surgery, who agreed that the most important thing was the evacuation of the suppurative collections. Initially, he underwent left maxillary sinusotomy, which revealed loss of anatomy at the uncinate level of the ethmoid, inflammatory-looking nasosinusal mucosa, polypoid, drainage of pus from the maxillary, ethmoid and frontal sinuses, and the presence of organized purulent secretion in the anterior ethmoid. The culture of these secretions was positive for *Staphylococcus xylosus*, while the culture of the brain secretion was negative for bacterial pathogens; the microorganism was identified using the MicroScan WalkAway

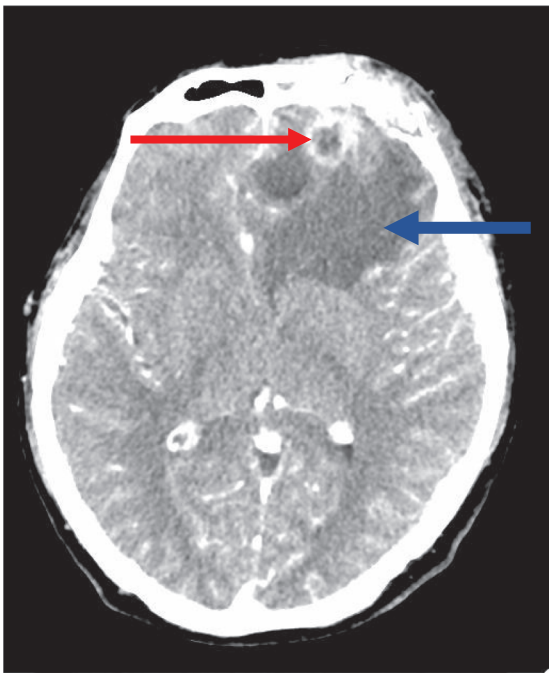

Figure 1. Contrast-enhanced CT scan, 13 days after the dental procedure. Collections in the left frontal lobe (The blue arrow indicates the abscesses, and the red arrow indicates the white ring enhancement, due to the contrast used).

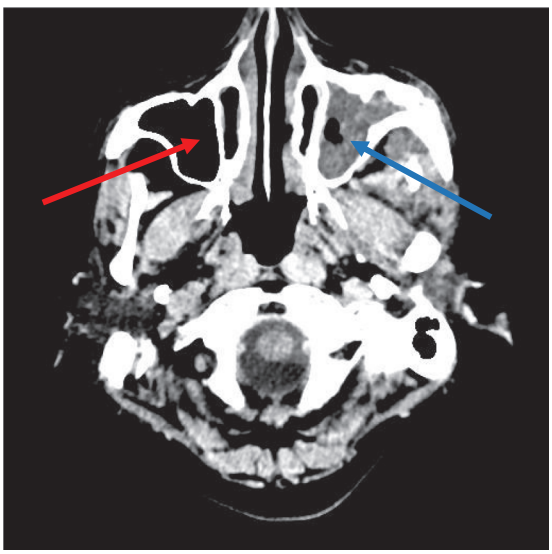

Figure 2. Contrast-enhanced CT scan. Collection in the left maxillary sinus (blue arrow). Note the normal right maxillary sinus (red arrow).

96 plus equipment. The strain was sensitive to oxacillin, cephalosporins of all generations, clindamycin, linezolid, tigecycline, and linezolid. Two weeks later, he was admitted to the Operating Room for craniectomy and evacuation of brain abscesses, and the culture of the brain secretion was negative for common bacterial pathogens. The patient received intravenous therapy: ceftriaxone 2 grams every 24 hours and metronidazole 500 mg every 8 hours, with excellent clinical response. The treatment lasted six weeks and the evolution was favorable. He has continued with follow-ups with Neurosurgery, Infectious Disease Medicine, Otorhinolaryngology and Head and Neck Surgery. He has currently developed chronic maxillary sinusitis in addition to permanent epiphora, as processes that require treatment.

Discussion

The evolution of a relatively young diabetic patient with poor metabolic control due to irregular treatment is highlighted. Seven days after undergoing tooth extraction, he developed maxillary, ethmoid and frontal sinusitis on the left side. In addition, brain abscesses in the ipsilateral frontal lobe were present, making the temporal relationship with the tooth extraction clear. Brain abscesses are usually the most serious and morbid, generating complications such as ventriculitis or cerebral empyema (18), with a mortality rate that varies between 3 and 30% (19,20). The influence of hyperglycemia on the genesis and prognosis of the reported infectious process must also be considered (21). On the other hand, being immunocompromised increased mortality risk as previously reported (22). The patient had a positive culture of the abscess and mucosa of the left maxillary sinus for *Staphylococcus xylosus*. According to the literature search, no publications of previous cases of odontogenic sinusitis caused by these bacteria have been found. Regarding the microbiology of *Staphylococcus xylosus*, it is a gram-positive coccus that is part of the group of coagulase-negative staphylococci (CNS) to differentiate them from *Staphylococcus aureus*, which is coagulase-positive. *Staphylococcus xylosus* is found on the skin and mucous membranes of humans and animals has been associated with skin

wound infections in mice (23) and has been detected in foods of animal origin (24). It is important to highlight that *Staphylococcus xylosus* has been reported very rarely causing opportunistic infections (25) and is currently considered an emerging pathogen able to create biofilms (26–29). It is important to note that there is cause-effect coherence between tooth extraction and the appearance of purulent collections in the paranasal sinuses and the brain, since, like S. epidermidis, *Staphylococcus xylosus* has been detected in the flora near the teeth (30).

Making clinical unity, it was assumed that brain abscesses were also caused by the same bacteria that caused multiple sinusitis, as there was no other probable cause, that is, another infectious focus to attribute hematogenous or contiguity dissemination. This proposal is based on the findings of numerous articles that show that the same germs that are part of the normal microbiota of the mouth have been found in brain abscesses (3). This case shows the importance of carrying out an adequate assessment of high-risk patients such as those with diabetes mellitus or other conditions that generate immunosuppression, before being subjected to invasive processes that could lead to systemic infections, increasing morbidity and mortality. It shows us the need to act promptly, prioritizing the solution of the most serious damages according to the patient's condition, especially regarding complying with the basic principle of "ipso pus, ipso evacua". Once the pus is found, it must be removed, this maneuver is much more important than the best antibiotic coverage to achieve the patient's improvement. It is necessary to consider *Staphylococcus xylosus* in the etiology of infectious processes of the head and neck and to take into account its destructive power. Therefore, the antibacterial coverage must contemplate this microorganism either escalating or de-escalating in the antibacterial scheme, according to clinical evolution. It is concluded that the reported case of a diabetic patient with poor glycemic control, presented brain abscesses with the same probable etiology as that of the parasinusal involvement, which led to complications that were resolved; however, chronic maxillary sinusitis and permanent epiphora persisted.

Ethical Approval: This case was reviewed and approved by the institutional research ethics committee of the Lambayeque-ESSALUD-Peru service network, with resolution number 897-GRPL-ESSALUD-2023, dated October 10, 2023.

Conflict of Interest: Each author declares that he or she has no commercial associations (e.g. consultancies, stock ownership, equity interest, patent/licensing arrangement etc.) that might pose a conflict of interest in connection with the submitted article.

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Declaration on the Use of AI: None.

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