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CASE REPORT

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Streptococcus constellatus causing concomitant extra and intracranial abscesses complicated with sagittal sinus thrombosis

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ABSTRACT

Streptococcus constellatus is a gram-positive coccus member of the *Streptococcus anginosus* group (SAG). It can be found in the oral flora, and may cause abscess more commonly in the gastrointestinal tract, lungs, and heart. Brain abscesses are severe neurological infections with high mortality rates. *Streptococcus* species other than *S. pneumoniae* are rare causes of brain abscesses. This case report highlights a severe case of extra and intracranial abscesses due to *S. constellatus* in an immunocompetent host

KEYWORDS: *Streptococcus constellatus.* Abscess. Brain. Oral flora.

INTRODUCTION

Streptococcus constellatus is a gram-positive cocci of the *Streptococcus anginosus* group (SAG), formerly known as the *Streptococcus milleri* group[1]. Although controversial and subject to debate, the anginosus group is among the five subgroups within the viridans group and includes other species such as *S. intermedius* and *S. anginosus*. SAG are commensals of mucosal membranes, like the oral cavity, pharynx, gastrointestinal tract, and genitourinary tract, which are known for their ability to form abscesses; however, the reason is not well established. Although it is not a common cause in adults, SAG is among the most prominent causes of brain abscess in the pediatric population[2,3].

Herein, we report a case of extra and intracranial abscesses due to *S. constellatus* in an immunocompetent host. Cases with extensive involvement are rarely reported. Most reported brain abscess cases are related to *S. intermedius*, and only a few due to *S. constellatus* have been documented.

Ethical aspects

Medical records were reviewed during the patient's hospitalization at the Hospital Sao Jose de Doencas Infecciosas (HSJ), an infectious disease center in Fortaleza City, Ceara State, Brazil. We reviewed the literature for similar cases. This study was approved by the Research Ethics Committee of the HSJ (protocol Nº 5.421.988).

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CASE REPORT

A 19-year-old man, without any previous medical history, was admitted to the emergency department with a 6-day fever (37.9°C), headache, nausea, and vomiting. Upon physical examination, the vital signs were: heart rate, 134 bpm; respiratory rate, 26 rpm; and blood oxygen saturation, 89%. Laboratory examination revealed 20,300/mm^3 leukocytosis (reference values are 4,000 to 10,000/mm^3), with a predominance of 16,321/mm^3 neutrophils, and 58,000/mm^3 thrombocytopenia (reference values are 150,000 to 450,000/mm^3). 431 U/L aspartate transaminase (reference values are 5 to 45 U/L), 145 U/L alanine transaminase (reference values are 7 to 56 U/L), and 213.8 mg/L C-reactive protein (reference values are < 3 mg/L) levels were above the reference limits. The anti-HIV test was negative. Renal function and electrolyte levels were unremarkable. Brain CT revealed soft tissue enlargement along the high convexity, with gaseous foci between (Figures 1A, 1C, and 1F), and an extradural collection with intermingled gaseous foci and a thickness of 1.1 cm next to the upper aspect of the sickle without determining the expansive effect (Figures 1B and 1C). A thick content inside the frontal and maxillary sinuses on the right side was also noted (Figures 1D and 1E).

Due to sepsis, the patient was admitted to the intensive care unit where the sepsis protocol was performed. A blood sample was collected, and broad-spectrum antibiotic therapy comprising ceftriaxone 2 g every 12 h, metronidazole 500 mg every 8 h, and oxacillin 2 g every 4 h was administered. The patient needed mechanical ventilation as his clinical condition had deteriorated.

Another brain CT scan was performed and revealed the same heterogeneous collection with air foci, with a difference in the presence of partial sagittal sinus thrombosis. Paranasal sinus CT scan showed right frontal, maxillary and ethmoidal sinus disease obliterating the respective drainage recesses, sinuous nasal septum and bullous left middle nasal concha. Other sites were also screened for abscesses. Both CT scans did not reveal any signs of osteomyelitis and no signs of subperiosteal abscess were found. The abdominal CT scan was normal. Transthoracic echocardiography performed ruled out endocarditis. To control the focus, soft tissue drainage was readily performed by general surgery (within 24 h of admission) as well as neurosurgical drainage (within 7 days of admission). The samples were sent for culture. Gram stain revealed gram-positive cocci. Anticoagulation was initiated with subcutaneous enoxaparin (40 mg every 12 h).

The *S. constellatus* identified in the blood and culture

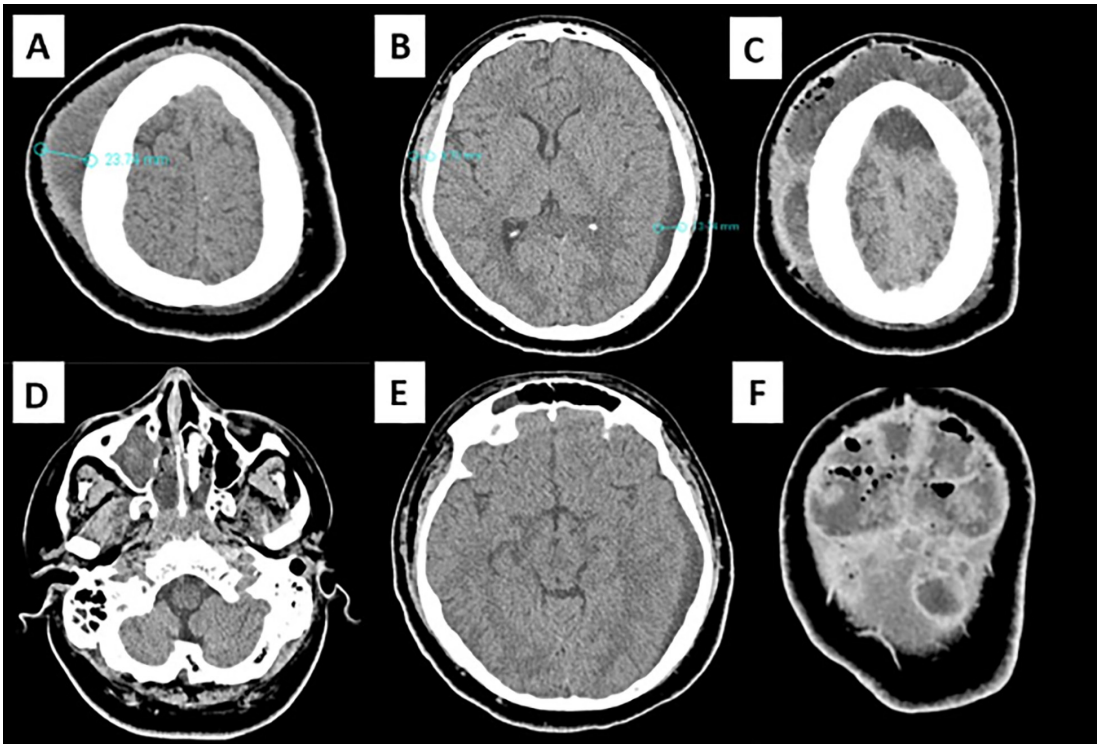

Figure 1 - Brain CT: A) Soft tissue enlargement (23.74 mm) along the high convexity, with gaseous foci; B) Another extradural collection with intermingled gaseous foci and a thickness of 1.1 cm next to the upper aspect of the sickle; C) Simultaneously extra and intracranial abscess without bone involvement; D and E) Thick content inside the frontal and maxillary sinuses on the right side; F) Soft tissue enlargement with multiple purulent abscesses and gaseous foci.

of the abscess pyogenic material using VITEK® 2 (bioMérieux, Marcy-l'Etoile, France) was resistant to β-lactams (MIC ≥ 8 mcg/mL to cefotaxime, and MIC ≥ 8 mcg/mL to penicillin) and susceptible to teicoplanin (MIC ≤ 0.12 mcg/mL) and vancomycin (MIC = 0.5 mcg/mL). Anaerobic cultures were negative and no other pathogen was identified. Accordingly, the antimicrobial therapy was changed to vancomycin 1.5 g every 12 h (20 mg/kg per dose) plus metronidazole 500 mg every 8 h. After 28 days of prolonged antibiotics and surgical drainage, the patient showed sensory improvement. No complications or adverse reactions to drugs were observed during the hospitalization. The patient was discharged approximately a month after admission. At the 6-month follow-up, the patient did not present any sequelae.

DISCUSSION

Here, we report a case of an extensive brain abscess with extracranial subcutaneous abscess due to *S. constellatus* complicated with sagittal sinus thrombosis. Brain abscesses are severe CNS infections with high morbidity and mortality rates. A cerebral abscess is commonly polymicrobial, and etiological identification is difficult. Brain parenchymal infection usually occurs through hematogenic or contiguous spread[1-9]. Herein, we hypothesized that the infection route was pansinusitis, which presented weeks before the CNS involvement. In most cases, brain abscesses are caused by a contiguous spread of infections, such as sinusitis or otitis. Other infections that may evolve into brain abscesses are orbital and dental[7-9].

Recently, a CDC national call for cases found 81 cases of pediatric abscesses, epidural empyemas, and subdural empyemas, in which 61% had at least one respiratory infection such as sinusitis (26%) and COVID-19 (18.2%)[10]; *S. intermedius* group isolates were the most frequent agents[10]. Pediatric and adult cases have shown the importance of *S. anginosus* as brain abscesses causing agents[11,12].

The most frequent symptoms of intracranial abscesses are fever and headache. Sensory loss and disorientation may also occur. The neurological symptoms and signs depend on the abscess location and can range from an asymptomatic disease to coma, and at times, may even lead to death. Frontal and temporal lobe abscesses may manifest as behavioral changes that can be misdiagnosed as psychiatric disorders. Clinical manifestations become more evident as the abscess grows and the surrounding swelling increases. Focal signs may be absent upon admission. Imaging studies using CT or MRI aid diagnosis[3,5,7].

S. constellatus is a member of the SAG with *S. intermedius* and *S. anginosus*. Antibiotics and surgical drainage are the treatments of choice. Of the cases in which *S. constellatus* was identified, three required surgical aspiration associated with large-spectrum antibiotics; the remaining five were solely treated with empirical antibiotic therapy[2-9]. *S. intermedius* is generally susceptible to beta-lactams, including penicillin, cephalosporins, and carbapenems[13]. The antibiotic choice and dosage depend on the clinical analysis, site, and infection severity. In dental-oral infections, penicillin VK can be used orally. In severe cases with CNS involvement, crystalline penicillin G 18–24 MU, 4–6/6 h or ceftriaxone 4 g/day divided into two daily administrations may be used[13]. Vancomycin also works well and is a reasonable alternative. A previous study showed that due to resistance to quinolones, these are not currently being used as empirical therapy[14,15]. Resistance to macrolides has also been documented[13]. Table 1 describes the cases of brain abscess in which *S. constellatus* was identified in medical literature.

Herein, the susceptibility profile of *S. constellatus* was different from earlier reports, warranting a change in the antibiotic regimen during hospitalization. Early identification through culture and antimicrobial susceptibility tests must be performed for antibiotic choice and prompt clinical response.

To our knowledge, this is not the first case of brain abscess caused by this microorganism, but the severe commitment inside and outside the skull cap in an individual with no known immunosuppression is noteworthy. We hypothesize that the concurrent spread in maxillary, ethmoidal, and frontal sinusitis infects the brain and outside the skull cap. This was reinforced by the absence of bone destruction. Another valid hypothesis is hematogenous spread, wherein severe sinusitis causes bacteremia with abscess formation. No abscesses were found in the abdominal region and infective endocarditis was ruled out. This study has some limitations; unfortunately, MALDI-TOF MS and molecular methods were not available at our center, and additional tests could not be performed because the strain was no longer viable. The *S. constellatus* species may be identified with low discrimination, as well as misidentified, by VITEK® 2, although the authors did not believe this occurred due to the high discrimination found (99%).

CONCLUSION

The main message of the current manuscript is that cultures and antibiograms offer important clues for diagnosis and therapeutic approaches. Another important finding is the ability of *S. constellatus* to form an abscess. This information is clinically relevant and must be considered during the cerebral abscess approach. Physicians

Table 1 - Description of reported cases of brain abscess due *S. constellatus* in the medical literature.

Article	Month/Year	Country	Age	Sex	Site of infection	Coinfection	Treatment	Outcome
Nakao *et al.*[2]	July/2001	Japan	10	Female	Parietal subdural abscess	*Eikenella corrodens*	Surgical drainage + Antibiotics	Cure
Göbels *et al.*[3]	February/2002	Germany	42	Male	Multiple abscesses (brain, cerebellum, basal ganglia and the pons)	None	Antibiotics	Cure
Chheda *et al.*[4]	April/2011	USA	54	Male	Multiple abscesses (frontal lobe / periventricular white matter)	None	Antibiotics	Cure
Şenol *et al.*[5]	July/2016	Turkey	25	Male	Thalamic abscess	None	Stereotactic drainage + Antibiotics	Cure
Yılmaz *et al.*[6]	May/2017	Turkey	59	Male	Brain abscess	None	Antibiotics	Death
Carretero[7]	August/2017	Spain	69	Female	Cerebellar abscesses / infective endocarditis	None	Antibiotics	Death
Mo *et al.*[7]	November/2017	China	48	Male	Meningitis	*Prevotella intermedia*	Antibiotics	Death
Shakoor *et al.*[9]	April/2020	USA	42	Male	Frontal lobe abscess	*Actinomyces sp.*	Surgical drainage + Antibiotics	Cure

must be aware of the importance of collecting culture samples from the blood and abscesses.

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CONFLICT OF INTERESTS

The authors declare no conflict of interests.

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