Suppurative infection of the central nervous system secondary to Streptococcus constellatus: about three cases

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Abstract

A brain abscess or empyema is a severe neurological infection with a high mortality rate. Rarely, Streptococcus species other than S. pneumoniae were responsible for brain abscesses or empyema. A few case series were reported in the literature.

We present three cases of severe empyema and abscess induced by S. constellatus in three immunocompetent individuals. A 12-year-old girl presented with febrile meningeal syndrome. The CT scan showed a brain abscess and empyema associated with hemispheric edema. She underwent surgery for empyema evacuation and frontal lobectomy with a decompressive flap bone. A 52-year-old man presented with right-hemisphere heaviness, headache, and fever. Cerebral MRI showed an abscess of the left semi-oval center with signs of ventriculitis. He underwent neurosurgical drainage. A 14-year-old child admitted with right frontal swelling and osteitis in the context of fever. Cerebral MRI showed a right hemispherical subdural collection and thrombophlebitis of the superior sagittal sinus.

The outcome was good only for the two children. Although S constellatus can cause serious infections in patients with underlying diseases and immunosuppression, physicians need to consider S constellatus infection in immunocompetent patients in the context of empyema and abscess.

Early neurologic drainage and antibiotics must be installed on time to have a good outcome.

Keywords: Streptococcus constellatus; Abscess; Brain; Empyema, Outcomes

INTRODUCTION

Brain abscesses and empyema are life-threatening infections(1). Intracranial infections may result from contiguous infections, such as mastoiditis or acute otitis media, or from hematogenous dissemination from an infectious source (2,3). S. pneumoniae is the most common etiologic agent of central nervous system infection (4,5). *Streptococcus constellatus (S. constellatus)* is an uncommon type of viridans streptococci(4). It is a gram-positive cocci of the *Streptococcus anginosus* group (SAG), formerly the *Streptococcus milleri* group (4,6,7). SAGs are commensals of mucosal membranes (the oral cavity, pharynx, gastrointestinal tract, and genitourinary tract) (8), known for their ability to form abscesses, namely in immunocompromised patients (4-6). Few case series are reported in the literature (6). We report three cases of severe empyema and abscess caused by *S. constellatus* in three immunocompetent hosts.

CASE REPORT 1

A 12-year-old girl presented to the emergency department with febrile meningeal syndrome, with a fever of 40°C, headache, nausea, and vomiting. She has no previous medical history. On physical examination, she was conscious (Glasgow Coma Scale =15/15), with a heart rate of 119 beats per minute (bpm), a blood pressure of 91/40 mmHg, a respiratory rate of 26 cpm, and a pulse oximetry of 96%. Laboratory examination revealed 39,000/mm^3 leukocytosis (reference values are 4,000 to 10,000/mm3), with a predominance of neutrophils (20,000/mm^3), and 424,000/mm^3 platelets count (reference values are 150,000 to 450,000/mm^3), 80 U/L aspartate transaminase (reference values are 5 to 45 U/L), 101 U/L alanine transaminase (reference values are 7 to 56 U/L), and 170 mg/L C-reactive protein (reference values are < 3 mg/L) levels were above the reference limits. Renal function and electrolyte levels were in normal ranges. A cerebral computed tomography scan, urgently performed, objectified a right parietal brain abscess and empyema associated with a significant right hemispheric edema responsible for subfalcal involvement, and a right frontal sinusitis with lysis of its posterior wall (Figure 1A). 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 intravenous antibiotics (cefotaxime, vancomycin, and metronidazole) were administered. Despite this early management, her respiratory and neurological condition had deteriorated, and the mechanical ventilation was indicated. She underwent a surgical evacuation of empyema and abscess with a decompressive bone flap. Her samples were sent to culture. Gram stain revealed gram-positive cocci, *Streptococcus constellatus*, sensitive to Cefotaxime. Within one day after surgery, the first control CT scan revealed a decrease in edema (Figure 1 B). On day 2, the evolution was unfavorable with neurological deterioration with the onset of right anisocoria due to an increase in cerebral edema and in midline deviation (0 mm *vs* 5 mm), and the presence of temporal involvement (Figure 1C). She underwent

a second surgery with flap bone enlargement and frontal lobectomy (Figure 1D). Cerebral MRI showed signs of meningoencephalitis without cerebral thrombophlebitis (Figure 1E). She was extubated on day 7, but hemiparesis persisted.

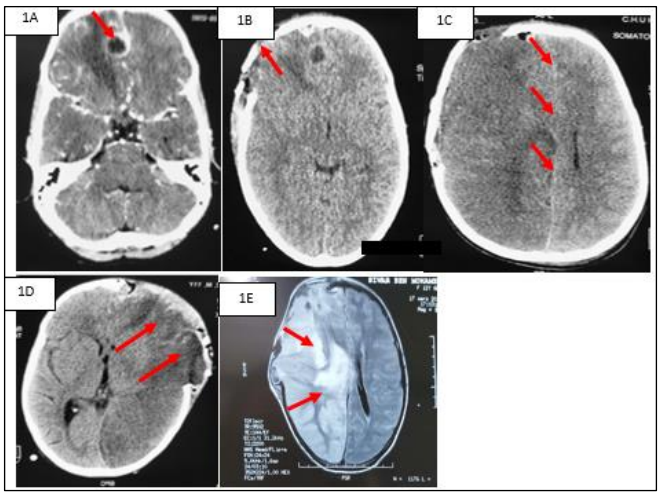

Figure 1: 1A: Injected CT scan: parietal brain abscess. 1B: control brain CT scan after surgery. 1C: Control brain CT scan after neurological worsening: increase in cerebral edema, increased midline deviation by 10 mm. 1D: Control brain CT scan after the second surgery: flap enlargement and frontal lobectomy 1E: MRI T2FLAIR: signal anomaly in the cortical zone and in the right frontoparietal white matter not systematized in FLAIR hyper signal with a restriction of the Apparent Diffusion Coefficient.

Figure 1: Injected brain CT-scan (1A): parietal brain abscess, Control brain -CT-scan after surgery (AB), Control brain CT-scan after neurological worsening, increase in cerebral edema, increased midline deviation by 10mm) (1C); control brain CT-scan after the second surgery: flap enlargement and frontal lobectomy (1D); MRI T2FLAIR: signal abnormality in te cortical zone and in the right frontoparietal white matter

CASE REPORT 2

A 52-year-old man with no previous history was admitted to the neurosurgery department with right-hemisphere heaviness, headache, and a fever (38.5°C). On admission, the patient was unconscious (Glasgow Coma Scale = 9/15) with aphasia, right facial paralysis, and right hemiplegia. The brain CT-scan (Figure 2A) showed a left frontal intracranial expansive process exerting a mass effect on the medial structures. Laboratory examination revealed 13,400/mm^3, leukocytosis, 199,000/mm^3 platelet count, and 298 mg/L C-reactive protein. Renal function and electrolyte levels were in normal ranges. Because of impairment of his consciousness and respiratory condition, related to aspiration pneumonia, the patient was admitted to intensive care. He underwent mechanical ventilation. With the onset of septic shock, noradrenaline infusion and antibiotics (cefotaxime and metronidazole*)* were administered. Cerebral MRI showed a pyogenic abscess (26x22 mm) of the left semi-oval center fissured in the lateral ventricle with signs of ventriculitis, and sub-factorial and temporal involvement (Figure 2B). Neurosurgical drainage of the empyema revealed a purulent liquid where *Streptococcus constellatus*, sensitive to cefotaxime, was identified.

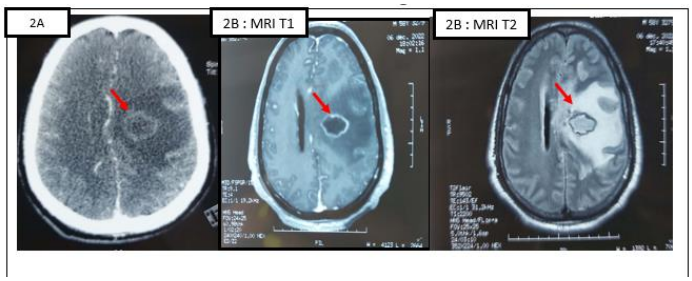

Figure 2: Injected brain CT-scan showing brain abscess 2B: MRI: intracranial expansive process of the left oval center in hypo signal T1 and hypersignal T2 with a restriction of the diffusion delimited by an irregular wall in hyper signal T1 and hypo signal T2 being enhanced after gadolinium injection, and measuring 27x18x27 mm. There is an important edema in glove-finger shape with a mass effect on the left ventricle and a contralateral hydrocephalus (MRI Aspect of pyogenic abscess with signs of ventriculitis and subfalcial and temporal involvement.

The chest radiograph, the transthoracic echocardiogram, and the ultrasonography of the abdomen were normal. The outcome was unfavorable, with alteration of his hemodynamic state leading to death.

CASE REPORT 3

A 14-year-old child, with no prior medical history, was admitted to the neurosurgery department with right frontal swelling with osteitis, as shown in the first CT scan (figure 3A) in the context of fever. Laboratory examination revealed 19,500/mm^3 leukocytosis, 264,000/mm^3 platelet count, and 298 mg/L C-reactive protein. He underwent surgery for the evacuation of the right frontal collection with osteitis. Figure 3B shows the post-surgery result of the CT scan. On day 2 post-surgery, the onset of a deterioration in his state of consciousness, right anisocoria, left hemiplegia, and aphasia led to mechanical ventilation. Cerebral MRI showed a right hemispherical subdural collection of 5 mm FLAIR hypersignal and diffusion with a low Apparent Diffusion Coefficient with right temporal involvement, superior sagittal sinus thrombophlebitis, and pansinusitis (Figure 3C). He underwent emergency surgery to evacuate the subdural collection. A broad-spectrum antibiotic therapy including *cefotaxime*, *vancomycin*, and metronidazole was administered. The bacteriological sample identified a *Streptococcus constellatus* sensitive to *cefotaxime*. On the sixth day, he developed a convulsive status epilepticus when the sedation was stopped. The control computed tomography scan (Figure 3D) showed the onset of ischemic lesions in the right hemispheric brain with an increase in cerebral edema and midline deviation (9 mm vs 7mm), and central involvement, requiring a second neurosurgical drainage (Figure 3E). The outcome was favorable, but he remained with left hemiplegia.

DISCUSSION

Here, we report three cases of extensive brain abscess and empyema due to S. constellatus in immunocompetent patients. In all cases of S. constellatus abscess reported in the literature, there was either underlying pathology or a history of immunosuppression (6). S constellatus is an

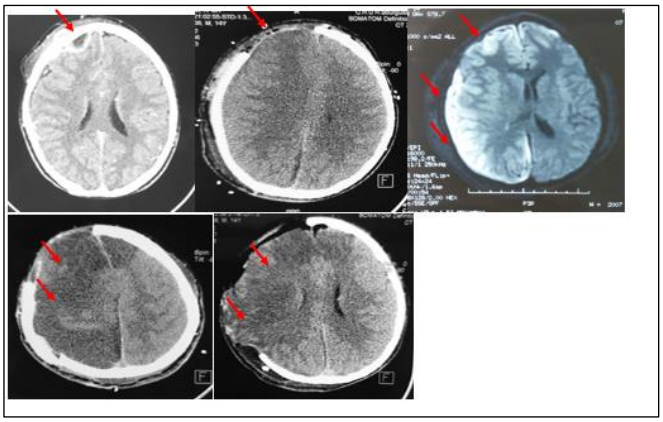

Figure 3: 31: right frontal swelling with osteitis; 3B: post-surgery brain CT-scan; 3C: Cerebral MRI: right hemispherical subdural collection of 5mm FLAIR hypersignal and Diffusion low apparent Diffusion Coefficient with right internal temporal engagement; 3D: development of ischemia in the right hemisphere with an increase in cerebral edema and in the midline deviation (9 vs 7 mm); 3E: post-surgery brain CT-scan. .

oropharyngeal commensal that colonizes the mouth and the upper airways. It can be pathogenic in patients with certain predisposing factors and

therefore responsible for a broader range of purulent infections, including odontogenic, pleura-pulmonary (9), intra-abdominal, genitourinary, soft tissue, and central nervous infections(8,10). S. constellatus is an extremely rare causative agent of brain abscesses in immunocompetent patients (2,11). Brain parenchymal infection usually occurs through hematogenic path (2,11) or contiguous spread (12). In our cases (13), we hypothesized that the infection route was pansinusitis, not well-treated. In most cases, brain abscesses were caused by a contiguous spread of infections, such as sinusitis or otitis. Orbital and dental infections are potential other causes of brain abscesses (13). One further complication was also noticed in our cases, thrombophlebitis, as seen in our third case. This complication was reported in a few cases (13,14).

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. Imaging studies using CT or MRI aid diagnosis(2,6), as done in our patients, and may show signs of sinusitis or complications such as thrombophlebitis, present in the third patient. For these infections, the treatment protocol consists of ceftriaxone or cefotaxime for at least two weeks. This is the best antibiotic choice, thanks to its distribution in the neural tissue. Intravenous metronidazole and clindamycin can be concurrently prescribed for up to six weeks when anaerobic bacteria are found, especially in polymicrobial abscesses. Vancomycin is the option when resistance or allergies are evidenced or to treat Staphylococcus (7). In our patients, we used cefotaxime as the first-line treatment of community meningitis, associated with metronidazole to treat anaerobic bacteria, possibly due to concurrent infection by S. constellatus (7). In two of our cases, Vancomycin was empirically administered and then stopped adapting to the antibiogram.

CONCLUSION

The foremost lesson to be learned from the current cases is that cultures and antibiograms are the best cues for making diagnoses and selecting accurate therapies. The ability of S. constellatus to form an abscess is another important finding, not only in patients with underlying diseases and immunosuppression. Physicians must consider S constellatus infection in immunocompetent patients in the context of empyema and abscess. Early neurologic drainage and antibiotics must be promptly done to ensure good outcomes.

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