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CASE REPORT

Fatal subdural empyema caused by *Streptococcus constellatus* and *Actinomyces viscosus* in a child—Case report

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Group milleri streptococci that colonize the mouth and the upper airways are generally considered to be commensal. In combination with anaerobics, they are rarely responsible for brain abscesses in patients with certain predisposing factors. Mortality in such cases is high and complications are frequent. We present a case of fatal subdural empyema caused by *Streptococcus constellatus* and *Actinomyces viscosus* in a previously healthy 7-year-old girl.

Introduction

Group milleri streptococci (GMS) comprise a heterogeneous group of streptococci, including the species intermedius, constellatus, and anginosus together with rare beta-hemolytic streptococci of Lancefield groups G and F. They are often considered to be commensals of the respiratory, intestinal, and urogenital tract.[1] After translocation into otherwise sterile sites, they may cause purulent infections and abscess formation mostly among seriously compromised patients. Actinomyces species are gram-positive, filamentous, anaerobic bacteria that exist as normal flora within the mouth, bronchi, gastrointestinal, and female genital tracts and constitute an uncommon cause of infection in humans characterized by abscesses and sinus tract formation, which involve the cervicofacial, thoracic, or abdominal regions.[2] We present a rare case of fatal subdural empyema caused by *Streptococcus constellatus* and *Actinomyces viscosus* in an immunocompetent 7-year-old girl.

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Case report

A previously healthy 7-year-old girl was admitted to our hospital with a 1-day history of 39°C fever and vomiting. On admission, she was lethargic with cool and cyanotic extremities but her vital signs were normal. Neck stiffness and Kernig's sign were positive. The remainder of the physical examination was normal. Cerebrospinal fluid contained 1,500 leukocytes (95% granulocytes), with a protein level of 0.7 g/L and a glucose level of 0.4 g/L. The diagnosis of bacterial meningitis was established and the patient was initially treated with intravenous ceftriaxone (150 mg/kg/d). Two days after her admission, she developed a convulsive status epilepticus with impairment of her consciousness (Glasgow coma scale = 6/15) necessitating her transfer to the pediatric intensive care unit. She was intubated and mechanically ventilated. The convulsive status epilepticus was refractory to intravenous bolus of phenobarbital (20 mg/kg) and high-dose midazolam infusion (600 μg/kg/hr) and necessitated the induction of a barbiturate anesthesia with thiopental. A cerebral computed tomography scan done on the day of admission revealed a left hemispheric subdural empyema (Fig. 1). Vancomycin and metronidazole were then associated to the initial antibiotherapy. Neurosurgical drainage of the empyema revealed a purulent liquid in which *S constellatus* was identified using the API 20 Strep test. Antimicrobial susceptibility testing was done using the minimum inhibitory concentration test. *S constellatus* was susceptible to penicillin G, ampicillin, cefotaxime, ofloxacin, erythromycin, clindamycin, rifampicin, and vancomycin. Anaerobic bacteria culture of the same sample of purulent liquid isolated *A viscosus*, a gram-positive anaerobic bacteria. According to the microtube broth dilution method, *A viscosus* was susceptible to penicillin G, ampicillin, cefotaxime, erythromycin, ofloxacin, vancomycin but resistant to metronidazole. The initial antibiotherapy was then discontinued and high doses of ampicillin (300 mg/kg/d) were administered. The otorhinolaryngeal examination was normal. The stomatological examination did not identify any dental infection but the patient had a poor oral hygiene with multiple dental caries. The chest radiograph, the

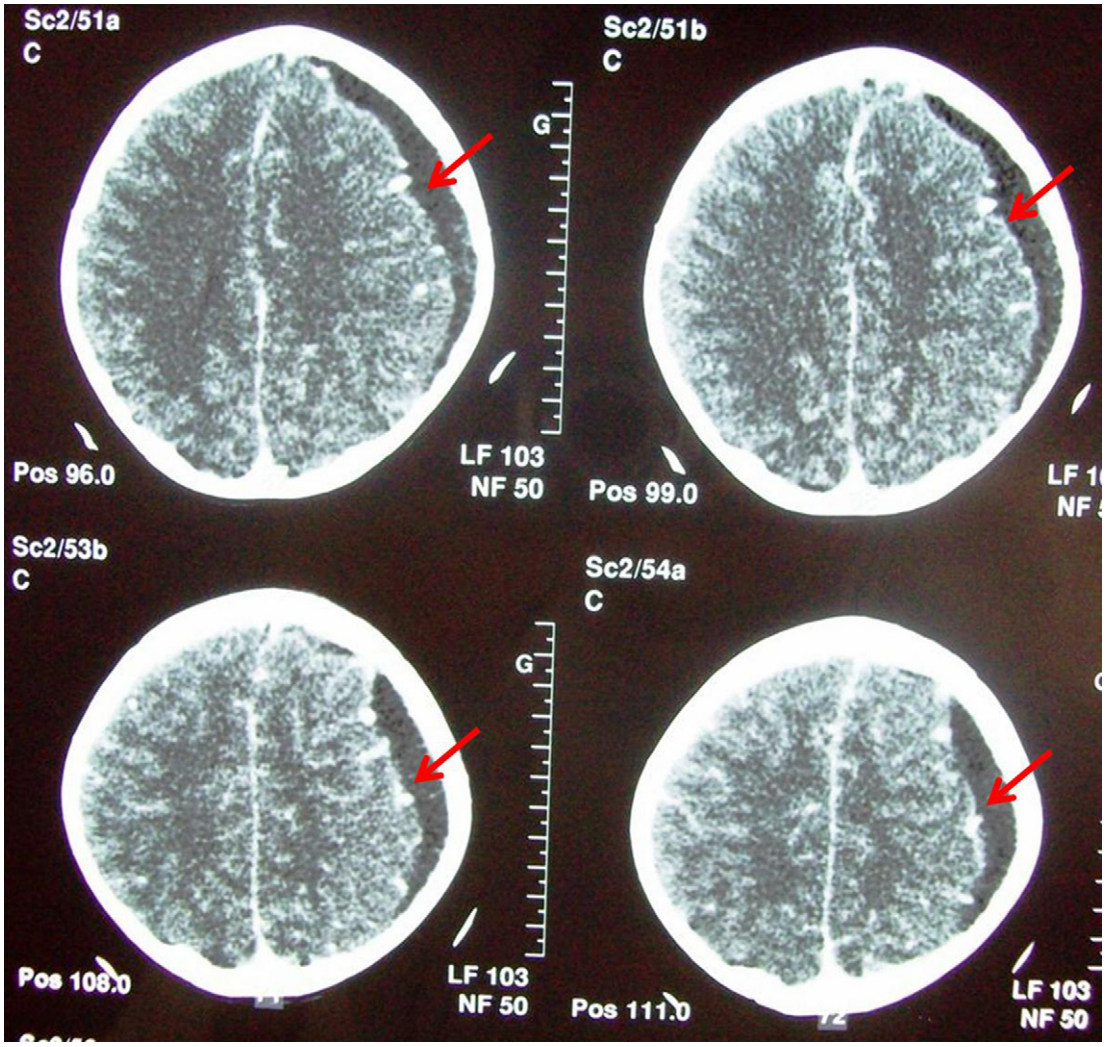

Figure 1. CT scan performed on the day of admission showing a left hemispheric subdural empyema. CT = computed tomography.

transthoracic echocardiogram, and the ultrasonography of abdomen were normal. Blood and cerebrospinal fluid cultures, done before antibiotherapy, remained negative. Human immunodeficiency virus serology was negative. Humoral and cellular immunity exploration, including lymphocyte subclasses count, study of neutrophil and lymphocyte functions, and serum immunoglobulin levels was normal. The ulterior clinical course was unfavorable with persistence of a deep coma after stopping thiopental. Control computed tomography scans showed the development of ischemic lesions of the left hemispheric brain with multiple frontal brain abscesses, residual subdural empyema, and bifrontal pneumocephaly requiring second neurosurgical drainage. The patient died on Day 17 of her admission to the pediatric intensive care unit.

Discussion

S constellatus is an oropharyngeal commensal, which colonizes the mouth and the upper airways.[3,4] *S constellatus* can be pathogenic in patients with certain predisposing factors and therefore responsible for a broader range of purulent infections, including odontogenic, pleura-pulmonary, intraabdominal, genitourinary, soft tissue, and central nervous infections.[4] Predisposing factors to brain infections caused by this bacterium include immunosuppression, neurosurgery, oral and neck infections, and dental procedures.[1,5–7] Cerebral abscesses caused by GMS without any predisposing condition as in our observation are rare.[7] *S constellatus* is more often isolated as part of mixed flora. Its isolation in combination with oral anaerobic bacteria is frequent and indicates a synergy between these two groups of bacteria.[4] *A viscosus*, anaerobic bacteria isolated in combination with *S constellatus* in our patient, is a part of the normal human flora of the mouth, bronchi, gastrointestinal, and female genital tracts. Symptomatic infections caused by Actinomyces species are rare and involved frequently in the head and neck, the thorax, the abdomen, or the pelvis.[8] The most common specie responsible for human actinomycosis is *israelii*. *A viscosus* is a seldom-encountered etiologic agent of human actinomycosis.[2] Risk factors for central nervous infections because of Actinomyces species included dental caries; dental infection; recent tooth extraction; head trauma; gastrointestinal tract surgery; chronic otitis, mastoiditis, or sinusitis; and chronic osteomyelitis.[9] In our patient, a poor oral hygiene with dental caries was noted suggesting an odontogenic etiology of this mixed infection. The review of the Entrez pubmed English literature found only two previous reports of brain abscesses because of both GMS and Actinomyces species.[10,11] *S constellatus* and *A viscosus* may rarely spread by the bloodstream and blood cultures are frequently negative as in our observation.[4,8] In addition, Actinomyces is a fastidious organism, requiring prolonged culturing for growth and identification.[10] It was fortunately isolated in anaerobic bacteria culture in our observation. The mortality rate because of GMS infections is high,[1] with severe complications, such as abscesses and empyema.[4–7] Central nervous infections caused by Actinomyces species had also a poor prognosis with high rates of mortality and of neurologic sequelae in survivors.[9] Either for *S constellatus* or *A viscosus*, penicillin is the mainstay of antibiotherapy. If the patient is allergic to penicillin, erythromycin or clindamycin can be used.[1,9] GMS infections mandate high-dose antibiotic treatment as penetration of antibiotics into abscesses may be poor.[1] For the two bacteria, *S constellatus* and *A viscosus*, duration of antibiotherapy must be prolonged from weeks to months. Antibiotherapy must be associated to surgical drainage.[3,9] The drainage of abscesses also allows identifying these bacteria.

Although rare, *S constellatus* and *A viscosus* had the potential to cause brain abscesses and empyema even in immunocompetent patients. An odontogenic etiology seems probable in our patient. Immediate initiation of antibiotherapy is the invariable mainstay of treatment and must be associated to a rapid surgical drainage to improve the outcome of these patients.

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