Dysphagia and Tongue Deviation

An Unexpected Cause

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CASE

A previously healthy, fully immunized 12-year-old boy was transferred to our hospital with a 2-week history of a progressive left temporal headache radiating to the left cervical area, intensified by movement. Additionally, he had fever (up to 38.4°C every 8 hours) for 2 days and dysphagia. No odynophagia or vomiting was reported. Of note, he was treated with ototopical antibiotic drops for a left acute suppurative otitis media 2 weeks before onset of the current illness. He was born in Brazil but lived in Portugal for 10 years and denied recent travel, skin lesions or bites, cattle, dogs or kitten exposure, and lived in the city center. His family history was unremarkable.

On admission, the patient was ill-appearing and uncomfortable with a temperature of 37.3°C (axillary), heart rate of 91 beats per minute, blood pressure of 100/54 mmHg, respiratory rate of 21 breaths per minute, and O_2 saturation of 100%. On physical examination, a painful left neck torticollis was noted with limited range of motion in all directions and slight swelling but no erythema. The neurologic exam detected an asymmetric elevation of the palate with tongue deviation to the left, but the function of the remaining cranial nerves was intact. There was absence of other focal neurologic signs. The rest of the physical examination was normal—no heart murmur, hepatosplenomegaly or rash.

His complete blood count revealed a white blood cell count of 13.6×10^9/L with differential of 84.1% neutrophils, 8% monocytes, 7.3% lymphocytes, 0.1% eosinophils and 0.5% basophils, hemoglobin of 11.2 g/dL and platelet count of 256×10^9/L. Coagulation panel showed a prothrombin time of 15.1 seconds (range: 10.2-12), international normalized ratio (INR) of 1.34 (range: 0.93–1.10), activated partial thromboplastin time of 29.3 seconds (range: 26–37), fibrinogen of 9.4 g/L (range: 1.54–4.88) and D-dimers of 787 µg/L (range: <230). His chemistry panel revealed a urea of 33 mg/dL (range: 15–36), creatinine of 0.52 mg/dL (range: 0.57–0.80), sodium of 135 mEq/L (range: 136–145), potassium of 3.9 mEq/L (range: 3.4–4.7), chlorine of 97 mEq/L (range: 98–107), aspartate transaminase of 14 U/L (range: 14–35), alanine transaminase of 8 U/L (range: 9–25), C-reactive protein of 412.7 mg/L (range: <5.0), erythrocyte sedimentation rate of 76 mm/h (range: <11) and creatine kinase of 30 U/L (range: 30–200).

Cervical computed tomography demonstrated diffuse thickening of the left paravertebral muscles (paraspinal component), reflecting myositis and enlarged cervical nodes at levels IIA/B, III and VA/B on the left. Cervical and parapharyngeal abscesses were excluded. The patient was empirically treated with intravenous penicillin and clindamycin for suspected cervical lymphadenitis.

A rapid throat test for beta-hemolytic group A *Streptococcus* was negative, antistreptolysin O titer was 590 UI/mL (range: 0–200) and anti-deoxyribonuclease B was 194 U/mL (range: 0–200). Serological testing for Epstein-Barr virus, cytomegalovirus, HIV, *Borrelia burgdorferi*, brucellosis and bartonellosis was negative.

An additional result revealed the diagnosis.

For Denouement see P. 1033.

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DENOUEMENT

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Continued from P. 1032.

On hospital day 2, magnetic resonance imaging (MRI) of the cervical region showed skull-base osteomyelitis involving the clivus, left exoccipital and C1 vertebrae, with a small left epidural abscess extending inferiorly with inflammation of the adjacent adipose and muscles. There was no evidence of spinal cord edema or compression, thrombosis, or inflammation of the ear, mastoid, or paranasal sinuses (Fig. 1).

Blood culture taken on admission (before antibiotic therapy) was later positive for *Streptococcus intermedius* (susceptible to penicillin and clindamycin), and intravenous therapy was changed to ceftriaxone due to the epidural abscess while maintaining clindamycin. Otorhinolaryngology examination revealed a normal left ear but a slight right-sided inflammatory debris in the external auditory canal, with no otorrhea or granulomas. Ofloxacin topic ear drops were applied until discharge.

The patient became afebrile by hospital day 5. MRI at day 16 documented improvement of the clivus skull base osteomyelitis with resolution of epidural abscess adjacent inflammation. There was normalization of inflammatory markers by day 20, and after 4 weeks of intravenous antibiotics, cranial nerve involvement and neck limitation had resolved. He was discharged to complete an additional 4 weeks of oral amoxicillin/clavulanic acid.

Skull base osteomyelitis is a rare but serious life-threatening condition that involves the bones and soft tissue at the base of skull. The typical form usually affects the temporal bone secondary to malignant otitis externa in older diabetic or immunosuppressed patients,[1–7] with *Pseudomonas aeruginosa* being the main pathogen.[3,5–7] Uncommonly, acute otitis media and mastoiditis can be implicated, with spread to intracranial compartments through preformed pathways, such as the oval window or the cochlear aqueduct.

Atypical skull base osteomyelitis, also known as central skull base osteomyelitis (CSBO), affects the sphenoid and occipital bones, mainly the clivus.[1–7] It is a less frequent condition that usually arises from a paranasal infection unrelated to otologic pathology,[2,5,7] such as sphenoidal or ethmoidal sinusitis, or from direct spread of an infectious process affecting the mastoid, retropharynx or oral cavity.[2,4,5] It can also be hematogenous in origin.[7] In some cases, a previous focus of infection cannot be identified.[2,5]

A broad range of organisms has been reported with CSBO, including *Streptococcus* species, *P. aeruginosa*, *Staphylococcus* species and *Enterococcus* species[1,2,4,6,7] and, less frequently, fungal infections.[2,7] The *Streptococcus anginosus* group, also known

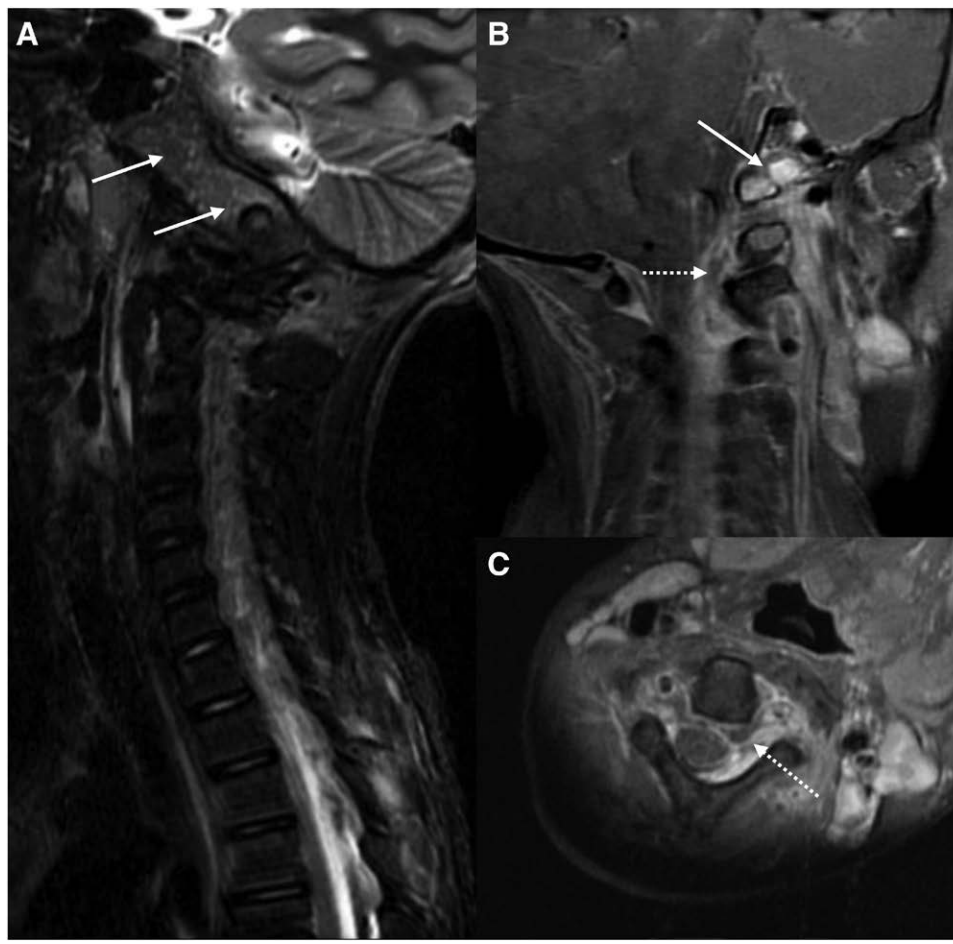

FIGURE 1. Magnetic resonance imaging (MRI) of the cervical region.
Left sagittal T2 STIR (A); oblique coronal T1 post-contrast (B); axial T1 post-contrast (C) demonstrating clival and exoccipital edema (solid arrow) and enhancement, left epidural abscess (dashed arrow) and left paraspinal myositis. STIR indicates short tau inversion recovery.

as the *Streptococcus milleri* group, is a subset of viridans streptococci comprising *S. anginosus*, *Streptococcus constellatus* and *S. intermedius*. These organisms are part of the normal oral flora with the potential to cause abscess and systemic infections at a range of sites, as liver and brain abscess, dentoalveolar infections and infective endocarditis.[1,8–12]

The clinical presentation of CSBO can be subtle and of nonspecific nature.[4–7] Pediatric patients can present with headache, sometimes as the only symptom,[1–4,6,7] and fever,[2,4–6] though this may be absent in immunocompromised patients.[6] Other symptoms may include neck/facial pain, neck stiffness, torticollis and sinus tenderness.[5,6,10] Cranial neuropathies usually occur later in the course and result from extension of the inflammatory/infectious process into the skull base where the lower cranial nerves emerge.[2–7] Cranial nerve XII shares a close relationship with cranial nerves IX, X and XI in the posterior cranial fossa as it leaves the skull in the hypoglossal canal. A basilar skull lesion may only involve the XII cranial nerve, but frequently, the other cranial nerves (IX, X and XI) are also affected. Other CSBO complications include sinus thrombosis, meningitis, brain abscess or cervical epidural abscess[1–4,6–8] and, very rarely, ischemic stroke.[4,6]

Imaging plays a vital role in the diagnosis of CSBO.[3,6] MRI has the highest sensitivity and specificity due to higher soft tissue discrimination and better visualization of bone marrow abnormalities compared with CT.[2,3,5–7] MRI findings of osteomyelitis include bone marrow T2 hyperintensity, contrast enhancement and adjacent soft tissue abnormalities,[1,3,6–8] which were all present in our patient. MRI and single-photon emission computerized tomography/computed tomography are useful for monitoring treatment response.[2,6,7]

The main treatment for CSBO includes a course of broad-spectrum antibiotics over a period of 4–12 weeks, with some experts suggesting at least 4 weeks of intravenous therapy.[1–6,8–12] Initial empirical treatment with good bone and central nervous system penetration should be started as soon as possible to cover both Gram-positive and Gram-negative bacteria and then deescalated based upon culture results and antimicrobial susceptibility testing.[1–6,8–12] Options include ceftriaxone or cefotaxime plus metronidazole or clindamycin, or meropenem, with the possible addition of vancomycin for methicillin-resistant *Staphylococcus aureus*.[4,9] Clinical improvement is usually seen 2 to 3 weeks following antibiotic administration.[1,3,4,9] Drainage/debridement should be considered if progressive neurological signs or refractory disease are present.[4,5,8,9,12]

Our patient had a clivus osteomyelitis whose primary focus could not be completely elucidated. He previously had an acute suppurative otitis media that could have been the origin of infection. Infection of the temporal bone can spread medially to the central skull base, making the true origin uncertain in some cases.[13] However, in this case, the mastoid was not involved, and *S. intermedius*, an organism from the normal oral flora, was identified, suggesting a nonotogenic source. Among 16 reported pediatric CSBO cases,[1,4,5] only 2 had mastoiditis, whereas 14 had a nonotogenic etiology, including 4 associated with retropharyngeal abscess and 3 associated with sinusitis. *S. intermedius* was involved in 4 cases, and of these, 2 had documented sinusitis and none had otitis or mastoiditis.[1,5] In cases without a clear source, distant seeding from *S. intermedius* bacteremia remains a possibility, as suspected in our case. Of note, although our patient's antistreptolysin O titer was elevated, a single measurement can have a considerable false-positivity rate, and, therefore, we did not consider it a significant finding.[14]

In conclusion, CSBO is a rare but serious infection that is potentially life-threatening[1,2,6,9] and can be easily misdiagnosed due to its subtle and nonspecific clinical presentation. Early diagnosis and prompt treatment are crucial due to the high morbidity related to the involvement of multiple cranial nerves and the high mortality rate.[1–3,5,6]

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