Arachnoid Granulation Masquerading as Lateral Sinus Vein Thrombosis

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Acute otitis media is rarely complicated by acute mastoiditis. Suspicion of acute mastoiditis is raised when the patient has persistent or recurrent fever with an erythematous, bulging tympanic membrane accompanied by erythema, swelling or tenderness in the mastoid area, and protrusion or displacement of the auricle

Acute mastoiditis is a severe infectious disease with possible intracranial complications that may be life-threatening. One of these complications is lateral sinus vein thrombosis. LSVT is characterized radiologically by a filling defect in the sinus. However, a filling defect in the lateral sinus has a differential diagnosis, one of which is arachnoid granulation. Arachnoid granulations are invaginations of arachnoid membranes into the dural sinuses and they do not require medical or surgical treatment. We present here the case of an infant with acute mastoiditis and a filling defect in the lateral sinus, as seen on computed tomography, suspected of being a LSVT. The use of different imaging modalilies, together with awareness of the differential diagnosis, revealed the true diagnosis of an arachnoid granulation.

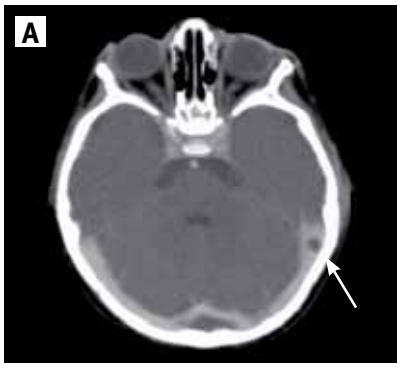
LSVT = lateral sinus vein thrombosis

PATIENT DESCRIPTION

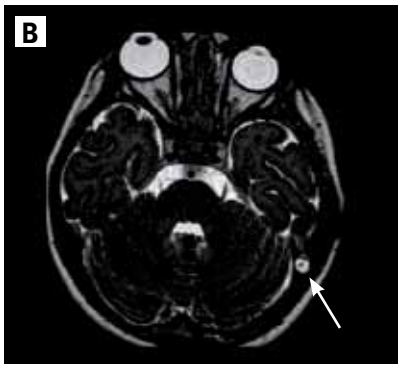
A 6 month old previously healthy female infant was presented to the Department of Otolaryngology following 2 days of high temperature accompanied by redness and swelling behind her right ear. She had a temperature of 38.8°C, heart rate 128 and blood pressure 92/66. Physical examination revealed a bulging, red and opacified tympanic membrane with significant sensitivity when palpating the left mastoid bone. Blood tests demonstrated a markedly high white blood cell count, 29,000/μl, of which 56% were neutrophils. Myringocentesis yielded copious pus. For the diagnosis of acute mastoiditis, systemic antibiotic treatment was initiated. Unenhanced and enhanced CT images of the brain and temporal bones were performed by her treating pediatrician [Figure A] and revealed a subperiosteal abscess of the mastoid. After 3 days of medical treatment there was no improvement. A simple mastoidectomy was therefore performed, after which her clinical status improved and she was discharged from the hospital.

She presented again to the emergency room 2 months later with similar complaints and the diagnosis of recurrent or persistent acute mastoiditis was suspected. Although she was hemodynamically stable

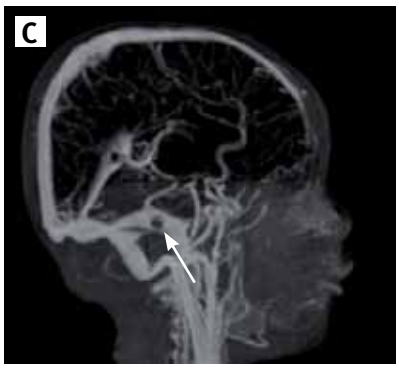
[A] Enhanced CT of the brain and temporal bones, axial plain at the level of the lateral sinuses showing the filling defect in the left lateral sinus (arrow)



[B] Axial T2 MRI of the brain showing the arachnoid granulation in the left lateral sinus (arrow)



[C] Reconstructed contrast-enhanced MRI venography depicting filling defect in the left lateral sinus (arrow)



and in a relatively good clinical condition, she continued to suffer from high fever. Hence, magnetic resonance imaging was performed including axial T2 [Figure B] and reconstructed contrast-enhanced magnetic resonance venography [Figure C], showing an arachnoid granulation protruding into the lateral sinus. Following the diagnosis of recurrent acute mastoiditis, conservative treatment with antibiotics was initiated with a good response.

COMMENT

In the current era of aggressive antibiotic treatment, the incidence of intracranial complications of otitis media has significantly decreased. Yet, these complications may still occur and may lead to a fatal outcome. Therefore, a high index of suspicion should be maintained for patients who present with acute mastoiditis. Lateral sinus vein thrombosis accounts for 2%–20% of intracranial complications of otitis media and may present with high spiking fevers, otalgia and headaches. Along with these clinical features, the diagnosis of LSVT is traditionally supported by different imaging modalities, usually contrast-enhanced CT. The usual radiological sign of LSVT is a filling defect in the sinus, as shown in Figure A. However, the differential diagnosis of a filling defect of the dural sinuses includes arachnoid granulations which share similar radiological characteristics with LSVT. After contrast administration, both lesions demonstrate filling defects in the dural sinuses. However, whereas the main radiological features of arachnoid granulation include a focal well-defined nodular defect in the sinus, as presented in Figures B and C, LSVT is characterized by a hyperdense lesion involving an elongated segment of the lateral sinus. This is in contrast to the focal lesion seen in all the figures and to the low density nidus on the CT [Figure A].

Arachnoid granulations are invaginations of arachnoid membranes into the dural sinuses. They function as valves allowing for the cerebrospinal fluid to drain into the venous system [1]. The most common location of the arachnoid granulations is beneath the superior sagittal sinus. In decreasing frequency, they present in the transverse sinus, cavernous sinus, superior petrosal sinus and straight sinus. Normally, they measure a few millimeters, but they may grow substantially and occlude the dural sinuses. This may make the imaging interpretation difficult.

Although CT as a mandatory diagnostic method in the case of acute mastoiditis is a matter of debate [2], some believe that since acute mastoiditis is a suppurative disease that can spread rapidly and produce intracranial complications, CT should be performed early in the course of disease. However, if intracranial complications are highly suspected, MRI is the imaging modality of choice [3]. Furthermore, MRI has the capability of identifying other intracranial findings that are not necessarily correlated with infections of the temporal bone. In addition, rarely is cholesteatoma manifested as acute mastoiditis, and MRI can differentiate a cholesteatoma from infection [4].

In our opinion, CT was performed in this patient too early in the course of the disease. Indeed, surgery was postponed for another 3 days after the diagnosis of subperiosteal abscess since most patients with mastoiditis recover without the need for surgery [2]. While some advocate needle drainage [5], in our department a simple mastoidectomy is usually performed to drain the mastoid.

In the case described here, the fact that the patient suffered from recurrent mastoiditis prompted us to perform an MRI, which confirmed the diagnosis of arachnoid granulation protruding into the lateral sinus rather than lateral sinus vein thrombosis. Obviously, this spared the patient possible surgical intervention to the lateral sinus.

In order to provide adequate treatment, the treating physician (pediatrician, radiologist, infectious disease, otolaryngologist) should be familiar with the differential diagnosis of a radiology filling defect in the dural sinuses and implement the various different imaging modalities in the context of complicated acute mastoiditis.

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"I am neither especially clever nor especially gifted. I am only very, very curious"

Albert Einstein (1879-1955), German-born theoretical physicist who developed the theory of general relativity, effecting a revolution in physics. Regarded as the father of modern physics and one of the most prolific intellects in human history, he received the 1921 Nobel Prize in Physics

"Lots of people want to ride with you in the limo, but what you want is someone who will take the bus with you when the limo breaks down"

Oprah Winfrey (born 1954), American talk show host and philanthropist