



What is Your Radiologic Diagnosis?

Radyolojik Tanınız Nedir?

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An eight-year-old boy with no known disease presents to the emergency department with complaint of nausea and ear pain in addition to headache for a month. The patient is started on antibiotic treatment in the outpatient clinic. While receiving treatment, the patient suffers from dizziness, recurrent vomiting, pink discharge from the left ear and subfebrile fever and is referred to our center. Laboratory tests reveals increased C-reactive protein (CRP) and erythrocyte sedimentation rate (ESR) (CRP= 203 mg/dL, ESR= 93 mm/hour) and leukocytosis (leukocyte=14.52x10³/μL). On physical examination, the left external auditory canal is discharging, tender and hyperemic. Neck movements are painful in all directions and restricted to the left. Audiometric testing reveals conductive hearing loss in the left ear and contrast-enhanced magnetic resonance imaging (MRI) of the ear is ordered. MRI shows dense effusion and diffusion restriction in the left mastoid cells and contrast enhancement in the mastoid cells in the post-contrast series (Figure 1). Adjacent to these areas, edematous signal changes in the left cerebellar hemisphere and a 6 mm diameter focus with peripheral contrast enhancement and central diffusion restriction adjacent to the mastoid cells are detected. Contrast-enhanced series and MR venography show a filling defect extending from the left transverse sinus to the sigmoid sinus and internal jugular vein (Figure 2).

What is your diagnosis based on ear MRI and MR venography findings?

DIAGNOSIS: Venous sinus thrombosis and cerebellar abscess as a complication of acute otomastoiditis

Brief discussion

The middle ear or tympanic cavity is an air-containing space within the temporal bone, connected to the nasopharynx via the eustachian tube and to the mastoid air cells via the tympanic antrum. As it is an extension of the upper respiratory tract, it is exposed to viral and bacterial contact through the eustachian tube. Acute otitis media is the most common localized infectious process in the first five years of life due to the relatively horizontal orientation of the eustachian tube and the presence of hypertrophic adenoid tissue in the nasopharynx. Streptococci (especially group A beta-hemolytic streptococci and *Streptococcus pneumoniae*) and *Haemophilus influenzae* account for 65-80% of bacterial agents. The clinical course of acute otitis media is usually short, and the process ends with activation of the host immune system (1).

Acute mastoiditis is a complication of middle ear infection affecting the mucoperiosteum of mastoid air cells and bone septa (2). Although it is less common today since the widespread use of oral antibiotics in otitis media cases, it is a serious condition with life-threatening consequences. Typical symptoms include persistent pain, fever and otorrhea despite appropriate treatment. The clinical diagnosis is based on retroauricular swelling and erythema and the presence of

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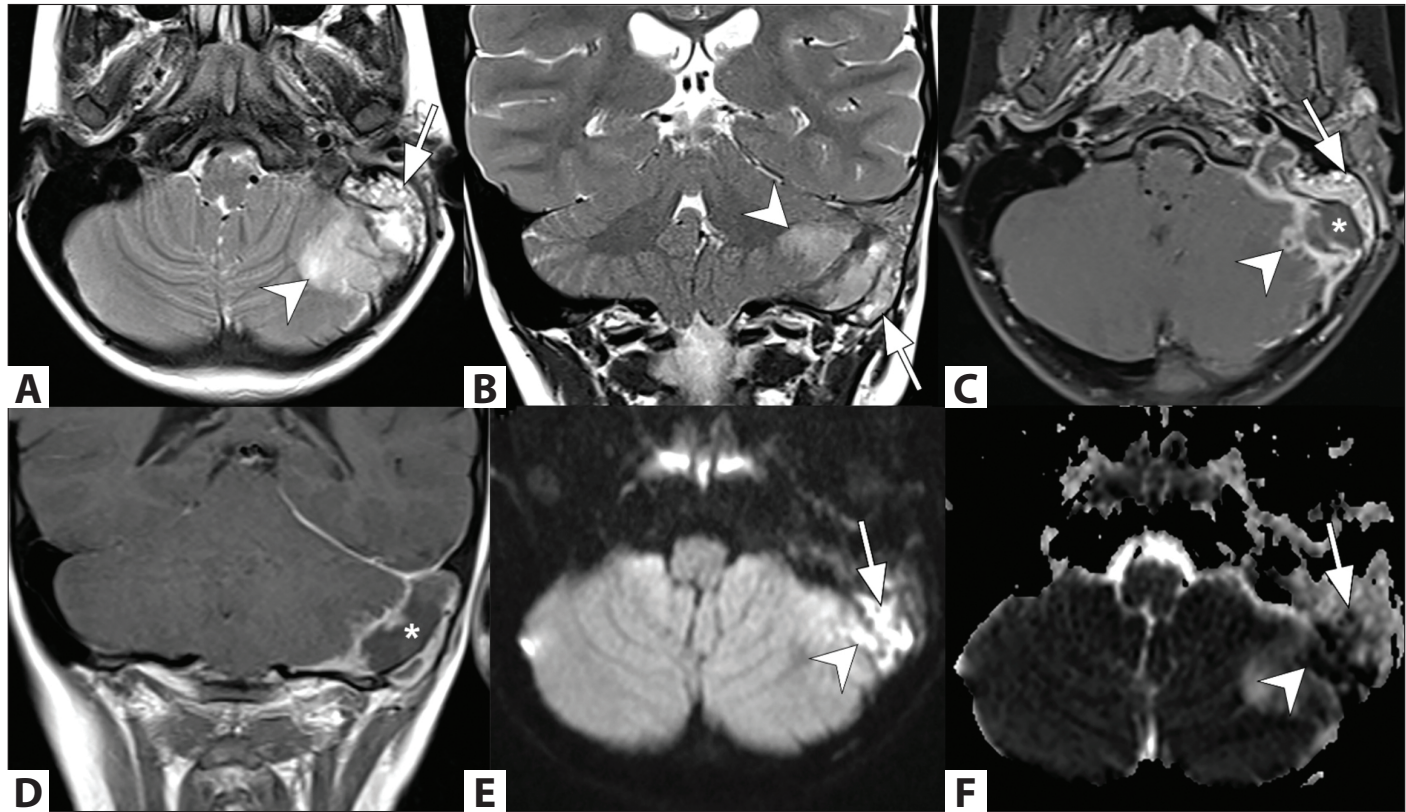


Figure 1. Axial (A) and coronal (B) T2-weighted images show effusion in mastoid cells (white arrow) and high T2 signal in the cerebellum (arrow head). Post-contrast T1-weighted axial (C) and coronal (D) images show contrast enhancement in the left mastoid cells (white arrow), filling defect in the left transverse sinus (asterisk) and microabscess in the left cerebellar hemisphere (arrow head). Diffusion-weighted images (E) and ADC maps (F) show diffusion restriction in mastoid cells (arrows) and sigmoid sinus (arrow head).



Figure 2. MR venography 3D reformat images show filling defect in the distal left transverse sinus and sigmoid sinus (white arrows).

concurrent or recent otitis media. Compared to adults, it has a rapid course and presents with severe clinical symptoms, especially in children younger than two years of age (2).

Radiologic imaging plays an important role in the diagnosis of acute otomastoiditis, especially in complicated cases.

Computed tomography (CT) is usually the first preferred imaging modality because of its sensitivity in detecting opacifications and bone destruction as well as its rapid and easy accessibility. In patients with typical clinical findings, opacification of mastoid air cells on CT supports mastoiditis. CT is also very useful in making the diagnosis of coalescent mastoiditis characterized by destruction of bone septa in mastoid air cells (1). However, the ability of CT to differentiate between the causes of opacifications (effusion, infection, neoplasia, etc.) is poor. MRI is superior to CT in both diagnosis and evaluation of complications (2). Typical findings of mastoiditis on MRI include partial or complete opacification of mastoid air cells, increased T2 signal representing mastoid effusion, contrast enhancement and/or diffusion restriction in mastoid cells (2). Imaging findings such as complete opacification of the tympanic cavity and mastoid, intense intramastoid contrast enhancement, dural contrast enhancement adjacent to the mastoid, bone erosion and extracranial complications are more common in children compared to adults (2).

Extension of the infectious process beyond the mastoid cells may lead to various intracranial and extracranial complications including meningitis, epidural, subdural and intraparenchymal abscesses, vascular thrombosis, osteomyelitis and deep neck abscesses (3). Approximately 2-3% of patients

with acute mastoiditis develop dural venous sinus thrombosis as a complication (4). The mechanism in the development of sinus thrombosis secondary to mastoiditis is the spread of the inflammatory process from the middle ear to the transverse-sigmoid sinus complex. The spread of infection to the venous sinuses occurs hematogenously via mastoid emissary veins and intraosseous vessels or directly by erosion of the bone adjacent to the venous sinus (3). The thrombus may spread towards the internal jugular vein or cavernous sinus as in our case. Inadequate venous drainage may lead to impaired cerebrospinal fluid circulation, which may lead to intracranial hypertension and hydrocephalus (3).

In complicated cases of otomastoiditis, treatment includes high-dose broad-spectrum antibiotics and sometimes surgical intervention (mastoidectomy or myringotomy with placement of a ventilation tube). Our patient underwent emergency mastoidectomy after radiologic imaging. During the operation, it was observed that the mastoid cavity was filled with granulation tissue and pus, the sigmoid sinus was obliterated with thrombus and pus was coming from the sigmoid sinus. *Pseudomonas aeruginosa* and *Staphylococcus hominis* growth was

observed in the culture obtained during the surgery. After surgery and antibiotic treatment (ceftriaxone, vancomycin and metronidazole), cerebellar parenchymal findings regressed and sinus thrombosis recanalized.

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