

Cerebral venous thrombosis, subdural empyema and cerebral abscess as complications of coalescent otomastoiditis

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Section: Head & neck imaging

Area of Interest: Head and neck Neuroradiology brain

Procedure: Diagnostic procedure

Procedure: Computer Applications-3D

Procedure: Contrast agent-intravenous

Imaging Technique: CT

Imaging Technique: MR

Special Focus: Infection Embolism / Thrombosis

Abscess Case Type: Clinical Cases

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Arenas MR.

Patient: 40 years, male

Clinical History:

A 60-year-old man with fever, hypoacusia, serohaematic discharge of the right ear and a history of hypertension and paranoid schizophrenia, was admitted to the emergency department. The patient presented with right-sided facial palsy, without other neurological manifestations.

Imaging Findings:

Axial and coronal CT of the temporal bone shows opacification of right mastoid air cells with erosion of the external cortex and sigmoid plate (Fig. 1a, b, c).

Areas of low attenuation are noted extending from the right transverse sinus to the jugular bulb on axial CT (Fig. 2a, c), prompting suspicion of dural sinus thrombosis. 3D reconstructed MRI (Fig. 2b, d, e) confirms this.

Contrast-enhanced CT shows a small hypodense area in the right temporal lobe, which raised the suspicion of cerebral abscess formation in the given context (Fig. 3a). The lesion is hyperintense on T2 MRI with peripheral contrast enhancement (Fig. 3d). Figure 3c demonstrate restricted diffusion.

Axial CT (Fig. 4a) shows a fluid collection extending along the right upper cerebral convexity which restricts on MRI DWI (Fig. 4b) and has an irregular outline (Fig. 4c, d).

Discussion:

Mastoiditis is defined as the inflammation of mastoid air cells resulting from obstruction of the mastoid antrum. Acute mastoiditis can be regarded as a complication of acute or chronic diseases such as cholesteatoma. It is the most frequently encountered complication of acute otitis media and may lead to a spectrum of intracranial complications.

When mastoiditis and otitis media are present simultaneously, the term acute otomastoiditis may be used. [1]

Streptococcus and *Haemophilus genii* account for most cases of bacterial origin. Invasive aspergillosis must be considered in immunocompromised individuals. [5]

CT is the diagnostic investigation of choice, providing bony and soft-tissue algorithms to precisely visualize the temporal bone and exclude concurrent complications such as dural venous sinus thrombosis and intracranial collections. MRI may contribute in the evaluation of complications such as subdural empyema and cerebral abscess, by demonstrating restricted diffusion on DWI. [2]

Complications arising from acute mastoiditis can be divided into three general anatomical categories: [3] temporal bone, cervical and intracranial. Although complications remain rare due to prompt antibiotic treatment, their incidence has been steadily increasing with the emergence of drug-resistance organisms. [4]

When breakdown of mastoid air cell bony septa is seen the term coalescent mastoiditis is employed, which is the result of the merger of mastoid air cells into larger cavities filled with pus and granulation tissue. Absence of clinical improvement with conservative management, progression of symptoms or the presence of a subperiosteal abscess can all warrant surgical intervention. [4]

The most common intracranial complication is an epidural abscess, resulting from spread of infection following bone destruction in coalescent mastoiditis. Less common, but more clinically evident, is the presence of a subdural empyema. MRI may manifest hyperintensity in the cerebral parenchyma adjacent to the subdural empyema, due to associated cerebritis. [4]

Dural venous sinus thrombosis is another complication of acute mastoiditis which may be asymptomatic. Identification of thrombus within the sinus by low attenuation on contrast enhanced CT, hyperintensity on T2W MRI and lack of flow on MRV should raise suspicion. [4]

Cerebral abscess in the context of otomastoiditis is most commonly seen in temporal lobe but may also occur in the posterior fossa.

Differential Diagnosis List: Coalescent otomastoiditis with cerebral venous sinus thrombosis, subdural empyema and cerebral abscess., Acquired cholesteatoma, Apical petrositis, Langerhans histiocytosis

Final Diagnosis: Coalescent otomastoiditis with cerebral venous sinus thrombosis, subdural empyema and cerebral abscess.

References:

- Mafee MF et al. (1985) Acute otomastoiditis and its complications: role of CT. *Radiology* May;155(2):391-7. (PMID: [3983389](#))
- Saat R et al (2015) MR imaging features of acute mastoiditis and their clinical relevance. *American Journal of Neuroradiology* Feb;36(2):361-7 (PMID: [25324497](#))
- Ludwig BJ et al. (2010) Diagnostic imaging in nontraumatic pediatric head and neck emergencies. *Radiographics* May;30(3):781-99 (PMID: [20462994](#))
- Vazquez E, et al. (2003) Imaging of complications of acute mastoiditis in children. *Radiographics* Mar-Apr;23(2):359-72. (PMID: [2640152](#))
- Koch, Hamilton et al. (2016) Diagnostic imaging , Head and Neck. 3rd Edition. Page 1042 Section 25. Page 1042

Figure 1

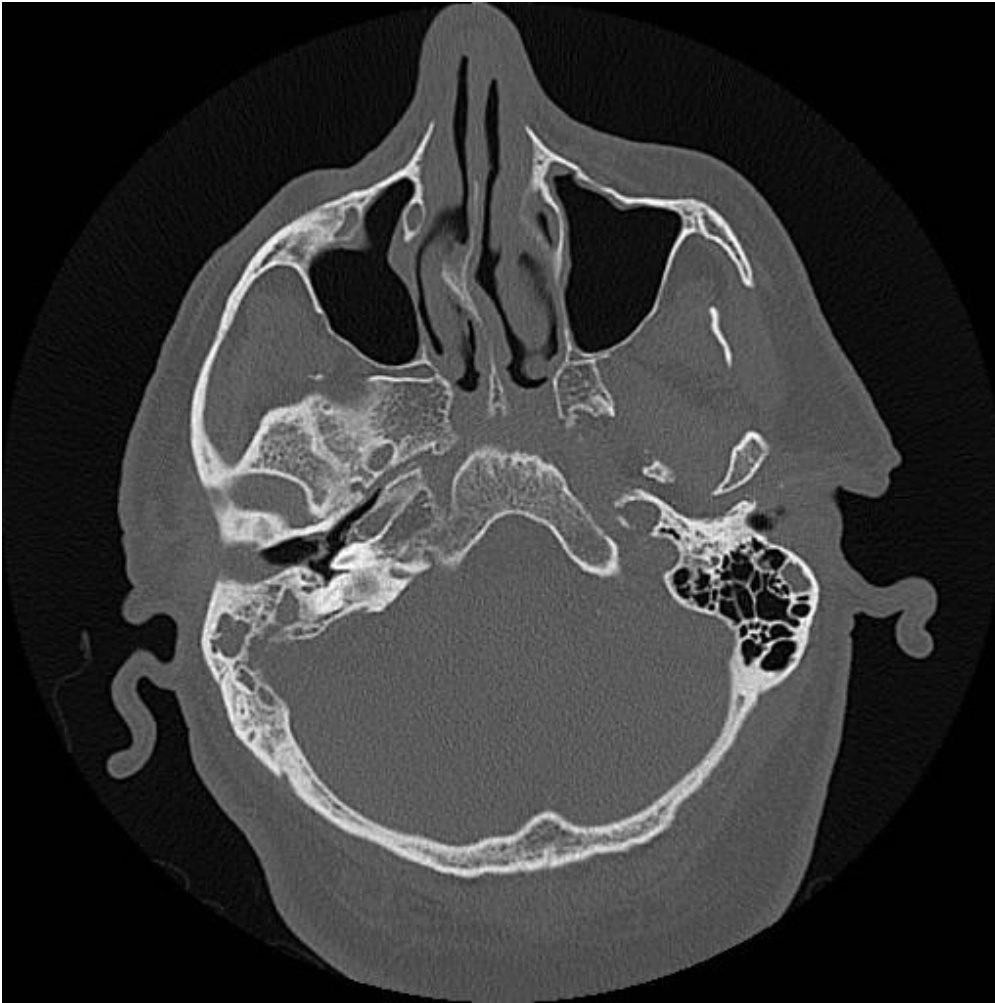
a



Description: Coronal CT bone window showing right-sided mastoid air cell and middle ear occupation.

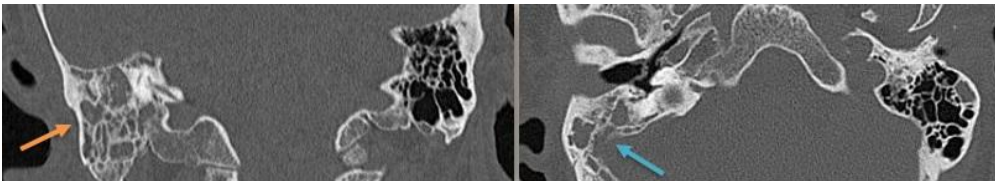
Origin: Nerses Nersesyan. Department of Radiology, Hospital Clínico Universitario de Valencia, Valencia, Spain.

b



Description: Axial CT bone window showing right-sided mastoid air cell and middle ear occupation. Erosion of mastoid air cells, resulting in communication with middle cerebral fossa. **Origin:** Nerses Nersesyan. Department of Radiology, Hospital Clínico Universitario de Valencia, Valencia, Spain.

c



Description: Annotated image indicating the presence of occupation of mastoid air cell (orange arrow) and mastoid cortex erosion (blue arrow). **Origin:** Nerses Nersesyan. Department of Radiology, Hospital Clínico Universitario de Valencia, Valencia, Spain.

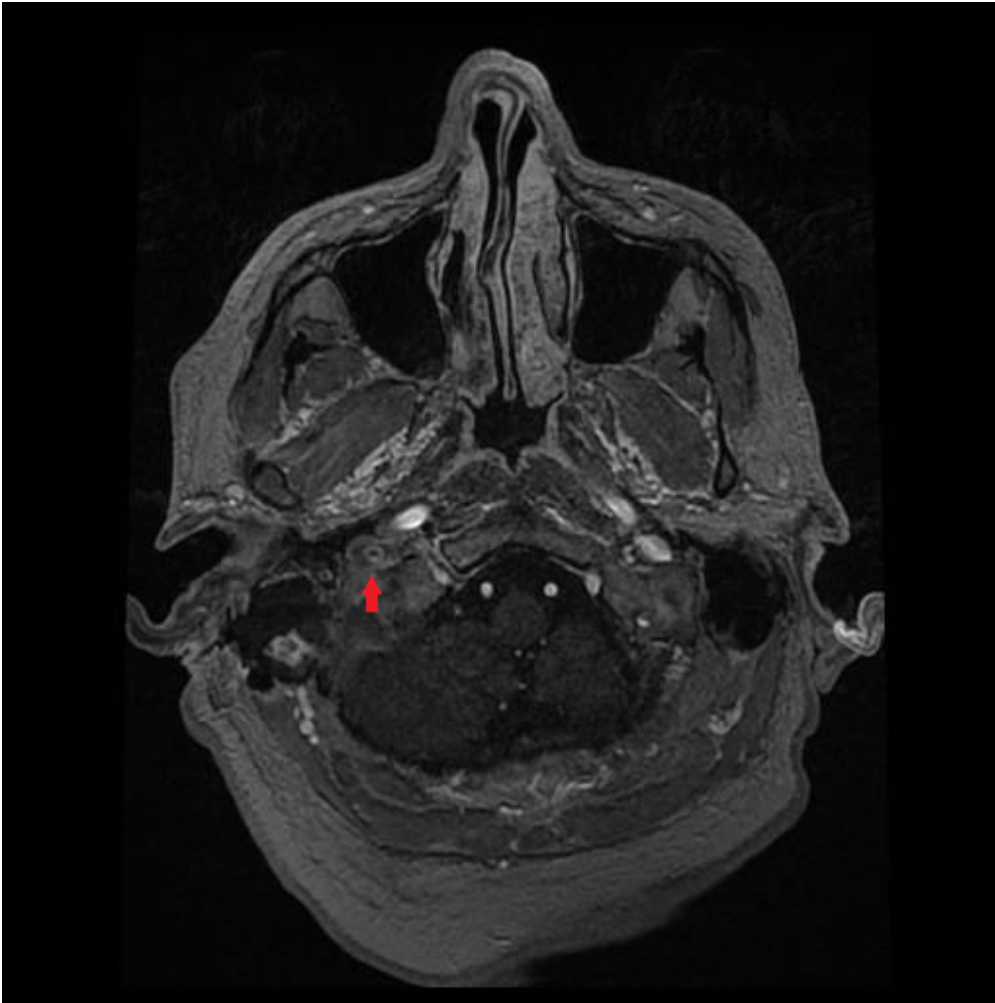
Figure 2

a



Description: Contrast-enhanced CT with area of hypoattenuation in the right internal jugular vein, compatible with occlusive thrombus. **Origin:** Nerses Nersesyan. Department of Radiology, Hospital Clínico Universitario de Valencia, Valencia, Spain.

b



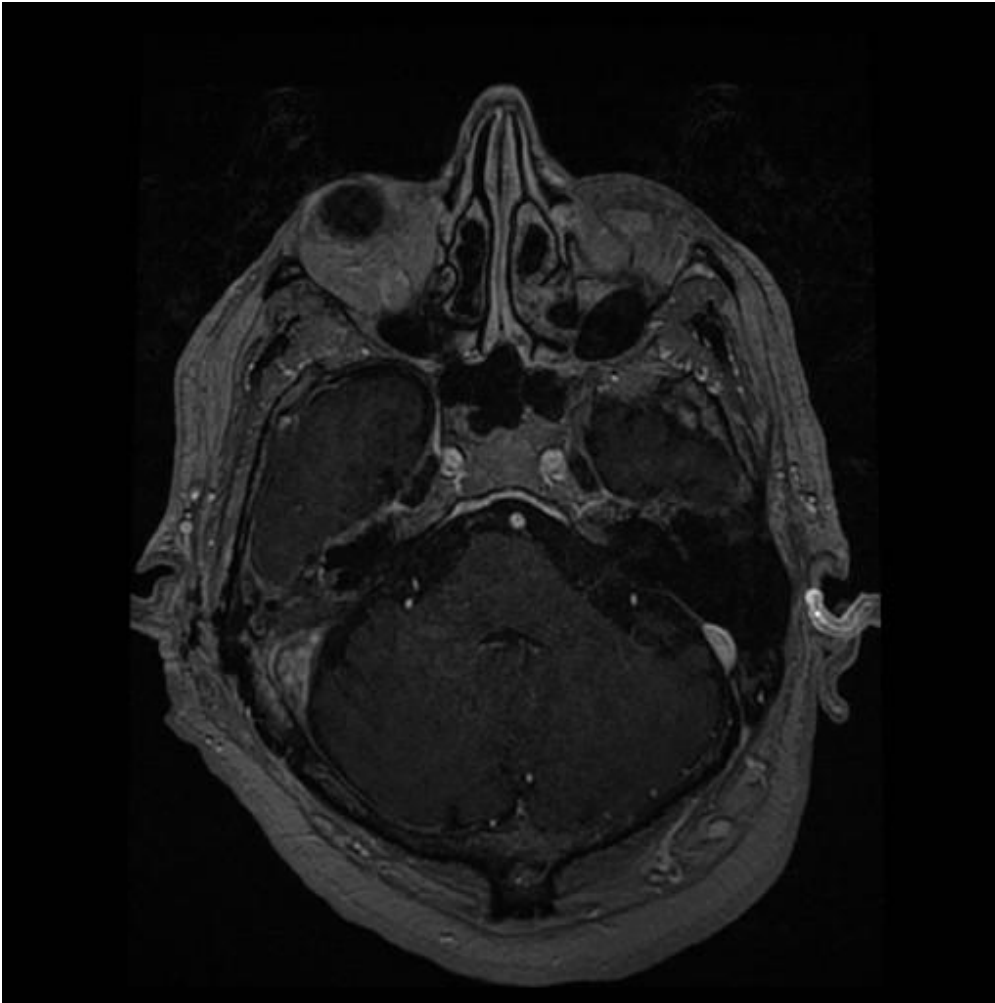
Description: 3D T1 contrast-enhanced MRI reconstruction showing the thrombus in the right jugular vein. **Origin:** Nerses Nersesyan. Department of Radiology, Hospital Clínico Universitario de Valencia, Valencia, Spain.

c



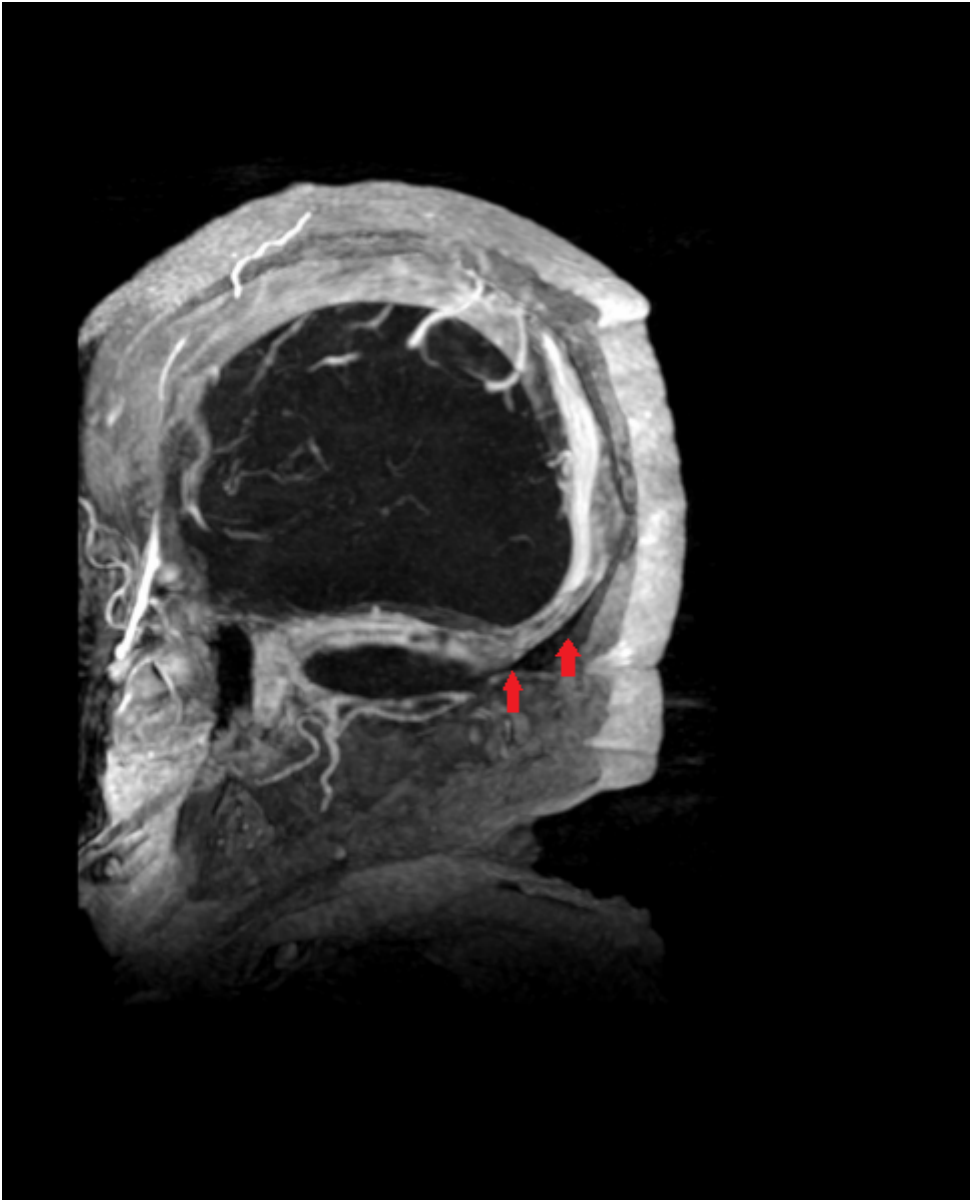
Description: Contrast-enhanced CT area of hypoattenuation in the right sigmoid sinus, compatible with occlusive thrombus. **Origin:** Nerses Nersesyan. Department of Radiology, Hospital Clínico Universitario de Valencia, Valencia, Spain.

d



Description: 3D T1 contrast-enhanced MRI reconstruction showing the thrombus in the right sigmoid sinus. **Origin:** Nerses Nersesyan. Department of Radiology, Hospital Clínico Universitario de Valencia, Valencia, Spain.

e



Description: 3D MRI vascular reconstruction showing areas of hypointensity, extending from the right transverse sinus into the sigmoid vein. **Origin:** Nerses Nersesyan. Department of Radiology, Hospital Clínico Universitario de Valencia, Valencia, Spain.

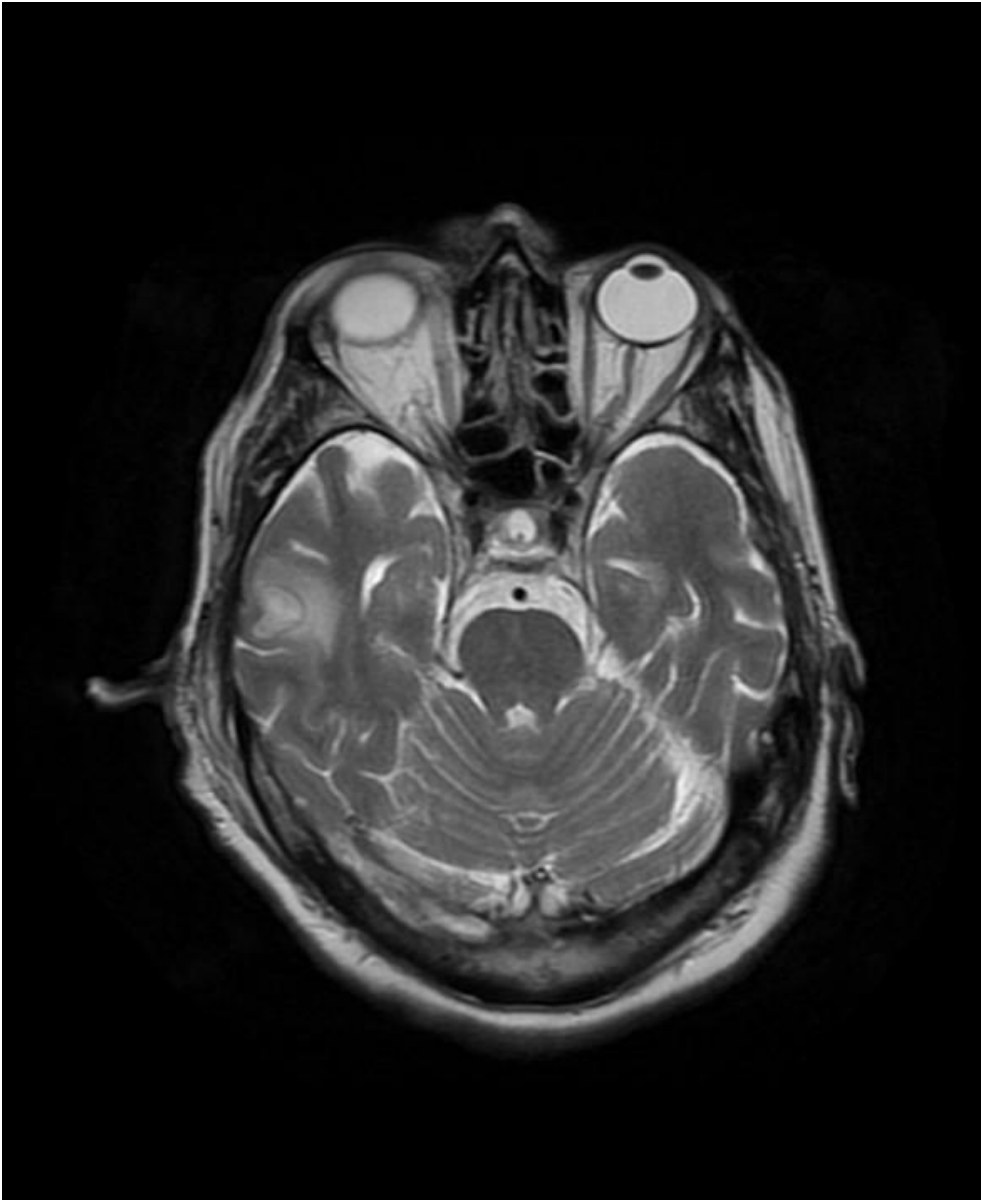
Figure 3

a



Description: Axial CT shows small hypodense area in the right temporal lobe, which should prompt the suspicion of cerebral abscess in the given context. **Origin:** Nerses Nersesyan. Department of Radiology, Hospital Clínico Universitario de Valencia, Valencia, Spain.

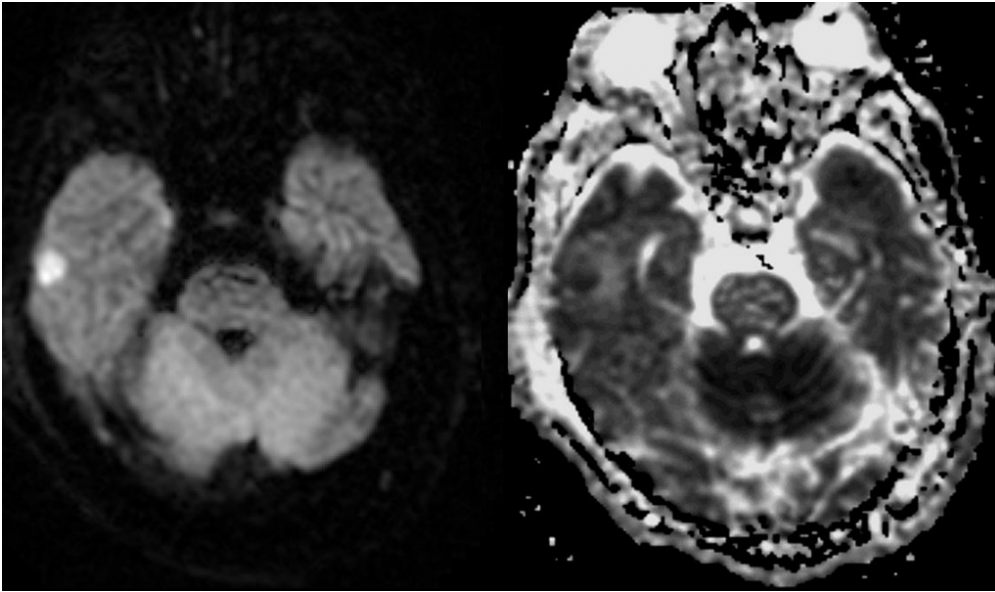
b



Description: MRI T2 shows small delineated hyperintense lesion with surrounding diffuse peripheral hyperintensity in the right temporal lobe, compatible with cerebral abscess with surrounding oedema.

Origin: Nerses Nersesyan. Department of Radiology, Hospital Clínico Universitario de Valencia, Valencia, Spain.

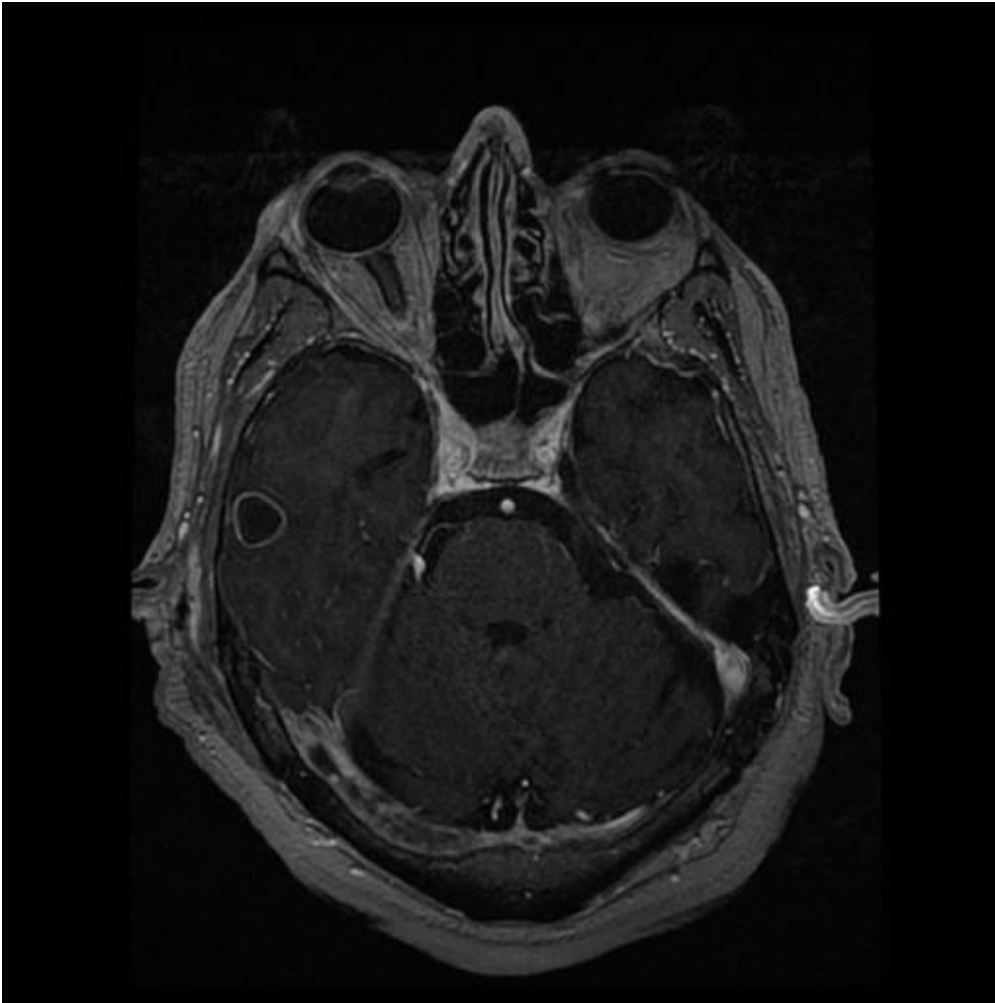
c



Description: B1000 and ADC images with small area of restricted diffusion in right temporal lobe.

Origin: Nerses Nersesyan. Department of Radiology, Hospital Clínico Universitario de Valencia, Valencia, Spain.

d



Description: MRI 3D reconstruction shows small peripherally enhancing area in the right temporal lobe, compatible with cerebral abscess. **Origin:** Nerses Nersesyan. Department of Radiology, Hospital Clínico Universitario de Valencia, Valencia, Spain.

Figure 4

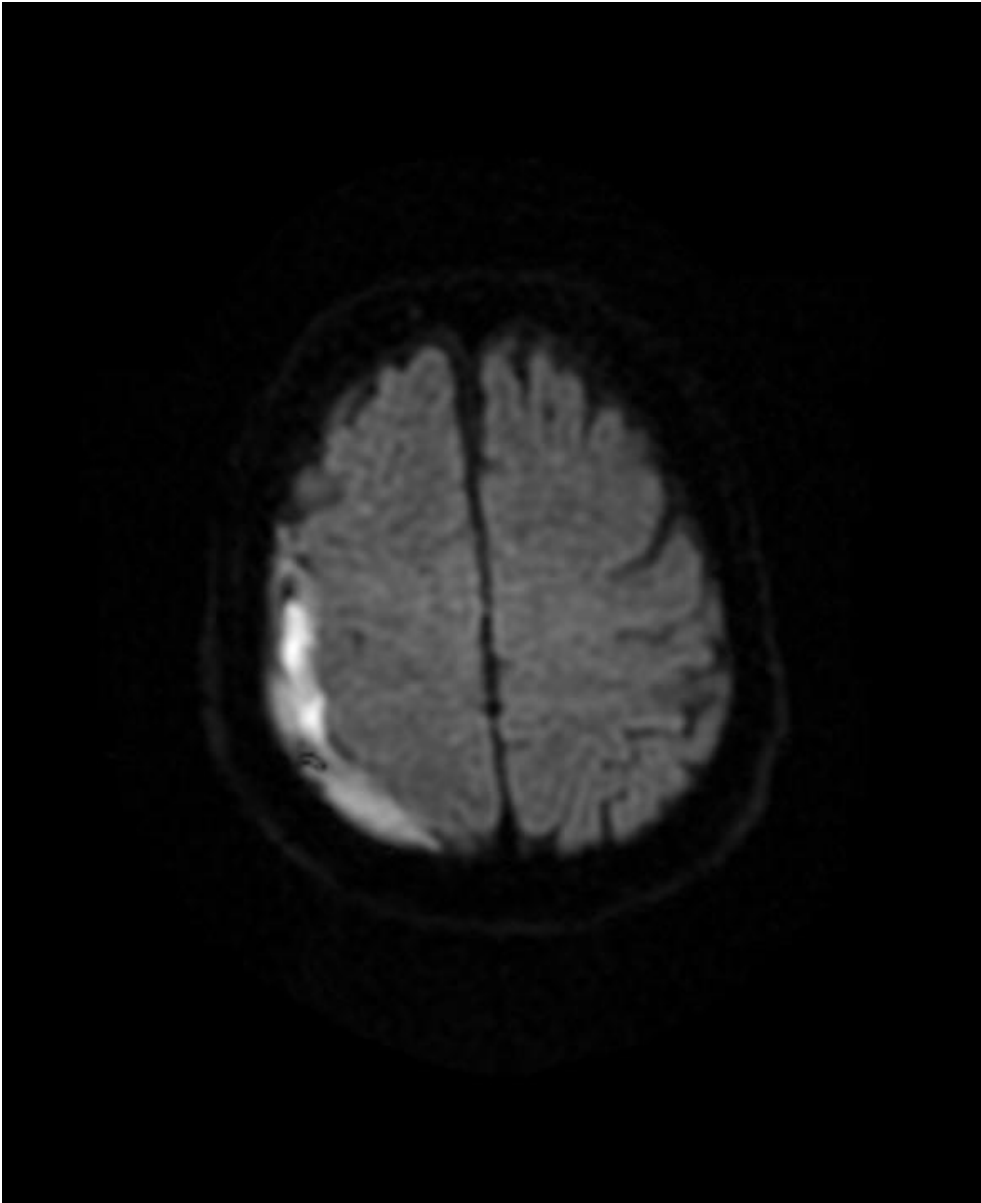
a



Description: Subdural collection in the right upper convexity consistent with subdural empyema.

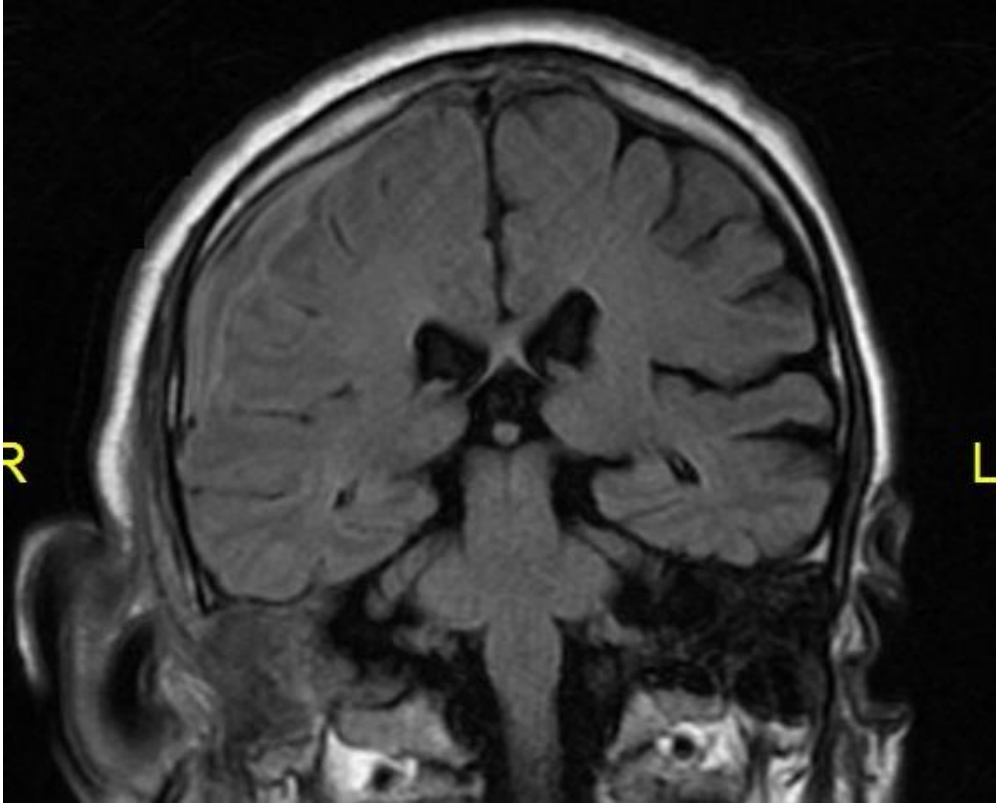
Origin: Nerses Nersesyan. Department of Radiology, Hospital Clínico Universitario de Valencia, Valencia, Spain.

b



Description: Subdural area of diffusion restriction in the right upper convexity consistent with subdural empyema. **Origin:** Nerses Nersesyan. Department of Radiology, Hospital Clínico Universitario de Valencia, Valencia, Spain.

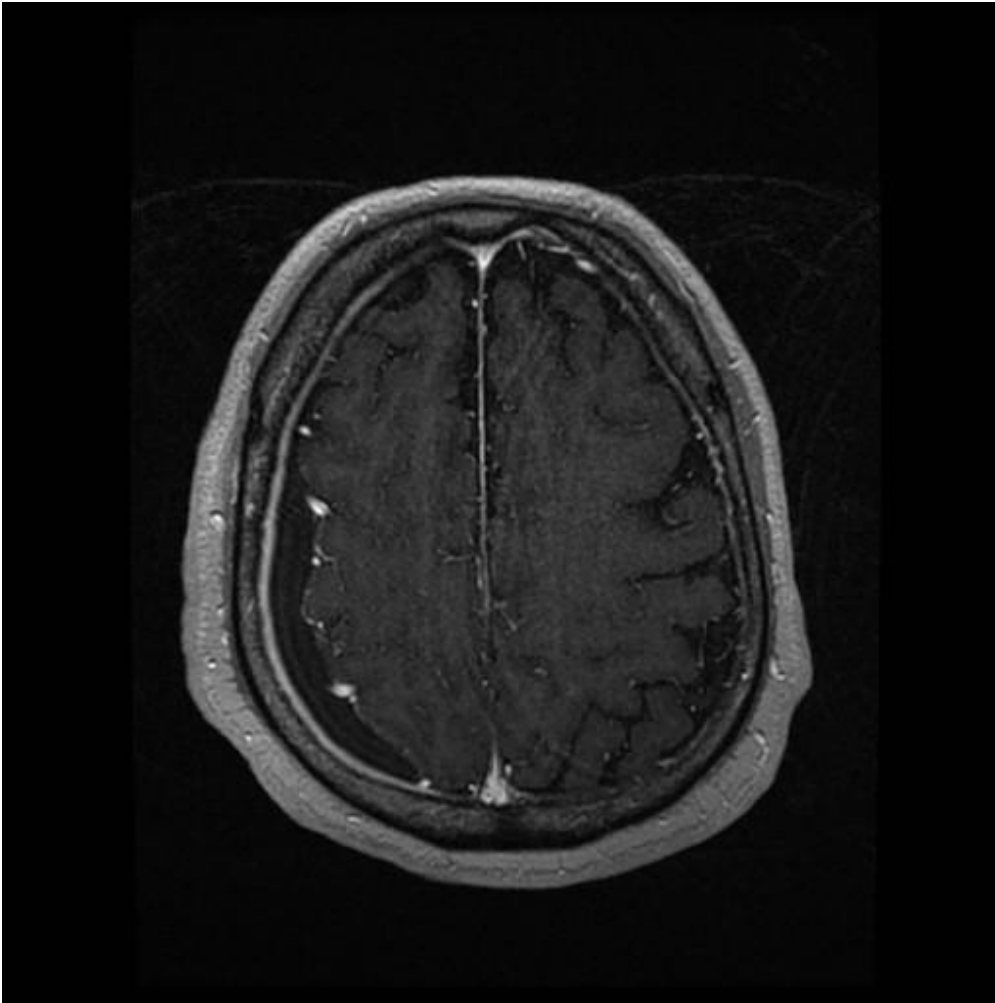
c



Description: Subdural collection in the right upper convexity consistent with subdural empyema.

Origin: Nerses Nersesyan. Department of Radiology, Hospital Clínico Universitario de Valencia, Valencia, Spain.

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