

Brain abscess secondary to chronic middle otitis

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Section: Neuroradiology

Area of Interest: Ear / Nose / Throat Neuroradiology
brain

Procedure: Complications

Procedure: Education

Imaging Technique: CT

Imaging Technique: MR

Imaging Technique: MR-Diffusion/Perfusion

Special Focus: Abscess Pathology Case Type: Clinical
Cases

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Patient: 24 years, male

Clinical History:

A 24-year-old male patient presented at the emergency department with headache, high-grade fever and sensory disturbance. He had a history of deafness and otorrhea.

Imaging Findings:

NECT temporal bone shows a soft-tissue mass that affects the right middle ear with ossicular chain erosion and bone defect of the ipsilateral tegmen tympani (Fig. 1).

CECT brain shows a well-defined hypodense focal lesion in the right temporal lobe with peripheral ring enhancing and mass effect. Moreover, affection of ipsilateral tentorium (Fig. 2).

MRI brain shows an internal content hypointense on T1WI, markedly hyperintense on T2WI and mildly hyperintense to CSF on FLAIR (Fig. 3). Gd-enhanced T1WI shows smooth, complete ring enhancing with extension to ipsilateral tentorium (Fig. 4). T2* GRE shows the dual rim sign (Fig. 3). DWI with b-value 1000 s/mm² demonstrates diffusion restriction (Fig. 5).

Discussion:

In the last 20 years, the incidence of intracranial complications of chronic otitis media has decreased due to the early use of antibiotics; however, the presence of cholesteatoma is an important risk factor for them. The otogenic brain abscess accounts for 25% of brain abscesses in children, whereas in adults it accounts for > 50%. Moreover, it occurs predominantly in men [1].

The cholesteatoma is a non-neoplastic lesion in the temporal bone composed of desquamated keratinising stratified squamous epithelium that form a mass. The cholesteatomas are classified as either congenital or acquired. The acquired cholesteatoma can be primary (80% of all middle ear cholesteatomas) or secondary [2].

The mechanics of spread are either through a bone defect on the tegmen tympani or by the dissemination of an

infected blood clot within an emissary vein of the skull to a venous sinus. The otogenic brain abscess most frequently affects the adjacent medial segment of the temporal lobe and lateral lobe of the cerebellum [1].

The clinical presentation is variable. The most frequent symptoms are headache, nausea, vomiting and deafness. Other signs and symptoms include sensory disturbance, seizures and neurological focalisation. If it affects the cerebellum, it can present dysmetria, dysdiadochokinesia and spontaneous nystagmus (cerebellar signs) [3].

The abscess development has four stages: 1) early cerebritis; 2) late cerebritis; 3) early capsule and 4) late capsule. On MRI, the cerebritis stages show low signal on T1WI and high signal on T2WI with patchy enhancement. When the abscess capsule forms, it shows a hyperintense center, hypointense border and hyperintense vasogenic oedema on T2WI with well-defined ring enhancement. Central high signal on DWI with low ADC is present [4]. Another finding on MRI is the dual rim sign (a hyperintense line located inside the low intensity rim) that can be seen on T2 * GRE and SWI.

CT is the imaging technique of choice to diagnose cholesteatoma in patients in whom it is clinically suspected. The findings associated with cholesteatoma include an expansile soft-tissue mass lateral in Prussak space with extension into lateral epitympanic recess. In addition, destruction in bones like ossicles, tegmen tympani and semicircular canals is seen, among others findings [4].

The pillars of the treatment are drainage of the abscess, eradication of the primary otogenic focus and prevention of recurrence of the abscess [1].

The patient was subjected to radical mastoidectomy. The diagnostic of cholesteatoma was made surgically.

Differential Diagnosis List: Otogenic brain abscess secondary to the cholesteatoma, High-grade glioma (e.g. glioblastoma), Brain metastasis, Tumefactive demyelinating lesion

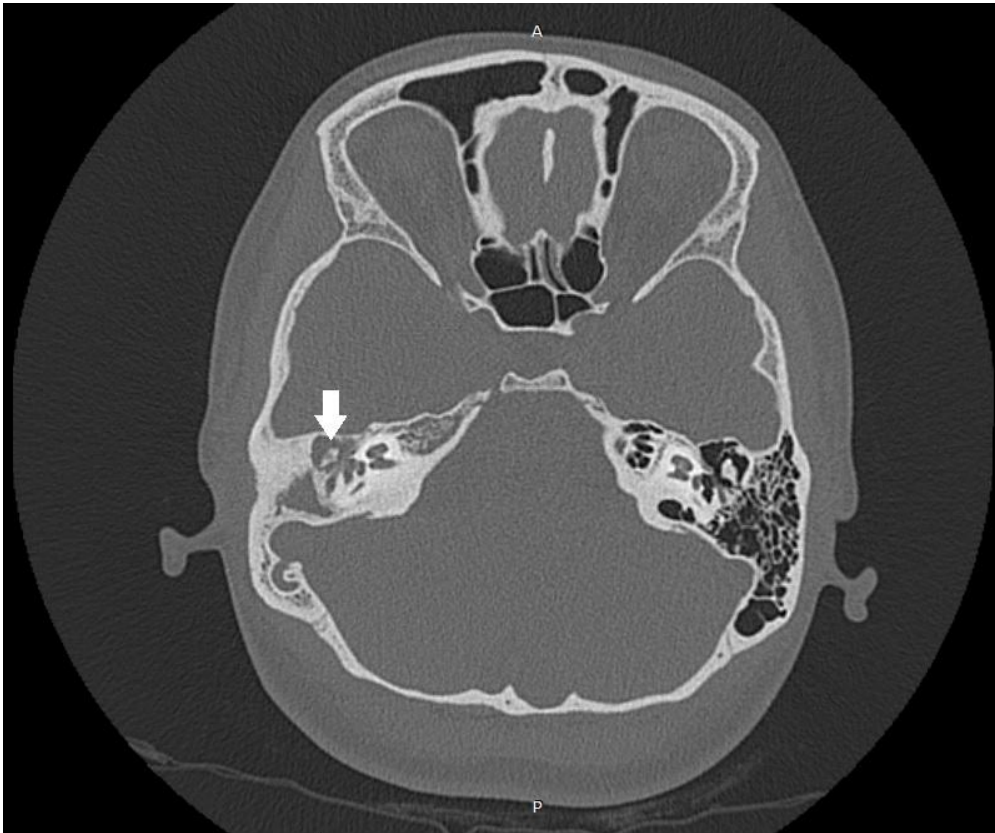
Final Diagnosis: Otogenic brain abscess secondary to the cholesteatoma

References:

- Choi J, Choi J II, Kim SD. (2014) Management of otogenic brain abscess using the transmastoid approach. J Korean Neurosurg Soc 55(3):178–80. (PMID: [24851158](#))
- Baráth K, Huber AM, Stampfli P, et al. (2011) Neuroradiology of cholesteatomas. Am J Neuroradiol 32(2):221–9. (PMID: [20360335](#))
- Watanabe KI, Hatano GY, Fukada N, et al. (2004) Brain abscess secondary to the middle ear cholesteatoma: A report of two cases. Auris Nasus Larynx 31(4):433–7. (PMID: [15571920](#))
- Muzumdar D, Jhawar S, Goel A. (2011) Brain abscess: An overview. Int J Surg 9(2):136–44. (PMID: [21087684](#))

Figure 1

a



Description: CT shows the presence of a soft tissue in the right middle ear with partial erosions of the hammer's head and incus' body (white arrow). Moreover, loss of pneumatization of adjacent mastoid cells. **Origin:** Department of radiology, Edgardo Rebagliati Martins National Hospital, Lima, Peru.

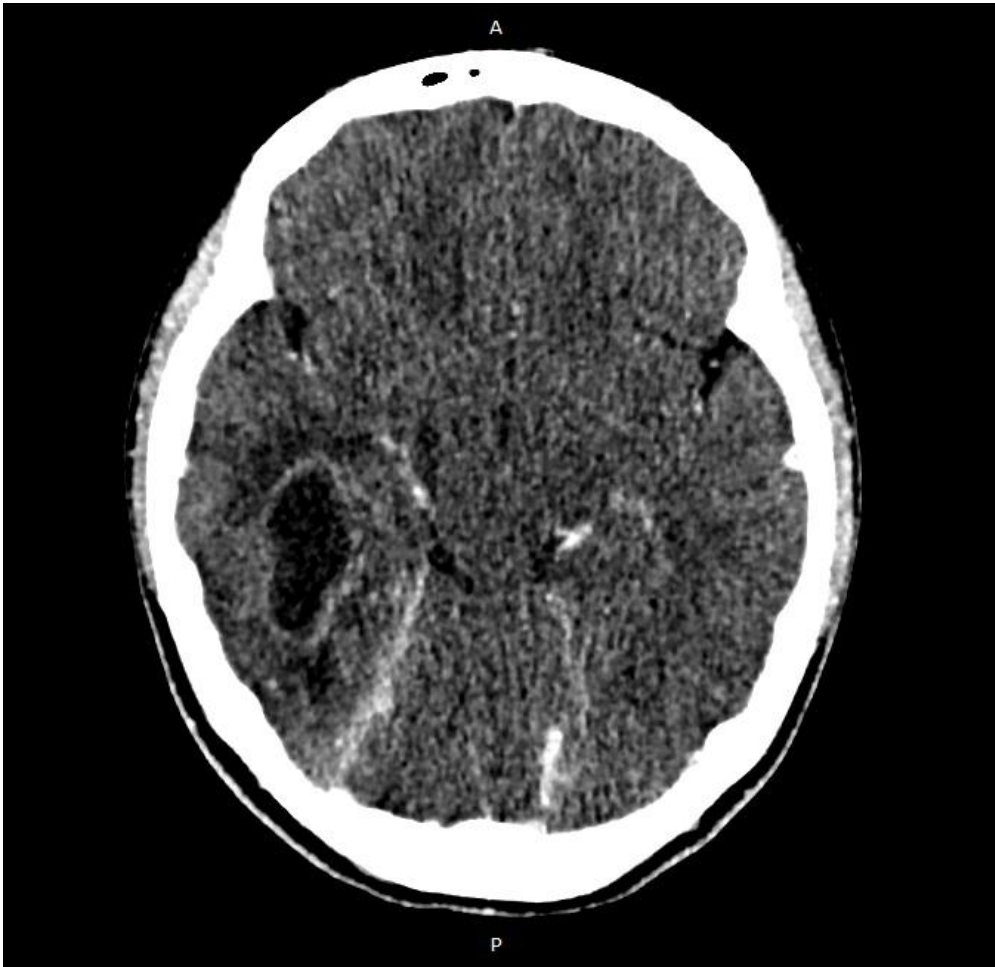
b



Description: CT shows a bone defect of the right tegmen tympani (white arrow). **Origin:** Department of radiology, Edgardo Rebagliati Martins National Hospital, Lima, Peru.

Figure 2

a



Description: Axial CECT shows a well-defined hypodense focal lesion with peripheral ring enhancing and some vasogenic oedema in right temporal lobe. **Origin:** Department of radiology, Edgardo Rebagliati Martins National Hospital, Lima, Peru.

b



Description: Axial CECT shows a well-defined hypodense focal lesion with peripheral ring enhancing and some vasogenic oedema in right temporal lobe. **Origin:** Department of radiology, Edgardo Rebagliati Martins National Hospital, Lima, Peru.

C



Description: Coronal CECT shows a well-defined hypodense focal lesion with peripheral ring enhancing, as well as thickening and enhancement of ipsilateral tentorium. **Origin:** Department of radiology, Edgardo Rebagliati Martins National Hospital, Lima, Peru.

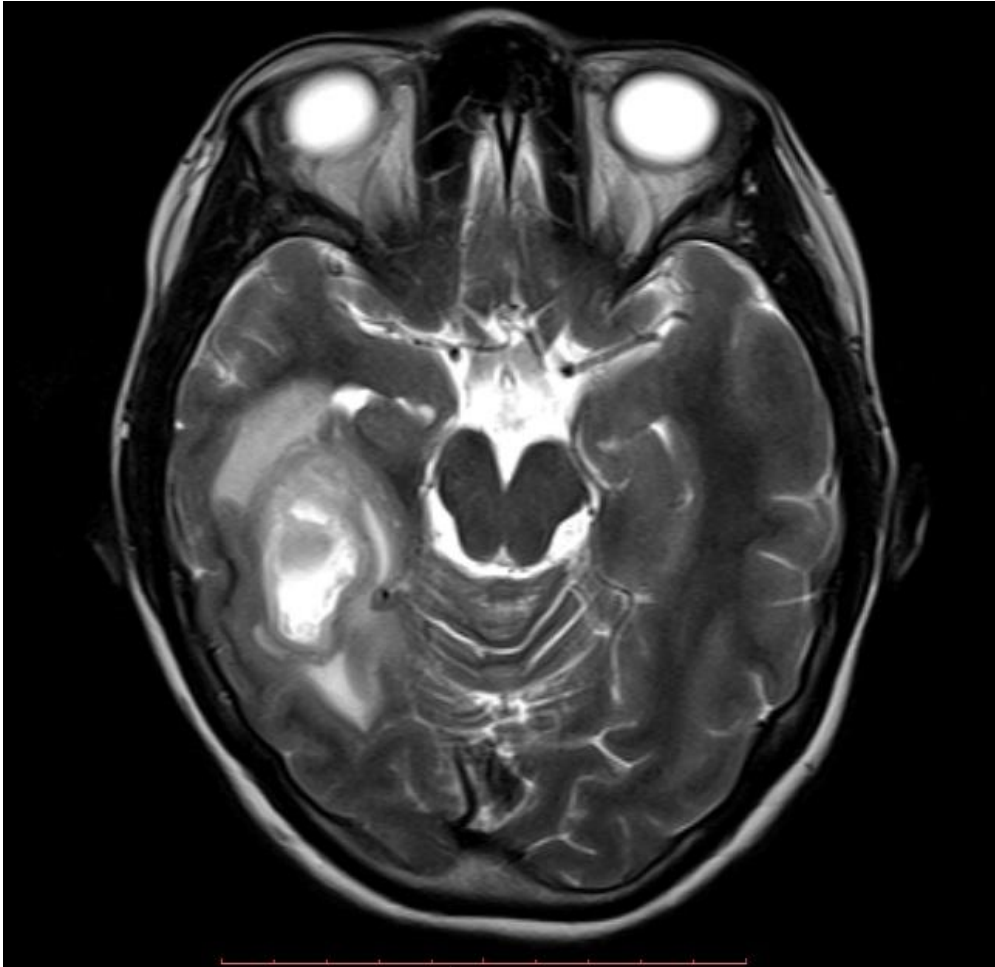
d



Description: Sagittal CECT shows a well-defined hypodense focal lesion with peripheral ring enhancing in right temporal lobe. **Origin:** Department of radiology, Edgardo Rebagliati Martins National Hospital, Lima, Peru.

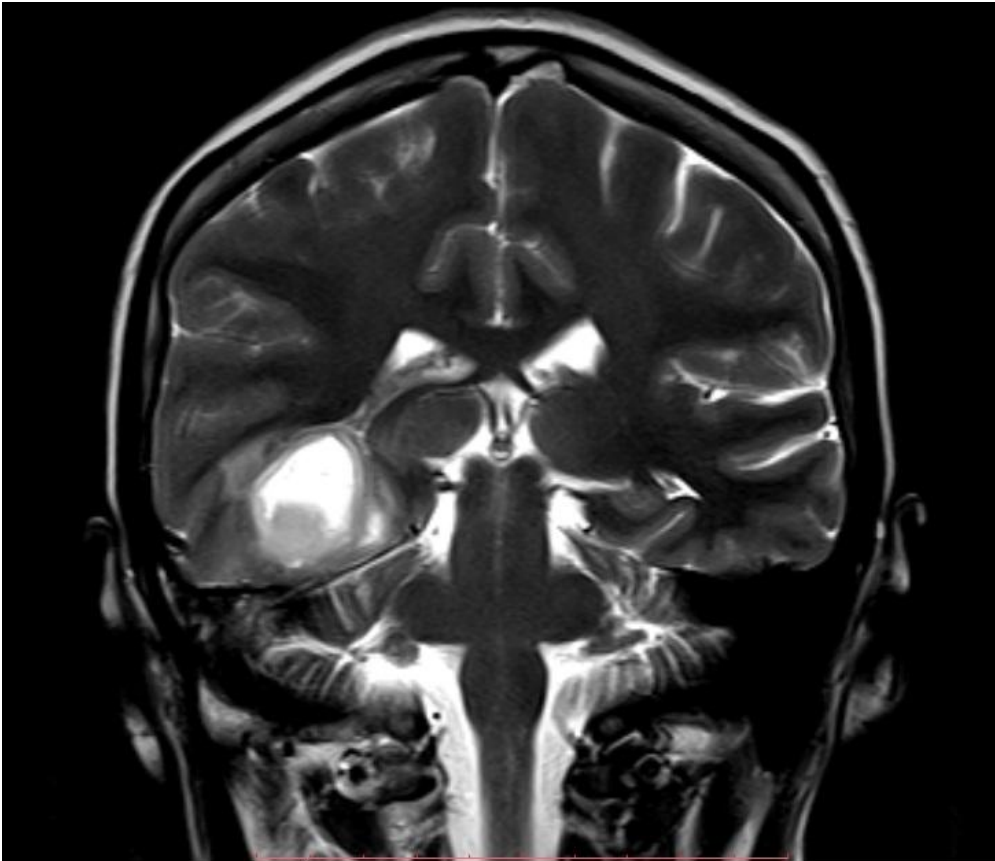
Figure 3

a



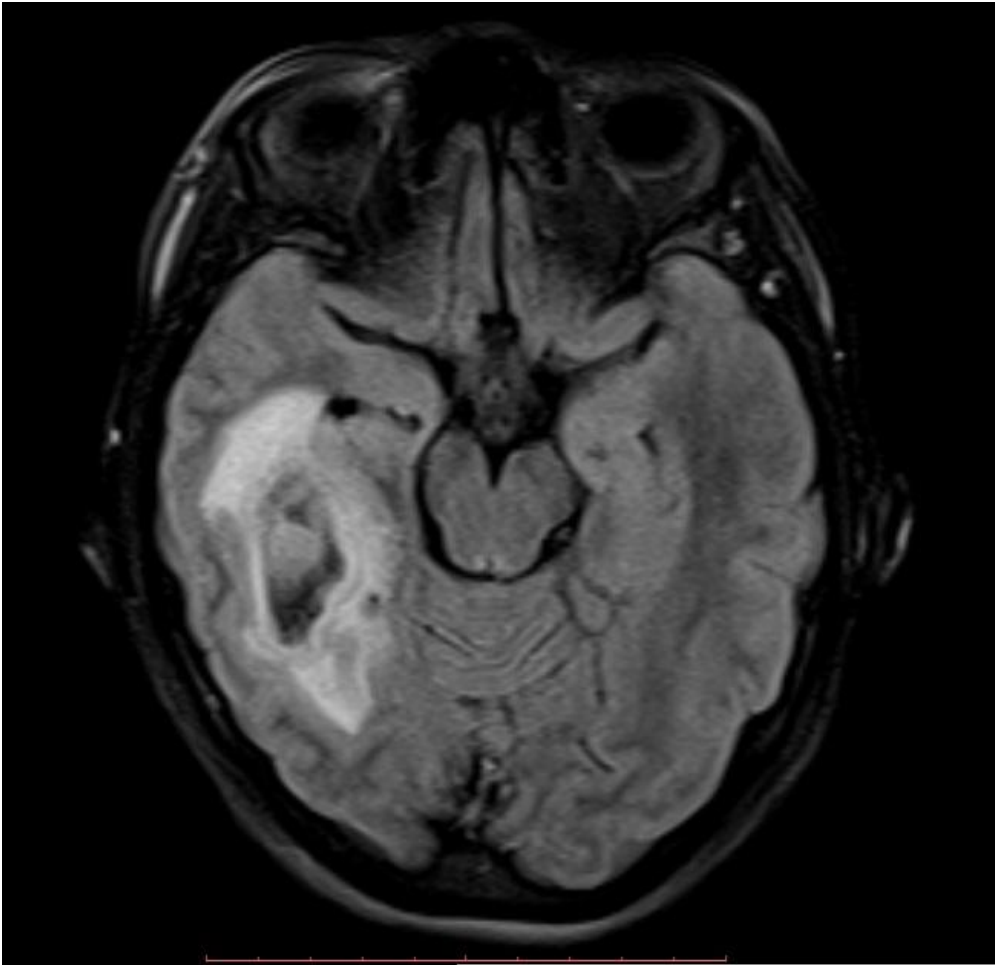
Description: The lesion in the right temporal lobe appears with hypointense capsule and hyperintense center on T2WI, associated with extensive vasogenic oedema and consequent mass effect. **Origin:** Department of radiology, Edgardo Rebagliati Martins National Hospital, Lima, Peru.

b



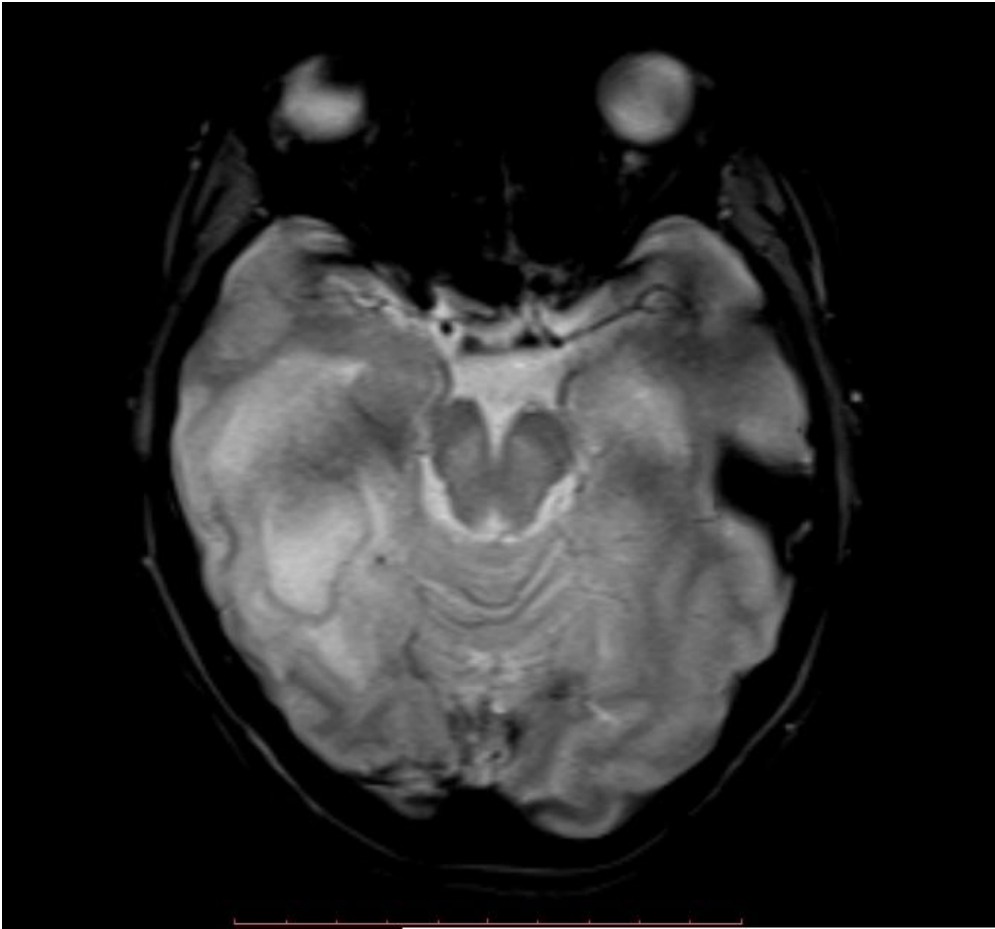
Description: The lesion in the right temporal lobe appears with hypointense capsule and hyperintense center on T2WI, associated with extensive vasogenic oedema and consequent mass effect. **Origin:** Department of radiology, Edgardo Rebagliati Martins National Hospital, Lima, Peru.

c



Description: FLAIR shows more evident surrounding oedema and mildly hyperintense center in relation to cerebrospinal fluid (CSF). **Origin:** Department of radiology, Edgardo Rebagliati Martins National Hospital, Lima, Peru.

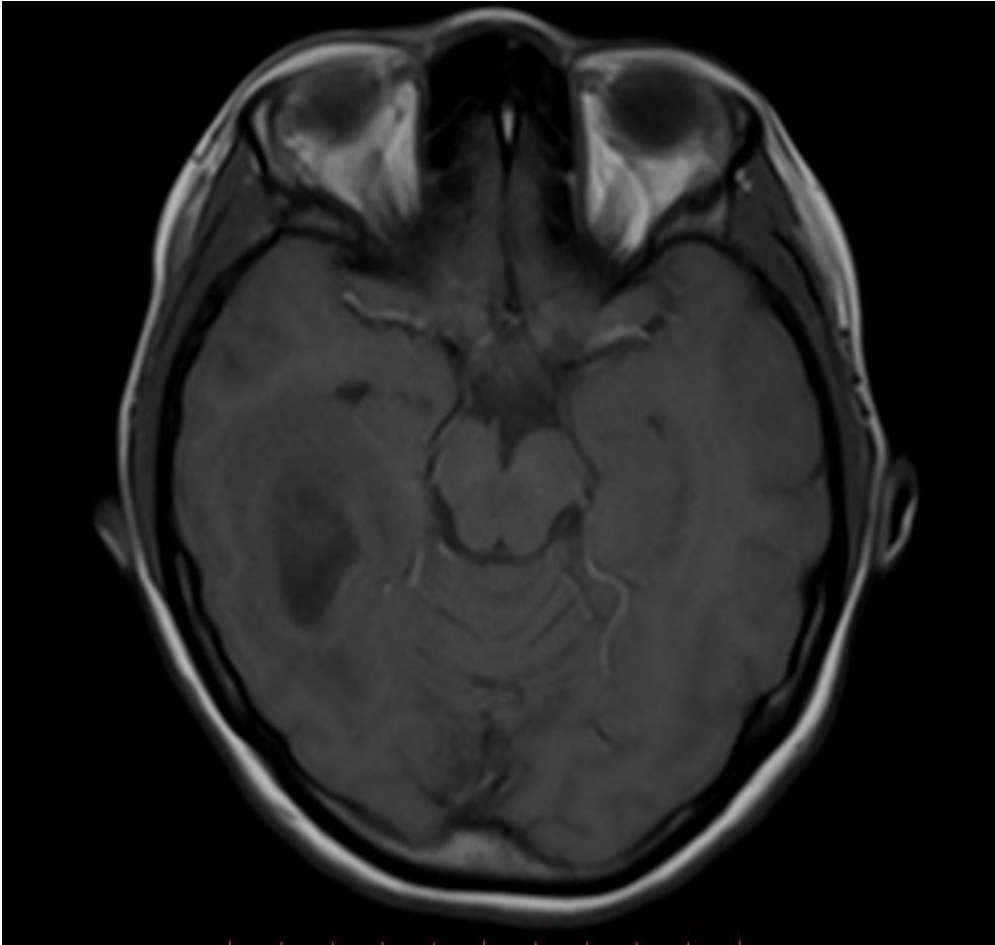
d



Description: T2* GRE shows the capsule with hypointense outer rim and hyperintense inner rim (dual rim sign). **Origin:** Department of radiology, Edgardo Rebagliati Martins National Hospital, Lima, Peru.

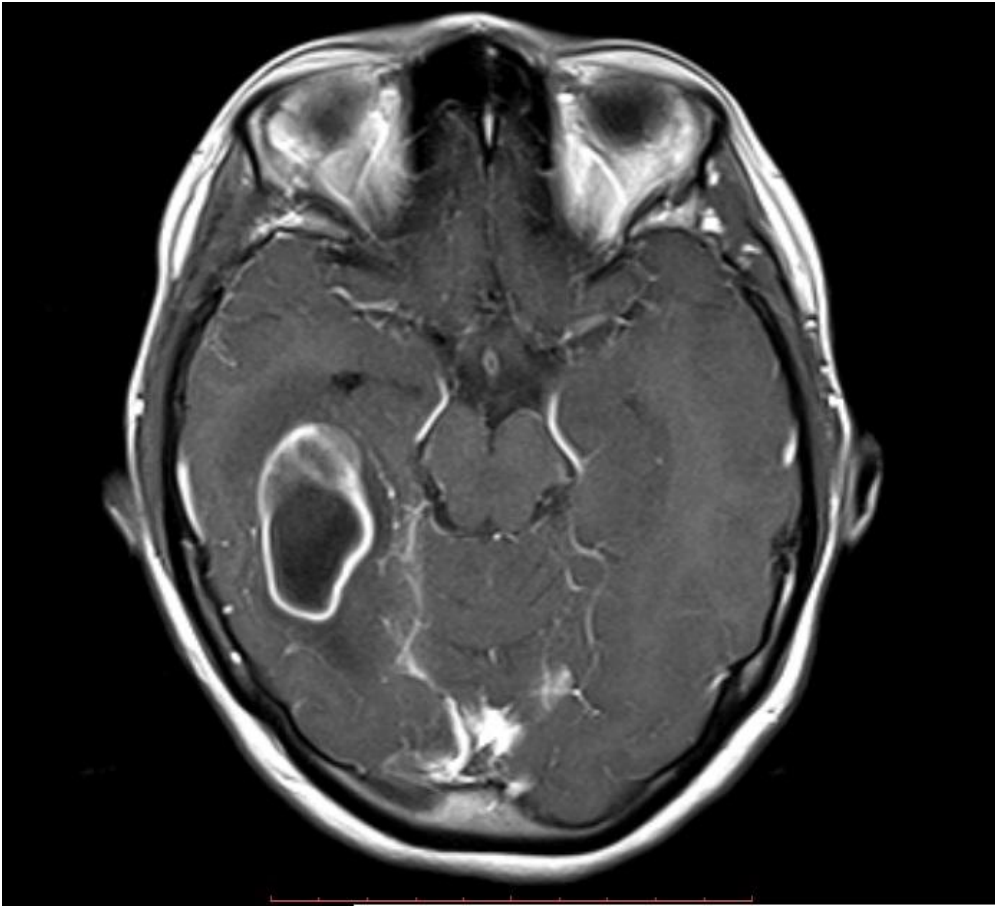
Figure 4

a



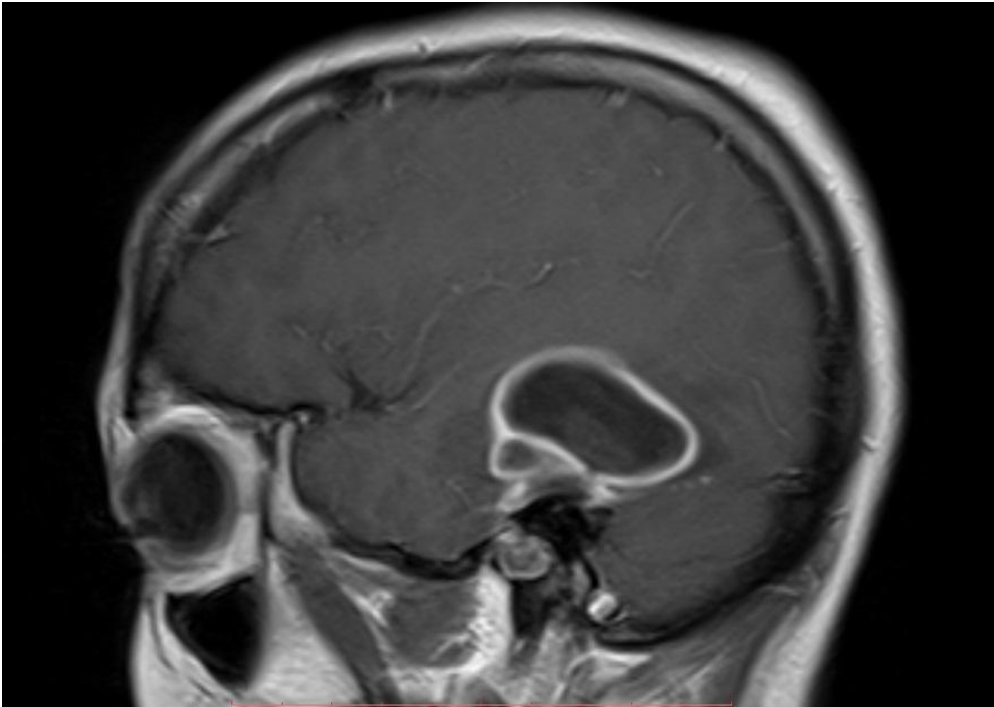
Description: Well-defined lesion with hypointense center and isointense rim on T1WI. **Origin:** Department of radiology, Edgardo Rebagliati Martins National Hospital, Lima, Peru.

b



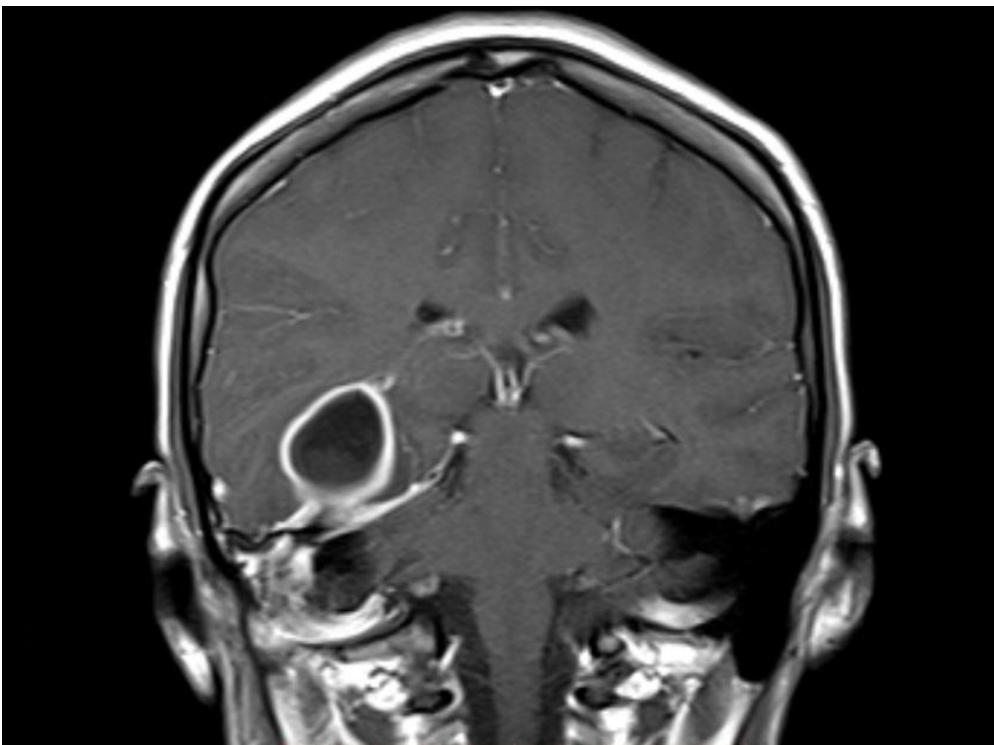
Description: Axial Gd-enhanced T1WI demonstrates a complete peripheral ring-enhancing lesion in the temporal lobe. **Origin:** Department of radiology, Edgardo Rebagliati Martins National Hospital, Lima, Peru.

c



Description: Sagittal Gd-enhanced T1WI demonstrates a complete peripheral ring-enhancing lesion in the temporal lobe. **Origin:** Department of radiology, Edgardo Rebagliati Martins National Hospital, Lima, Peru.

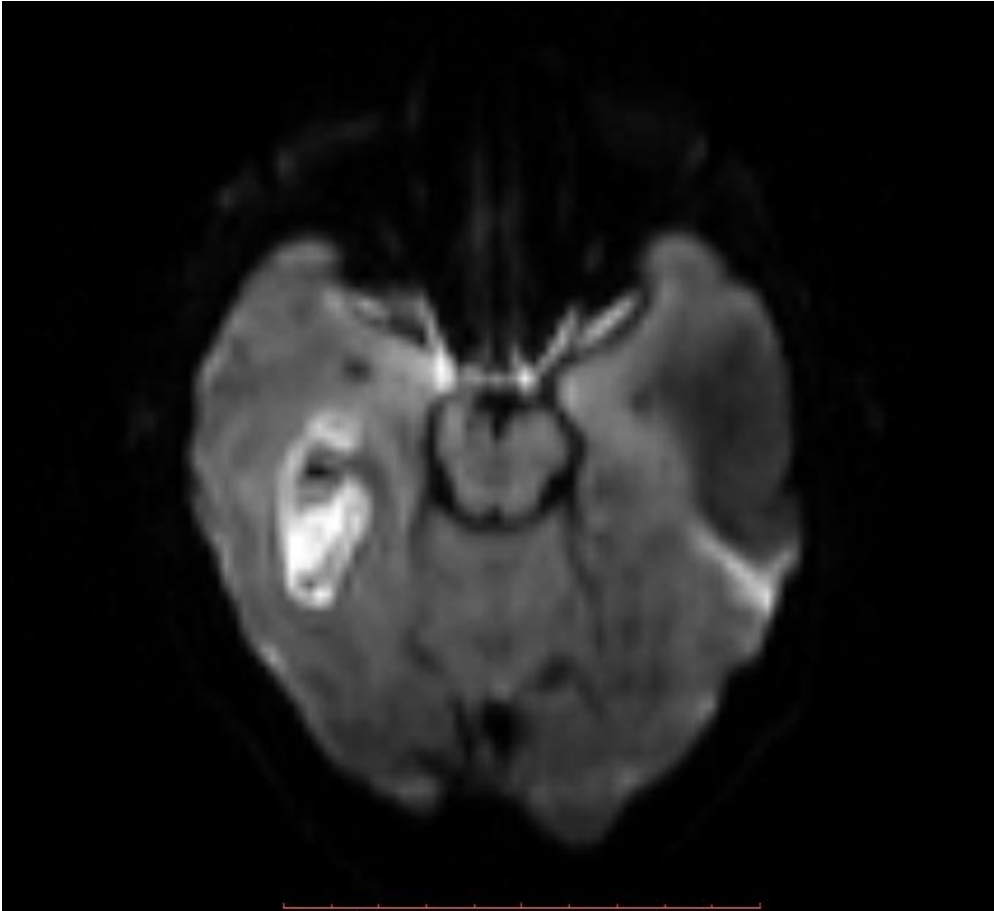
d



Description: Coronal Gd-enhanced T1WI demonstrates a complete peripheral ring-enhancing lesion, as well as thickening and enhancement of ipsilateral tentorium. **Origin:** Department of radiology, Edgardo Rebagliati Martins National Hospital, Lima, Peru.

Figure 5

a



Description: The center of the lesion shows high signal on DWI and low signal on ADC map (not shown), which demonstrates diffusion restriction. **Origin:** Department of radiology, Edgardo Rebagliati Martins National Hospital, Lima, Peru.