Case 18845

Eurorad

Paediatric brain metastasis from pelvic rhabdomyosarcoma mimicking encephalitis

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Section: Paediatric radiology
Area of Interest: Neuroradiology brain Paediatric
Imaging Technique: CT
Imaging Technique: MR
Case Type: Clinical Case
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Patient: 12 years, female

Clinical History:

A 12-year-old girl with pleomorphic pelvic rhabdomyosarcoma (Figures 1a, 1b, 1c, and 1d), diagnosed one year ago, was admitted to the paediatric emergency department with dysarthria, agitation, right arm numbness, eye deviation, and a focal seizure. She had undergone surgery and radiotherapy six months ago, and her chemotherapy was ongoing. A PET-CT performed 40 days prior showed no metabolic activity in the tumour region and no evidence of metastasis. On examination, she had stable vital signs, transient fever, no meningeal sign, alongside neurologic findings of dysarthria and left-sided weakness.

Imaging Findings:

Initial head CT and MR revealed cerebral sulcal effacement and cortical diffusion restriction in the left parietotemporal lobe. A subsequent MR scan showed a millimetric cystic lesion with vascularised walls, perilesional vasogenic oedema, and overlying leptomeningeal enhancement (Figures 2a, 2b, 2c, and 2d). These findings suggested cerebritis or a possible abscess. Blood tests revealed elevated C-reactive protein (11.3 mg/L), with normal complete blood count and cerebrospinal fluid parameters. The latter was negative for infectious or malignant cells, including *Toxoplasma gondii*.

She was hospitalised and treated empirically with antibiotics and antivirals despite inconclusive infection markers. Her symptoms improved, but a follow-up MR study after two weeks revealed significant progression, including worsening diffusion restriction, meningeal enhancement, cortical thickening, a 5 mm subfalcine shift, and compression of the left lateral ventricle (Figures 3a, 3b, and 3c). Brain metastasis was suspected and confirmed on biopsy via left frontoparietal craniotomy.

Discussion:

The diagnosis of brain metastasis in paediatric rhabdomyosarcoma (RMS) is challenging in case of atypical presentations; therefore, MR could guide appropriate management strategies. To our knowledge, this is the first reported case of cerebral metastasis from rhabdomyosarcoma resembling encephalitis in the literature.

The most comprehensive studies on brain metastasis of RMS were conducted by Moreira et al. [3] and De et al. [1], involving 59 and 23 patients, respectively. These studies found leptomeningeal enhancement to be the most common pattern. However, lesions may also present as haemorrhagic or non-haemorrhagic parenchymal masses [5–7]. Importantly, imaging features of cerebral abscesses can overlap with those of primary or secondary neoplasms. Accompanying cortical gyriform diffusion restriction, commonly seen in infections, can further complicate the differentiation. While clinical and laboratory parameters, along with the response to treatment, can aid in diagnosis, these features may overlap.

In our case, initial imaging with CT and MR revealed sulcal effacement and cortical diffusion restriction in the left parietal lobe, findings often associated with encephalitis. A subsequent MR examination demonstrated a cystic lesion with high signal intensity on the wall after contrast injection, perilesional vasogenic oedema, and leptomeningeal enhancement. These features pointed towards an infectious aetiology. Although in oncology, a metastatic lesion is typically the top differential in a patient with cancer rather than infection, the patient's symptoms improved after being treated empirically with antibiotics and antivirals. Due to this, the diagnosis of an infectious aetiology became stronger.

A follow-up study performed 2 weeks later revealed increased cortical swelling with associated high cellularity, meningeal enhancement, and subfalcine shift. Therefore, a biopsy was carried out; this was consistent with infiltrative neoplastic tissue. This case underscores the importance of considering metastatic disease in oncological patients presenting with neurological symptoms but not associated signs of infection.

Diffusion restriction on MR is indicative of high cellularity within a lesion, as seen in cancer due to densely packed neoplastic cells restricting water molecule movement, leading to hyperintensity on DWI and hypointensity on apparent diffusion coefficient (ADC) maps, spectroscopy and perfusion, which are valuable techniques for differentiating infectious from neoplastic lesions. However, these were not acquired in our patient due to her clinical improvement after starting antibiotherapy. Additionally, PET-CT was not repeated as it had been performed 40 days earlier and was negative for metastases, with no activity observed in the primary tumour [8,9].

This case highlights the diagnostic complexity and the necessity of comprehensive radiological assessments in children with aggressive extracranial cancer and unusual neurological manifestations. Early recognition of atypical brain metastases can lead to timely diagnosis, tailored treatment plans, and potentially improved outcomes.

Differential Diagnosis List: Encephalitis, Cerebral abscess, Primary brain tumour, Brain metastasis from rhabdomyosarcoma

Final Diagnosis: Brain metastasis from rhabdomyosarcoma

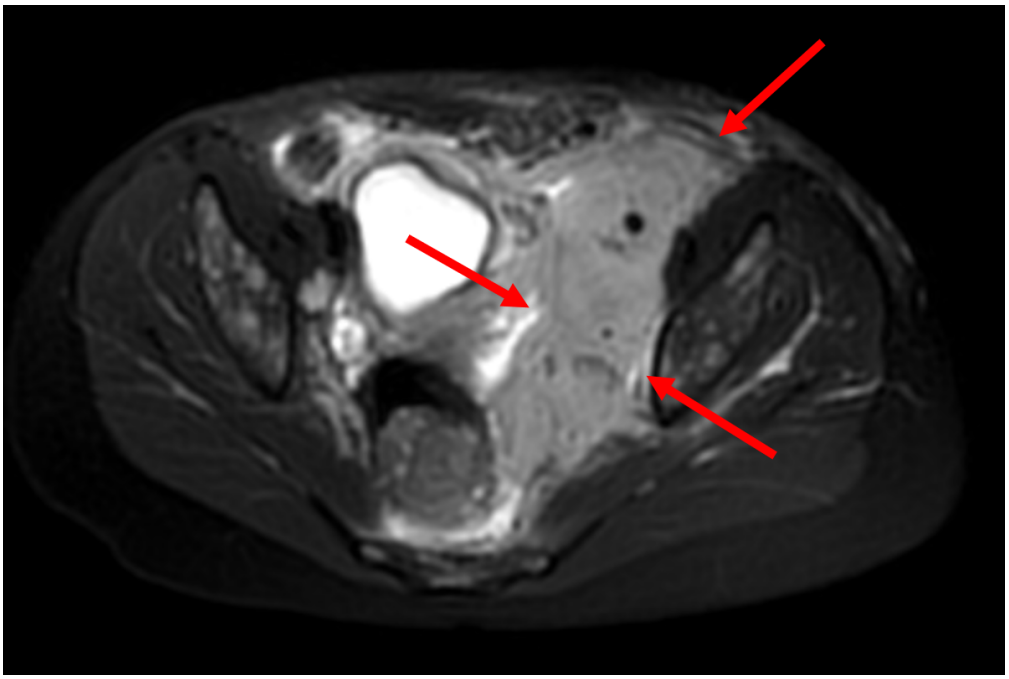
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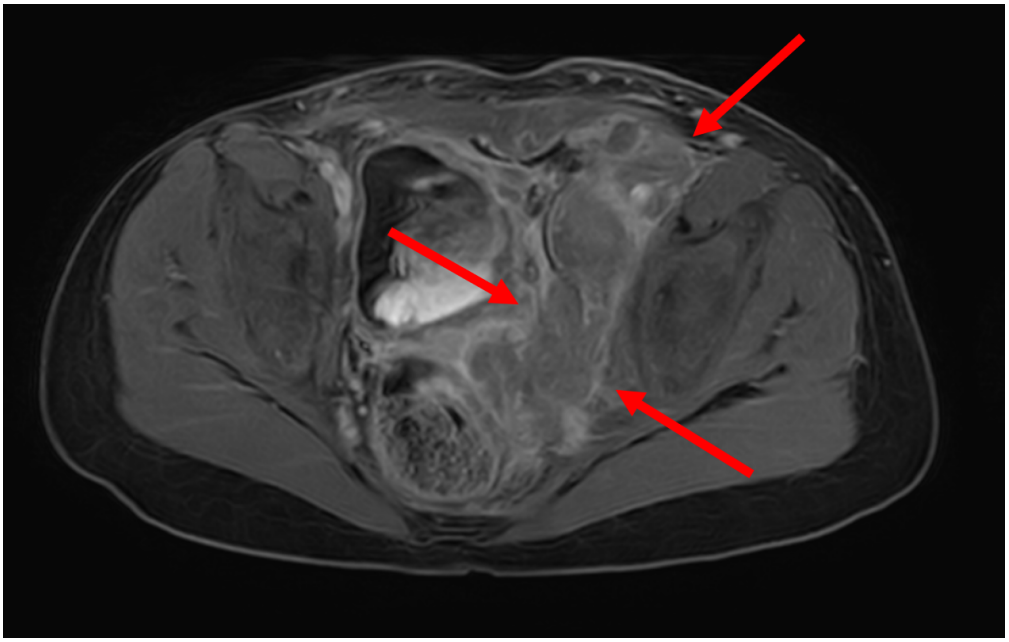
Figure 1

a



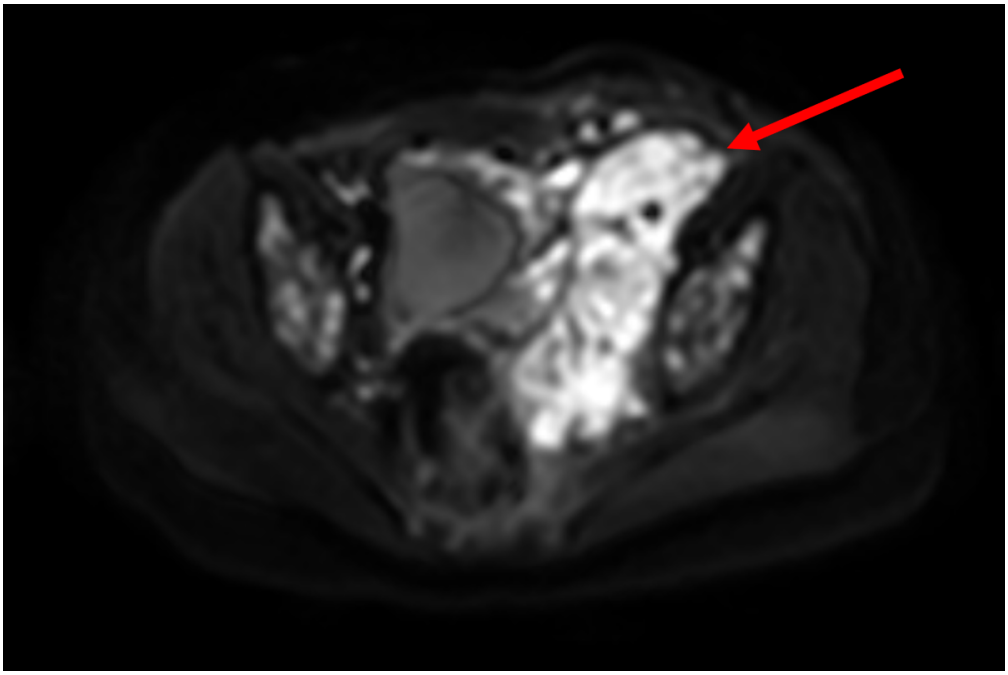
Description: T2-weighted image showing a hyperintense, infiltrative amorphous rhabdomyosarcoma in the left pelvis (red arrows). **Origin:** © Department of Radiology, Dokuz Eylül University Research and Application Hospital, ?zmir, Türkiye, 2024

b



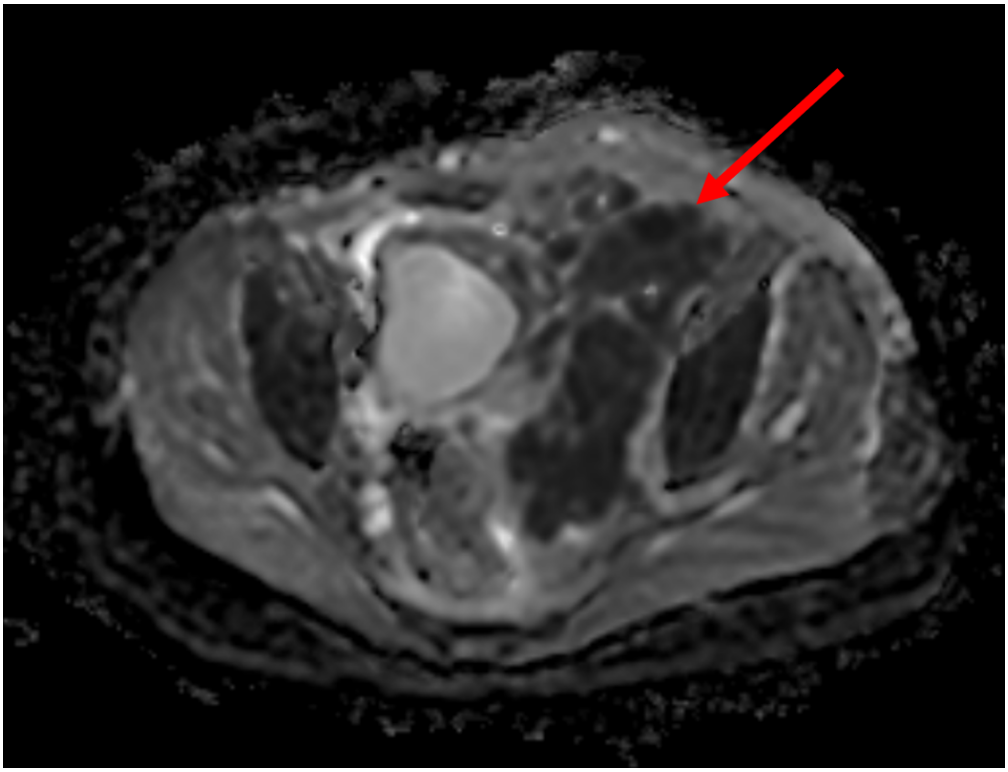
Description: Post-contrast T1-weighted image demonstrating heterogeneous enhancement (red arrows). **Origin:** © Department of Radiology, Dokuz Eylül University Research and Application Hospital, ?zmir, Türkiye, 2024

c



Description: Diffusion-weighted imaging and apparent diffusion coefficient map showing marked diffusion restriction (red arrows). **Origin:** © Department of Radiology, Dokuz Eylül University Research and Application Hospital, ?zmir, Türkiye, 2024

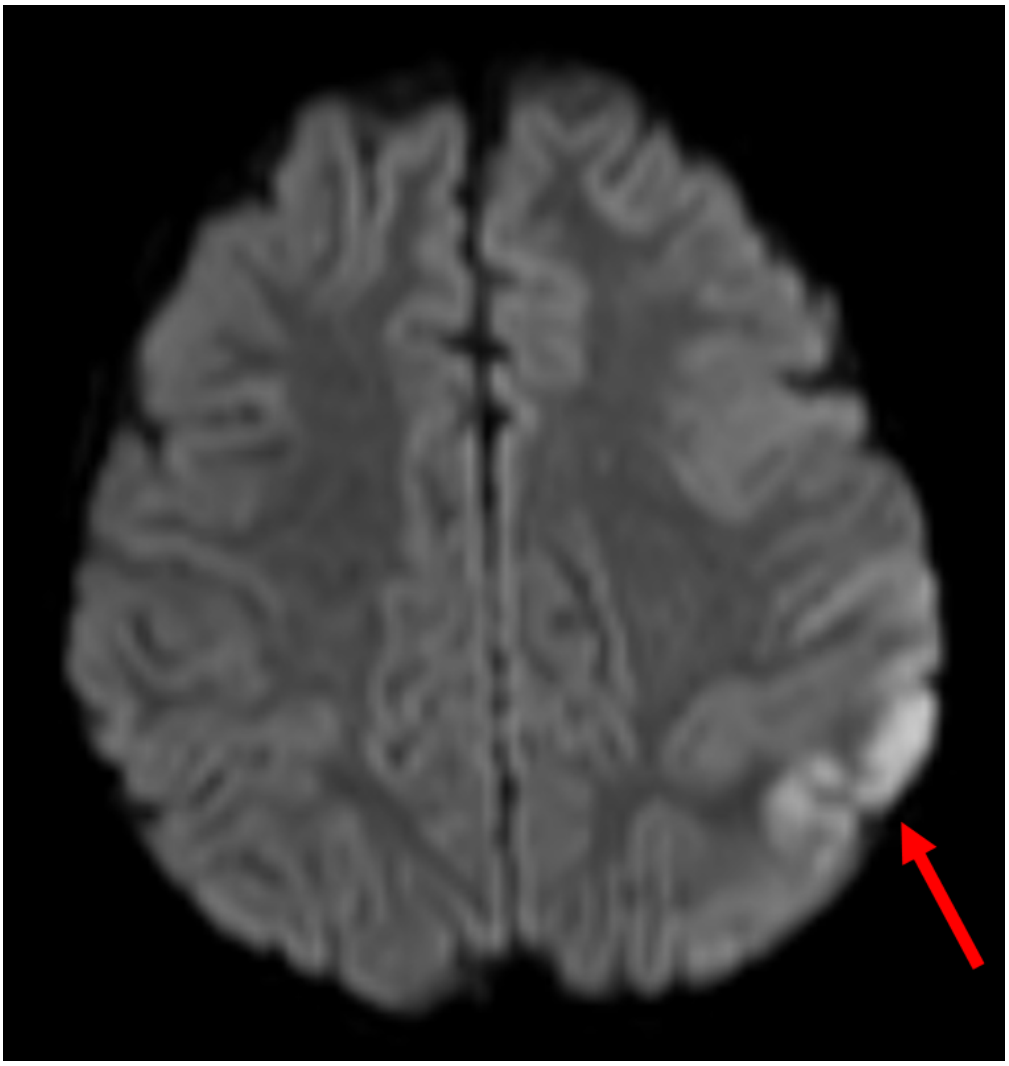
d



Description: Diffusion-weighted imaging and apparent diffusion coefficient map showing marked diffusion restriction (red arrows). **Origin:** © Department of Radiology, Dokuz Eylül University Research and Application Hospital, ?zmir, Türkiye, 2024

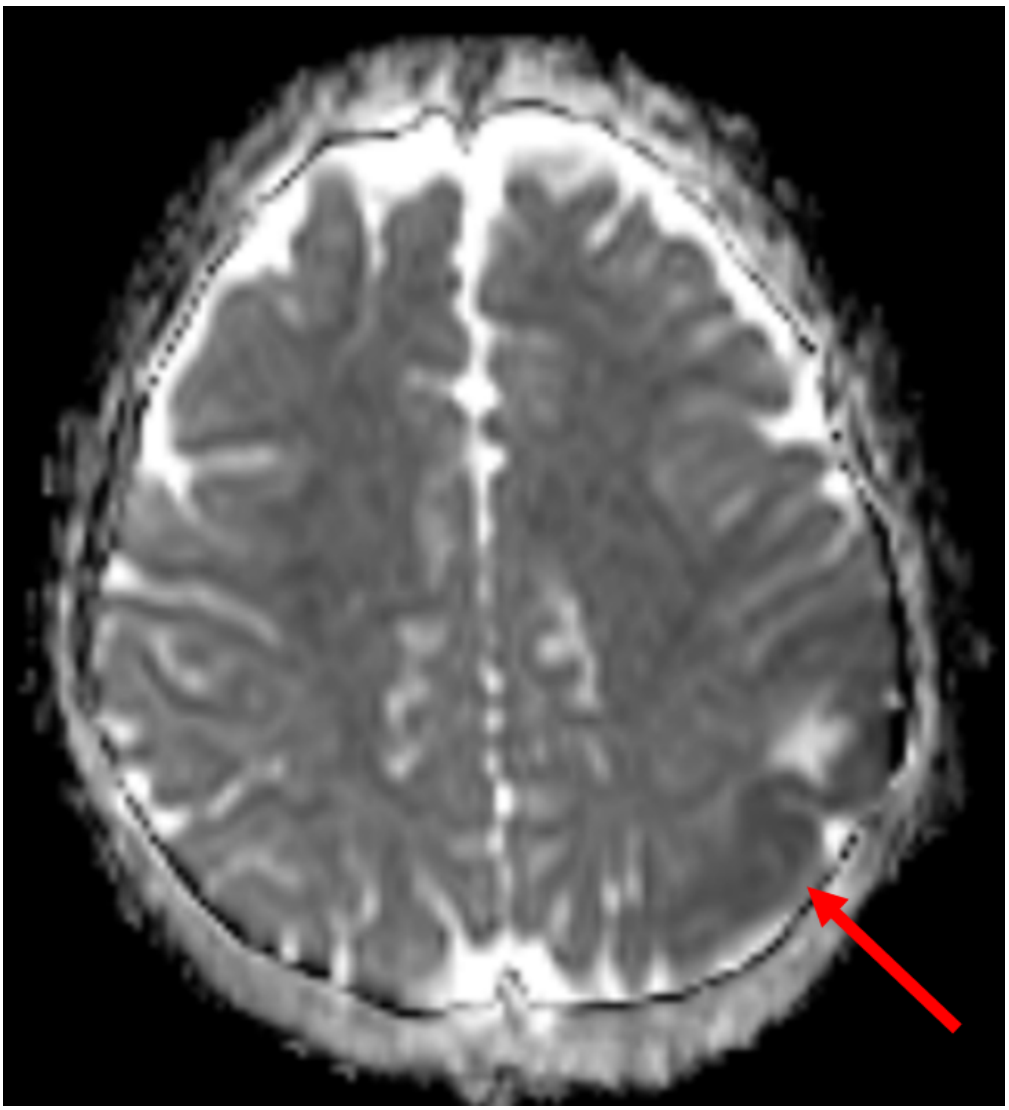
Figure 2

a



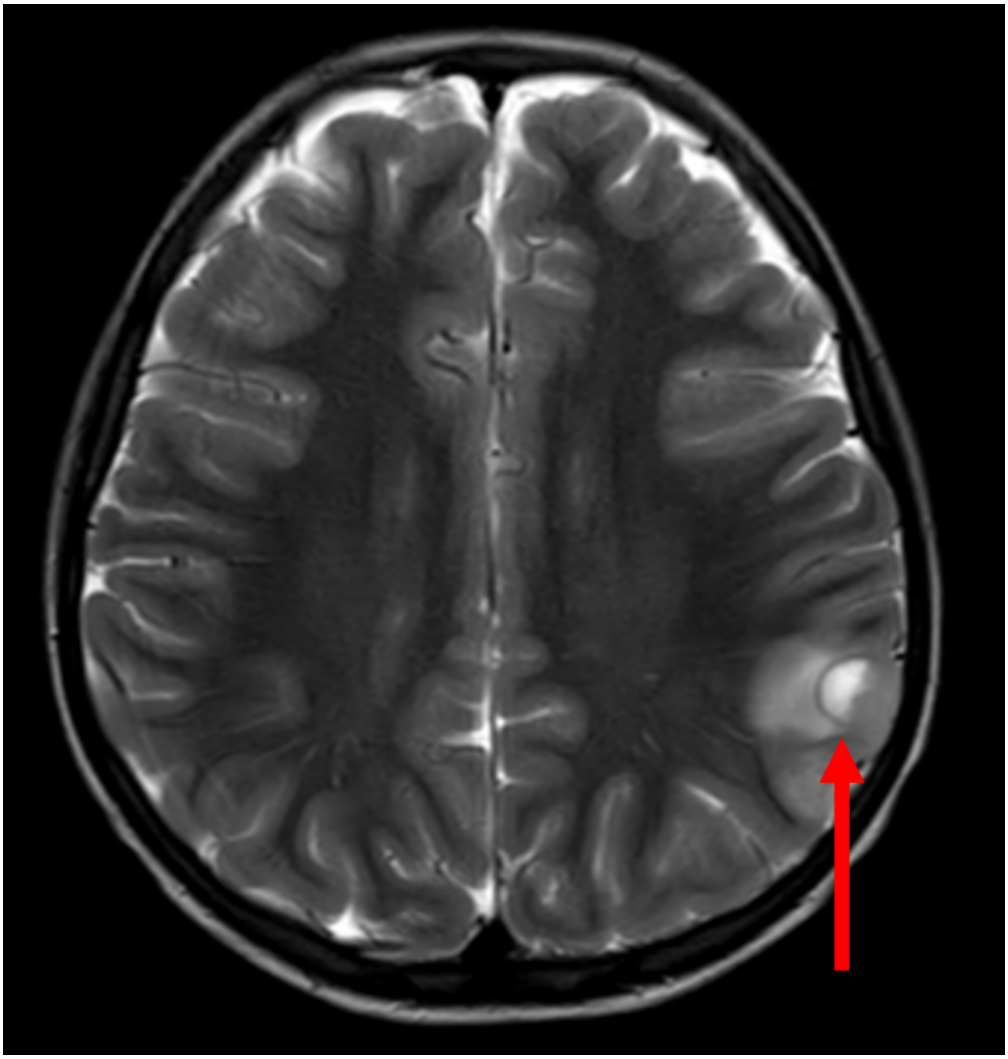
Description: Diffusion-weighted imaging and apparent diffusion coefficient map showing sulcal effacement and cortical diffusion restriction in the left parietal lobe (red arrows). **Origin:** © Department of Radiology, Dokuz Eylül University Research and Application Hospital, ?zmir, Türkiye, 2024

b



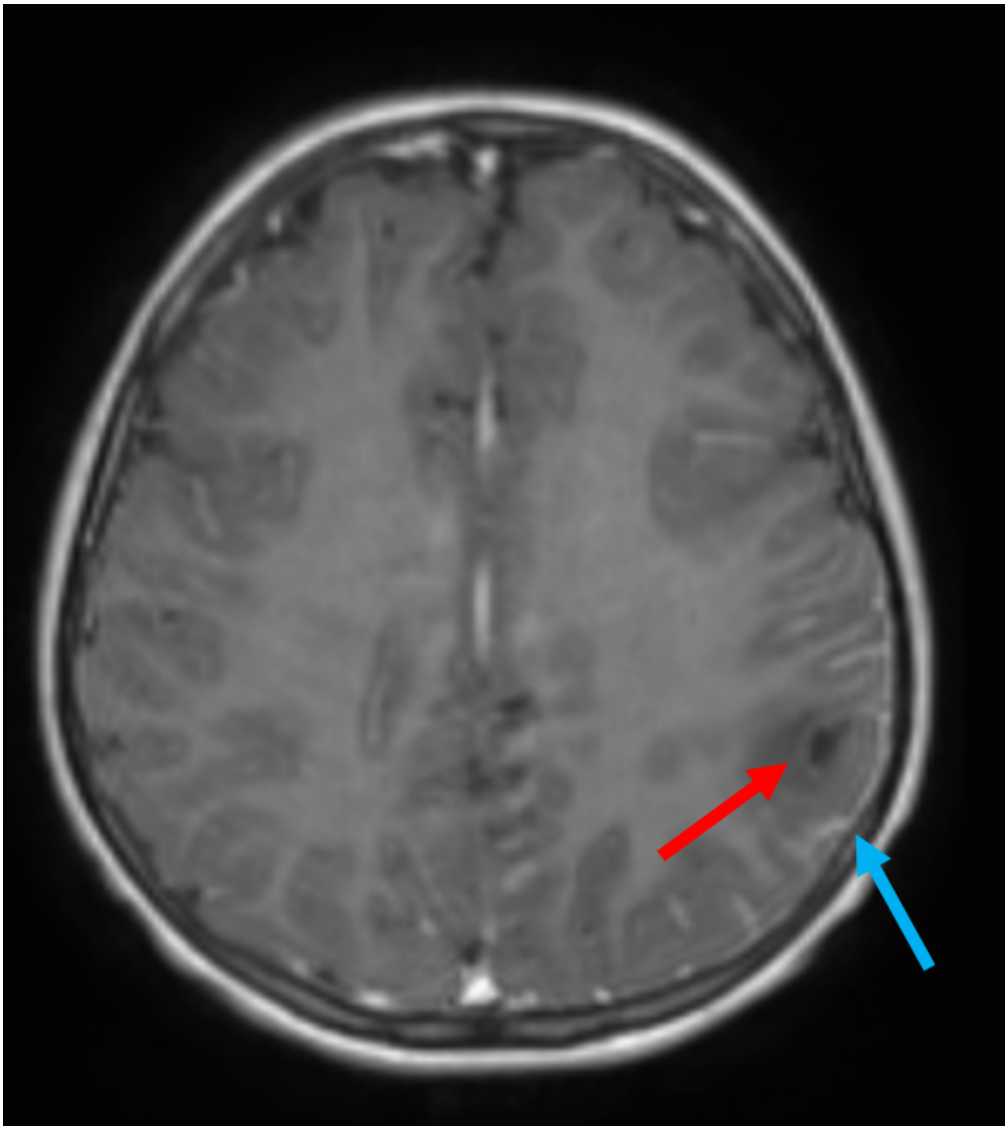
Description: Diffusion-weighted imaging and apparent diffusion coefficient map showing sulcal effacement and cortical diffusion restriction in the left parietal lobe (red arrows). **Origin:** © Department of Radiology, Dokuz Eylül University Research and Application Hospital, ?zmir, Türkiye, 2024

c



Description: T2-weighted image revealing millimetric cystic lesion with perilesional vasogenic oedema in the left parietal lobe. **Origin:** © Department of Radiology, Dokuz Eylül University Research and Application Hospital, ?zmir, Türkiye, 2024

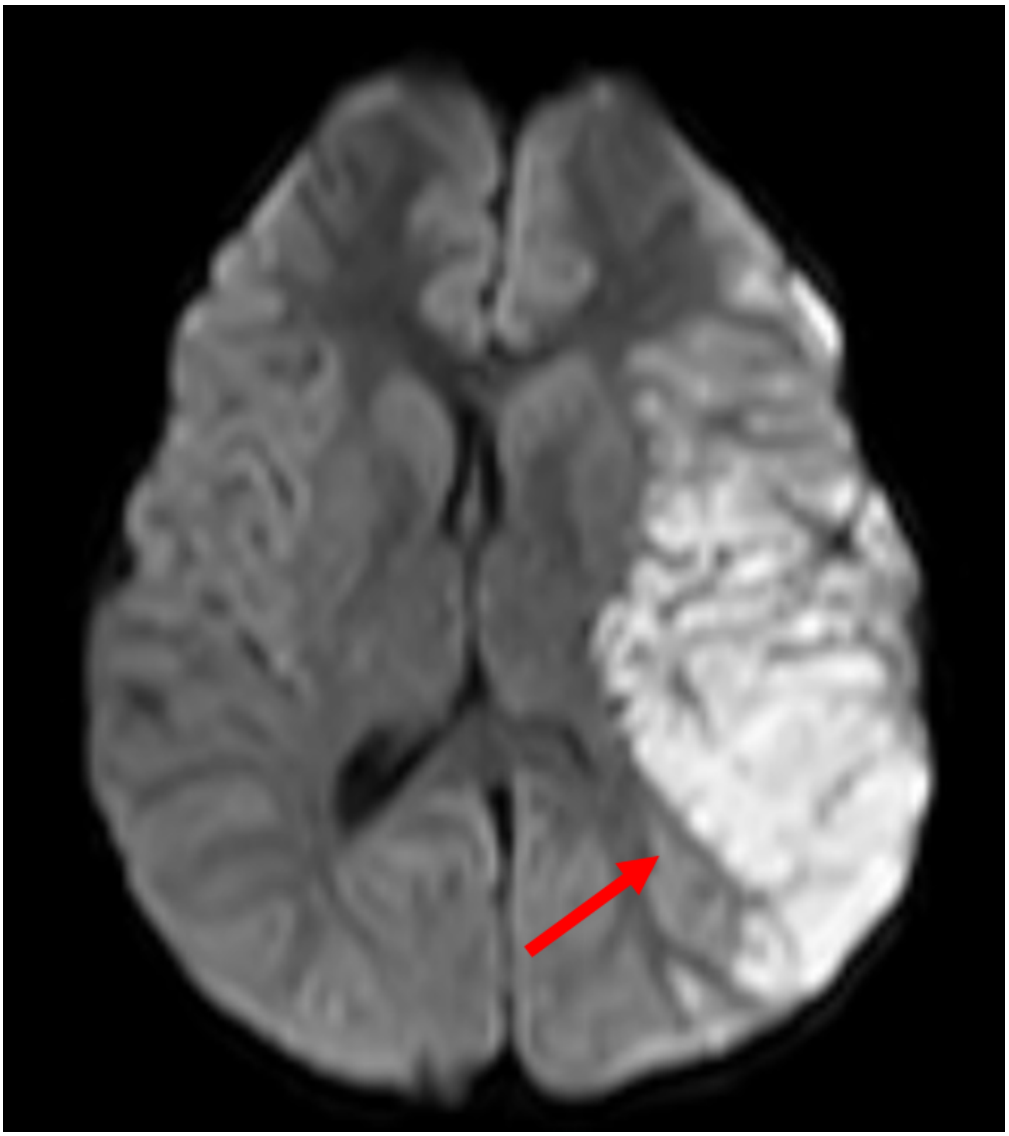
d



Description: Post-contrast T1-weighted image displaying wall with high signal intensity on the wall of the cystic lesion after contrast injection (red arrow) and overlying leptomeningeal enhancement (blue arrow) at the left parietotemporal lobe. **Origin:** © Department of Radiology, Dokuz Eylül University Research and Application Hospital, ?zmir, Türkiye, 2024

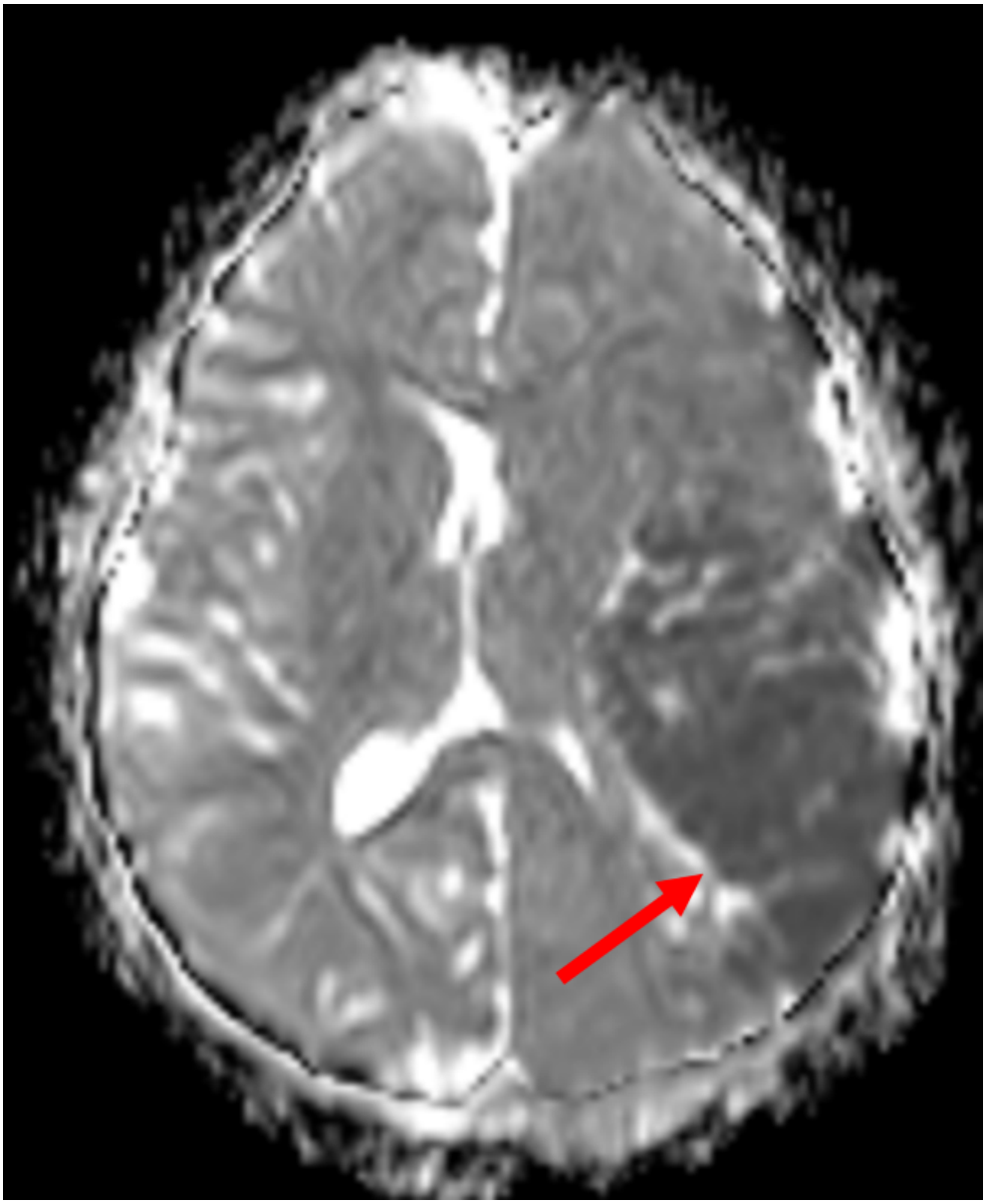
Figure 3

a



Description: Diffusion-weighted imaging and apparent diffusion coefficient map demonstrating more extensive left parietotemporal diffusion restriction (red arrows). **Origin:** © Department of Radiology, Dokuz Eylül University Research and Application Hospital, ?zmir, Türkiye, 2024

b



Description: Diffusion-weighted imaging and apparent diffusion coefficient map demonstrating more extensive left parietotemporal diffusion restriction (red arrows). **Origin:** © Department of Radiology, Dokuz Eylül University Research and Application Hospital, ?zmir, Türkiye, 2024

c



Description: FLAIR image revealing marked swelling and oedema of the cerebral cortex in the left parietotemporal lobe, with effacement of the sulci (red arrow). **Origin:** © Department of Radiology, Dokuz Eylül University Research and Application Hospital, ?zmir, Türkiye, 2024