

## Multimodality Imaging of a Retrocerebellar Abscess in Early Infancy Complicated by Acute Hydrocephalus and Ipsilateral Thalamic Infarction

### Case Report

Mehmet Salih Karaca<sup>1</sup>, Ali Oğuz<sup>1</sup>, Tarık Sağlam<sup>1</sup>, Sadullah Şimşek<sup>1</sup>

1. Gazi Yaşargil Training and Research Hospital, Department of Radiology, Diyarbakır, Türkiye

### ABSTRACT

**Background:** Brain abscesses are uncommon in early infancy, and posterior fossa abscesses are particularly rare. In this age group, clinical findings may be nonspecific, and imaging plays a central role in establishing the diagnosis and characterizing complications such as obstructive hydrocephalus and secondary ischemic injury. We report the imaging features of a *Staphylococcus aureus* retrocerebellar abscess presenting with acute hydrocephalus and ipsilateral thalamic infarction in a 6-week-old infant.

**Case presentation:** A 6-week-old female infant presented with fever, vomiting, irritability, and a tense anterior fontanel. Transfontanel ultrasonography demonstrated marked hydrocephalus, a hyperechoic lesion in the left thalamus, and a retrocerebellar loculated collection. CT and contrast-enhanced MRI confirmed a retrocerebellar abscess compressing the fourth ventricle, with marked diffusion restriction with low ADC values and peripheral rim enhancement. Diffusion-weighted MRI also demonstrated an acute ipsilateral thalamic infarction, attributed to acute obstructive hydrocephalus. Due to ventricular obstruction, urgent external ventricular drainage was performed for CSF diversion, followed by surgical abscess drainage via an occipital approach. Culture of the abscess material grew *Staphylococcus aureus*. The patient improved clinically with targeted antimicrobial therapy, and follow-up imaging showed regression of hydrocephalus.

**Conclusion:** In infants presenting with nonspecific symptoms and signs of raised intracranial pressure, early neuroimaging is essential. Multimodality imaging provides key diagnostic clues for posterior fossa abscess. Diffusion-weighted MRI is particularly valuable for confirming abscess and detecting associated ischemic injury, thereby influencing the urgency and scope of management planning.

**Keywords:** Brain abscess; posterior fossa; diffusion-weighted imaging; hydrocephalus; thalamic infarction; *Staphylococcus aureus*

### Introduction

Brain abscesses (BAs) are uncommon in the pediatric population but represent serious infections requiring prompt diagnosis and

treatment due to their high morbidity and mortality. While the incidence is approximately 8% in developing countries, it is reported to be around 1–2% in Western nations [1]. In children, brain abscesses

most commonly arise from the spread of local infections such as dental, sinus, or otologic sources. In neonates, however, BAs often occur secondary to meningitis or hematogenous dissemination from a distant infectious focus. In a subset of cases, no identifiable primary source is detected, and these cases are classified as cryptogenic.

In early infancy, the most frequently reported causative microorganisms are *Citrobacter* and *Proteus* species [2]. Although *Staphylococcus aureus* is a major cause of brain abscesses in older children and adults, it has been reported only rarely during the first months of life [3]. Pediatric brain abscesses predominantly occur in the supratentorial region; in one large pediatric series, only 8.1% were located in the posterior fossa [4]. Posterior fossa abscesses, particularly those involving the cerebellum, may exert mass effect on the fourth ventricle, resulting in acute obstructive hydrocephalus. In neonates and young infants, abscesses may reach a significant size before clinical symptoms become apparent. Therefore, early neuroimaging is crucial for timely diagnosis and optimal management.

In early infancy, prompt bedside transfontanel ultrasonography can provide an immediate, noninvasive assessment of ventricular dilatation and associated parenchymal abnormalities, facilitating early recognition and timely escalation to cross-sectional imaging [5]. In line with current guidance on brain abscess management, early cross-sectional imaging is recommended when an abscess is suspected, with MRI—particularly diffusion-weighted imaging and ADC mapping—emphasized for confirming

purulent collections and delineating associated complications (including ischemic injury) that may influence urgent management decisions[6].

Here, we present the characteristic imaging findings of a rare *Staphylococcus aureus* retrocerebellar abscess in early infancy causing acute obstructive hydrocephalus and an associated ipsilateral thalamic infarction in a 6-week-old infant.

### **Case Report**

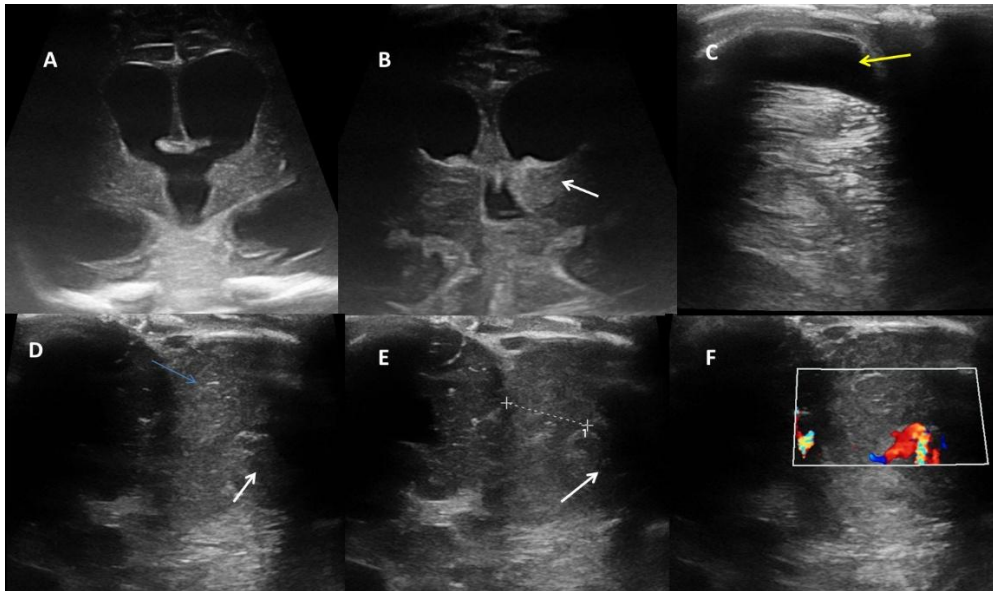
A 6-week-old female infant presented with fever, vomiting, and irritability. Laboratory tests showed elevated inflammatory markers (CRP 135 mg/L; WBC  $13.95 \times 10^9/L$ ). On examination, the anterior fontanel was markedly tense.

Transfontanel ultrasonography demonstrated marked dilatation of the lateral and third ventricles. A 13-mm hyperechoic focus was noted in the left thalamus. In addition, a retrocerebellar loculated collection extending toward the cerebellopontine region measured up to 15 mm in thickness. The cerebellar parenchyma appeared heterogeneous with increased vascularity (Figure 1).

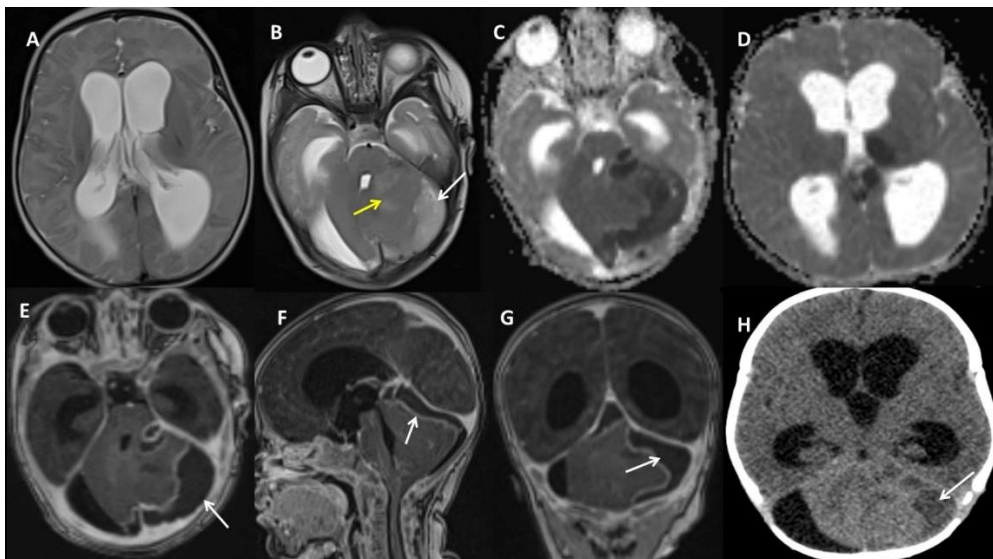
Non-contrast head CT revealed a hypodense lesion in the left retrocerebellar region causing mass effect on the cerebellum and compression of the fourth ventricle. Contrast-enhanced MRI demonstrated a retrocerebellar collection bounded superiorly by the tentorium, partially encasing the left cerebellar hemisphere and extending to the cerebellopontine angle. The lesion was heterogeneously hyperintense on T2-weighted images and showed peripheral rim enhancement.

Diffusion-weighted imaging showed marked diffusion restriction with low ADC values, consistent with an abscess. Perilesional T2 hyperintensity and focal enhancement in the left cerebellar hemisphere suggested accompanying

cerebellitis. DWI also demonstrated diffusion restriction in the left thalamus, compatible with acute infarction, attributed to acute obstructive hydrocephalus (Figure 2).



**Figure 1.** Ultrasound images demonstrating hydrocephalic dilatation of the lateral and third ventricles (A). A 1-cm hyperechoic lesion in the left thalamus (arrow) (B). A right retrocerebellar arachnoid cyst (yellow arrow) (C). Heterogeneous hypoechoic fluid loculation in the left retrocerebellar region (blue arrow) (D, E). Posterior displacement of the cerebellum (white arrow) (D, E). Increased vascularity in the left cerebellar hemisphere on Doppler ultrasonography (F).



**Figure 2.** Axial T2-weighted MRI showing hydrocephalus (A). Heterogeneous hyperintense retrocerebellar lesion (white arrow) with adjacent cerebellar signal alterations (yellow arrow) (B). Diffusion restriction in the retrocerebellar region and left thalamus (C, D). Axial, sagittal, and coronal post-contrast images showing abscess extension (E-G). Non-contrast CT demonstrates the retrocerebellar abscess (H).

Empiric antibiotics were initiated. Due to obstructive hydrocephalus, urgent CSF diversion with external ventricular drainage was performed, followed by surgical drainage of the abscess via a left occipital approach. Culture of the abscess material grew *Staphylococcus aureus*. Blood cultures were negative and no primary infectious focus was identified, suggesting a cryptogenic origin. Targeted antimicrobial therapy was continued for four weeks. On follow-up, ventricular dilatation regressed and inflammatory markers decreased, with clinical improvement. The patient was discharged with stable neurological findings and scheduled for outpatient follow-up.

### Discussions

Posterior fossa abscesses have limited space for expansion; consequently, even relatively small lesions may compress the fourth ventricle and lead to rapid-onset obstructive hydrocephalus, which has been reported in approximately 30–35% of pediatric posterior fossa abscesses [7]. In our patient, the acute left thalamic infarction likely reflected the hemodynamic consequences of abrupt ventricular obstruction and raised intracranial pressure due to posterior fossa mass effect. Although thalamic/posterior circulation infarctions secondary to acute hydrocephalus are rarely reported, proposed mechanisms include venous congestion, arterial compression, and reduced cerebral perfusion pressure. Importantly, diffusion-weighted MRI with ADC mapping was pivotal not only for confirming abscess (marked diffusion restriction with low ADC values) but also for detecting the associated ischemic injury, thereby helping to define the urgency and scope of management.

Following the imaging-based diagnosis, urgent CSF diversion with external ventricular drainage and surgical drainage of the retrocerebellar collection via an occipital approach were performed. Microbiological analysis of the abscess material then established the etiologic diagnosis. Abscess culture in our case grew *Staphylococcus aureus*, an uncommon pathogen in early infancy. Cryptogenic abscesses account for 15–22% of pediatric cases [8]. Reports of *S. aureus* brain abscesses in the neonatal period are scarce but highlight the pathogen's potential to cause severe central nervous system infections even in the earliest months of life [3].

Brain abscess remains associated with substantial morbidity and mortality despite advances in neuroimaging and management. Historically, mortality decreased from approximately 30% to around 10% after the widespread adoption of CT [3]. Contemporary data nevertheless indicate clinically meaningful short- and mid-term mortality, with reported 30-day, 90-day, and 1-year mortality rates of 7%, 13%, and 20%, respectively, and sequelae occurring in up to ~70% of survivors, most commonly neurological deficits and epilepsy [6, 9, 10, 11]. In our case, MRI—particularly diffusion-weighted imaging with ADC mapping—played a key role in rapid lesion characterization and complication assessment, thereby supporting timely multidisciplinary decision-making.

Although controlled studies on optimal treatment in infants are limited, clinical experience supports a combined approach of targeted antimicrobial therapy and timely

neurosurgical intervention when indicated. In our patient, multimodality imaging was integral to management: ultrasonography and CT rapidly demonstrated acute ventricular obstruction, while contrast-enhanced MRI with diffusion-weighted imaging and ADC mapping confirmed abscess and delineated the extent of posterior fossa mass effect and associated ischemic injury. These imaging findings directly informed the urgency of CSF diversion with external ventricular drainage and subsequent occipital surgical drainage, resulting in marked clinical improvement. Nevertheless, long-term prognosis may remain guarded, as infants with brain abscess can develop later neurodevelopmental sequelae, including cognitive delay and learning difficulties [12]. Accordingly, structured long-term neurological assessment and interval follow-up imaging are recommended to document resolution and monitor for evolving sequelae.

### **Conclusion**

Retrocerebellar abscess in early infancy is rare but can rapidly precipitate fourth ventricular obstruction, acute hydrocephalus, and secondary ischemic injury. In infants presenting with nonspecific systemic symptoms and signs of raised intracranial pressure, early neuroimaging should be pursued without delay. Transfontanel ultrasonography can provide an immediate bedside assessment of hydrocephalus and associated parenchymal abnormalities, whereas MRI—particularly diffusion-weighted imaging with ADC mapping—is pivotal for confirming the diagnosis of abscess and for identifying concomitant infarction that may

otherwise be overlooked. Recognition of these imaging findings is critical to guide urgent multidisciplinary management and may improve short-term stabilization; however, long-term clinical and radiological follow-up remains essential given the risk of subsequent neurodevelopmental sequelae.

### **Acknowledge**


**Ethics approval and consent to participate:** Not applicable. This is a single case report. Institutional requirements were followed, and all procedures were conducted in accordance with the Declaration of Helsinki.

**Consent for publication:** Written informed consent was obtained from the patient's legal guardian for publication of this case report and accompanying images.

**Availability of data and materials:** All data generated or analyzed during this study are included in this published article. Further details are available from the corresponding author upon reasonable request.

**Competing interests:** The authors declare that they have no competing interests.

**Funding:** The authors received no specific funding for this work.

 **Cite:** Karaca, M. S., Oğuz, A., Sağlam, T., & Şimşek, S. (2026). Multimodality Imaging of a Retrocerebellar Abscess in Early Infancy Complicated by Acute Hydrocephalus and Ipsilateral Thalamic Infarction. *Acta Medica Young Doctors*, 2(3), 51–56.

1. Muzumdar D, Jhawar S, Goel A. Brain abscess: an overview. *Int J Surg.* 2011;9(2):136-44. doi: 10.1016/j.ijisu.2010.11.005.
2. El-Khashab M, Zonouzi TH, Naghani IM, Nejat F. Cerebellar staphylococcal abscess accompanied with high alfa-fetoprotein in a young infant. *Iran J Pediatr.* 2012 Dec;22(4):539-42. PMID: 23431058; PMCID: PMC3533158.
3. Vartzelis G, Theodoridou M, Daikos GL, Dellagrammaticas H, Syriopoulou VP. Brain abscesses complicating *Staphylococcus aureus* sepsis in a premature infant. *Infection.* 2005 Feb;33(1):36-8. doi: 10.1007/s15010-005-4062-z.
4. Gilard V, Beccaria K, Hartley JC, Blanot S, Marqué S, Bourgeois M, Puget S, Thompson D, Zerah M, Tisdall M. Brain abscess in children, a two-centre audit: outcomes and controversies. *Arch Dis Child.* 2020 Mar;105(3):288-291. doi: 10.1136/archdischild-2018-316730.
5. Licht-van der Stap RG, de Vries LS, Alarcon A, Govaert P, Steggerda SJ; EurUS.Brain group. Cranial ultrasound in neonatal brain infections. *Dev Med Child Neurol.* 2025;67(8):986-1003. doi:10.1111/dmcn.16279
6. Bodilsen J, D'Alessandris QG, Humphreys H, Iro MA, Klein M, Last K et. al. ESCMID Study Group for Infections of the Brain (ESGIB). European society of Clinical Microbiology and Infectious Diseases guidelines on diagnosis and treatment of brain abscess in children and adults. *Clin Microbiol Infect.* 2024 Jan;30(1):66-89. doi: 10.1016/j.cmi.2023.08.016.
7. Agrawal D, Suri A, Mahapatra AK. Primary excision of pediatric posterior fossa abscesses--towards zero mortality? A series of nine cases and review. *Pediatr Neurosurg.* 2003 Feb;38(2):63-7. doi: 10.1159/000068051.
8. Chetty M, Rakhi B, Rachana K, Sujatha S, Srinivasan GM. An Eight Year Clinico-Microbiological Retrospective Study on Brain Abscesses in India. *Microbiol Insights.* 2022 Jun 28;15:11786361221106111. doi: 10.1177/11786361221106111.
9. Laulajainen-Hongisto A, Lempinen L, Färkkilä E, Saat R, Markkola A, Leskinen K et. al. Intracranial abscesses over the last four decades; changes in aetiology, diagnostics, treatment and outcome. *Infect Dis (Lond).* 2016 Apr;48(4):310-316. doi: 10.3109/23744235.2015.1113557.
10. Bodilsen J, Dalager-Pedersen M, van de Beek D, Brouwer MC, Nielsen H. Incidence and mortality of brain abscess in Denmark: a nationwide population-based study. *Clin Microbiol Infect.* 2020 Jan;26(1):95-100. doi: 10.1016/j.cmi.2019.05.016.
11. Helweg-Larsen J, Astradsson A, Richhall H, Erdal J, Laursen A, Brennum J. Pyogenic brain abscess, a 15 year survey. *BMC Infect Dis.* 2012 Nov 30;12:332. doi: 10.1186/1471-2334-12-332.
12. Tsutsumi S, Arai H, Hishii M, Suzuki K, Sato K. A case of neonatal cerebellar abscess. *Childs Nerv Syst.* 2003 Sep;19(9):683-5. doi: 10.1007/s00381-003-0741-1.