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UNLOCKING THE BRAIN'S HIDDEN PARASITE: A RARE CHILDHOOD CASE OF GIANT CEREBRAL HYDATID CYST

Paediatric Radiology

Dr. Prashant Ghogare* Junior Resident Department of Radiodiagnosis, All India Institute of Medical Sciences, Bhopal*Corresponding Author

Dr. Harshvardhan Pallem Junior Resident Department of Radiodiagnosis, All India Institute of Medical Sciences, Bhopal

Dr. Jitendra Sharma Associate Professor Department of Radiodiagnosis, All India Institute of Medical Sciences, Bhopal

Dr. Abhishek Senior Resident Department of Radiodiagnosis, All India Institute of Medical Sciences, Bhopal

ABSTRACT

Cerebral hydatid disease is an uncommon manifestation of echinococcosis, accounting for only 1–2% of all hydatid infections, with a predilection for the pediatric population. We report a rare case of a giant intracerebral hydatid cyst in a 7-year-old female child who presented with progressive headache, vomiting, and long-standing right-sided hemiparesis. Neuroimaging with CT and MRI demonstrated a large, well-defined, non-enhancing cystic lesion in the left fronto-parietal region, causing marked mass effect and herniation, with characteristic internal folded membranes. The lesion was completely excised using the Dowling–Orlando technique without rupture. Histopathological examination confirmed the diagnosis of hydatid cyst by demonstrating a laminated ectocyst and scolices with hooklets. This case highlights the importance of recognising characteristic imaging features of cerebral hydatid disease and emphasises the critical role of radiology–pathology correlation in establishing a definitive diagnosis, particularly in endemic regions.

KEYWORDS

Cerebral hydatid cyst, Echinococcus granulosus, Intracranial cystic lesion, Folded membranes sign

INTRODUCTION

Hydatid disease is a zoonotic parasitic infection caused by the larval stage of Echinococcus granulosus [1]. The liver and lungs are the most commonly involved organs, while central nervous system involvement is rare, accounting for approximately 1–2% of cases [2,3]. Cerebral hydatid cysts are more frequently encountered in children, likely because the patency of the ductus arteriosus allows bypass of hepatic and pulmonary filtration [4].

In India, hydatid disease remains endemic in several regions, and although intracranial involvement is uncommon, it poses significant diagnostic and therapeutic challenges due to its slow growth, late presentation, and potential for severe neurological morbidity. Accurate preoperative diagnosis based on imaging is crucial to guide surgical planning and avoid cyst rupture. [2]

Case Presentation

Patient History

A 7-year-old female presented to emergency department with a 10-day history of worsening headaches and multiple episodes of vomiting. The patient had also been experiencing gradual weakness of the right upper limb over the past 2.5 years. Initial treatment was sought at a local hospital, where she was admitted for 10 days due to fever, and then referred to our institute for further management.

Clinical Examination

Upon examination, the patient was drowsy with a Glasgow Coma Scale (GCS) score of E3V4M5. Pupillary examination showed a right pupil size of 2 mm and a left pupil size of 4 mm, both non-reactive to light. The patient exhibited left-sided third nerve palsy and right-sided hemiparesis. Further neurological examination showed Broca's aphasia and weakness in the right upper limb with a muscle power of 3/5. The patient was continent and had no sensory deficits.

Imaging Studies

Computed Tomography (CT) Scan

CT imaging revealed a large, well-marginated, thin-walled cystic lesion in the left fronto-parietal lobe, measuring approximately 8.0 x 8.1 x 7.9 cm. The cyst shows near cerebrospinal fluid (CSF) density (mean HU +8), with eccentric nodular projections from its wall and a crescent-shaped fluid density likely suggesting cyst content leakage. There was minimal perilesional edema and no evidence of calcifications seen. The lesion caused significant mass effect, including displacement of cerebral structures, midline shift, and uncal herniation.

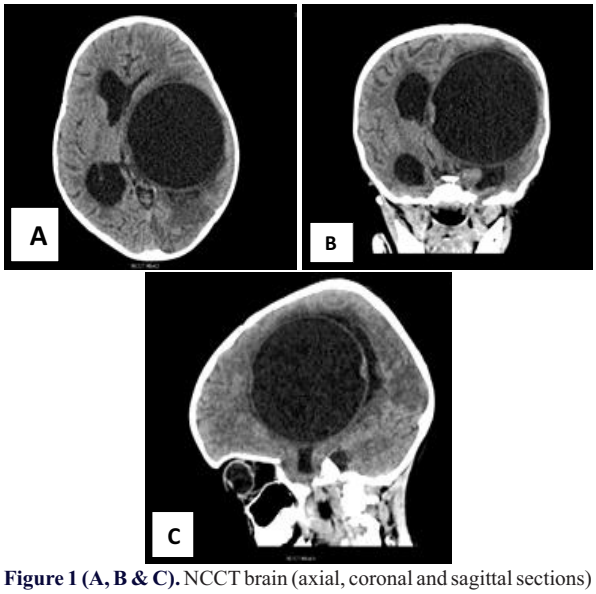
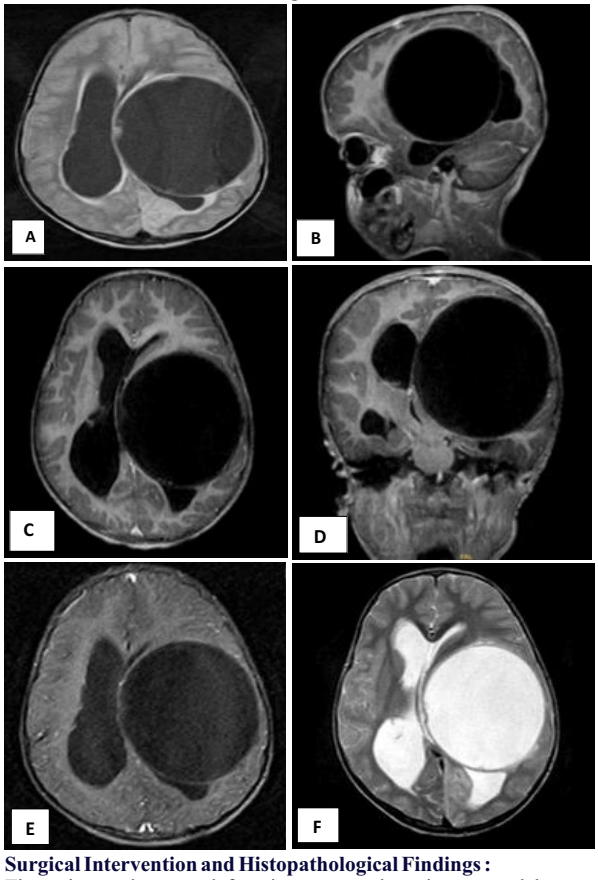


Figure 1 (A, B & C). NCCT brain (axial, coronal and sagittal sections) showing a large CSF-attenuation cystic lesion in the left fronto-parietal region with internal eccentric nodular projections, marked mass effect and surrounding hypodense edema. Magnetic Resonance Imaging (MRI)CA large, well-defined, non-enhancing fluid intensity lesion seen in the left fronto-parietal lobes, with internal folded membranes and nodular projections with signal characteristics similar to CSF. Internal crumpled and folded membranes were visualized. No mural nodule or solid enhancing component was seen on post-contrast images. The lesion caused compression of the left lateral and third ventricles with contralateral ventricular dilatation, periventricular CSF seepage, rightward midline shift, and left uncal herniation. Mild vasogenic edema noted in the adjacent posterior temporal and occipital lobes.

Figure 2(A to F). Preoperative MRI brain showing a large non-enhancing cystic lesion appearing T1 hypointense T2 hyperintense showing complete suppression on FLAIR sequence with no

enhancement on post contrast sequences. T2 hypointense internal folded membranes are seen with significant mass effect



Surgical Intervention and Histopathological Findings :

The patient underwent a left parieto-temporal craniotomy, and the cyst was meticulously removed using the Dowling-Orlando technique to avoid rupture. Intraoperative findings included a well-encapsulated cyst with no daughter cysts observed. The contents of the cyst were clear.

Figure 3: Surgical specimen of the removed hydatid cyst.

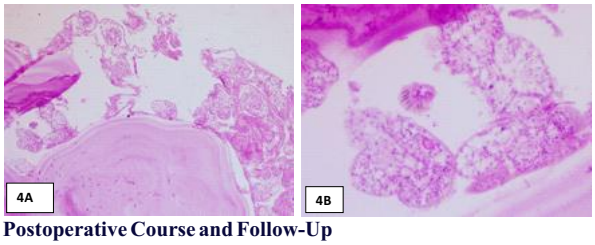
Histopathology:

On low-power microscopy, sections showed a thick, acellular, eosinophilic laminated ectocyst with characteristic concentric lamellations. Adjacent fragments of the inner germinal layer were identified with minimal host inflammatory response.

On high-power examination, well-formed scolices with radially arranged refractile hooklets, rostellum, and calcareous corpuscles were seen arising from the germinal layer. There was mild non-specific inflammatory infiltrate, with no evidence of granuloma, atypia, or malignancy. These findings were diagnostic of a hydatid cyst.

Figure 4A. Low-power photomicrograph (H&E, ×4) showing laminated ectocyst with concentric lamellations.

Figure 4B. High-power photomicrograph (H&E, ×40) demonstrating scolices with characteristic refractile hooklets.



Postoperative Course and Follow-Up

During the hospital stay, the post-operative imaging was done on POD1, which showed complete removal of hydatid cyst with no residual mass effect. The patient's neurological status improved significantly, and she was discharged with a GCS of E4V5M6, moving all four limbs with residual right wrist joint weakness.

DISCUSSION

Cerebral hydatid cysts, although rare, present unique diagnostic challenges due to their overlapping features with other intracranial cystic lesions [5,6]. In this case, a 7-year-old female presented with a large cystic lesion in the left fronto-parietal lobe, leading to the consideration of multiple differential diagnoses, including arachnoid cyst, cystic glioma, brain abscess, dermoid or epidermoid cyst, Neuroglial cyst and metastatic cystic lesion.

Arachnoid cysts, which are benign and filled with cerebrospinal fluid, typically appear as well-defined, non-enhancing lesions on MRI. However, they generally do not cause significant mass effect or midline shift, and they lack the folded internal membranes and nodular projections seen in this case. Additionally, the absence of perilesional edema and herniation features further ruled out an arachnoid cyst.

Brain abscesses typically appear as ring-enhancing lesions with restricted diffusion on MRI, due to the presence of pus. The lesion in this case lacked peripheral ring enhancement and did not show restricted diffusion, which is inconsistent with a brain abscess. The presence of internal membranous structures unique to hydatid cysts helped to rule out this possibility.

Dermoid and epidermoid cysts usually contain fat or show characteristic diffusion restriction, and are often located along midline structures or specific anatomical locations. The lack of fat content, calcifications, and diffusion restriction in this case, along with the atypical location, made these differentials unlikely.

Metastatic cystic lesions can appear as multiple or solitary cysts with variable enhancement patterns, usually associated with a history of a primary malignancy, which was absent in this case. The non-enhancing nature of the cyst and the lack of other malignant features further ruled out a metastatic origin.

Cystic gliomas, such as pilocytic astrocytomas, may present as cystic lesions with an enhancing mural nodule or solid component. In the present case, the lesion was entirely cystic, non-enhancing, and lacked any solid mural component, effectively excluding a neoplastic etiology.

Classically, cerebral hydatid cysts are described as solitary, spherical or oval, thin-walled intra-axial cystic lesions, most commonly located in the supratentorial compartment, particularly within the parietal or fronto-parietal regions in children [3,5]. They typically demonstrate CSF-equivalent attenuation on CT and CSF-equivalent signal intensity on MRI, with absence of wall enhancement, calcification, or diffusion restriction in uncomplicated cases. Despite their often large size, these cysts characteristically show minimal perilesional edema, a feature attributed to the slow growth of the lesion and the lack of host inflammatory response.

Neuroglial cysts are rare benign intra-axial lesions that also follow CSF signal intensity on all imaging sequences and typically do not enhance. However, they are usually small, smoothly marginated lesions without internal septations or membranous structures, and they rarely produce significant mass effect or midline shift. Furthermore, neuroglial cysts lack internal folded membranes or nodular projections and are not associated with parasitic elements. The presence in this case of a giant cystic lesion with characteristic internal folded membranes, significant mass effect, and minimal surrounding edema strongly favored a diagnosis of hydatid cyst over a neuroglial cyst.

The present case closely mirrors these classical imaging features. The lesion was a giant, well-defined intra-axial cyst with CSF-equivalent signal characteristics, distinct internal folded membranes, absence of enhancement, and disproportionately minimal surrounding edema despite significant mass effect, midline shift, and uncal herniation. The visualization of crumpled internal membranes—representing detached germinal layers—is considered a characteristic radiological sign of hydatid disease and was a key diagnostic clue in this case [6].

The diagnosis of a hydatid cyst was further substantiated by histopathological examination, which demonstrated a laminated acellular ectocyst and scolices with refractile hooklets, features pathognomonic for hydatid disease. The absence of granulomatous inflammation or neoplastic changes on histology correlates well with the imaging findings of a smooth-walled, non-enhancing cyst and minimal perilesional edema [7]. This case underscores the importance of considering parasitic infections in the differential diagnosis of intracranial cystic lesions, particularly in endemic regions, and highlights the critical role of radiology–pathology correlation in achieving an accurate and confident diagnosis.

CONCLUSION

This case highlights the importance of considering hydatid disease in the differential diagnosis of intracranial cystic lesions, particularly in patients from endemic regions. Early diagnosis and appropriate surgical management are critical for preventing complications and ensuring a good clinical outcome.

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