Bilateral Pulmonary Hydatid Cysts in An Adolescent: Histological Confirmation of The Left Cyst With Associated Chronic Inflammation: A Case Report

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Abstract

Background: Histopathological examination establishes the nature of a pulmonary cystic lesion by demonstrating parasite-derived structures and characterising the surrounding tissue response.

Case presentation: A 16-year-old boy with exertional dyspnoea had bilateral pulmonary cystic lesions detected during investigations for right iliac fossa pain. CT showed a right air-containing lesion measuring 6.5 × 8.5 cm, suspicious for a ruptured hydatid cyst, and a thin-walled, fluid-attenuation left lower-lobe lesion measuring 7.4 × 7.7 cm. The left lesion was surgically removed. Gross examination demonstrated an 8 × 7.5 × 7.3 cm cyst with a thin, friable wall. Microscopically, an acellular laminated membrane and protoscolices with hooklets established the diagnosis of a hydatid cyst. Adjacent tissue showed reactive lymphoid follicles, eosinophilic inflammation and necrosis. No malignancy was identified. Albendazole was administered as adjunctive treatment, and satisfactory left lung expansion was described at discharge.

Conclusion: The combination of an acellular laminated membrane and protoscolices provided morphological confirmation of a pulmonary hydatid cyst. The associated inflammation represented a host tissue response but did not, by itself, establish cyst rupture or bacterial superinfection. Correlation with imaging defined the wider bilateral pulmonary presentation.

Keywords: pulmonary hydatid cyst; histopathology; protoscolices; laminated membrane; case report.

Introduction

Cystic echinococcosis is a zoonotic infection caused by the larval stages of the Echinococcus granulosus species complex. Humans acquire infection through ingestion of eggs shed by infected canids, and the liver and lungs are the principal sites of cyst development [1]. Pulmonary disease requires an organ-specific approach: management strategies developed for hepatic cysts cannot simply be transferred to the lung [2].

Histopathology identifies the acellular laminated membrane, germinal elements and protoscolices when present, and distinguishes these parasite-derived structures from the surrounding host tissue [3,4]. The laminated layer has a specialised mucin-rich structure distinct from the surrounding host-derived fibrous tissue [5]. We describe the gross and microscopic findings of a surgically removed left pulmonary hydatid cyst in an adolescent, with imaging correlation for bilateral pulmonary lesions.

Case presentation

Patient information

A 16-year-old boy was referred to the thoracic surgery service at Al Jalaa Hospital for Surgery and Accidents, Benghazi, Libya, following the detection of bilateral pulmonary cystic lesions during investigations for right iliac fossa pain. He had undergone an appendicectomy approximately two weeks before thoracic admission. There was no history of chronic illness, smoking or animal contact.

Presenting complaints and timeline

Before thoracic admission, right iliac fossa pain prompted investigations during which the pulmonary lesions were detected. The patient reported exertional dyspnoea. He was admitted to the thoracic surgery service on 21 July 2025. The left-sided cystectomy specimen was received for histopathological examination on 28 July 2025, and he was discharged on 31 July 2025.

Clinical findings

The respiratory complaint was exertional dyspnoea. The patient denied cough, chest pain, fever, night sweats and weight loss.

Diagnostic assessment

Imaging: Contrast-enhanced CT of the chest, abdomen and pelvis demonstrated the following findings.

Right lung: A cystic mass measuring approximately 6.5 × 8.5 cm contained air and layered curvilinear soft-tissue structures. Adjacent consolidation and atelectasis were present, with a mild right pleural effusion. These findings were suspicious for a ruptured hydatid cyst; a pulmonary abscess could not be excluded.

Left lower lobe: A separate, well-defined, thin-walled, fluid-attenuation lesion measured approximately 7.4 × 7.7 cm and was compatible with an intact hydatid cyst.

No mediastinal lymphadenopathy was described. Cardiac size and the great vessels were unremarkable.

Abdominal and pelvic findings: No hepatic cysts were identified. Enlarged mesenteric lymph nodes were present in the right iliac fossa, the largest measuring approximately 1.3 cm, with a small volume of pelvic free fluid. Right inguinal lymph nodes measured up to approximately 1.2 cm. Their relationship to the pulmonary disease was not established.

Preoperative impression: Bilateral pulmonary hydatid cysts, with suspected rupture or complication of the right lesion and an intact appearance of the left lesion. The patient underwent surgical treatment of the left lesion.

Therapeutic intervention

Operation and intraoperative findings: Under general anaesthesia, a left thoracotomy was performed. Adhesions involving the cyst, adjacent lung and chest wall were described. The cyst was removed, bronchial openings were sutured and two chest drains were inserted. No blood transfusion was recorded.

Perioperative care: Antimicrobial treatment and postoperative analgesia were administered. Albendazole was given as adjunctive antiparasitic treatment.

Histopathological examination

Gross pathology: The specimen was submitted in two containers.

Container 1 (cystectomy specimen): A white, rubbery cyst with a smooth external surface measured 8 × 7.5 × 7.3 cm. On sectioning, approximately 400 mL of clear, thick fluid was released. The wall was thin and friable, measuring 1–2 mm, with white nodules and chalk-like internal material.

Container 2: Three irregular, rubbery, grey-white to dark-grey tissue fragments measured 6.5 × 4 × 1.8 cm in aggregate. Their cut surfaces contained firm, linear fibrous areas.

Microscopic findings:

The cyst wall contained an acellular laminated membrane, characteristic of a hydatid cyst.

Protoscolices with hooklets were identified (Figure 1).

The surrounding tissue showed reactive lymphoid follicles, eosinophilic inflammation and areas of necrosis, consistent with a chronic inflammatory response.

No malignancy was identified.

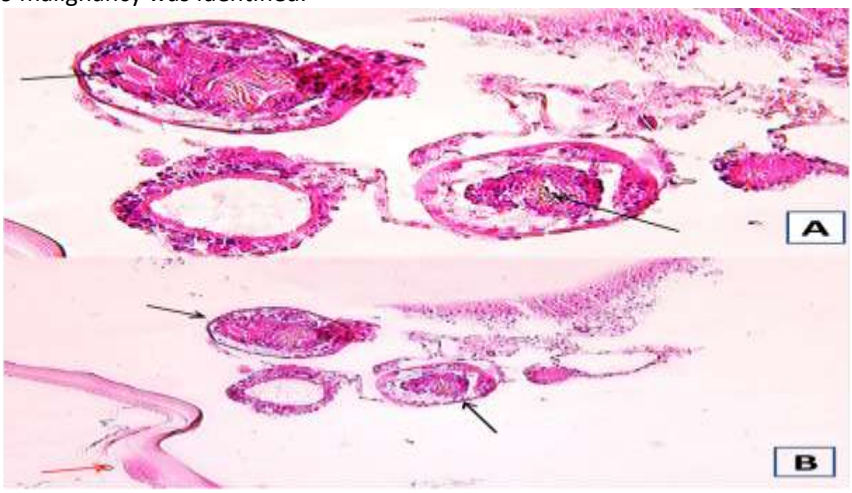


Figure 1. Histological features of the left pulmonary hydatid cyst. (A) Protoscolices with identifiable hooklets (black arrows). (B) Protoscolices (black arrows) adjacent to the acellular laminated membrane (red arrow). Haematoxylin and eosin; original magnification: (A) ×400 and (B) ×200.

Final pathological diagnosis: Left pulmonary hydatid cyst with protoscolices and a surrounding chronic inflammatory response.

Postoperative course and follow-up

The patient was discharged on 31 July 2025. The discharge assessment described satisfactory expansion of the left lung. Albendazole was administered as adjunctive treatment. Long-term recurrence and the subsequent course of the right pulmonary lesion were not assessed.

Discussion

The central finding was the histological identification of a pulmonary hydatid cyst through the combined presence of an acellular laminated membrane and protoscolices with hooklets. These structures provide direct morphological evidence of echinococcosis and distinguish the lesion from non-parasitic pulmonary cysts [3,4]. The surrounding lymphoid and eosinophilic response was an associated host reaction rather than the sole basis of diagnosis.

The distinction between the parasite wall and the host capsule is important when interpreting the specimen. The laminated layer is an extracellular, acellular structure produced by the parasite; the outer fibrous adventitial tissue is derived from the host. Contemporary work describes the laminated layer as a meshwork of mucins bearing carbohydrate chains, rather than a collagenous layer [5]. The diagnosis in this case rested on its characteristic lamination in association with protoscolices. The nucleated germinal layer is another component of echinococcal cyst architecture; its recognition in a given section depends on tissue preservation and sampling [4].

Protoscolices and hooklets were the most specific diagnostic elements in the examined tissue. Protoscolex production is a feature of fertile hydatid cysts, but the presence of these structures in a histological section does not establish that they remained viable at excision [4,6]. Likewise, the morphology supports cystic echinococcosis without establishing the infecting species or genotype within the Echinococcus granulosus complex. Molecular characterisation would be required for that level of attribution [6].

The adjacent reactive lymphoid follicles, eosinophils and necrosis documented the tissue response to the lesion. These findings should be interpreted with the parasite morphology and clinical context. Research on the laminated layer demonstrates a complex interface between parasite material and host immune cells, but routine morphology cannot establish the specific immune pathways operating in an individual patient [5]. Eosinophilic inflammation does not independently prove a systemic allergic reaction, while necrosis does not by itself demonstrate bacterial superinfection. No organism-specific evidence of bacterial infection was described in this specimen.

Imaging provided context for the pathological findings. The left lesion appeared thin-walled and fluid-filled, whereas the right lesion contained air and curvilinear internal structures with adjacent consolidation and pleural fluid. Such features warrant consideration of a complicated or ruptured hydatid cyst, with pulmonary abscess remaining a differential diagnosis [3]. The left-sided specimen confirmed the nature of the excised lesion but could not establish the integrity or microbiological status of the contralateral lesion. Bronchogenic cyst, abscess and cavitating neoplasm are relevant diagnostic considerations for pulmonary cystic lesions; identification of the laminated membrane and protoscolices resolved the diagnosis in the sampled left lesion [3,4]. No malignant features were identified.

Pulmonary echinococcosis commonly requires surgery, with the approach determined by cyst characteristics and preservation of functioning lung tissue [2,7]. A series of 872 patients included 126 with bilateral disease, demonstrating that bilateral involvement is a recognised presentation [8]. In this patient, excision of the left lesion enabled pathological confirmation, and albendazole was administered as an adjunct. International guidance supports an individualised approach according to organ involvement, cyst characteristics and the intervention performed [9,10,11]. Pulmonary-specific guidance also cautions against routine preoperative albendazole for intact lung cysts because of rupture concerns [7,9]. The WHO recommendation for uncomplicated pulmonary cysts ≤5 cm does not directly cover the larger lesions in this patient.

The principal strength of the report is direct demonstration of the parasite together with the surrounding host response. Its scope is the histopathological diagnosis of the excised left pulmonary cyst, supported by gross findings and imaging correlation. The contralateral lesion was not sampled, and long-term clinical outcomes were not assessed; therefore, the findings do not establish bilateral cure or treatment efficacy. Further imaging and clinical follow-up remain relevant to patient care, but the diagnostic contribution of the resected specimen is clear [12].

Conclusion

Histopathological examination confirmed a left pulmonary hydatid cyst in a 16-year-old boy with bilateral pulmonary lesions. An acellular laminated membrane and protoscolices with hooklets were the decisive diagnostic findings. Reactive lymphoid follicles, eosinophilic inflammation and necrosis characterised the surrounding host response without independently proving rupture or bacterial infection. The case demonstrates the diagnostic value of recognising parasite-specific structures and correlating them with the radiological presentation.

Consent for surgical treatment

Written informed consent for surgical treatment was obtained from the patient's family.

Conflicts of interest

The authors declare no conflicts of interest.

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