



Case report

Ruptured splenic hydatid cyst

Qiang Guo^{a,1}, Huajin Liu^{a,b,1}, Guojie Wang^{a,b,*}^a Department of Radiology, The First People's Hospital of Kashi Prefecture, Kashi Prefecture, Xinjiang Uygur Autonomous Region, 844000, China^b Department of Radiology, Fifth Affiliated Hospital of Sun Yat-sen University, Zhuhai, Guangdong, 51900, China

ARTICLE INFO

Keywords:

Hydatid cyst

Spleen

Computed tomography

ABSTRACT

Hydatid cysts of the spleen are rare. Our report details a case wherein an 8-year-old boy with a ruptured splenic hydatid cyst suffered ongoing abdominal pain and shock. Computed Tomography (CT) imaging showed an irregular cyst at the spleen's lower edge with a "floating membranes" sign. Emergency surgery was performed to remove the hydatid cyst and repair the ruptured spleen. During follow-up, the patient was treated with Albendazole orally for 12 months.

1. Introduction

Echinococcosis causes hydatid disease and is common in the areas such as the Middle East, South America, western China, the eastern Mediterranean, and sub-Saharan Africa [1–3]. Hydatid cysts most commonly affect the liver (75%), followed by the lung (15.4%), and the spleen (5.1%) [4]. A primary hydatid of the spleen may occur via an arterial path after passing through the liver and lung, or via a venous path, bypassing the liver and lung. The secondary spleen hydatid usually follows hepatic hydatid cyst rupture with systemic dissemination or intraperitoneal spread (see Fig. 1).

2. Case report

An 8-year-old boy from Xinjiang developed persistent abdominal pain after a 1-m fall. The patient has no medical history or family history. The child was expeditiously transported to a nearby medical facility, where an emergent abdominal Computed Tomography (CT) scan identified a questionable liver laceration, spleen cyst, and mild ascites. Approximately 10 hours post-onset, he was transferred to a superior hospital for further treatment. Physical examination showed the following: temperature 37.5 °C, heart rate 167 beats/min, respiratory rate 34 breaths/min, blood pressure 106/58 mmHg, and BMI 19 kg/m². He exhibited a diminished mental state and abdominal tenderness without rebound tenderness. The liver was not palpable. However, the spleen was enlarged and could be felt. Abdominal percussion indicated dullness and tenderness in the liver area, no kidney tenderness, and positive shifting dullness was observed. Auscultation revealed hyperactive bowel sounds. Laboratory tests revealed an increased white blood cell count ($11.93 \times 10^9/L$, normal range $4.3\text{--}11.3 \times 10^9/L$), mainly due to monocytosis and eosinophilia ($1.33 \times 10^9/L$ and $0.92 \times 10^9/L$, respectively). The high-sensitivity C-reactive protein was elevated (8.78 mg/L, normal range 0–4 mg/L). Other test results are shown in Table 1. Subsequent CT imaging revealed an irregular low-density cyst at the inferior margin of the spleen displaying a "floating membranes" sign (Figures A, B, and C), suggestive of possible infection and rupture linked to echinococcosis. Moreover, the presence of a flat low-

* Corresponding author. Department of Radiology, Fifth Affiliated Hospital of Sun Yat-sen University, 52 East Meihua Rd., Zhuhai City, 519000, China.

E-mail address: wanggj5@mail.sysu.edu.cn (G. Wang).

¹ The authors Qiang Guo and Huajin Liu contributed equally to the manuscript.

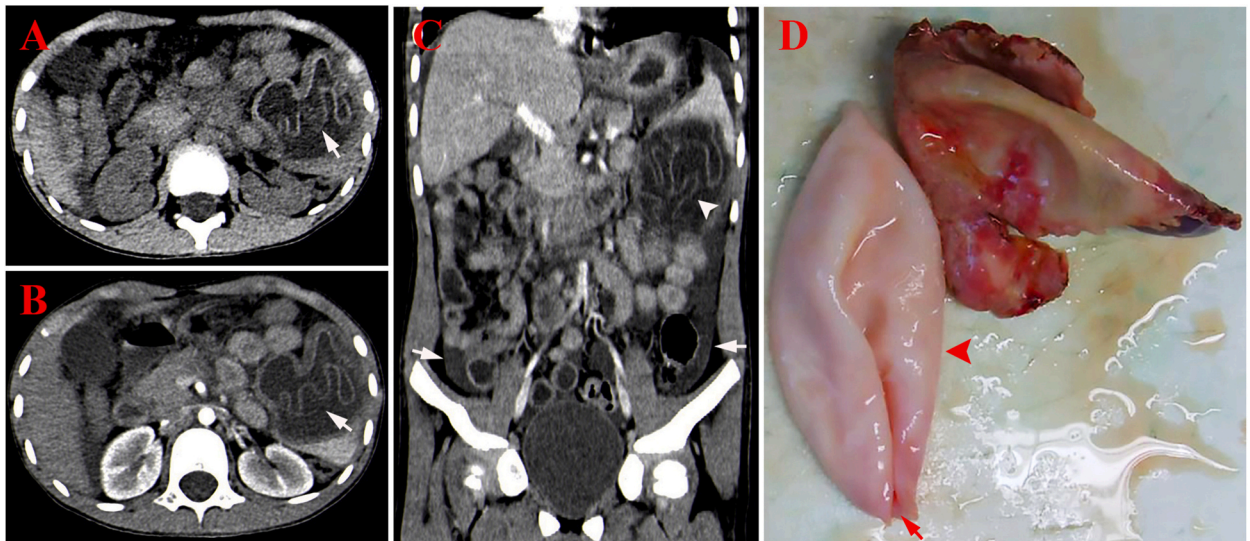


Fig. 1. The non-enhanced (A, axial) and enhanced (B, axial; C, coronal) Computed Tomography images depict a ruptured splenic hydatid cyst (A/B, arrows) displaying a “floating membranes” sign (C, arrowhead). Additionally, there was little effusion in the left and right paracolic sulci (C, arrows). The gross pathological specimen (D) illustrates a hydatid cyst (arrowhead) with localized rupture (arrow).

density region in the right lobe of the liver indicated the possibility of a liver hydatid cyst or rupture. Furthermore, a small amount of effusion was noted in the abdominal cavity (**Figure C**). The patient underwent emergency surgery. Abdominal exploration revealed a significant hematoma (approximately 600ml) in the abdominal cavity. The hematoma was first aspirated, and further exploration revealed a ruptured hydatid cyst at the lower pole of the spleen, surrounded by a large amount of hydatid fluid. The lower pole of the spleen had a localized rupture with active bleeding. Strict hemostasis was applied to the ruptured surface of the spleen, the inner cyst of the hydatid cyst was removed, and the residual cavity was soaked in hypertonic saline for 15 minutes, followed by aspiration and scrubbing with hypertonic saline cotton balls. After no significant bleeding was observed, the abdominal and pelvic cavities were extensively irrigated with a large volume of saline (approximately 20,000ml) and aspirated clean. No obvious scolices or daughter cysts were found in the abdominal and pelvic cavities. The stomach, duodenum, intestines, colon, mesentery, and bladder were uninjured. The liver capsule was intact with no evident bleeding. The surgery lasted approximately 2 hours, with an estimated blood loss of about 100ml and an intraoperative blood transfusion of 400ml.

Pathological analysis confirmed hydatid cyst (**Figure D**). Postoperatively, the patient received infection control, nutritional support, and a prescription for oral Albendazole (10 mg/kg, twice a day). On the second day following the surgical procedure, laboratory tests revealed a modest reduction in eosinophil count ($0.88 \times 10^9/L$) and an elevation in C-reactive protein levels (23.82 mg/L) compared to the previous examination. The patient was discharged ten days after admission. A follow-up CT scan 1 month later revealed the spleen exhibiting irregular shape and uneven density, suggesting postoperative alterations. The low-density lesion in the liver's right lobe showed no significant change from prior images. The patient was prescribed oral Albendazole twice daily for 12 months, along with regular follow-ups.

3. Discussion

This case pertains to a ruptured splenic hydatid cyst in an 8-year-old male. The spleen is the third most common site for hydatidosis [4,5], with splenic hydatid cysts being infrequent in pediatric patients. Hydatid cysts grow slowly by about 2–3 cm annually [6]. Patients with familial echinococcosis may have no symptoms for 5–20 years before diagnosis and about 30 % of splenic cysts are asymptomatic for life [7]. Ruptured hydatid cysts can cause symptoms such as fever, urticaria, eosinophilia, and anaphylactic shock. Even minor damage to cyst integrity can lead to severe allergic reactions with serious outcomes. The rupture of hydatid cysts is frequently attributed to trauma or elevated intracystic pressure. In this case, trauma-induced cyst rupture prompted symptoms like fever, eosinophilia, and anaphylactic shock, and the eosinophilia suggested the potential for allergic reactions from bloodborne lesion fragments [8].

In regions with a high prevalence of echinococcosis, ultrasound (US) examination is the most accessible, cost-effective, and widely utilized diagnostic modality [9]. The most common appearance of a hydatid cyst in the US is an anechoic, smooth, round cyst, which is difficult to distinguish from a benign cyst. When the fluid pressure inside the cyst increases, detachment can occur, leading to the separation of the parasitic membrane; these detached pathological membranes seen in the US are referred to as “snake/serpent signs”. The “Water-Lily” sign refers to the collapse of the cystic layer, causing the inner membrane to fall into the fluid [4]. Overall, CT has a higher sensitivity than US, ranging from 95 to 100 %. CT is also superior to US in detecting extra-hepatic cysts and is more sensitive in depicting fine cyst wall calcifications [4]. In our case, the CT image showed a membranous structure inside the splenic hydatid cyst and

Table 1
Preoperative laboratory examination findings of the patient.

Variables	Results	Reference value	Units
Blood routine			
Red blood cell	4.8	4.2–5.7	10 ¹² /L
Hemoglobin	132	118–156	g/L
Hematocrit	38.5	36–46	%
Mean corpuscular volume	80.2	77–92	fL
Mean corpuscular hemoglobin	27.6	25–34	pg
Mean corpuscular hemoglobin concentratio	344	310–355	g/L
Red cell distribution width	44	35.1–46.3	fL
Platelet	435	167–453	10 ⁹ /L
Platelet Distribution Width	15.8	15.5–18.1	%
White blood cell	11.93	4.3–11.3	10 ⁹ /L
Neutrophils percentage	57.2	31–70	%
Lymphocyte percentage	23.7	23–59	%
Monocytes percentage	11.2	2–11	%
Eosinophil percentage	7.7	1–10	%
Basophils percentage	0.2	0–1	%
Absolute value of neutrophils	6.83	1.6–7.8	10 ⁹ /L
Absolute value of lymphocyte	2.82	1.5–4.6	10 ⁹ /L
Absolute value of monocytes	1.33	0.13–0.76	10 ⁹ /L
Absolute value of eosinophil	0.92	0.00–0.68	10 ⁹ /L
Absolute value of basophils	0.03	0.00–0.07	10 ⁹ /L
Hypersensitive C-reactive protein	8.78	0–4	mg/L
Liver function			
Alanine aminotransferase	10	5–40	U/L
Aspartate aminotransferase	16	8–40	U/L
Total-bilirubin	6	3.4–19	μmol/L
Direct bilirubin	1.2	0–6.8	μmol/L
Indirect bilirubi	4.8	5.1–12.2	μmol/L
Total protein	67.5	65–85	g/L
Albumin	39.3	40–55	g/L
Globin	28.2	20–40	g/L
Albumin/Globulin	1.39	1.2–2.4	A/G
Alkaline phosphatase	96	<750	U/L
γ glutamyl transferase	15	11–50	U/L
Total bile acids	3.2	<10	μmol/L
Cholinesterase	5020	5000–14000	U/L
Adenosine deaminase	14.3	4.0–22	U/L
Blood coagulation function			
Prothrombin time	12.7	9–14	second
Fibrinogen	3.05	2–4	g/L
D-Dimer	5.93	0–0.55	mg/L

the wall's discontinuity, demonstrating a “floating membranes” sign, confirming a rupture.

Emergency surgery is often the most effective treatment for ruptured splenic hydatid cysts [7]. Splenectomy is the preferred treatment for patients with large cysts at or near the central splenic hilum because of the lower risk of recurrence [10]. It is recommended to prioritize the preservation of the spleen in cases of superficial cysts localized within the spleen and cysts with significant adhesions. In pediatric instances, particular attention should be given to maximizing spleen preservation to reduce the likelihood of severe post-splenectomy infections [4,11]. Due to the patient's young age and increased risk of severe infections without a spleen, we chose to keep the spleen. We flushed the abdominal cavity with saline after cyst fluid leaked, and suggested a 12-month albendazole treatment to reduce the chance of recurrence.

4. Conclusion

Rupture of splenic hydatid cysts is rare, especially in children, and presents with symptoms like abdominal pain, allergies, and shock. Diagnosis can be made through ultrasound or CT. The “floating membranes” sign indicates a ruptured hydatid cyst. It is recommended that urgent surgical intervention be pursued for the removal of the cyst, in conjunction with hypertonic saline irrigation and a regimen of oral Albendazole lasting more than six months, to mitigate the risk of recurrence. Furthermore, regular follow-up examinations are recommended.

Funding statement

This study did not receive financial support from public, commercial, or not-for-profit funding agencies.

Data availability statement

Data are available on request.

CRediT authorship contribution statement

Qiang Guo: Writing – original draft, Resources, Formal analysis, Data curation. **Huajin Liu:** Writing – original draft, Resources, Data curation, Conceptualization. **Guojie Wang:** Writing – review & editing, Writing – original draft, Visualization, Data curation, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgment

This study was approved by the Ethics Committee of the First People's Hospital of Kashi Prefecture. Patient permission for this publication was obtained.

References

- [1] H. Wen, L. Vuitton, T. Tuxun, et al., Echinococcosis: advances in the 21st century, *Clin. Microbiol. Rev.* 32 (2) (2019 Feb 13) e00075, <https://doi.org/10.1128/CMR.00075-18>, 18.
- [2] K. Li, M. Shahzad, Epidemiology of cystic echinococcosis in China (2004–2016), *Trav. Med. Infect. Dis.* 33 (2020 Jan-Feb) 101466, <https://doi.org/10.1016/j.tmaid.2019.101466>.
- [3] G. Engin, B. Acunaş, I. Rozanes, et al., Hydatid disease with unusual localization, *Eur. Radiol.* 10 (12) (2000) 1904–1912, <https://doi.org/10.1007/s003300000468>.
- [4] K. Rasheed, S.A. Zargar, A.A. Telwani, Hydatid cyst of spleen: a diagnostic challenge, *N. Am. J. Med. Sci.* 5 (1) (2013 Jan) 10–20, <https://doi.org/10.4103/1947-2714.106184>.
- [5] S. Sachar, S. Goyal, S. Goyal, et al., Uncommon locations and presentations of hydatid cyst, *Ann. Med. Health Sci. Res.* 4 (3) (2014 May) 447–452, <https://doi.org/10.4103/2141-9248.133476>.
- [6] R.A. Wani, A.A. Malik, N.A. Chowdri, et al., Primary extrahepatic abdominal hydatidosis, *Int. J. Surg.* 3 (2) (2005) 125–127, <https://doi.org/10.1016/j.ijssu.2005.06.004>.
- [7] M. Safioleas, E. Misiakos, C. Manti, Surgical treatment for splenic hydatidosis, *World J. Surg.* 21 (4) (1997 May) 374–377, <https://doi.org/10.1007/pl00012256>; discussion 378.
- [8] D.A. Vuitton, Echinococcosis and allergy, *Clin. Rev. Allergy Immunol.* 26 (2) (2004 Apr) 93–104, <https://doi.org/10.1007/s12016-004-0004-2>.
- [9] F. Tamarozzi, O. Akhan, C.M. Cretu, et al., Prevalence of abdominal cystic echinococcosis in rural Bulgaria, Romania, and Turkey: a cross-sectional, ultrasound-based, population study from the HERACLES project, *Lancet Infect. Dis.* 18 (7) (2018) 769–778, [https://doi.org/10.1016/S1473-3099\(18\)30221-4](https://doi.org/10.1016/S1473-3099(18)30221-4).
- [10] K. Atmatzidis, B. Papaziogas, C. Mirelis, et al., Splenectomy versus spleen-preserving surgery for splenic echinococcosis, *Dig. Surg.* 20 (6) (2003) 527–531, <https://doi.org/10.1159/000073689>.
- [11] G.L. Cullingford, D.N. Watkins, A.D. Watts, et al., Severe late postsplenectomy infection, *Br. J. Surg.* 78 (6) (1991 Jun) 716–721, <https://doi.org/10.1002/bjs.1800780626>.