Extrahepatic Abdominal Hydatid Disease Caused by Echinococcus granulosus: Imaging Findings

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OBJECTIVE. The classical findings in hydatid disease caused by Echinococcus granulosus with liver or lung involvement are well known. However, diagnosing hydatid disease at unusual locations may be challenging because of variable imaging appearances depending on the host reaction. The purpose of this pictorial essay is to review the sonographic, CT, and MRI features of extrahepatic abdominal hydatid disease including intraperitoneum, retroperitoneum, diaphragma, bone, and soft tissue of the abdomen.

CONCLUSION. Extrahepatic abdominal hydatid lesions have nearly identical imaging features, including the presence of cyst wall calcification, daughter cysts, and membrane detachment. The combinations of radiologic and serologic tests especially in patients living in the endemic areas contribute to the diagnosis. Despite their rarity, being familiar with the spectrum of radiologic findings in these unusual sites is helpful to improve diagnostic accuracy.

Keywords: abdominal imaging, CT, extrahepatic hydatid disease, MRI, sonography

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Hydatid disease (HD) is a zoonotic infection caused by Echinococcus granulosus and rarely by Echinococcus multilocularis. The disease is often manifested by slowly growing cystic masses and continues to be a significant health problem in many sheep- and cattle-raising areas [1]. Although the liver (75%) and lung (15%) are the most commonly involved organs, the disease can be seen anywhere in the body (10%) [2, 3]. Imaging findings range from purely cystic lesions to solid-appearing masses. Ringlike or total calcification can be seen during the natural evolution and is more common in the liver, spleen, and kidney [1]. The endocyst may detach from the pericyst causing “floating membranes” inside the cavity, a finding that is highly specific for hydatid disease. The cyst may appear as a well-defined fluid collection with a localized split in the wall. Complete detachment of the membranes inside the cyst has been referred to as the “water lily sign” on sonography [4–6]. Multivesicular cysts manifest as well-defined fluid collections in a honeycomb pattern, with multiple septa representing the walls of the daughter cysts. When daughter cysts are separated by the hydatid matrix (a material with mixed echogenicity), they show a “wheel spoke” pattern [7].

Sonography is the most sensitive technique for the detection of membranes, septa, and hydatid sand within the cyst. CT may display the same findings as sonography and is best in showing cyst wall calcification, cyst infection, and peritoneal seeding. MRI shows the characteristic low-signal-intensity rim of the hydatid cyst on T2-weighted images [8].

The aim of this study was to show the sonographic, CT, and MRI features of surgically confirmed abdominal HD caused by E. granulosus at various locations including the whole extrahepatic intraabdominal organs, retroperitoneum, peritoneum, diaphragma, bone, and soft tissue in the abdomen.

Intraperitoneum and Retroperitoneum

Intrapertoneal HD accounts for 13% of all abdominal hydatidosis. The cysts develop secondary to spontaneous or iatrogenic rupture of hepatic, splenic, or mesenteric cysts and can be located anywhere in the peritoneum. Primary peritoneal involvement is extremely rare [7]. Single and unilocular peritoneal hydatid cysts may not be distinguished from other peritoneal cysts including mesenteric and duplication cysts on the basis of imaging findings alone. Isolated retroperitoneal HD is also rare and usually secondary to the involvement of liver [1] (Figs. 1–7).

Spleen

Involvement of the spleen is relatively rare and is the third most common site after the
liver and lungs. The incidence of splenic involvement has been reported to be from 0.9% to 8% [1]. Primary splenic hydatidosis is quite rare and accounts for less than 2% [9]. It develops secondary to systemic dissemination or intraperitoneal spread from ruptured liver hydatid cysts. Splenic and hepatic cysts are commonly solitary and show the classical radiologic appearance of HD (Figs. 8–11). The differential diagnosis of splenic hydatidosis includes epidermoid cysts, pseudocysts, abscess, hematoma, and neoplasms [9].

Genitourinary Tract

Primary pancreatic involvement is very rare (0.25% of the cases), and it is often associated with hepatic disease [10]. The diagnosis of a hydatid cyst in the pancreas is extremely difficult on the basis of imaging findings without a high index of suspicion. The cyst may easily be confused with a pseudocyst of the pancreas. However, the presence of a thickened and more laminated wall than a simple cyst and a thin layer of calcification within the lesion associated with liver HD may suggest a hydatid cyst (Fig. 12). The differential diagnosis includes pseudocyst, serous cystadenoma, and mucinous cystic neoplasm [10].

Diaphragma

Diaphragmatic localization is very rare, with an incidence of 1%, and most of these are generally associated with primary liver disease [14]. Multiphase thoracoabdominal MRI or reformatted CT scans may help to show its topographical relationships and pulmonary and hepatic involvement. The CT findings consist of thickened and lobulated diaphragma with unilocular or multilocular cysts. Cysts may split the leaves of the diaphragma. CT is valuable for visualizing transdiaphragmatic migration of hydatid disease and evaluating the thoracic component (Fig. 17).

Abdominal Bone and Soft Tissues

Primary soft-tissue involvement by HD is uncommon even in endemic areas and represents 0.5–4.7% of patients [3]. Primary focus within muscle in the absence of pulmonary or hepatic involvement is very unusual. Imaging findings are variable and nonspecific including unilocular cyst, multilocular cyst, and complex solid lesion. The frequency of osseous involvement in HD is 1–2.4% [15]. It is most commonly seen in the spine and pelvis. Imaging findings include a well-defined, typically multiloculated, osteolytic lesion with expansion of the bone, thinning of the cortex, and extension into the adjacent soft tissue. The intraosseous component may calcify, but the intraosseous component rarely shows calcification [1] (Figs. 18 and 19).

References

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Fig. 1—Intraperitoneal hydatid disease (HD) in 20-year-old woman with history of liver HD.
A, Axial sonogram of abdomen through level of gallbladder shows cyst (arrow) compressing gallbladder (star). Cyst has split wall in its posterior (arrowhead). This appearance is caused by separation of laminated membrane from pericyst and is characteristic for hydatid cysts.
B, Axial T1-weighted MR image shows cyst near gallbladder and double rim is seen on posterior surface, with hyperintense pericyst located more externally (black arrow) and hypointense middle membrane situated internally (white arrow).

Fig. 2—Rectovesical hydatid disease in 25-year-old woman complaining of constipation. Contrast-enhanced CT image shows low-attenuation mass (arrow) with radially oriented internal septae displacing rectum (arrowhead).

Fig. 3—Disseminated intraperitoneal hydatid disease in 17-year-old girl who presented with constipation and bilateral flank pain.
A, Contrast-enhanced axial CT image shows multiple intraperitoneal purely cystic masses (arrows) and marked bilateral hydronephrosis (stars).
B, Sagittal reformatted CT image reveals unilocular, thick-walled retrovesical cyst (arrowhead) displacing distal ureter causing hydronephrosis.
Fig. 4—Intraperitoneal hydatid disease (HD) in 20-year-old man complaining of epigastralgia.
A, Axial sonogram of epigastrium shows large cystic lesion (arrow) containing multiple peripheral rounded smaller cysts and solid part (arrowhead), which settles in dependent part of cyst pointing matrix or detached membrane, consistent with hydatid cyst (“wheel spoke” pattern).
B, Axial T2-weighted MR image shows large epigastric hydatid cyst (arrow) containing multiple daughter cysts displacing stomach and liver HD (arrowhead). There is also heterogeneous hypointense lesion in splenogastric space (star).
C, Coronal contrast-enhanced CT image reveals rupture of splenic hydatid cyst (arrow) into splenogastric space (star). HD of liver (arrowhead) is also seen.
D, Axial contrast-enhanced CT image above bladder shows another cyst with enhancing pericystic wall and barely seen internal septa (arrow).

Fig. 5—Disseminated abdominal hydatid disease in 17-year-old girl with abdominal pain. Axial contrast-enhanced CT image shows intraperitoneal uniloculated and multiloculated cysts (black arrowheads) and multiple liver (white arrowheads) and spleen (thick white arrows) cysts. Pancreas (thin white arrows) has thickened and heterogeneous appearance as consequence of hydatid involvement.

Fig. 6—Pelvic hydatid disease causing sciatalgia in 60-year-old woman.
A, Axial contrast-enhanced CT shows lobulated low-attenuated masses in presacral region (arrows).
B, Axial fat-suppressed T2-weighted image shows hyperintense multiloculated cystic mass (arrowheads).
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Fig. 7—Retroperitoneal hydatid disease in 25-year-old woman with right flank pain. Axial contrast-enhanced CT image shows cystic mass (arrow) extending to right lumbar region with barely seen central hydatid matrix (star) in right posterior pararenal region. Large hydatid cyst is also seen in liver (arrowhead).

Fig. 8—Involvement of spleen in 20-year-old man with liver and peritoneal hydatid disease (HD).
A, Sagittal sonogram of spleen shows heterogeneous solid hyperechoic mass (arrowhead).
B, Contrast-enhanced axial CT shows hypodense lesion (black arrow) in spleen with speck of calcification (black arrowhead) on lateral wall and epigastric (white arrow) and liver HD (white arrowhead).

Fig. 9—Isolated hydatid disease (HD) of spleen in 50-year-old woman who presented with painful mass in left upper quadrant. Axial contrast-enhanced CT image shows multiloculated cystic mass with multiple peripheral daughter cysts and dense matrix in center (arrow), typical of HD.

Fig. 10—83-year-old woman with spleen lesion incidentally discovered on CT during investigation for urinary stone disease. Axial contrast-enhanced CT image shows heavily calcified mass that contains detached membranes (arrow).

Fig. 11—43-year-old man with left upper quadrant pain.
A, Turbo field-echo coronal MR image shows hypointense mass with detached internal membrane (arrowhead), suggesting hydatid disease.
B, Axial T1 image shows heterogeneous hypointense mass (arrowhead).
C, Axial contrast-enhanced T1 image shows enhancement of vascularized part of pericyst (arrowheads).
Fig. 12—Hydatid disease of pancreas in 42-year-old woman with 6-month history of epigastric pain. Axial contrast-enhanced CT image shows uniloculated cystic mass (arrow). Diagnosis was only made by means of positive serology and was confirmed by surgery.

Fig. 13—Primary hydatid disease of kidney in 21-year-old man who presented with flank pain. Axial unenhanced CT image through upper pole of right kidney shows large cyst (arrow) with daughter cyst (arrowhead) in its periphery, which has typically lower attenuation than mother cyst.

Fig. 14—Hydatid disease of adrenal gland in 74-year-old woman with right flank pain. Axial contrast-enhanced CT image shows cystic mass (star) with rim calcification (arrowhead).

Fig. 15—Hydatid disease (HD) of uterus in 72-year-old woman who presented with pelvic pain. Axial contrast-enhanced CT image shows cystic mass (arrow) in uterus associated with liver HD (not shown).

Fig. 16—Hydatid disease (HD) of ovary in 24-year-old pregnant woman with liver HD. A, Axial T1-weighted MR image shows gestational sac (arrow) and multilocular cystic left ovary (arrowhead). B, Sagittal T2-weighted image shows cystic lesion containing multiple septations and small cysts (arrowhead).
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Fig. 17—Involvement of diaphragm in 21-year-old woman with known liver hydatid disease. Contrast-enhanced CT shows marked thickening of diaphragm (arrows), which contains small daughter cysts (arrowheads).

Fig. 18—Hydatid disease (HD) of abdominal wall (arrowhead) in 10-year-old girl who presented with painful mass. Axial unenhanced CT image shows simple cyst of lateral abdominal wall. Associated liver HD made diagnosis easier in this patient.

Fig. 19—Musculoskeletal involvement of left sacroiliac region in 59-year-old man who presented with left lower extremity pain and diminished arterial pulses. Axial contrast-enhanced CT image shows cystic masses involving left psoas muscle (arrow), sacrum, ileum (black arrowhead), and gluteus muscles (white arrowhead). (Reprinted with permission from [15] Kizilkaya E, Silit E, Basekim C, Karsli AF. Hepatic, extrahepatic soft tissue and bone involvement in hydatid disease. Turk J Diagn Intervent Radiol 2002; 8:101–104)
This article has been cited by:


2. Sib Wáng, Yibo Ma, Weishan Wáng, Yi Dai, Haohao Sun, Jing Li, Shan Wáng, Feng Li. 2021. Status and prospect of novel treatment options toward alveolar and cystic echinococcosis. *Acta Tropica* 54, 106252. [Crossref]


4. Ramazan TOPCU, İsmail SEZİKLİ, Murathan EKRİNT, Orhan ASLAN, Murat Baki YILDIRİM, Bulut ÖZKAN, Doğukan DURAK. 2020. Ekstrahepatic yerleşimi primer intraabdominal kist hıdatikle cerrahi yaklaşımu. *Turkish Journal of Clinics and Laboratory*. [Crossref]


6. Meriem Braiki, Azzaza Mohamed, Fethi Derbel. Introductory Chapter: Overview on Echinococcosis. *[Crossref]*


11. Wáng Shanshan, Li Hui, Liu Yan, Wang Li, Ren Yongfăng, Wang Yan, Muhetarjiang Kader, Jia Wenxiao. 2018. The study of biochemical profile of cyst fluid and diffusion-weighted magnetic resonance imaging in differentiating hepatic hydatid cysts from liver simple cysts. *Journal of Clinical Laboratory Analysis* 32:1, e22192. [Crossref]


16. Hepatic Echinococcus Cyst 222-225. [Crossref]


18. Maria Arraiza, Ur Metser, Rajkumar Vajpeyi, Korosh Khalili, Anthony Hanbidge, Erin Kennedy, Sangeet Ghai. 2014. Primary cystic peritoneal masses and mimickers: spectrum of diseases with pathologic correlation. *Abdominal Imaging*. [Crossref]


20. Mohammad Niknejad, Aditya Shetty. Retroperitoneal hydatid infection. [Crossref]


23. Jeanette Y. Chun, Young H. Kim. Spleen Infectious and Inflammatory Disorders 1511-1522. [Crossref]
25. Duygu Herek, Nevzat Karabulut. 2012. CT demonstration of pulmonary embolism due to the rupture of a giant hepatic hydatid disease. Clinical Imaging 36:5, 612-614. [Crossref]
29. José Manuel Ramia Ángel, Roberto de la Plaza, José E. Quiñones Sampedro, Pilar Veguillas Redondo, Jorge García-Parreño Jofré. 2011. Fistula quistocutánea hidatídica. Cirugía Española 89:3, 189-190. [Crossref]
30. M. Estorch Cabrera, V. Camacho Marti, C. Artigas Guix, J. Duch Renom, A. Flotats Giralt, I. Carrió Gasset. 2010. SPECT-TAC con 67Ga-citro en un quiste renal gigante infectado. Revista Española de Medicina Nuclear 29:5, 268-269. [Crossref]
31. Sheffali Gulati, Atin Kumar, Ajit Harishkumar Goenka, Anita Choudhary, Jitendra Kumar Sahu. 2010. Whole-body MR and cysticercosis: reply to Wiwanitkit. Pediatric Radiology 40:8, 1457-1457. [Crossref]
32. David N. Ishimitsu, Rola Saouaf, Cindy Kallman, Bonnie L. Balzer. 2010. Renal Hydatid Disease. RadioGraphics 30:2, 334-337. [Crossref]
33. I. Sall, H. El Kaoui, A. El Khader, A. Bounaim, A. Ait Ali, S.M. Bouchentouf, C. Ould Jiddou, A. Zentar, K. Sair. 2010. Une masse abdominale. La Revue de Médecine Interne 31:2, 149-150. [Crossref]
37. Dean A. Nakamoto. Spleen 1771-1803. [Crossref]