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Case Report

Hepatic and extra-hepatic hydatid cysts: A case series of radiological and clinical insights ☆

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ABSTRACT

Hydatid disease, caused by *Echinococcus granulosus*, is a parasitic infection that primarily affects the liver but can also involve other organs, including the spleen, kidney, and peritoneum. This case series examined 9 patients with hydatid cysts, highlighting their clinical presentations, radiological findings, and management strategies. This study analyzed 9 patients diagnosed with hepatic and extrahepatic hydatid cysts. Comprehensive evaluations were performed for all patients, including clinical history and contrast-enhanced computed tomography (CT) imaging. The cases included cystic lesions in the liver (7 patients), spleen (3 patients), kidney (2 patients), and peritoneum (1 patient). Typical radiological features, such as the "double-wall sign," daughter cysts, and peripheral calcifications, were observed. The management strategies varied from surgical excision to medical therapy with albendazole. Hydatid disease presents diverse clinical and radiological features. Early diagnosis using advanced imaging techniques and a multidisciplinary approach is critical for effective management and prevention of complications.

Background

Hydatid disease, also known as cystic echinococcosis, is a parasitic infection caused by the larval stage of *Echinococcus granulosus* or, less commonly, *Echinococcus multilocularis*. It remains a significant public health concern in regions where livestock farming and close human-animal interactions are common. These include areas such as the Mediterranean basin, Middle East, Central Asia, South America, and sub-Saharan Africa [1,2]. The parasite lifecycle involves canines as definitive hosts and livestock as intermediate hosts, with humans acting as accidental hosts when they ingest parasite eggs from contaminated food or water [3,4]. Once inside the human body, eggs hatch into larvae, which then migrate via the bloodstream to the liver (70%-80% of cases) and lungs (10%-15%). Other less

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commonly affected organs include the spleen, kidneys, brain, and peritoneum [5]. The disease often progresses silently, with cysts growing slowly over the years before the clinical symptoms manifest. Larger cysts or cysts in critical anatomical locations can lead to significant complications, including rupture, secondary infection, or compression of adjacent structures [6].

The clinical presentation of hydatid disease is variable, depending on cyst size, location, and stage of development. Liver involvement often presents as right upper quadrant pain, hepatomegaly, or jaundice in cases of bile duct compression [7]. Extrahepatic involvement can lead to a wide spectrum of symptoms, such as flank pain in renal cysts or abdominal distension in peritoneal diseases. Although rare, splenic hydatid cysts may present with left upper quadrant discomfort or splenomegaly [8]. Early diagnosis of hydatid disease relies heavily on imaging modalities. Ultrasonography is widely used because of its availability and sensitivity for identifying cystic lesions, particularly hepatic hydatid cysts. It provides essential information on cyst structure, wall thickness, and the presence of daughter cysts or hydatid sand [9]. The World Health Organization (WHO) classification system categorizes cysts into active, transitional, and inactive stages based on ultrasound characteristics [10].

Computed tomography (CT) and magnetic resonance imaging (MRI) provide detailed anatomical information and are indispensable for detecting extrahepatic involvement. In particular, CT imaging is preferred for identifying cyst calcifications, internal septations, and complications, such as rupture or infection. The characteristic “double-wall sign” on CT is highly specific for hydatid cysts [11]. MRI is useful in assessing soft tissue involvement and distinguishing hydatid cysts from other cystic lesions, such as neoplastic or congenital cysts [12]. Serological tests, including enzyme-linked immunosorbent assays (ELISA) and indirect hemagglutination, are adjunctive tools that detect antibodies against *E. coli* antigens. However, sensitivity can vary depending on the location and stage of the cyst. False-negative results are more common for extrahepatic or calcified cysts [13,14].

HD treatment of hydatid disease is multidisciplinary, encompassing medical, surgical, and minimally invasive approaches. Albendazole and mebendazole, the primary antiparasitic agents, are used as first-line therapies, particularly for small cysts or inoperable cases. These drugs disrupt the microtubular structure of the parasite, leading to cyst degeneration over time [15]. However, medical therapy alone is often insufficient for larger cysts or those that cause complications. Surgical intervention remains the cornerstone for the management of complicated hydatid cysts, particularly in the liver. Techniques such as cystectomy or pericystectomy aim to remove the cyst while preserving surrounding healthy tissue. Minimally invasive procedures such as percutaneous aspiration, injection, and re-aspiration (PAIR) have gained popularity for uncomplicated cases, offering lower morbidity rates than open surgery [16]. PAIR involves aspirating cyst contents under ultrasound guidance, injecting a scolicidal agent (e.g., hypertonic saline), and re-aspirating debris to sterilize the cyst cavity [16].

Despite advances in diagnosis and treatment, recurrence rates remain a significant concern, particularly in endemic regions. Long-term follow-up with imaging and serological testing is essential to monitor recurrence or residual disease [17,18]. Public health measures, including deworming of domestic animals and public education on food hygiene, play a critical role in reducing the incidence of hydatid disease.

Case presentation

Case 1

A 40-year-old female presented with a 1-month history of acute abdominal pain, which had an abrupt onset and radiated to the back. The patient also reported a history of fever for 3 weeks. There were no associated symptoms, such as cough, cold, loss of consciousness, seizures, or bowel and bladder disturbances. She had been diagnosed with type 2 diabetes mellitus for the past 10 years, but had no other significant medical or surgical history. No abnormalities were evident on the clinical examination. Radiological evaluation using noncontrast CT of the abdomen revealed a well-circumscribed, unilocular, nonenhancing cystic lesion in the spleen. The lesion displayed the characteristic “double-wall sign,” which is a hallmark feature of hydatid cysts. This finding led to the diagnosis of splenic hydatid cyst, an uncommon presentation of hydatid disease (Fig. 1).

Case 2

A 72-year-old male presented with complaints of abdominal distension lasting 2 months, along with recent onset of loss of appetite and fever for 6 days. The patient also experienced constipation for 1 week. The patient denied any symptoms such as cough, cold, seizures, or bowel and bladder disturbances. His medical history was notable for hypertension, which was diagnosed 11 years ago. The patient had no other comorbidities. Contrast-enhanced CT (CECT) of the abdomen revealed an enlarged liver with multiple well-defined cystic lesions, predominantly in the left hepatic lobe. These cysts showed partially calcified walls, daughter cysts, and enhanced internal septation. The largest cysts were located in segments VII and VIII of the liver. These imaging features were consistent with those of multilocular hepatic hydatid cysts (Fig. 2).

Case 3

A 32-year-old male presented with a 6-month history of persistent right-flank pain. He denied systemic symptoms, such as fever, vomiting, or seizures, and there were no associated bowel or bladder complaints. The patient had no significant medical or surgical history and no known comorbidities. Abdominal contrast-enhanced computed tomography revealed a large, well-defined, multiseptate exophytic cystic lesion involving the upper, middle, and lower poles of the right kidney. The lesion had a thick peripheral enhancing wall with calcific foci and extended superior to the inferior surface of the liver. The findings were diagnostic of an isolated renal hydatid cyst, a rare extrahepatic manifestation of hydatid disease (Fig. 3).

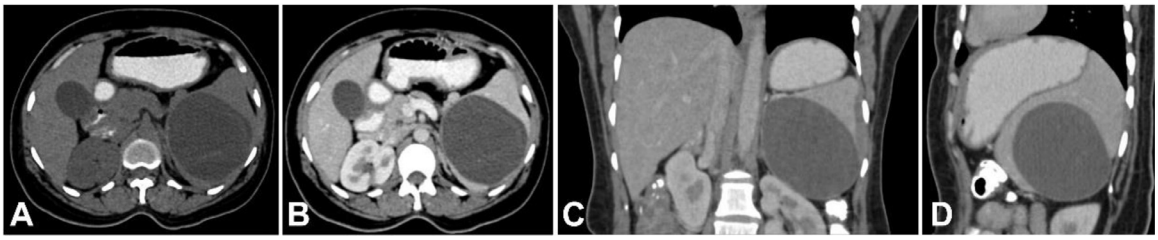

Fig. 1 – (A) Noncontrast CT abdomen axial section, (B-D) Contrast-enhanced computed tomography axial, coronal and sagittal section shows a well-circumscribed, unilocular, nonenhanced cystic lesion in the spleen with typical "double-wall sign" of hydatid cyst.

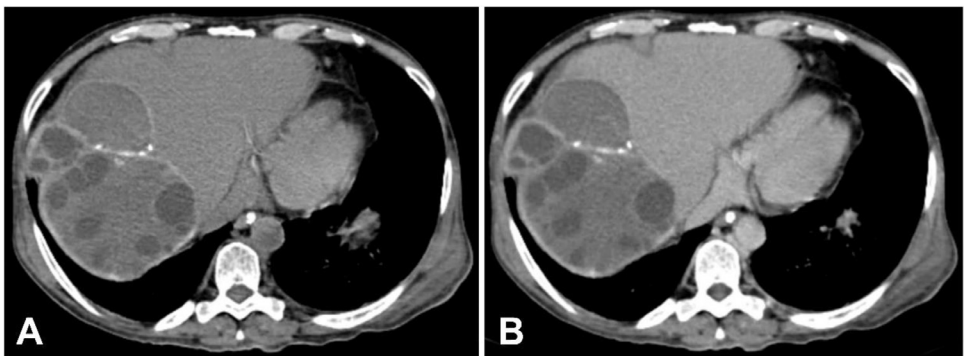

Fig. 2 – (A-B) CECT shows an enlarged liver with multiple well-defined cystic lesions with partially calcified walls, multiple daughter cysts, and enhancing internal septations in the left lobe of the liver, the largest in segments VII and VIII s/hydatid cysts.

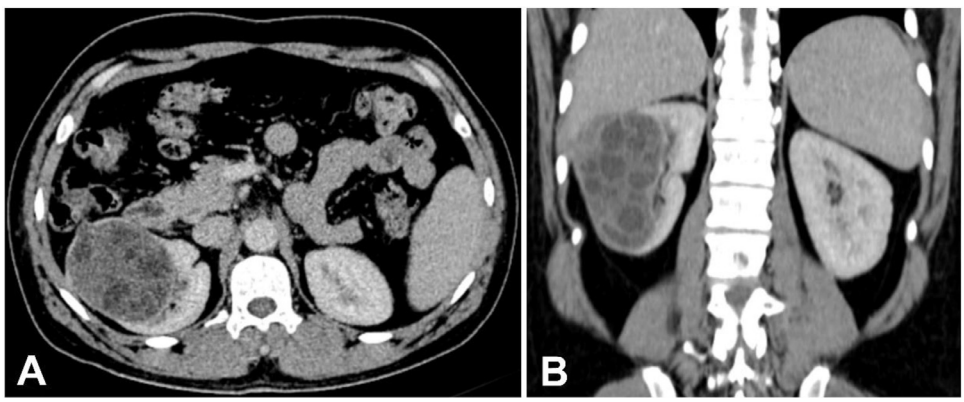

Fig. 3 – (A-C) Isolated renal hydatid cyst CECT showing a large well-defined multiseptated exophytic cystic lesion with a peripherally thick enhancing wall and few calcific foci within the wall, involving the upper, middle, and lower pole of the right kidney. Superiorly, the lesion is reaching upto inferior surface of liver, f/s/o hydatid cyst.

Case 4

A 36-year-old female presented with progressive abdominal pain for 6 months. The pain was nonradiating, and the patient denied any history of trauma, fever, vomiting, or bowel and bladder disturbances. Her medical history was unremarkable and there had no known comorbidities. Abdominal contrast-enhanced computed tomography revealed a well-defined cystic lesion with folded membranes and peripheral calcifications in segment VIII of the liver, consistent with a hydatid hepatic cyst. Additionally, another cystic lesion containing multiple daughter cysts and hydatid sand was observed in the peritoneum, located in the gastrosplenic region, compressing the left kidney and pancreas. These findings suggested the presence of both hepatic and peritoneal hydatid cysts (Fig. 4).

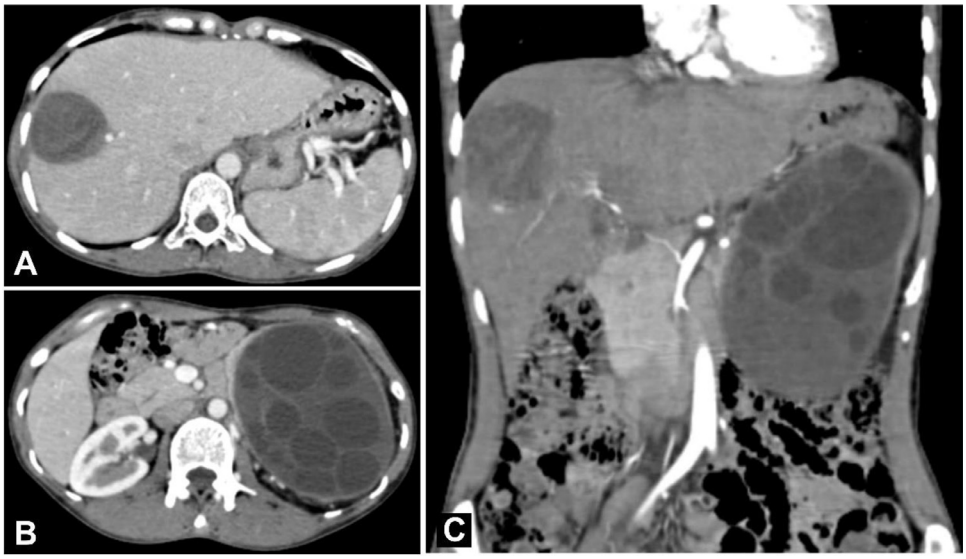

Fig. 4 – (A-C) CECT showing a cystic lesion with folded membranes and peripheral calcifications in segment VIII of the liver, consistent with a hydatid cyst. Another cystic lesion with daughter cysts and hydatid sand is seen in the peritoneum, extending from the left hypochondrium to the lumbar region, compressing the left kidney and pancreatic tail, which is also suggestive of a hydatid cyst.

Case 5

A 58-year-old male shepherd reported abdominal distension that persisted for 5 years, accompanied by acute abdominal pain for 2 months. He also experienced fever and vomiting for 5 days. The patient had no bowel or bladder complaints, significant medical history, or comorbidities. CECT imaging revealed extensive multiloculated cystic lesions involving the liver, spleen, and peritoneal cavity. These cysts had peripheral enhancing walls and internal septations, with multiple daughter cysts within the larger "mother cysts." A hypodense lesion with calcification was observed in liver segment VI. Imaging findings confirmed disseminated hydatid disease involving multiple organs (Fig. 5).

Case 6

A 46-year-old female presented with a 3-month history of pain in the right hypochondrium accompanied by intermittent vomiting for 5 days. She denied fever, bowel or bladder disturbances, and had no history of significant medical conditions or comorbidities. CT imaging, including both noncontrast and contrast-enhanced scans, revealed a large, multiloculated, nonenhancing subcapsular cystic lesion in segments VI, VII, and VIII of the liver. The cyst contained small daughter cysts and showed peripheral calcifications, which are characteristic of hepatic hydatid cysts (Fig. 6).

Case 7

A 50-year-old female presented with a 1-year history of abdominal pain. This was accompanied by nausea, vomiting, and fever over the past 5 days. She also reported the presence of a palpable abdominal mass on the right side for 1 month. Her medical history was unremarkable and, had no known comorbidities. CECT imaging revealed a large, nonenhancing cystic lesion with tiny fat density foci, hypodense contents, and peripheral wall calcifications in liver segments II, IVa, and VIII. The cyst extended to the subcapsular region and caused significant compression of the hepatic veins and inferior vena cava. The imaging findings were consistent with those of a stage CE4 hepatic hydatid cyst (Fig. 7).

Case 8

A 55-year-old female farmer presented with a 3-month history of right flank pain and vomiting over the past 5 days. She had no associated bowel or bladder complaints and no significant medical history or comorbidities. CECT revealed 2 well-defined heterogeneously hypodense cystic lesions with folded membranes and calcifications in segments VI and VII of the liver. An additional exophytic cystic lesion with linear calcifications was identified at the lower pole of the right kidney. These findings confirm the presence of hepatic and renal hydatid cysts (Fig. 8).

Case 9

A 63-year-old male presented with progressive abdominal distension for 6 months, accompanied by acute loss of appetite, fever, and vomiting for the past 5 days. He had no bowel or bladder complaints, significant medical history, or comorbidities. CECT imaging revealed multiple cystic lesions in the liver and spleen. The liver appeared enlarged with cysts exhibiting partially calcified walls, daughter cysts, and enhanced internal septations in segments VII and VIII. Similar cystic

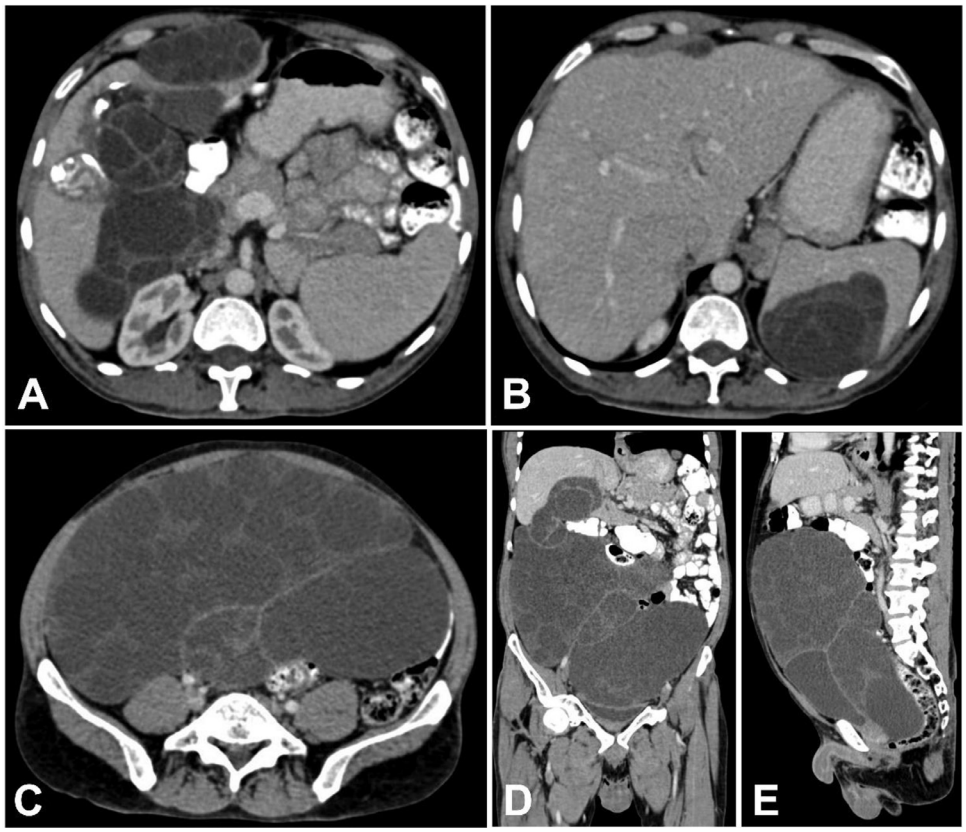

Fig. 5 – Axial, coronal, and sagittal sections reveal diffuse multiloculated cystic lesions involving the liver, spleen, and peritoneal cavity, characterized by internal septations and peripheral enhancing walls. Each cyst contained multiple smaller daughter cysts within the mother cyst. These lesions compress the adjacent structures and viscera. A hypodense lesion with multiple calcifications was observed in segment VI of the liver.

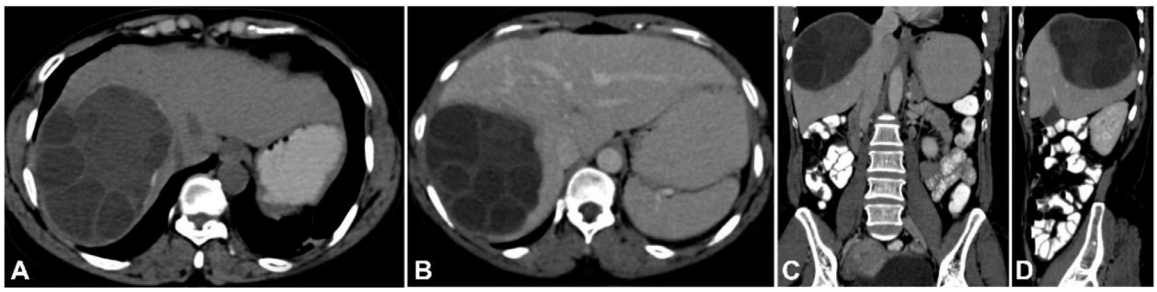

Fig. 6 – Noncontrast and contrast-enhanced CT images reveal a large, multiloculated, nonenhancing subcapsular cystic lesion in segments VI, VII, and VIII of the liver. The lesion contained small daughter cysts and exhibited peripheral wall calcifications suggestive of a hydatid cyst.

lesions were also observed within the splenic parenchyma. These findings were diagnostic of multiple intrahepatic and intrasplenic hydatid cysts (Fig. 9).

Case 10

A 60-year-old female presented with a 5-month history of abdominal pain that was gradual in onset and progressively worsened. The pain radiated to the back and was associated with a history of fever lasting 3 weeks. The patient had no complaints of cough, cold, bowel, or bladder disturbance. Her medical history included hypertension diagnosed 10 years prior with no other comorbidities. Contrast-enhanced CT (CECT) revealed a multiloculated cystic lesion with a predominantly solid component and multiple variably sized daughter cysts in the spleen. The wall of the lesion was partially calcified, which was consistent with the diagnosis of a splenic hydatid cyst (Fig. 10).

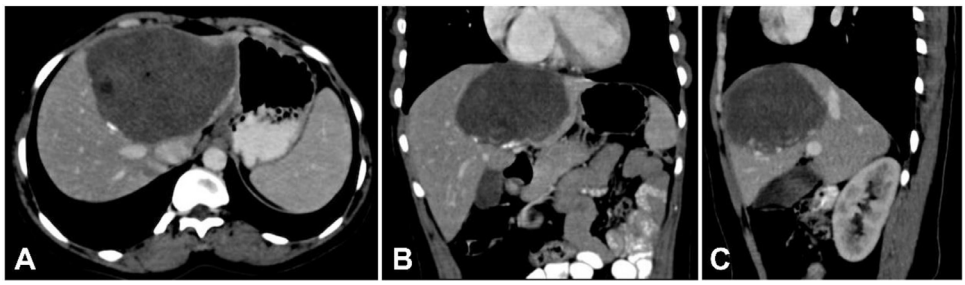

Fig. 7 – Axial, coronal, and sagittal sections reveal a large, nonenhancing cystic lesion with tiny fat density foci, a hypodense cystic area, and peripheral wall calcifications in segments II, IVa, and VIII of the liver, suggesting a hydatid cyst (stage CE4). The lesion extended to the subcapsular region along the diaphragmatic and anterior surfaces of the liver, causing significant compression of the hepatic veins and hepatic IVC.

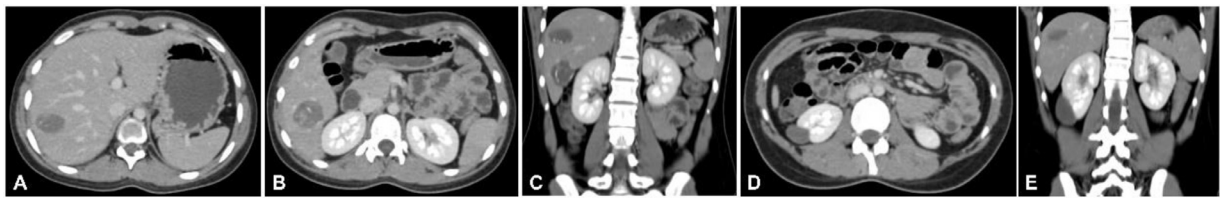

Fig. 8 – (A-C) Two well-defined, heterogeneously hypodense cystic lesions with folded membranes and calcifications are observed in segments VI and VII of the liver, consistent with hydatid cysts (WHO Type CE5). (D-E) A well-defined exophytic, heterogeneously hypodense cystic lesion with linear calcifications is observed in the lower pole of the right kidney, suggestive of a renal hydatid cyst.

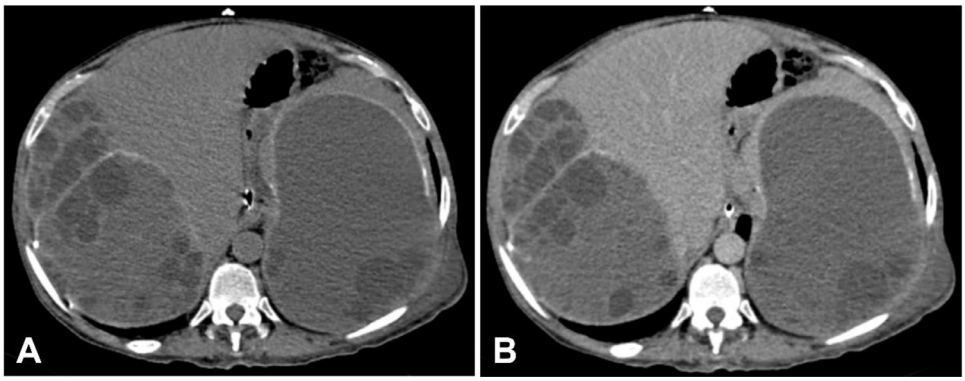

Fig. 9 – The liver is enlarged with multiple well-defined cystic lesions, partially calcified walls, daughter cysts, and enhanced internal septations, the largest in segments VII and VIII, indicative of hydatid cysts. A similar cystic lesion was noted in the splenic parenchyma, suggesting an intrasplenic hydatid cyst.

Discussion

Hydatid disease, caused by *Echinococcus granulosus* or *Echinococcus multilocularis*, continues to be a significant public health problem in endemic regions, such as the Mediterranean, Africa, South America, Asia, and parts of Eastern Europe. Its global impact is underscored by its zoonotic nature, with humans acting as accidental hosts following the ingestion of eggs from contaminated food or water [10,19]. This parasitic infection predominantly affects the liver (50%-70%) due to portal filtration, followed by the lungs (20%-30%). However, rare sites, such as the spleen, kidney, peritoneum, and brain, are occasionally involved [3,20]. The present case series highlights the diverse clinical and radiological spectra of hepatic and extrahepatic hydatid cysts.

Imaging modalities and diagnostic features

Radiological imaging remains the cornerstone of hydatid cyst diagnosis, as serological tests may lack sensitivity and specificity, particularly in endemic regions. Ultrasonography is of-

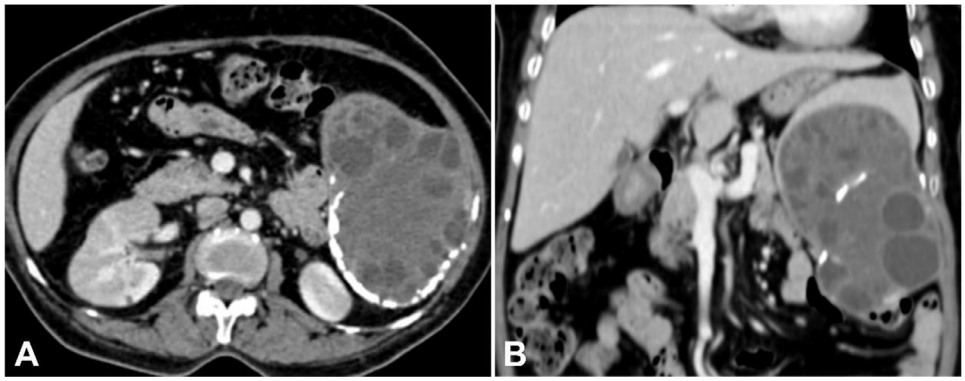

Fig. 10 – Axial and coronal sections of the abdomen reveal a multiloculated cystic lesion with a predominantly solid component and multiple variable-sized daughter cysts in the spleen. The wall of the lesion showed partial calcification, suggestive of a hydatid splenic cyst.

ten the initial investigation because of its availability and ability to characterize cysts based on the WHO classification system [21]. However, computed tomography (CT) offers superior resolution and is critical for assessing cyst size, location, calcifications, and complications such as rupture or secondary infection [22]. In this series, CT imaging revealed hallmark signs such as the "double-wall sign" (case 1), daughter cysts (cases 2, 5, and 9), and peripheral calcifications (cases 6, 7, and 8). These findings are consistent with those of prior studies that identified these features as diagnostic hallmarks of hydatid disease [7,23]. Additionally, multiseptate lesions with enhanced septations, observed in several cases, highlight the advanced stages of cystic echinococcosis, which require meticulous planning for intervention [24].

Hepatic hydatid cysts

The liver, being the most common site of involvement, was affected in 6 of the 9 cases in this series. The high prevalence aligns with its physiological role in trapping *Echinococcus* oncospheres from portal circulation [25]. In cases 5 and 7, extensive hepatic involvement was observed, with multiloculated cysts causing significant mass effects, including compression of adjacent structures, such as the inferior vena cava and hepatic veins. Such complications underscore the importance of timely diagnosis and intervention to prevent severe morbidity [1,26].

Extra-hepatic hydatid cysts

Although the liver is most commonly affected, extrahepatic hydatid cysts present unique diagnostic and therapeutic challenges. In this series, splenic involvement (case 1), renal involvement (cases 3 and 8), and peritoneal involvement (case 4) highlighted the diverse manifestations of hydatid disease. Splenic hydatid cysts are rare, accounting for less than 10% of all cases [27]. Their rarity often delays diagnosis, as they mimic other splenic pathologies such as abscesses or neoplasms [28]. Renal hydatid cysts, seen in only 2%-3% of cases, typically present with nonspecific symptoms, such as flank pain, as observed in cases 3 and 8 [11]. In both cases, CECT revealed characteristic thick-walled, multiseptate cystic lesions, confirming the diagnosis. The coexistence of hepatic and renal cysts in case 8 underscores the potential for widespread dissemination in untreated or recurrent hydatid disease [29]. Peritoneal hydatid cysts, as observed in case 4, are usually secondary to hepatic cyst rupture. The spillage of hydatid material into the peritoneal cavity results in implantation and growth of cysts at various locations. In this case, the cyst compressed adjacent organs, including the pancreas and kidney, highlighting the potential for severe complications [30,31].

Complications and challenges

Hydatid disease can lead to life-threatening complications if left untreated. Rupture of cysts into the biliary tree, peritoneal cavity, or adjacent organs can cause anaphylaxis, secondary infections, or dissemination. The compression of critical structures, such as the hepatic veins and inferior vena cava observed in case 7, exemplifies the potential for severe morbidity [32]. Such cases require immediate intervention to mitigate risks.

Management strategies

HD management of hydatid disease is guided by the WHO-IWGE classification, which stratifies cysts based on their stage and complexity [3]. Treatment options include percutaneous aspiration, injection, and re-aspiration (PAIR), surgical excision, or medical therapy with albendazole or mebendazole. The choice of therapy depends on cyst characteristics such as size, location, and complications. In this series, large, complicated cysts, such as those in cases 5 and 7, were managed surgically, reflecting the current standard of care for multiloc-

ulated or compressive lesions. Surgical techniques, including cystectomy and pericystectomy, aim to remove the cyst entirely while minimizing spillage and recurrence [33]. In contrast, smaller or uncomplicated cysts may be managed with PAIR, a minimally invasive technique proven effective for cystic echinococcosis [27]. Albendazole therapy is often used as an adjunctive therapy to reduce preoperative cyst viability and prevent postoperative recurrence. However, its efficacy is limited in calcified cysts or those with thick walls, as seen in advanced stages, such as cases 6 and 8 [34].

Implications and future directions

This case series highlights the need for a multidisciplinary approach for managing hydatid disease, particularly in cases with multiorgan involvement or complications. The findings underscore the critical role of advanced imaging modalities in diagnosis and preoperative planning. Additionally, there is a need for more robust data on the long-term efficacy of newer minimally invasive techniques, such as robot-assisted hydatid cystectomy. Prevention of hydatid disease remains a public health priority in endemic areas. Improved sanitation, control of stray dog populations, and public awareness campaigns are essential to reduce Echinococcus transmission [35].

Conclusion

This case series highlights the diverse clinical and radiological spectrum of hepatic and extrahepatic hydatid cysts, emphasizing the importance of early diagnosis and tailored management strategies. The cases presented demonstrate that hydatid disease, although commonly involving the liver, can affect other organs, such as the spleen, kidney, and peritoneum, often leading to diagnostic challenges. Advanced imaging techniques, particularly contrast-enhanced CT, play a pivotal role in confirming diagnoses, determining the extent of the disease, and planning appropriate interventions. A multidisciplinary approach that combines surgical, medical, and radiological expertise is crucial for optimal patient outcomes, particularly in complex cases involving multiple organ systems. These findings reinforce the need for increased clinical awareness and meticulous evaluation of endemic regions to ensure timely and effective treatment.

Ethical approval

Formal consent was not required for this study.

Patient consent

Written informed consent was obtained from the patient for the publication of this case report.

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