Royal Free London
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ABDOMINAL MANIFESTATIONS OF HYDATID DISEASE

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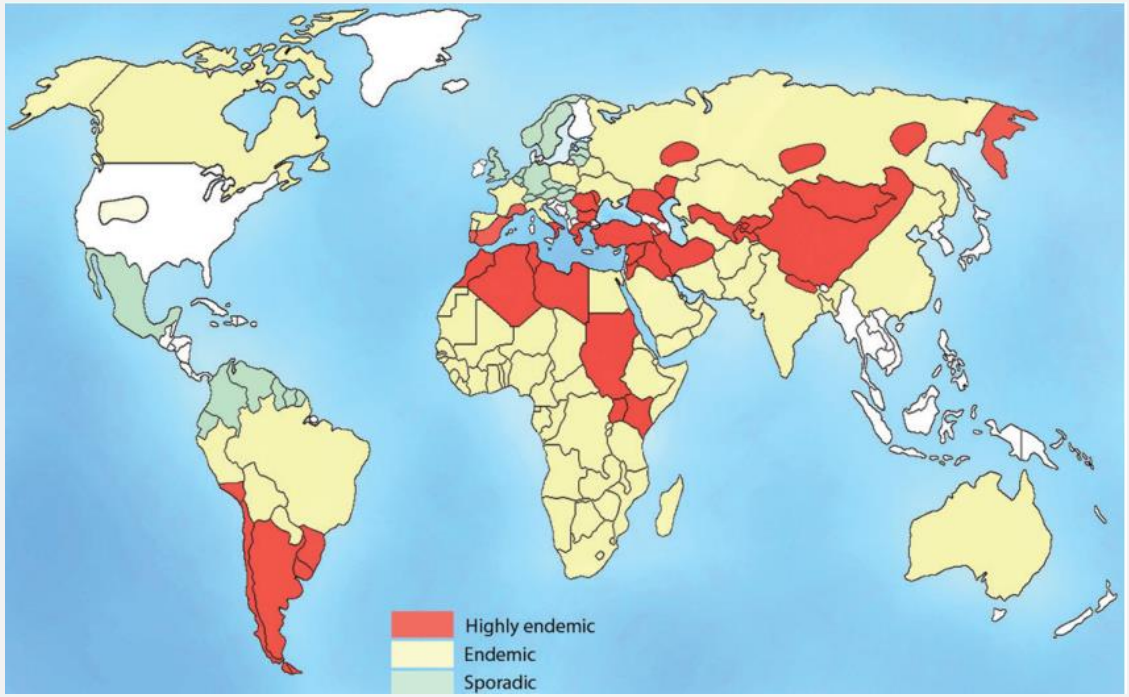
BACKGROUND

- Hydatid disease is a worldwide parasitic infection produced by the larval stage of the Echinococcus tapeworm.
- It is transmitted from animals to humans via the faecal-oral route.
- The two main types of hydatid disease are caused by E granulosus and E multilocularis.
- The former is the most common hydatid disease in human and commonly encountered in the Mediterranean region, Africa, South America and the Middle East.
- Hydatid cysts mainly affect the liver (75%), followed by the lung (15%), and the ability to affect many other organs.
- Medical imaging modalities are pivotal for the diagnosis of hydatid disease with high sensitivity and specificity.
- We present multimodality images of the abdominal manifestation and complications of hydatid disease including intra-hepatic disease, biliary spread and peritoneal involvement.



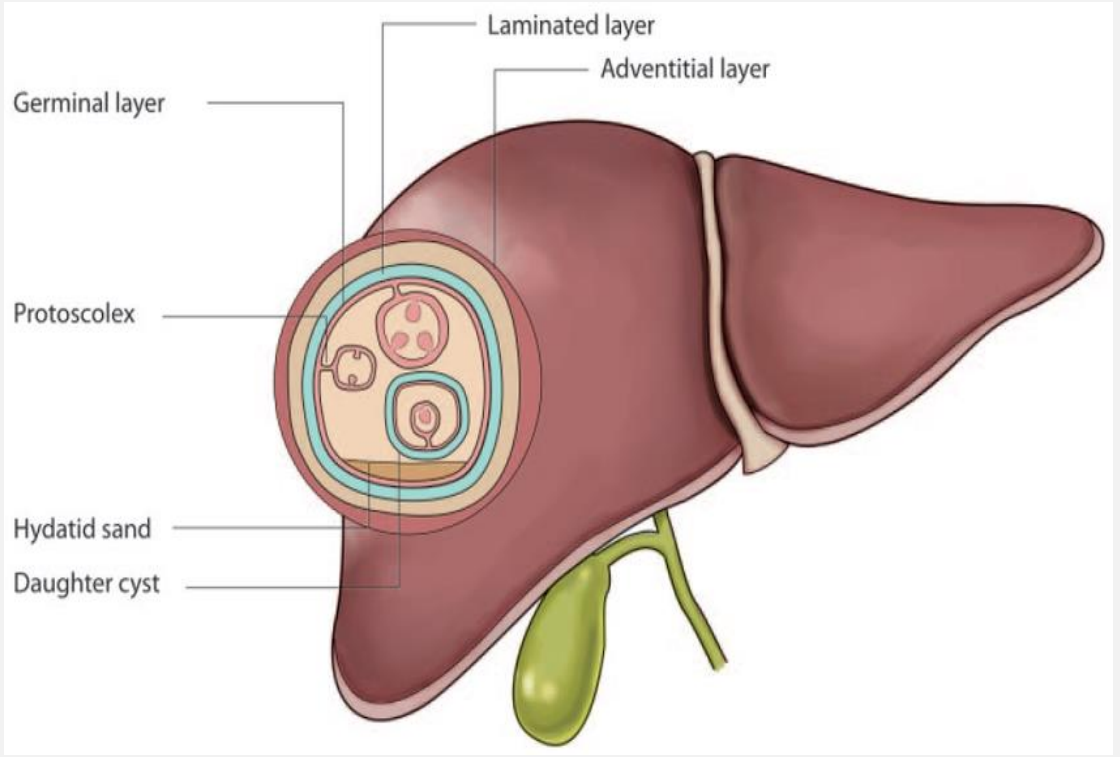
Graph: the geographic distribution of E granulosus, with high endemic areas marked in red.

Reference: Pedrosa I, Saíz A, Arrazola J, Ferreirós J, Pedrosa CS. Hydatid disease: radiologic and pathologic features and complications. RadioGraphics 2000;20(3):795–817

HYDATID CYST LAYERS

The hydatid cyst is composed of three layers:

- **(a) The outer layer (Pericyst)**
  - Forms the fibrous protective outer layer composed of modified host cells including fibroblasts, giant cells and eosinophils
  - Forms as result of the host response
- **(b) The middle laminated layer**
  - This is a laminated membrane allowing the passage of nutrients
- **(c) The inner germinal layer**
  - This layer plays an important role in the reproductive functions of the parasite
  - This is the layer where the daughter cysts reside



Govindasamy A, Bhattarai PR, John J. Liver cystic echinococcosis: a parasitic review. Therapeutic Advances in Infectious Disease. 2023;10. doi:10.1177/20499361231171478

Mehta P, Prakash M, Khandelwal N. Radiological manifestations of hydatid disease and its complications. Trop Parasitol. 2016 Jul-Dec;6(2):103-112. doi: 10.4103/2229-5070.190812.

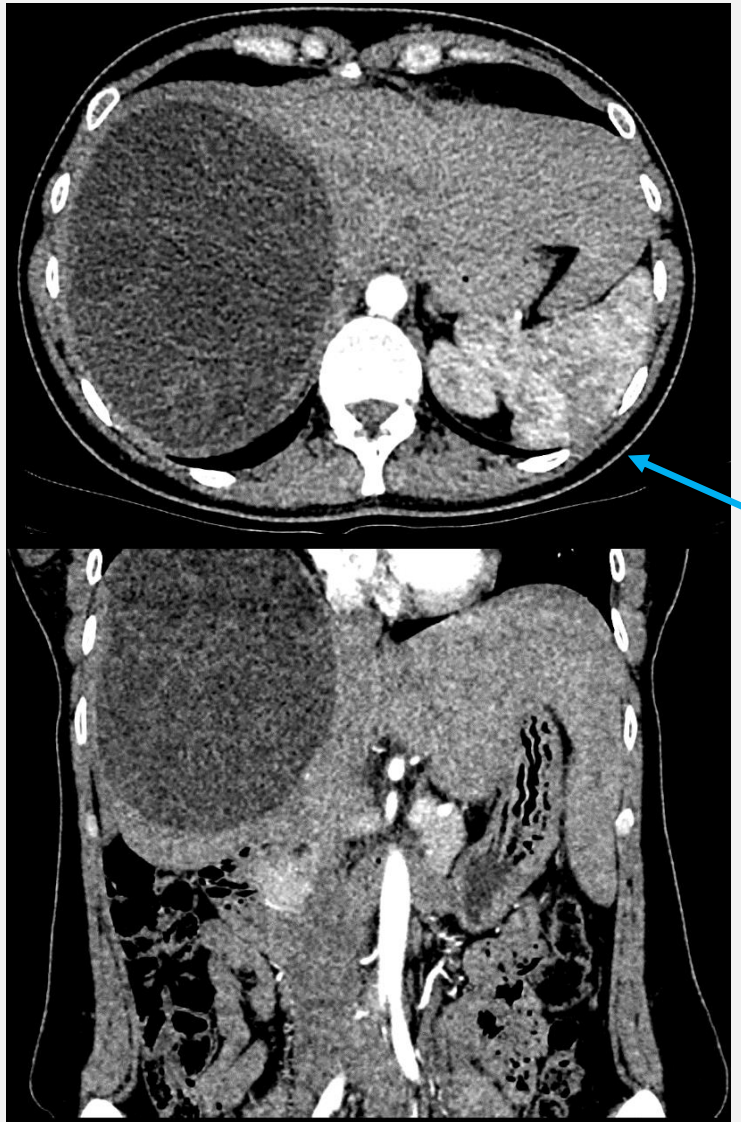
HYDATID CYST CLASSIFICATION

- Established by the World Health Organization.
- Based on ultrasound (US) features, applicable to CT and MR imaging

- **Type I: Simple Cyst**
  - Resembles a simple cyst.
  - Minimal internal debris may be present.
- **Type II: Cysts with Vesicles**
  - Shows internal vesicles representing daughter cysts.
  - Both Type I and Type II are viable cysts.
- **Type III: Complex Internal Architecture**
  - Complex internal structure.
  - Mainly composed of hydatid sand and detached membranes.
  - In the process of losing viability.
- **Type IV: Mainly Solid**
  - Predominantly solid with scattered calcifications.
- **Type V: Densely Calcified Masses**
  - Indicates nonviability.
  - Cysts are densely calcified masses.

Zalaquett E, Menias C, Garrido F, Vargas M, Olivares JF, Campos D, Pinochet N, Luna A, Dahiya N, Huete Á. Imaging of Hydatid Disease with a Focus on Extrahepatic Involvement. Radiographics. 2017 May-Jun;37(3):901-923. doi: 10.1148/rg.2017160172. PMID: 28493801.

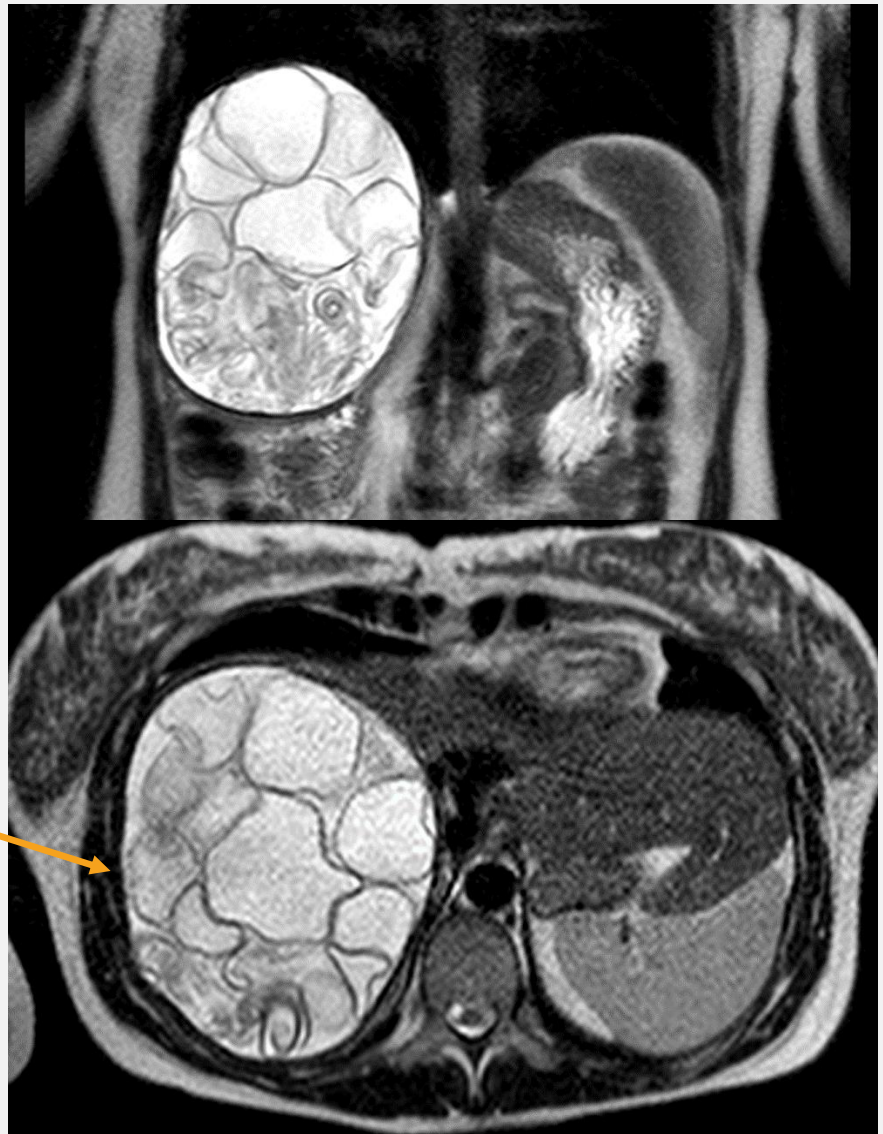
CASE 1



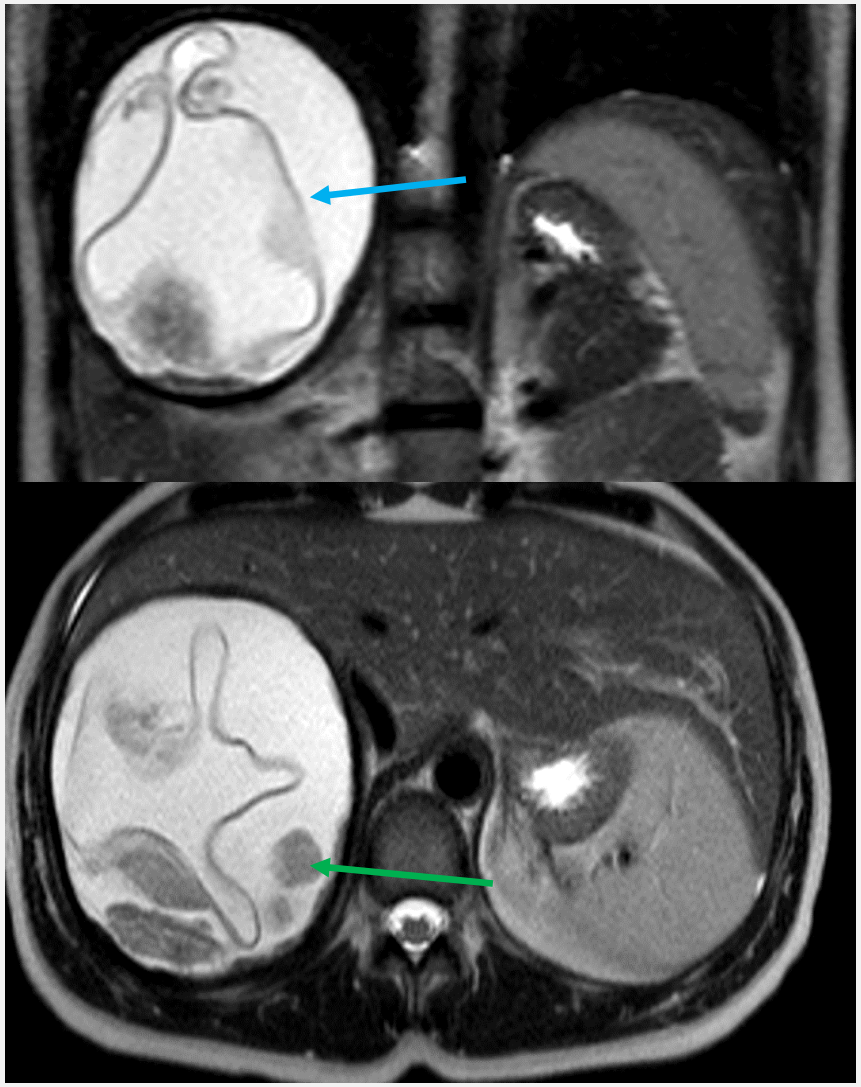
CT (right) and MRI (left) appearances of a large 16 x 13 cm hydatid cyst occupying most of the right liver.

CT demonstrates multiple enhancing septations.

MRI demonstrates multiple Low T2 signal detached membranes.



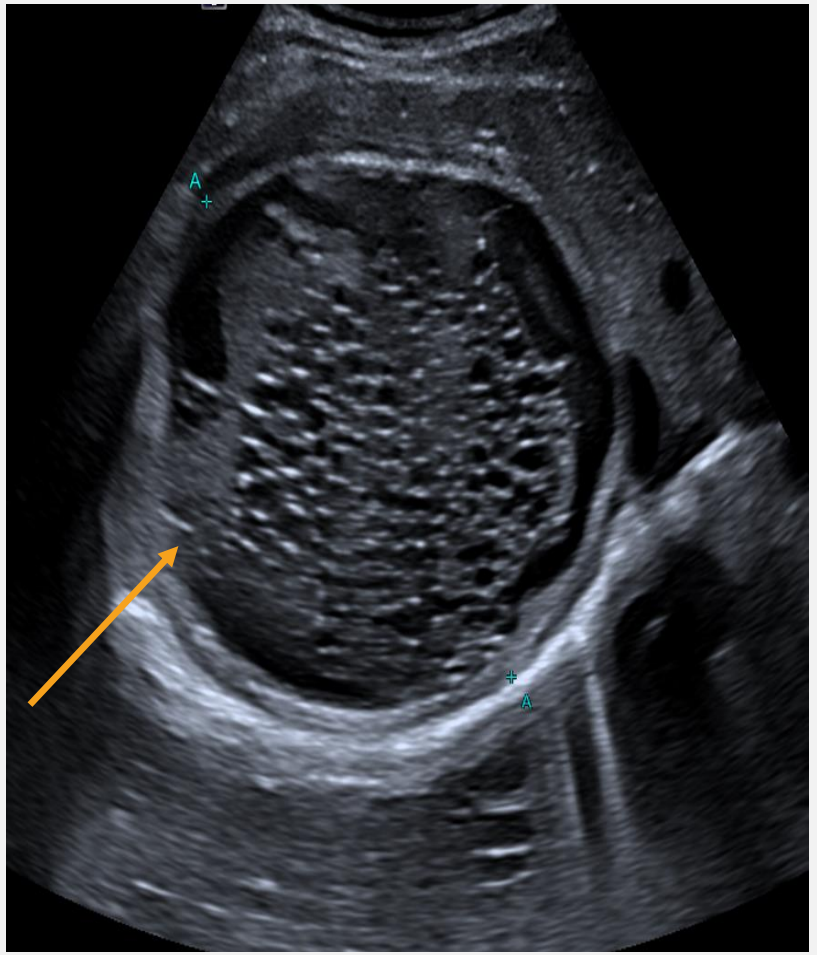
CASE 2



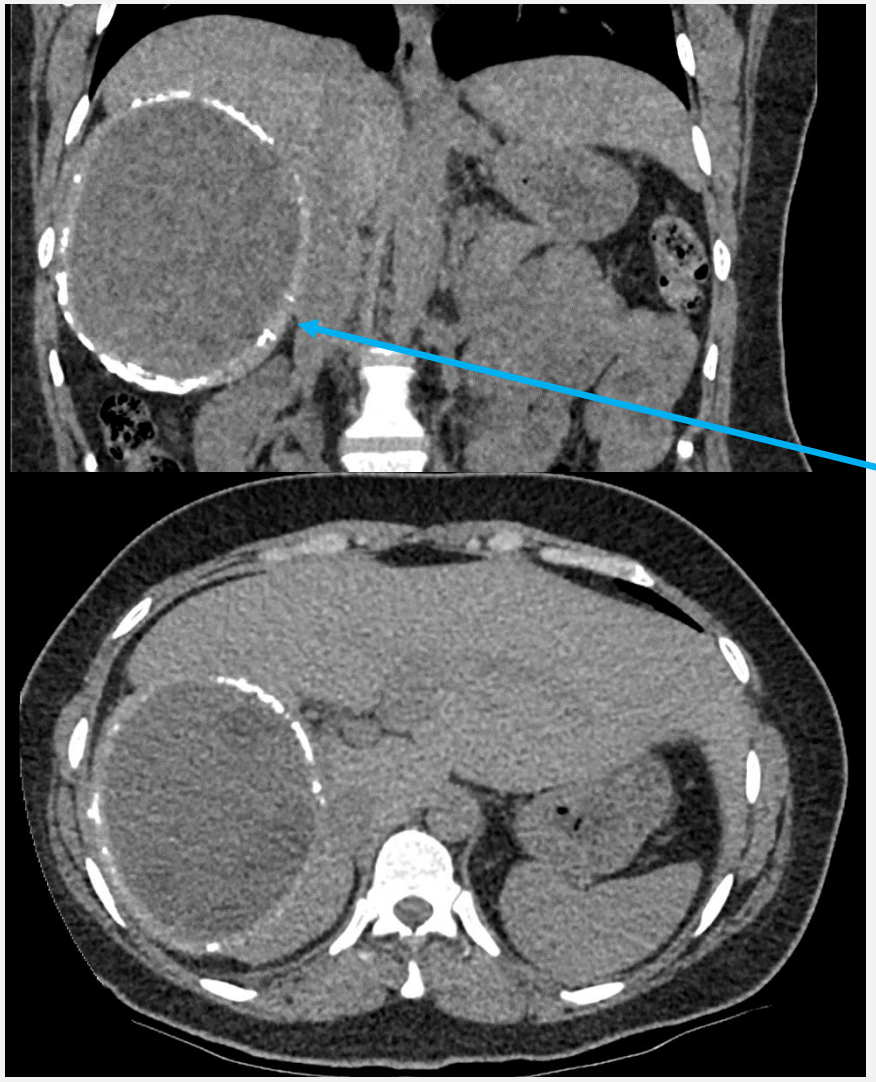
MRI (right) and USS (left) appearances of a large 12 cm hydatid cyst occupying segments VII and VIII.

MRI demonstrates an internal collapsed membrane (blue arrow) and multiple daughter cysts (green arrow).

USS demonstrates a large spongiform thick-walled cyst with multiple septa representing the walls of the daughter cysts (orange arrow).



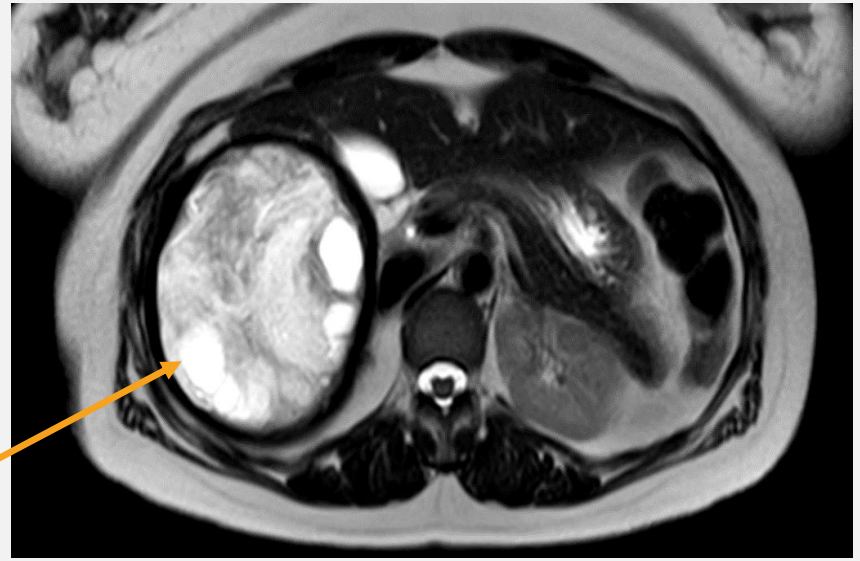
CASE 3



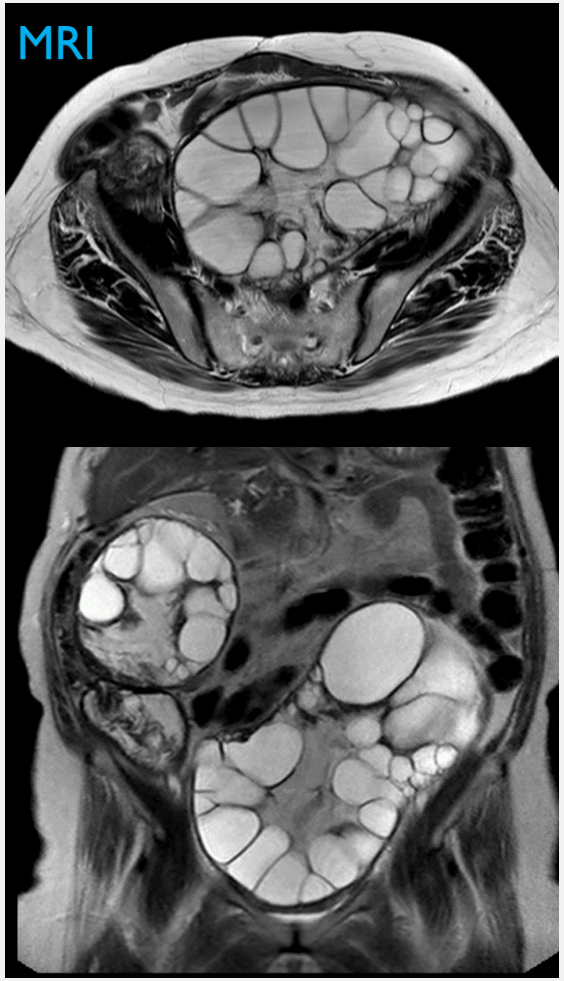
CT (right) and MRI (left) appearances of a large 12 x 12 x 9 cm peripherally calcified hydatid cyst in segment V/VI.

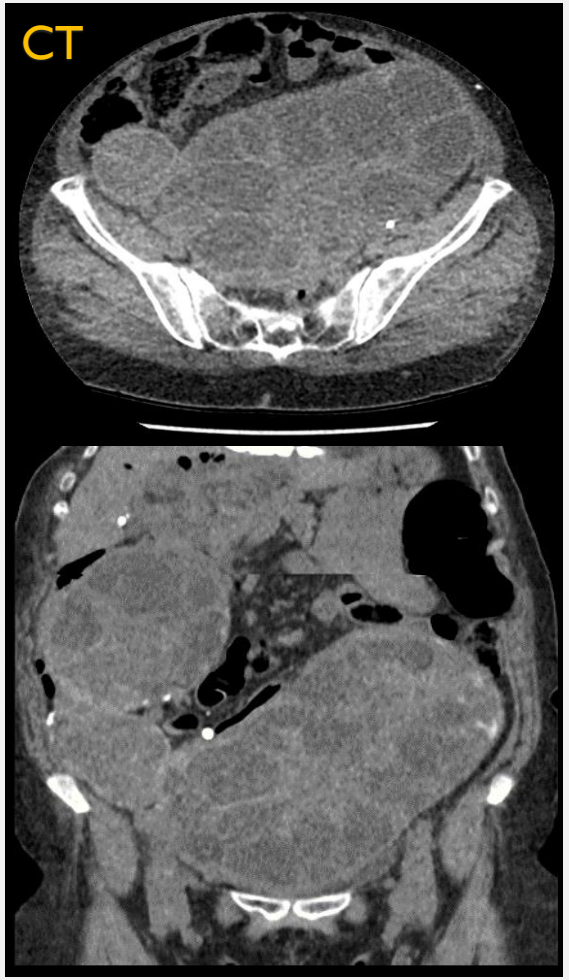
CT demonstrates a large peripherally calcified cyst with multiple daughter cysts.

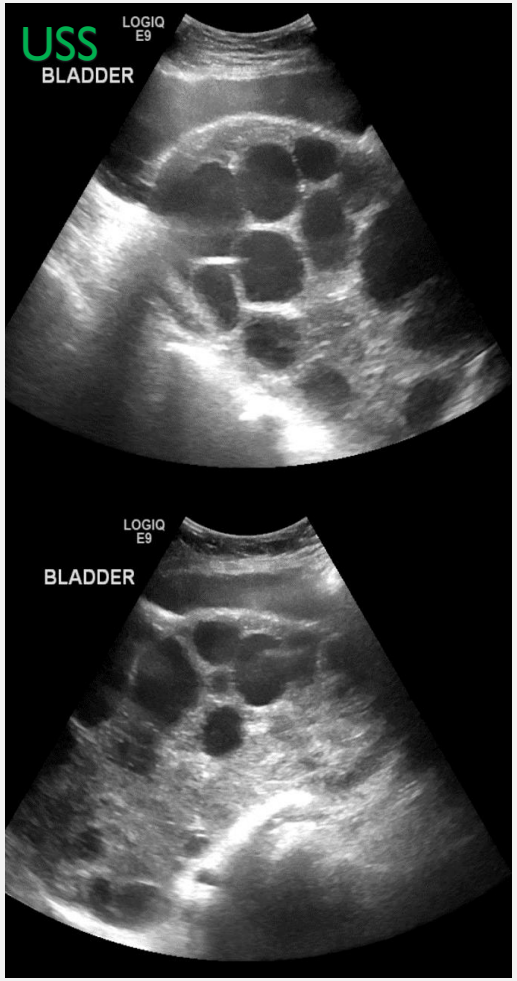
MRI demonstrates multiple high T2 signal daughter cysts, with low peripheral T2 corresponding to the peripheral calcification.



CASE 4





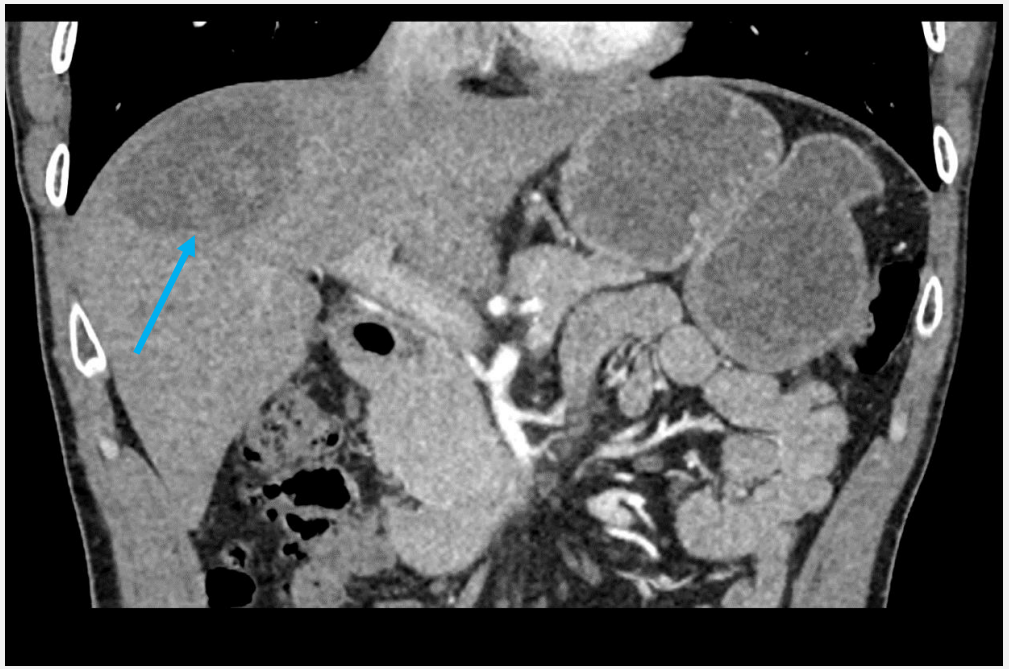


MRI, CT and USS appearances of disseminated hydatid disease in the abdomen and pelvis.

CT and MRI, demonstrate large hydatid cysts with innumerable daughter cyst in the liver, abdomen and pelvis.

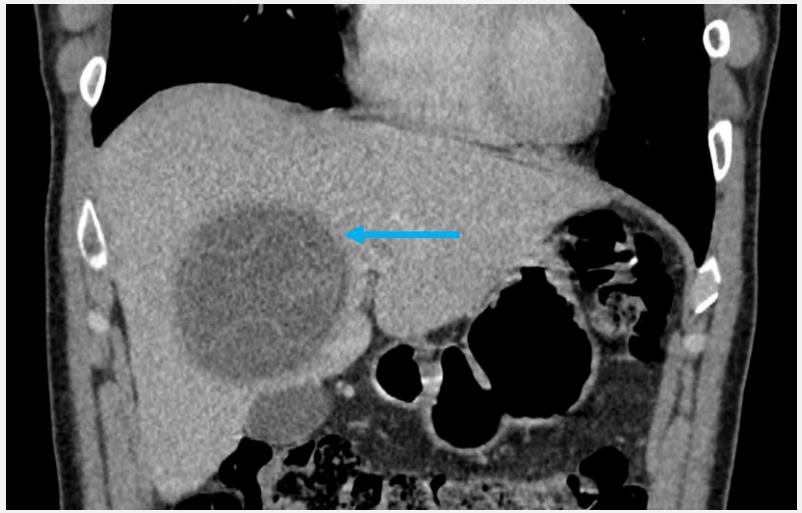
USS shows a large pelvic mass with multiple hypoechoic cysts daughter cysts.

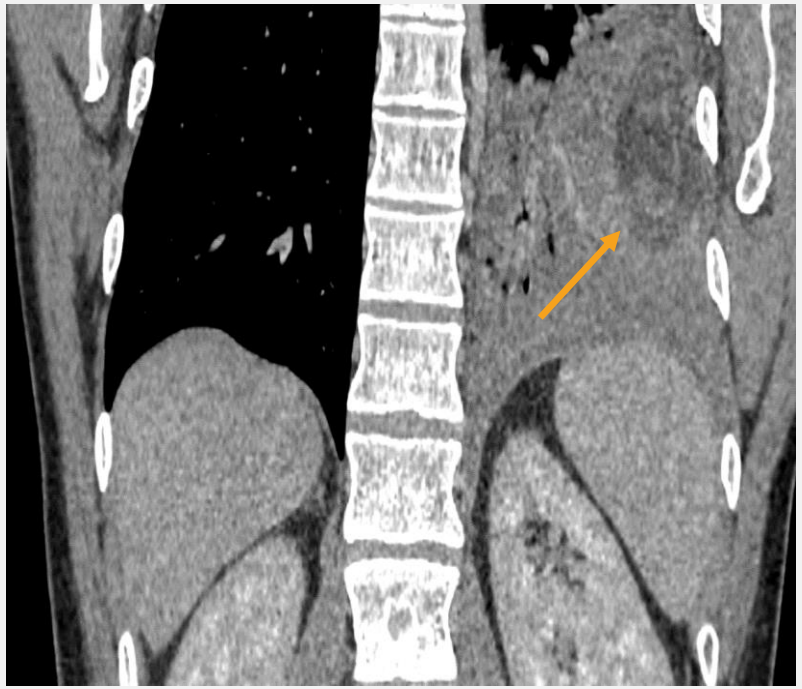
CASE 5

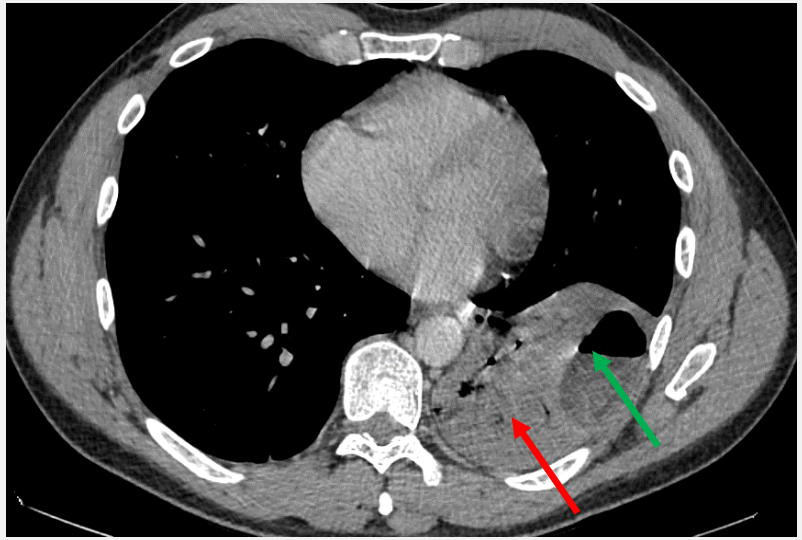


- CT demonstrating a 9.2 x 6.2 x 8.5 cm left upper quadrant mixed density thick-walled cystic structure containing internal septations. This lies between the lateral wall of the stomach and the splenic flexure of the colon with no definite connection with the gastric or colonic lumen (orange arrow).
- A further fluid density lesion is seen in the right liver with internal membranes (blue arrow).
- Appearances are in keeping with **hydatid disease with extra-hepatic dissemination.**

CASE 6



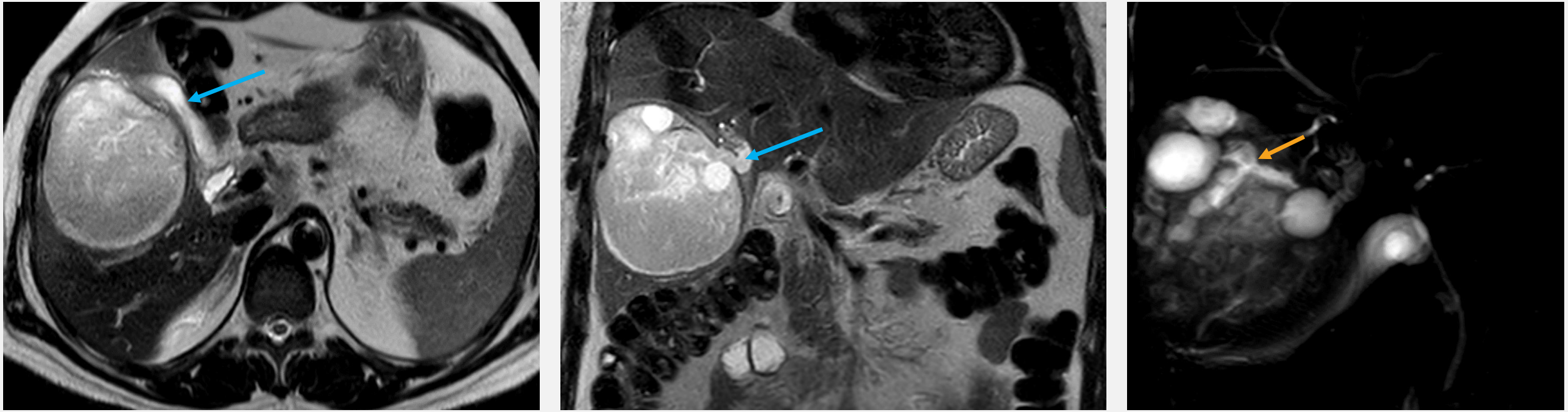




CT images demonstrating hepatic (blue arrow) and left intra-thoracic hydatid disease (orange arrow).

On the axial CT, an air-fluid level is seen (green arrow) , indicating rupture of the hydatid cyst into the bronchial tree, resulting in dense lower lobe consolidation (red arrow).

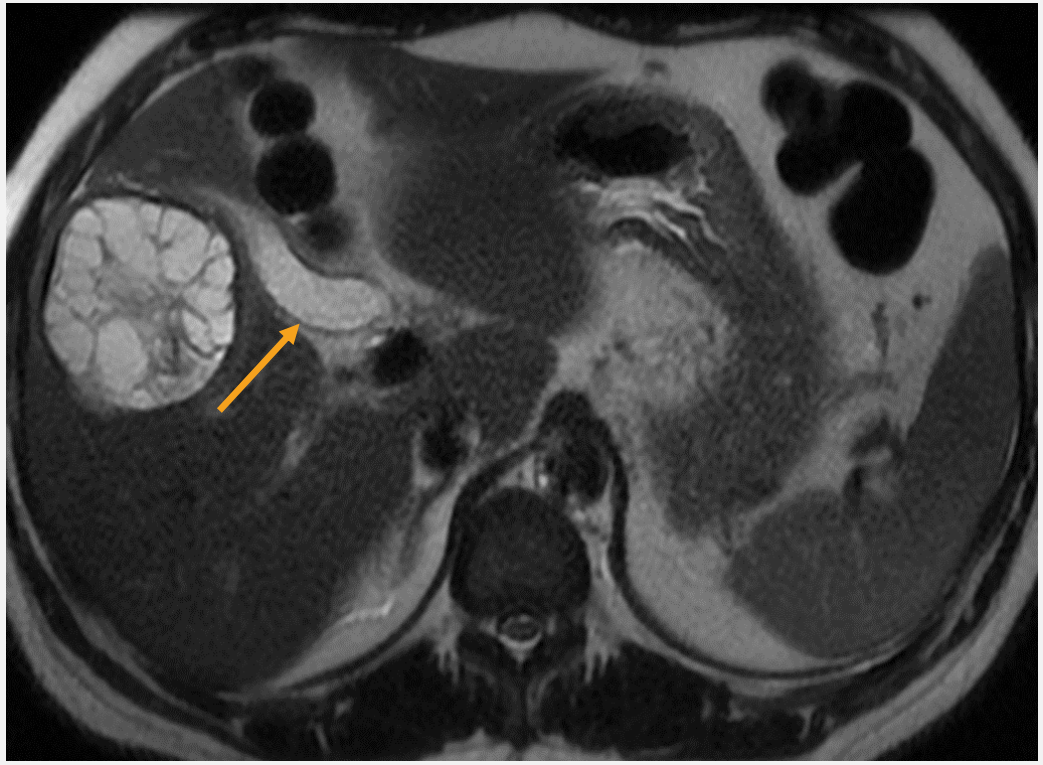
CASE 7

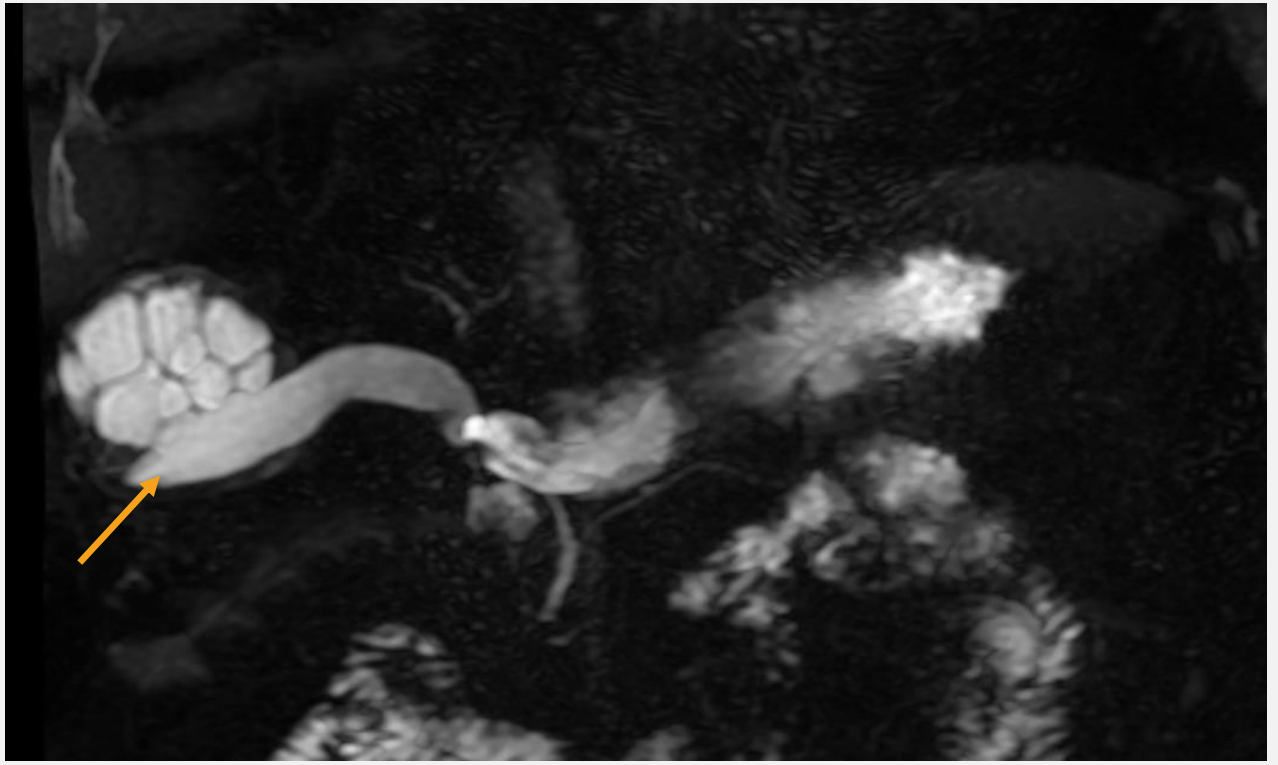


- Axial and Coronal T2 sequence MRI liver demonstrating a large hydatid cyst in segment V/VIII with internal matrix and peripheral daughter cysts. There is evidence of rupture into a dilated segment V duct (blue arrow).

- MRCP images demonstrate a dilated segment V duct as result of biliary rupture of the hydatid cyst (orange arrow).

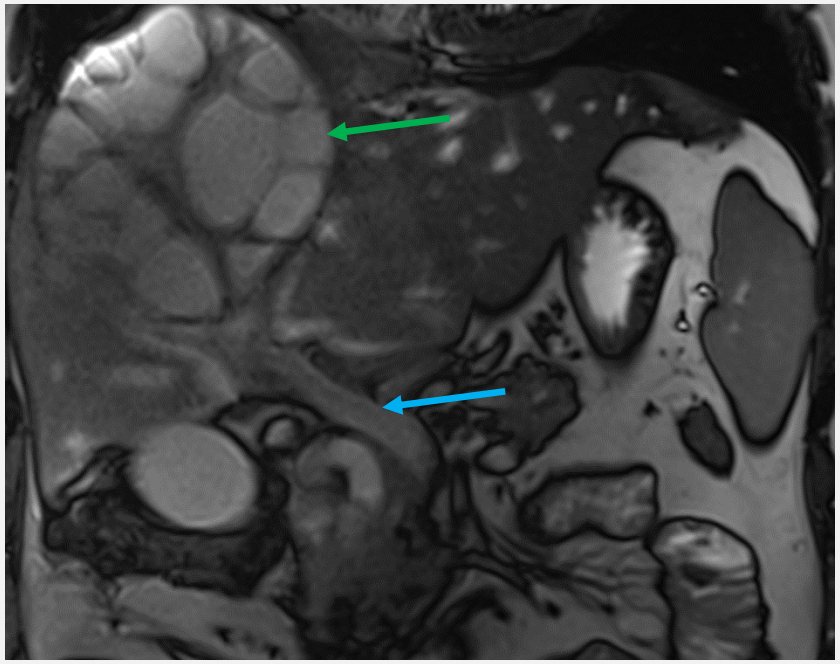
CASE 8

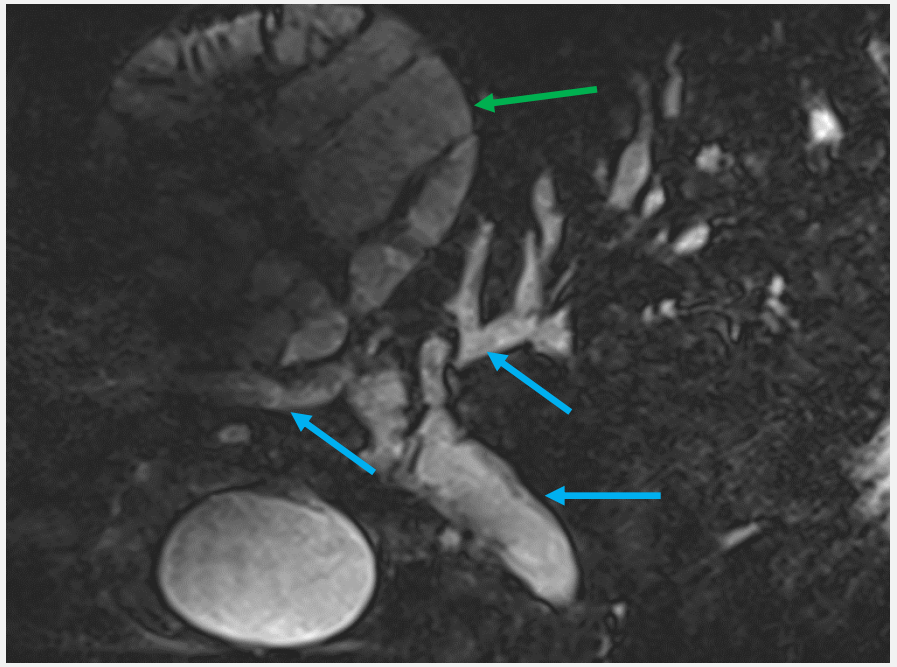


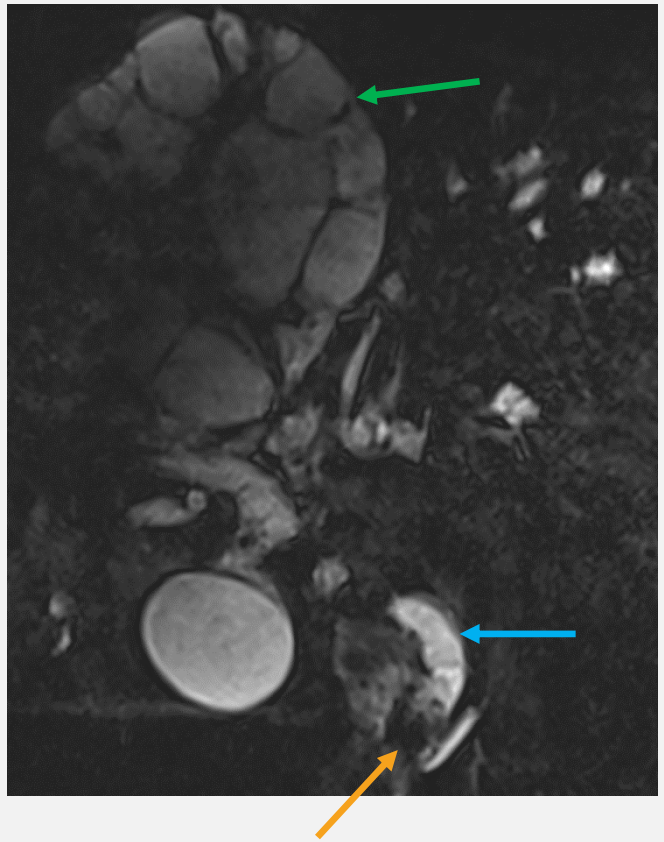


- Axial T2 sequence MRI liver and MRCP demonstrating segment V/VIII hydatid cyst with evidence of rupture into the right anterior duct resulting in a dilated intrahepatic bile duct (Orange arrow).

CASE 9

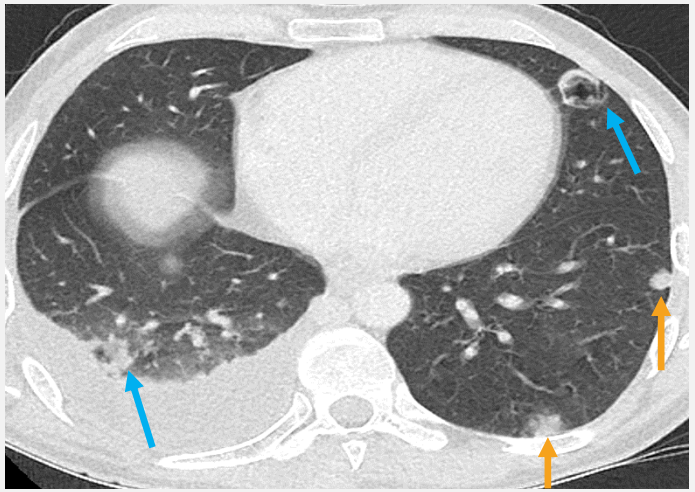






- Coronal T2 sequence MRI liver and MRCP demonstrating large segment VII/VIII hydatid cyst (green arrow) with marked intra- and extra-hepatic duct dilatation (blue arrow) because of a ruptured daughter cyst into the distal CBD (Orange arrow).

CASE 10



MRI: abnormal tissue completely replacing the right lobe of the liver which is of heterogeneous signal (green arrow).

CT: Heterogeneous, predominantly low-density mass with areas of calcification and fluid attenuation occupying most of the right lobe.
There is no significant enhancement of the lesion on postcontrast imaging (red arrow).

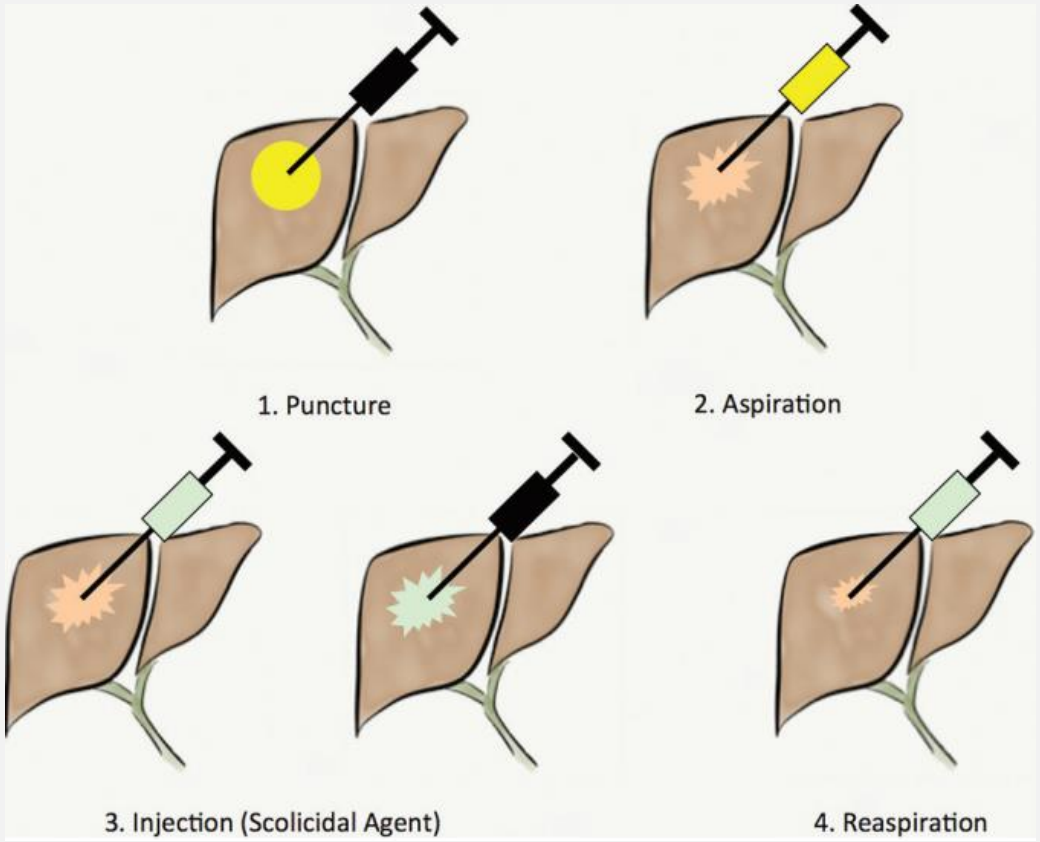
Multiple cavitating (blue arrow) and non cavitating nodules within the imaged lungs (orange arrow).

Alveolar echinococcosis is a highly aggressive form of hepatic hydatid disease caused by Echinococcus multilocularis. Unlike E. granulosus, it does not form a well-defined encapsulated mass but rather infiltrates the liver and surrounding structures, particularly at the porta hepatis. This **solid form of hydatid disease** can exhibit calcification and typically demonstrates no relevant enhancement. Although the liver is the primary site, it **can spread to other organs such as the lung**, heart, and brain. In the lung, alveolar echinococcosis can manifest with both solid and cavitating lesions, reflecting the infiltrative nature of the disease.

MANAGEMENT

The main management options for hydatid disease are:

1. **Surgery:**
    - **Cyst Removal (Hydatidectomy):** The mainstay of treatment involves the surgical removal of the hydatid cysts. This is typically performed using techniques such as cystectomy or pericystectomy, aiming to remove the cyst while minimizing the risk of cyst rupture and spillage of parasite material.
2. **Pharmacological Therapy:**
    - **Antiparasitic Medications:** Prior to surgery and as an adjunct to it, antiparasitic medications are often administered to reduce the viability of the parasite and prevent recurrence. Albendazole and mebendazole are the commonly used drugs.
3. **Puncture, Aspiration, Injection, Re-aspiration (PAIR):**
    - **In some cases,** a less invasive approach called PAIR may be considered. This involves draining the cyst using a needle (aspiration), injecting a scolicidal solution to kill the larvae, and then aspirating the cyst contents.
4. **Monitoring and Follow-up:**
    - Watch and wait approach for inactive and silent cysts



PAIR approach: Aspiration of the cyst followed by injection of a scolicidal agent (like saline or ethanol); this leaves a collapsed space. Patients receive antiparasitic treatment before and after to reduce the risk of parasite spreading.

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SUMMARY

- Hydatid disease is found in various regions globally. In non-endemic areas, the risk persists due to immigration and travel.

- Although predominantly affecting the liver, hydatid disease manifests in diverse abdominal locations, including the biliary tree and extra-hepatic organs.

- Hydatid disease exhibits characteristic imaging patterns on US, CT and MRI.
  It can mimic other cystic conditions such as infective and neoplastic disease. The differential diagnosis should consider the disease's location and specific imaging features.

- Knowledge of the pathogenesis, imaging traits, and treatment of extrahepatic hydatid disease is essential for accurate radiologic diagnosis and guiding appropriate treatment.