

COMPLICATIONS OF HEPATIC HYDATID DISEASE: IMAGING FEATURES FOR THE DIAGNOSIS

Silvia Greco¹, Roberto Cannella¹, Giusy Pecoraro¹, Dario Giambelluca¹,
Emanuele Battaglia², Francesco D'Arpa², Massimo Midiri¹, Giuseppe
Brancatelli¹



¹Section of Radiology

²Emergency General Surgery
University Hospital P. Giaccone
Palermo, Italy



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COMPLICATIONS OF HEPATIC HYDATID DISEASE: IMAGING FEATURES FOR THE DIAGNOSIS

LEARNING OBJECTIVES

- Describe the pathogenetic mechanism and clinical presentation of the most common complications of hepatic hydatid disease.
- Discuss their main features with different multimodality imaging techniques.

Case quiz: what's the most likely diagnosis?

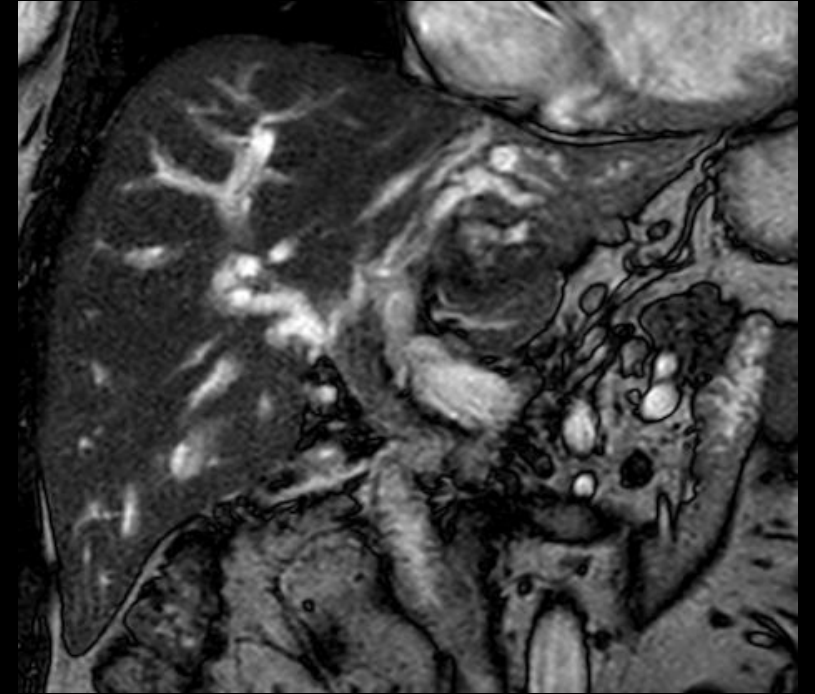
- Male, 48 years old
- Right upper quadrant abdominal pain and jaundice. He refers four previous hospital admissions, during the last three years, for similar milder symptoms.



US



CT axial



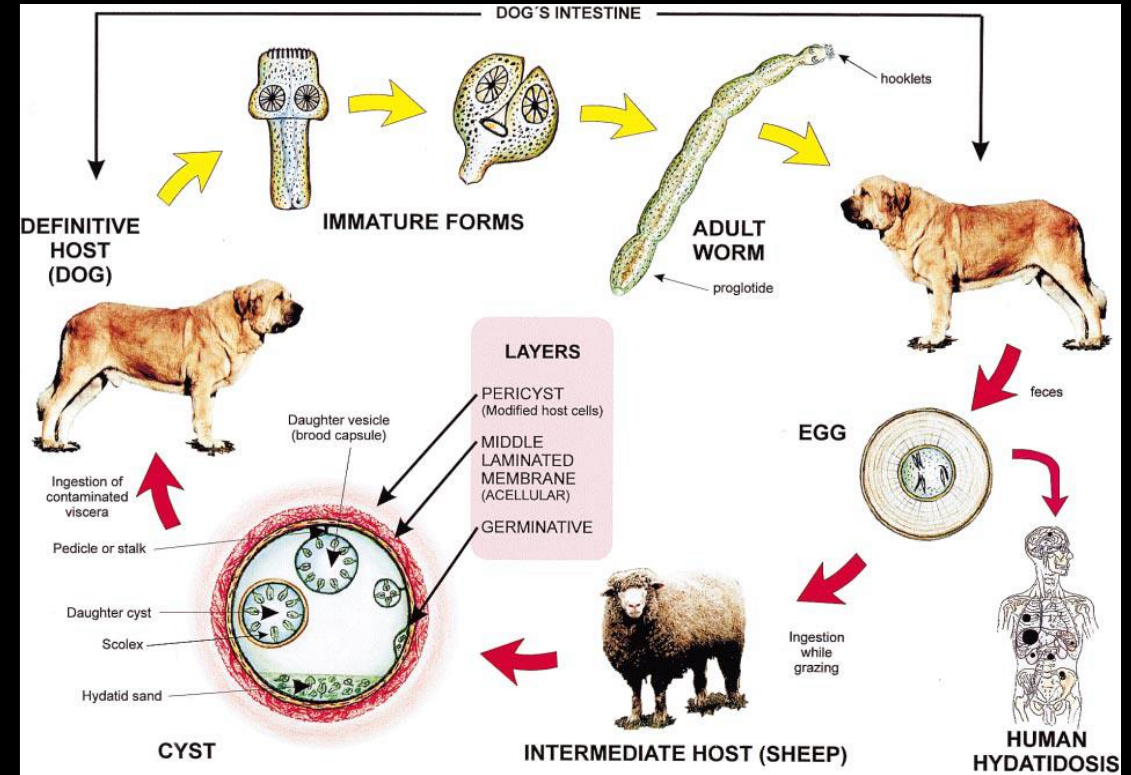
BTFE coronal

COMPLICATIONS OF HEPATIC HYDATID DISEASE: IMAGING FEATURES FOR THE DIAGNOSIS

Background

Hydatid disease, also known as echinococcosis, is a parasitic infection by larval forms of the genus *Echinococcus*, with the *E. granulosus* being the organism responsible of the majority of cases.

- Definitive hosts are carnivores (e.g. dogs, foxes, cats), while the intermediate ones are most commonly sheep.
- Humans may become accidental intermediate hosts through contact with a definitive host (usually a domesticated dog) or ingestion of food contaminated with *Echinococcus* eggs.



Life cycle of *E. granulosus*

(Pedrosa I, Saiz A, Arrazola J et al: Hydatid disease: radiologic and pathologic features and complications. Radiographics, 2000; 20: 795–817)

COMPLICATIONS OF HEPATIC HYDATID DISEASE: IMAGING FEATURES FOR THE DIAGNOSIS

Histology of a typical hydatid cyst:

- An outer fibrous capsule (pericyst), composed of modified host cells that form a rigid protective zone.
- A middle laminated acellular membrane (ectocyst) that allows passage of nutrients and is easily ruptured, predisposing to infection.
- An inner germinal layer (endocyst) where the scolices (the larval stage of the parasite) and laminated membrane are produced.

Daughter vesicles are small spheres that contain the protoscolices, which pass into the cyst fluid after vesicles rupture within the cyst, forming a white sediment known as hydatid sand.

Enhanced CT scan

Patient (F,50 yo)

Large Hydatid cyst with multiple daughter vesicles (*)



COMPLICATIONS OF HEPATIC HYDATID DISEASE: IMAGING FEATURES FOR THE DIAGNOSIS

Liver is the primary and most common location of hydatid infection.

Hydatid cysts are most commonly encountered as incidental findings on imaging exams, appearing as multiple well demarcated cystic lesions, showing coarse cystic wall calcifications, intralesional septa and daughter cysts.

Severe complications may rarely occur, requiring urgent intervention:

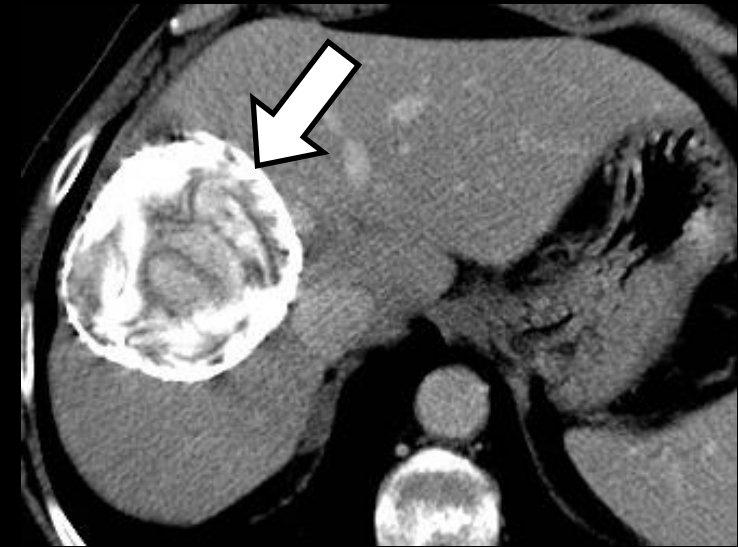
RUPTURE

- Contained
- Communicating
- Direct

SUPERINFECTION



a. F, 38 yo



b. F, 65 YO

PVP CT

Two patients with different imaging appearance of hydatid liver cyst:
a. unilocular cystic lesion b. partially or completely calcified cyst.

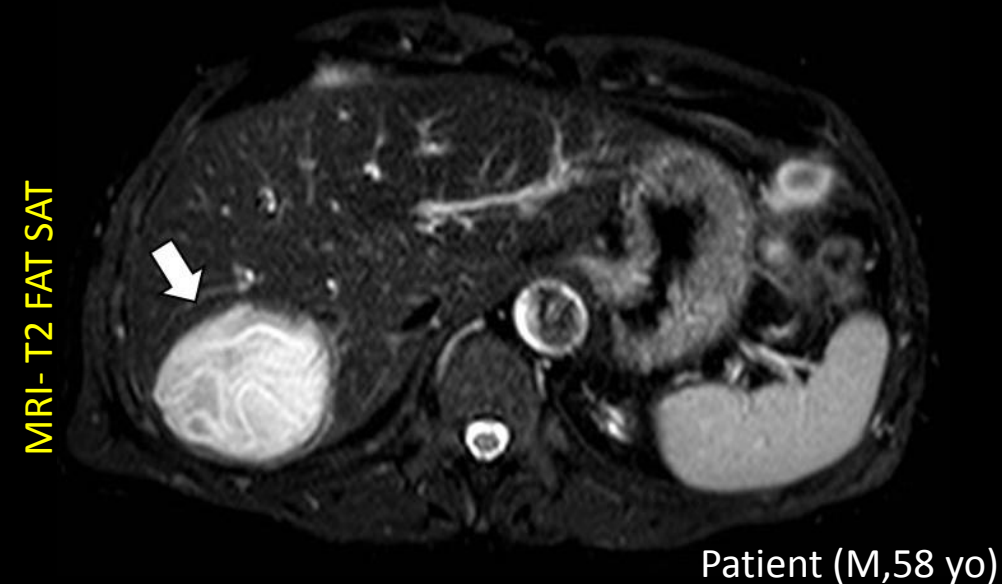
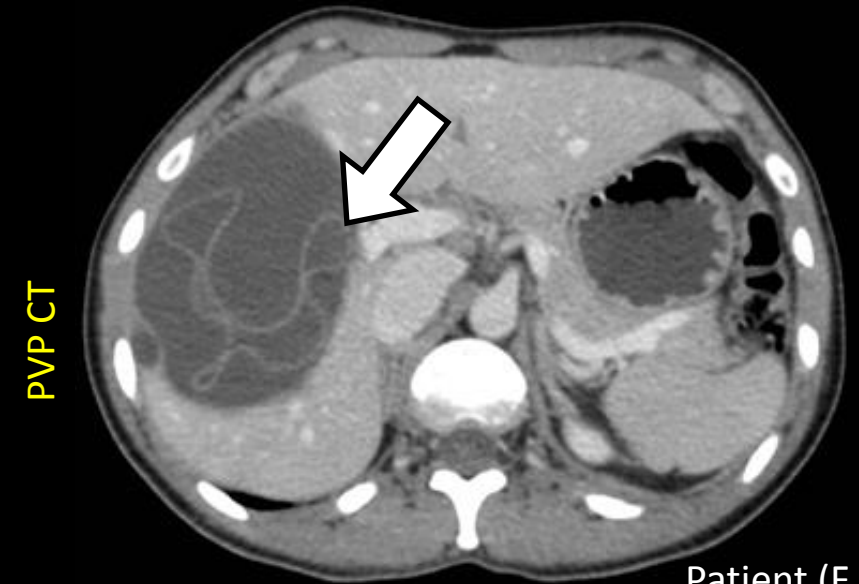
COMPLICATIONS OF HEPATIC HYDATID DISEASE: CONTAINED RUPTURE

BACKGROUND

- The endocyst ruptures but the pericyst remains intact.
- Hydatid fluid collects into the space between the pericyst and the endocyst leading to the collapse of the endocyst.
- It may be related to degeneration, trauma, or response to therapy.

IMAGING FINDINGS

- “*Waterlilly sign*” or “*snake or serpent sign*”: detached undulating membranes inside the hydatid cyst appear as serpentine linear structure (hyperdense on CT, hyperintense on T2w MRI)
- No reduction in the cyst size.



COMPLICATIONS OF HEPATIC HYDATID DISEASE: COMMUNICATING RUPTURE

BACKGROUND

- The most common and serious complication.
- Progressive increasing pressure within the cyst leads to evacuation of its content into the biliary radicles that have been incorporated by the pericyst.

It is subdivided into two subtypes, depending on the size of communication:

1) with small biliary radicles, due to small fissures or bile-cyst fistulas → more frequent but usually overlooked

2) with main biliary radicle due to larger perforation of the hydatid cyst → cholestatic jaundice

Rupture into:

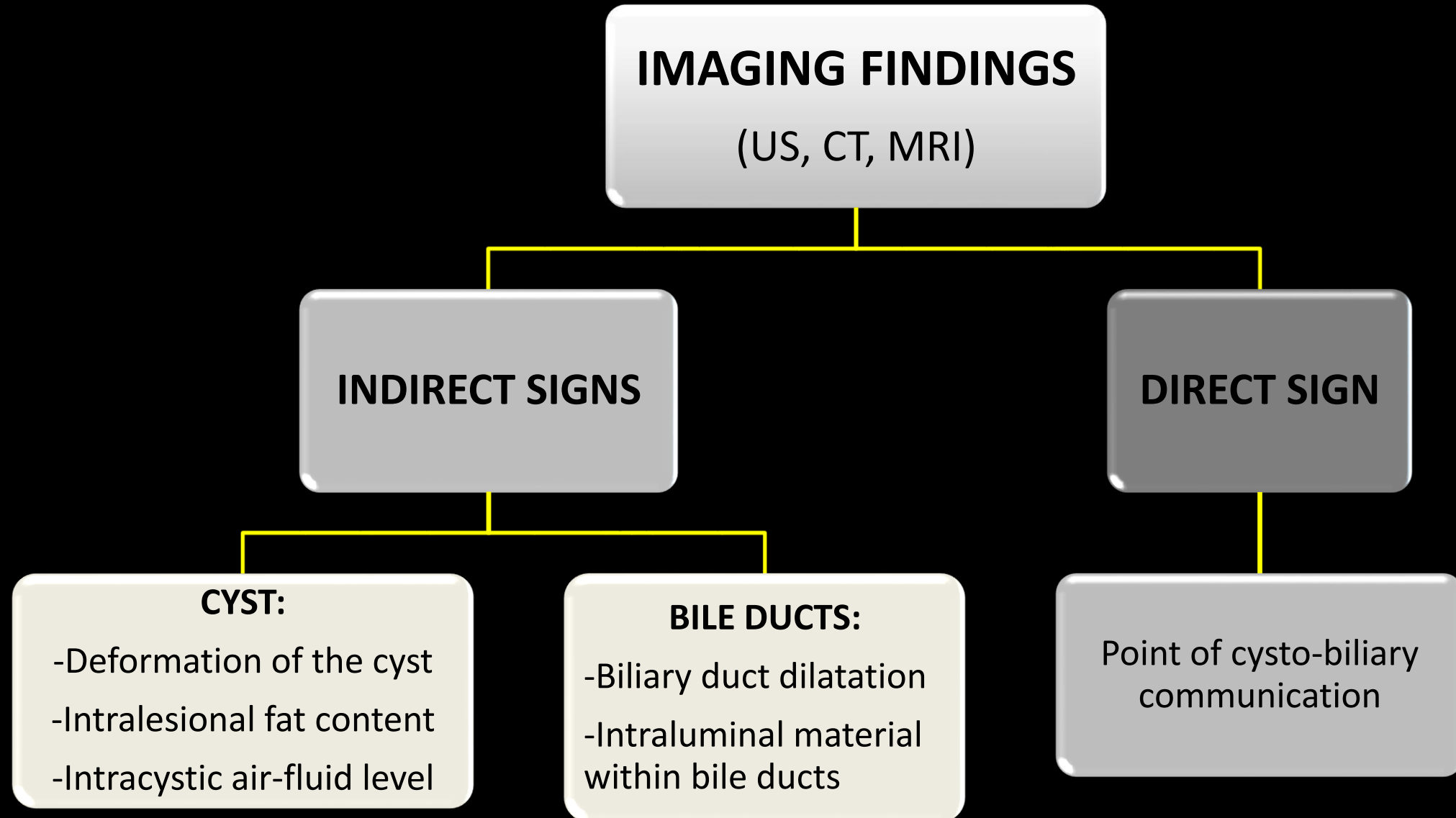
- the right duct: 55-60% of cases
- the left duct: 25-30% of cases
- into the confluence or gallbladder: rarely

In both cases hydatid **fluid-sand** and occasionally **daughter cysts** can be discharged into the **biliary tree**.

CLINICAL PRESENTATION

Jaundice, biliary obstruction, acute pancreatitis or septicemia.

COMPLICATIONS OF HEPATIC HYDATID DISEASE: COMMUNICATING RUPTURE

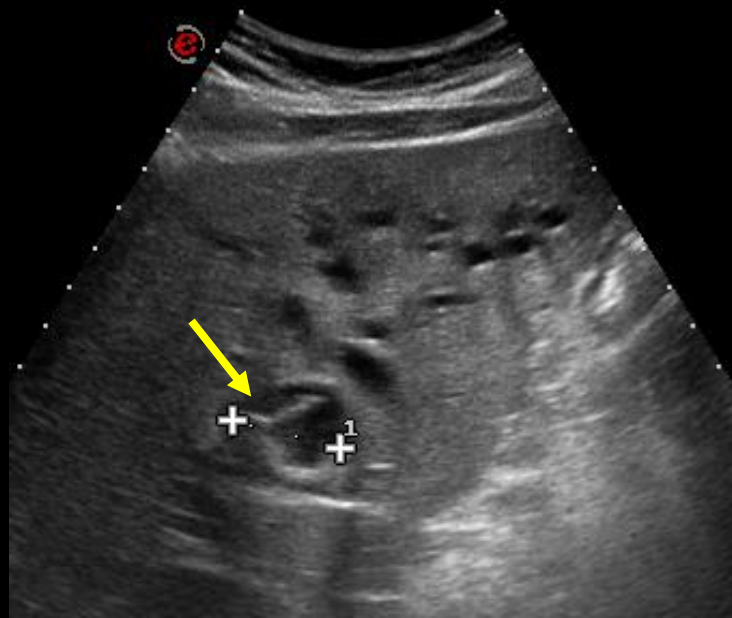


COMPLICATIONS OF HEPATIC HYDATID DISEASE: COMMUNICATING RUPTURE

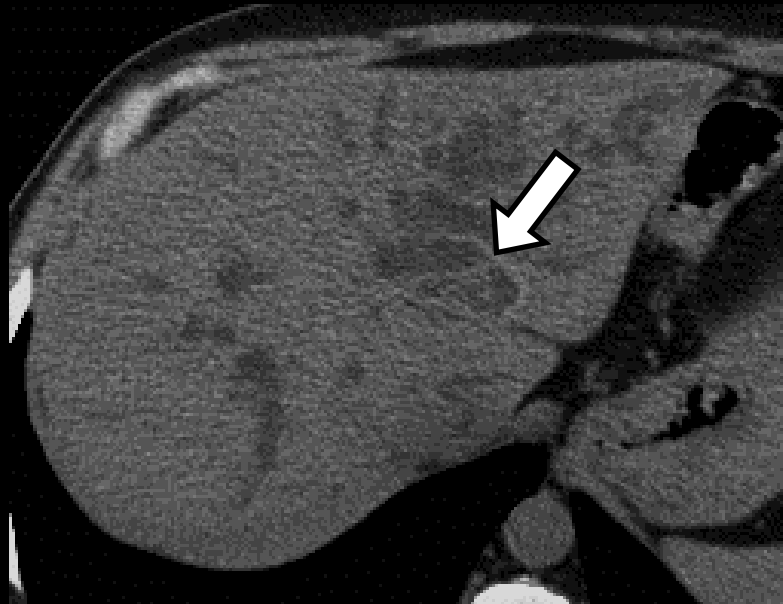
IMAGING FINDINGS

Cyst:

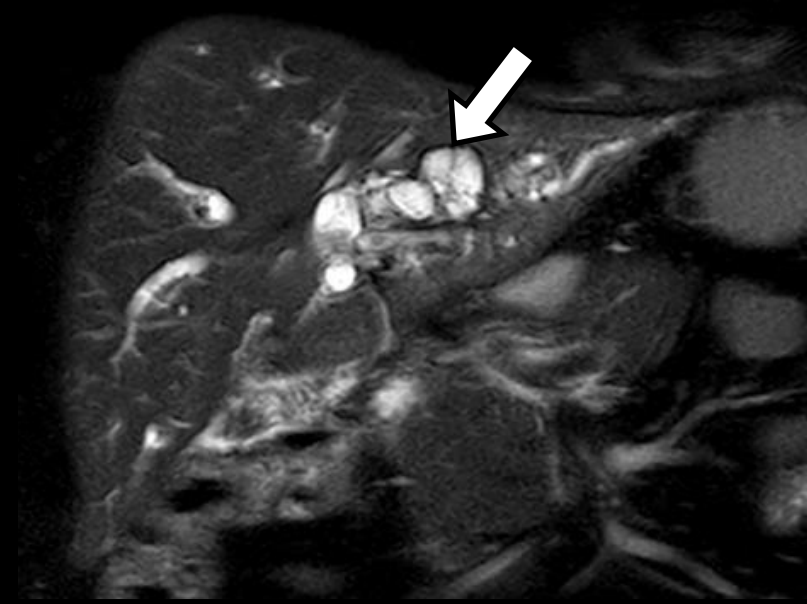
- deformation of the cyst, indirect sign suggesting decreased intra-cystic pressure (US, CT, MR)



US



PRE-CONTRAST CT



T2 Fat-Sat- CORONAL

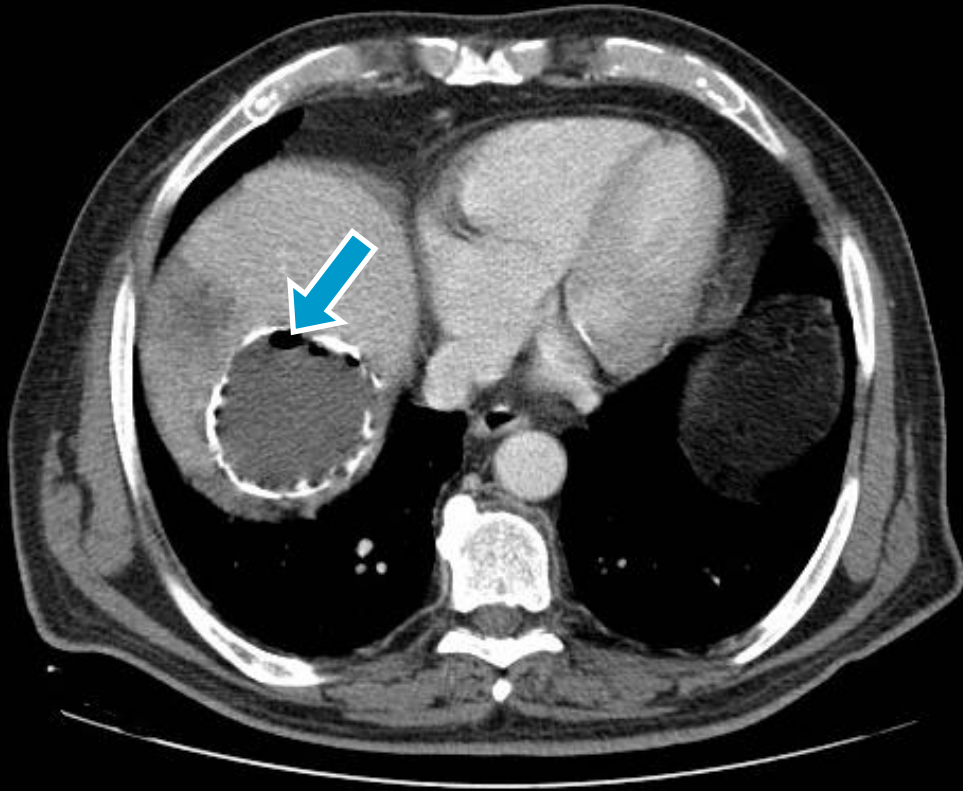
Patient M, 48 yo: Cystic lesion, with hyperattenuating/hypointense contour (suggesting wall calcification), appears deformed resembling tubular structure.

COMPLICATIONS OF HEPATIC HYDATID DISEASE: COMMUNICATING RUPTURE

IMAGING FINDINGS

Cyst:

- intra-cystic air-fluid levels



Patient M, 72 yo
PVP CT

- intra-cystic air content

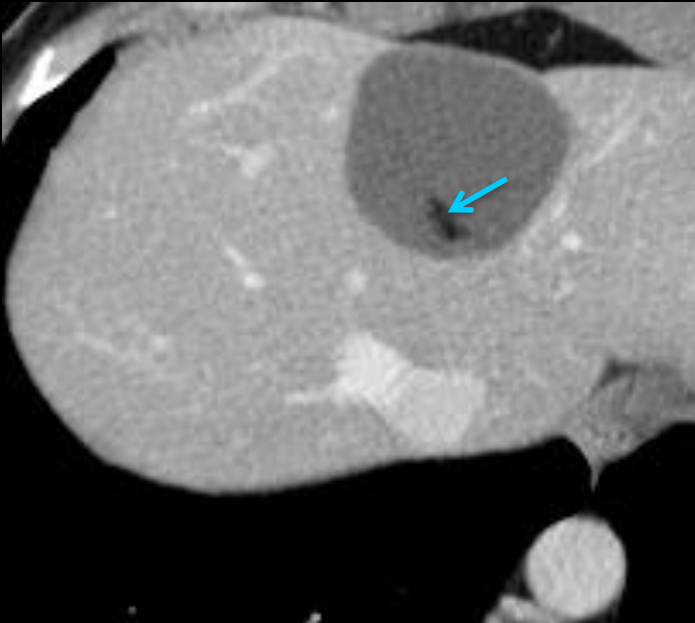


Patient M, 66 yo
PRE-CONTRAST CT

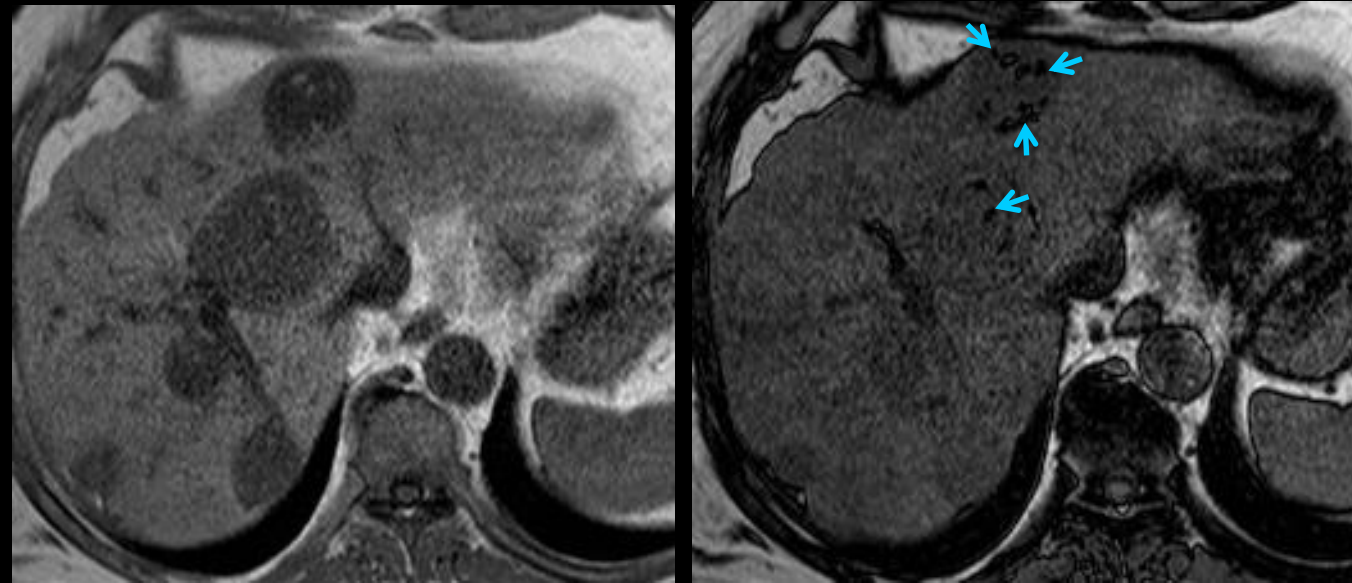
COMPLICATIONS OF HEPATIC HYDATID DISEASE: COMMUNICATING RUPTURE

IMAGING FINDINGS

- intra-lesional fat : the presence of fat is thought to be related to the lipid content of the bile; this is a sign that predicts intrabiliary communication.
- **CT:** hypoattenuating focus within the cyst.
- **MR:** intracystic foci with **Chemical shift** on dual phase GRE T1 sequences



Patient F, 41 yo
PVP CT



Patient M, 66 yo
DUAL PHASE GRE T1W MRI

COMPLICATIONS OF HEPATIC HYDATID DISEASE: COMMUNICATING RUPTURE

IMAGING FINDINGS: Bile ducts

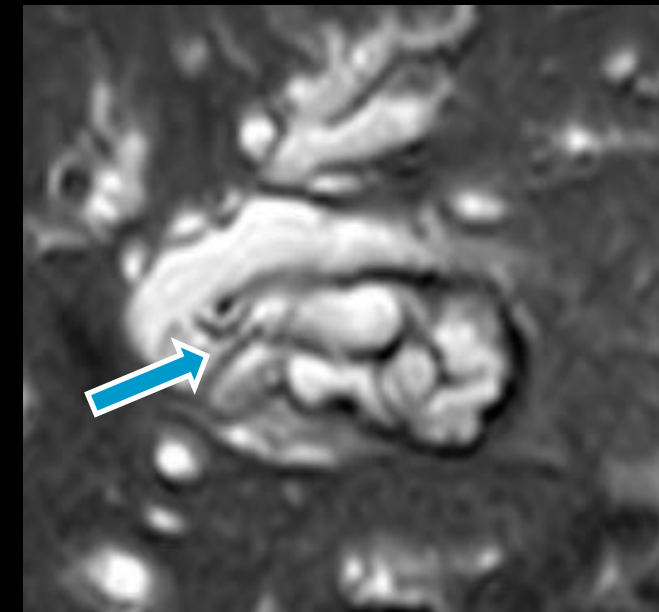
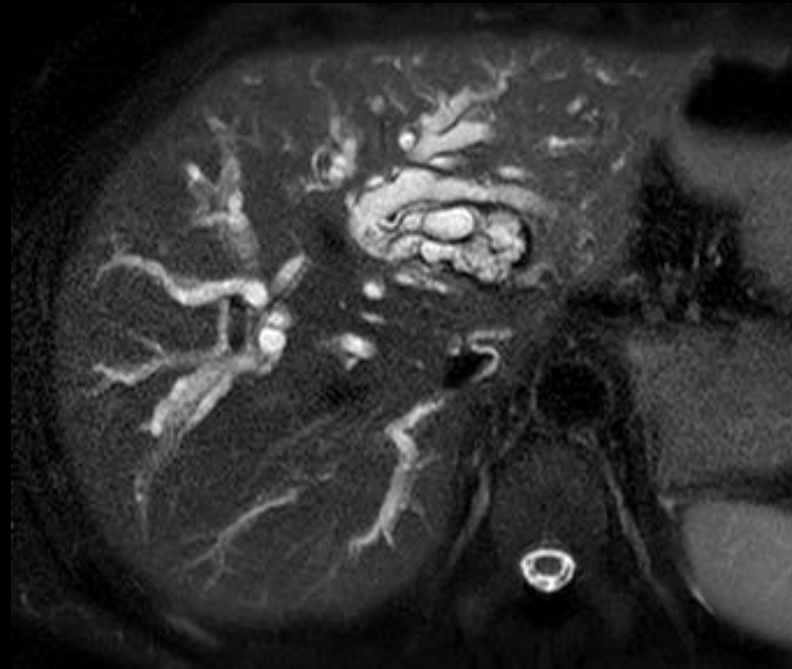
- biliary duct dilatation
- direct communication of the cyst with the bile duct



Patient M, 48 yo

PVP CT

Diffuse intrahepatic biliary dilatation



Patient M, 48 yo

T2W FAT SAT MRI

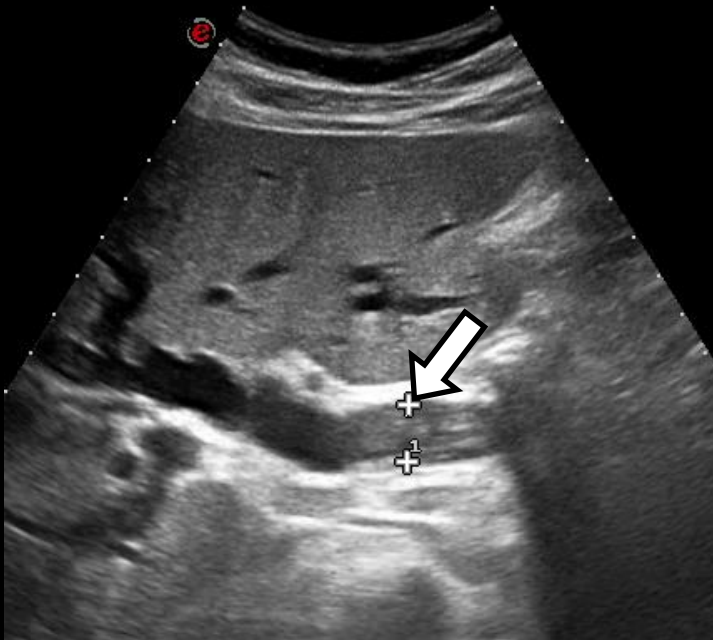
Notice the **discontinuity** of the cyst representing the point of cystobiliary communication.

COMPLICATIONS OF HEPATIC HYDATID DISEASE: COMMUNICATING RUPTURE

IMAGING FINDINGS: Bile ducts

- Intraluminal material within bile ducts:

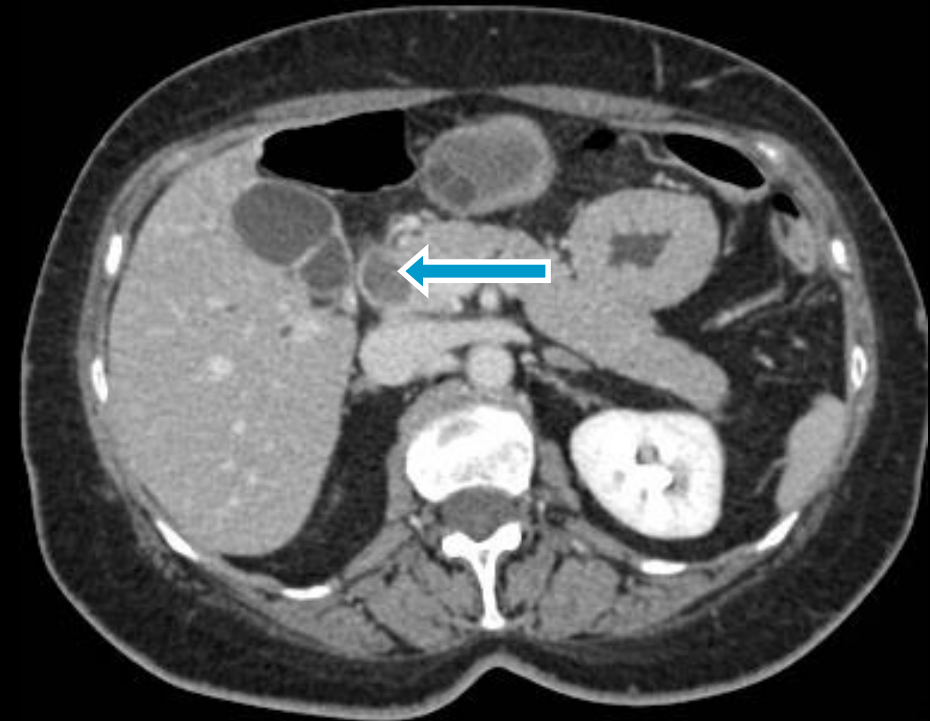
➤ **US:** hyperechoic foci without posterior shadowing



Patient M, 48 yo **US**

Intraluminal material into the lumen of the common bile duct.

➤ **CT:** high-attenuation material filling the biliary radicles or common bile duct



Patient F, 65 yo **PVP CT**

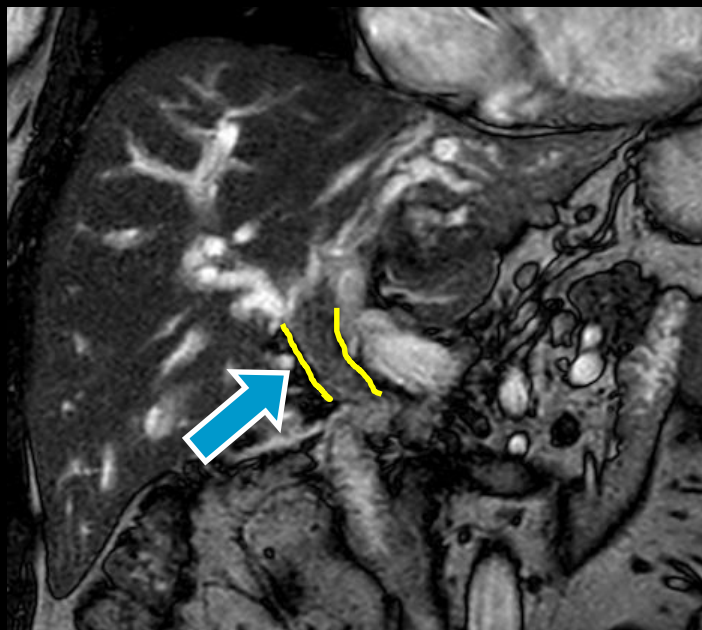
COMPLICATIONS OF HEPATIC HYDATID DISEASE: COMMUNICATING RUPTURE

IMAGING FINDINGS: Bile ducts

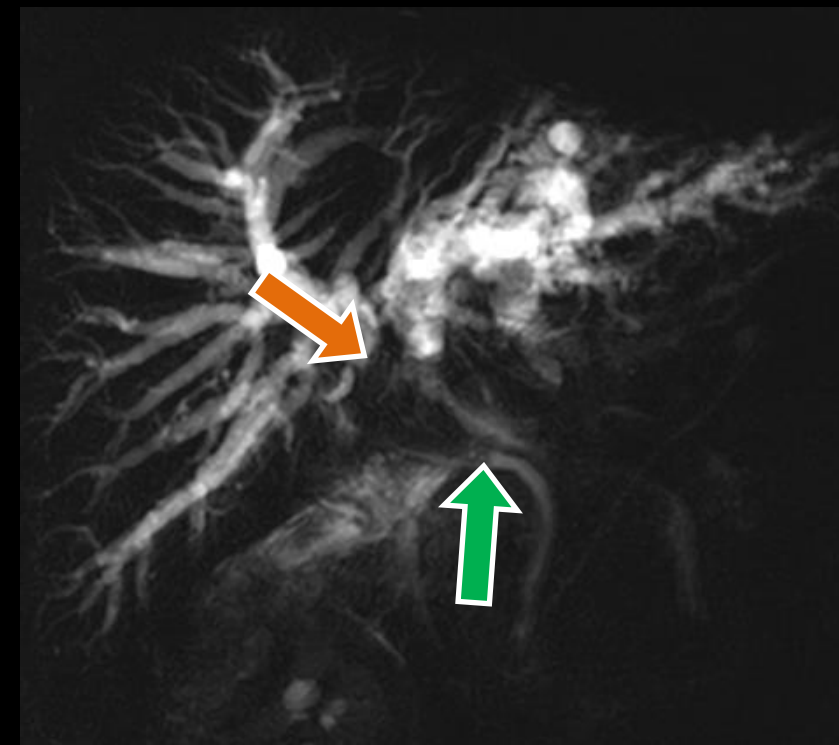
- Intraluminal material within the bile ducts:
 - MR: hypointense filling defect on T2-weighted images



T2W Non Fat-Sat MRI



CORONAL BTFE MRI



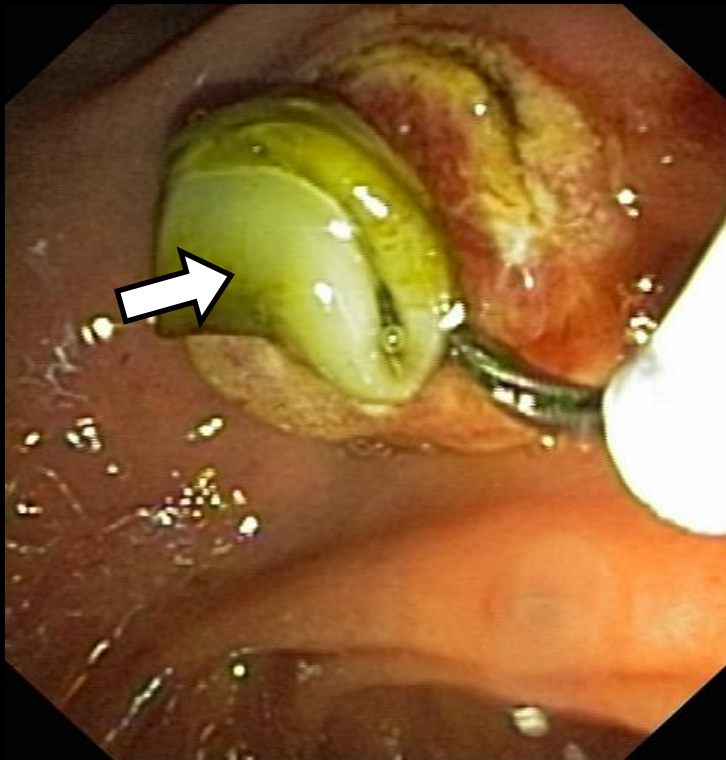
RADIAL

Patient (M, 48 yo) with communicating rupture

Endoluminal defect on T2w sequences, from the confluence of the right and left hepatic ducts to the common hepatic duct (between yellow lines). This is visible on radial sequences as signal loss from the hilar biliary confluence to the common hepatic duct.

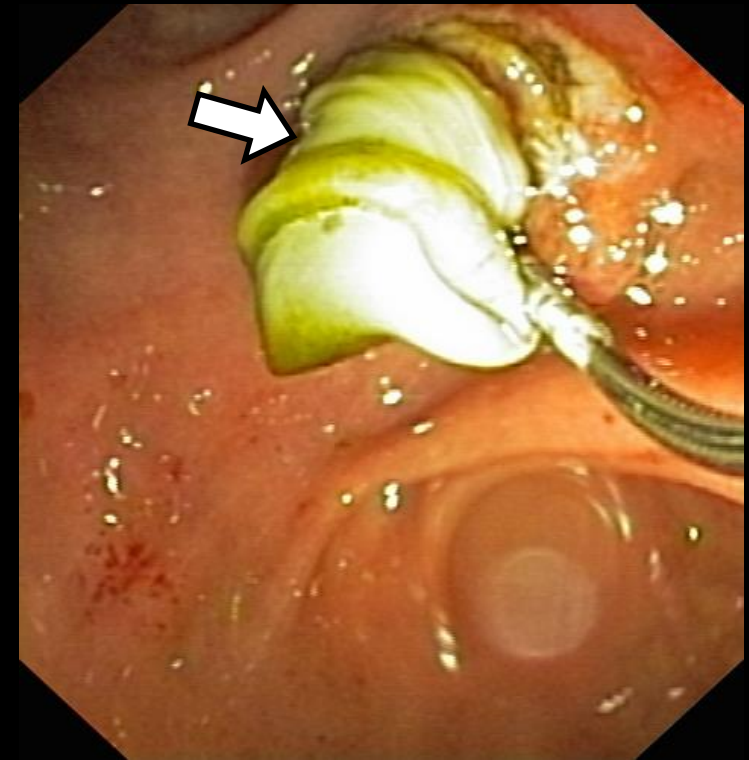
COMMUNICATING RUPTURE: ROLE OF ERCP

- In cases of frank intrabiliary rupture, white, shiny hydatid membranes are mostly seen within the duodenum or protruding from the papilla Vateri during ERCP.
- In late phases, membrane particles lose their shiny characteristic and mimic bile stones as they become colored by bile acids.



Patient F, 65 yo

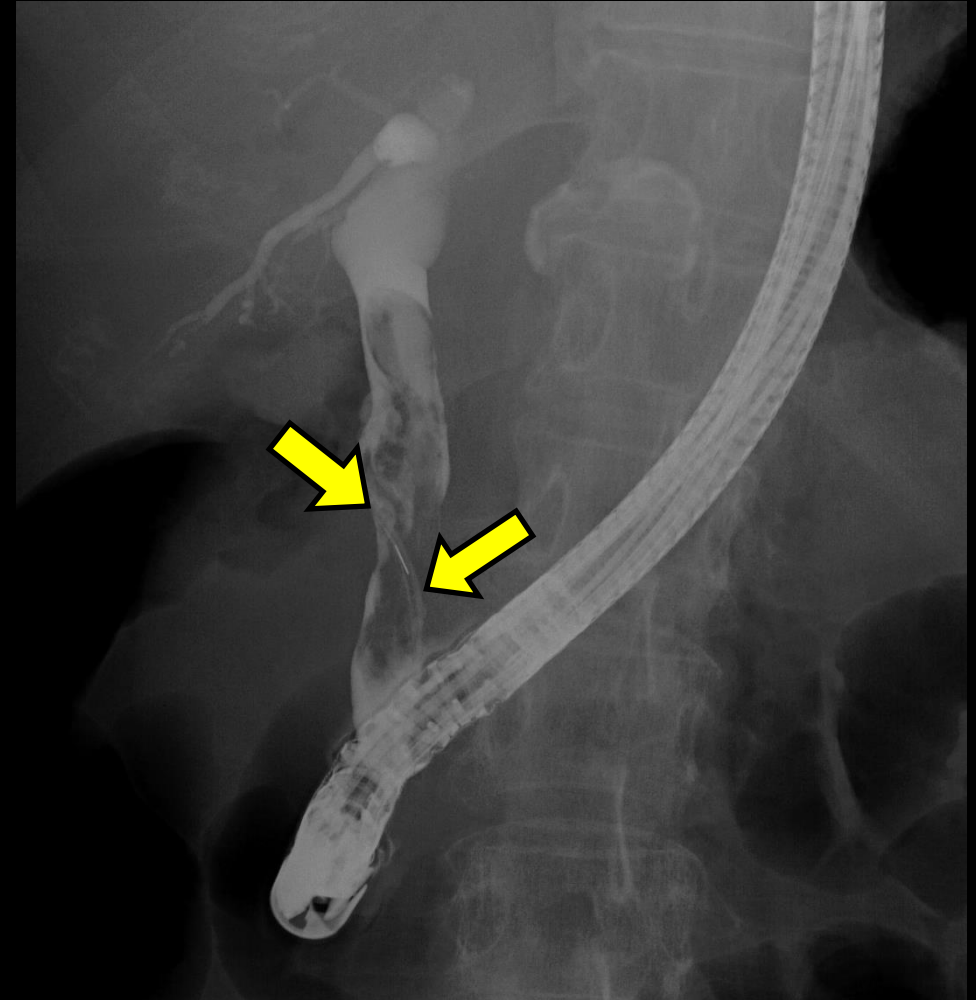
ERCP



Endoscopic images of a patient with communicating rupture: hydatid membranes extraction (white arrows).

COMMUNICATING RUPTURE: ROLE OF ERCP

- On cholangiography, **linear wavy filling defects** of laminated hydatid membranes can be easily seen within the main bile duct.
- Daughter cysts can be seen as rounded or oval lucent filled defects.

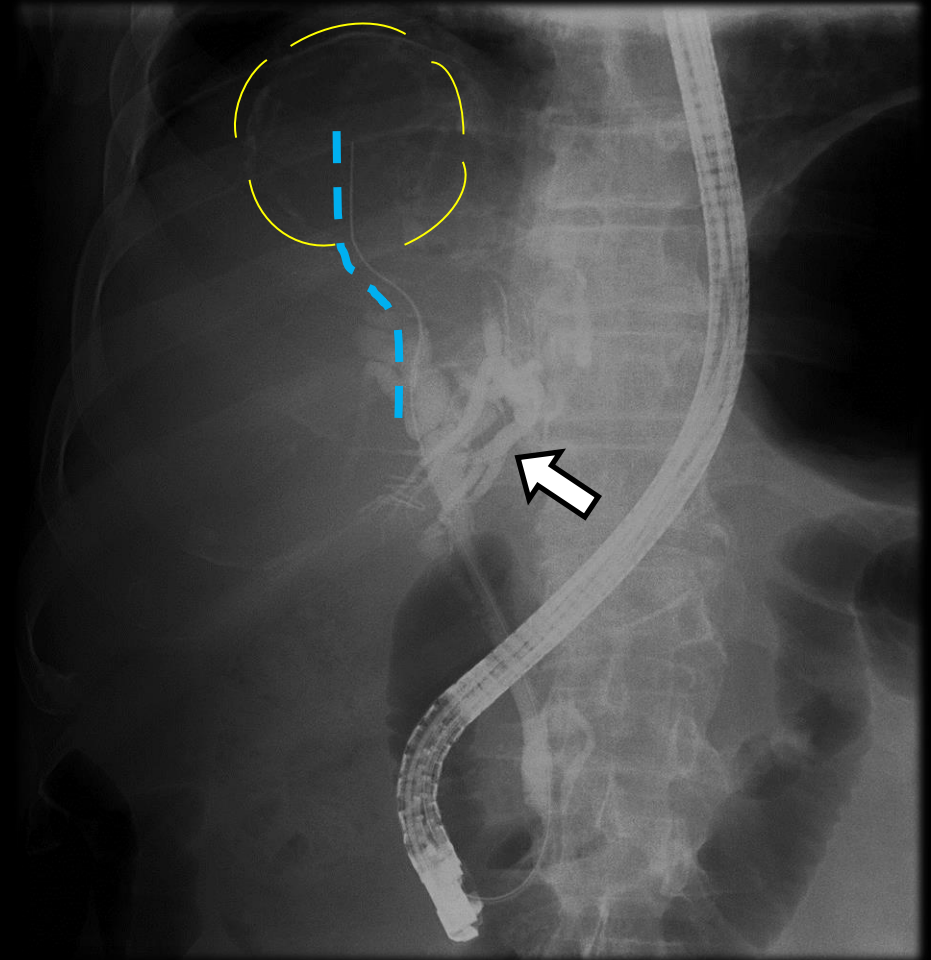


Patient F, 65 yo ERCP

Communicating rupture: role of ERCP

Cholangiography

- Linear calcified opacities (**yellow lines**) represent the wall of the liver hydatid cyst.
- Intrahepatic bile duct dilatation (white arrow).
- The catheter (**blue line**) is introduced from the common bile duct up to the intrahepatic radicles and enters directly into the cyst: it demonstrates the cystobiliary communication.



ERCP of a patient (M, 72 yo) with communicating rupture
The **catheter** enters directly into the cyst.

Communicating rupture: role of ERCP

- ERCP is more commonly used therapeutically than diagnostically.
- Studies have suggested that MRCP is comparable to ERCP as a diagnostic tool because of its high sensitivity in bile duct pathologies.
- ERCP can fail to detect simple communications and may promote the formation of postoperative biliary fistulae.
- Even in the most experienced hands, serious complications can result from ERCP, including pancreatitis, bleeding, infection or perforation.
- Therefore, suspected minor communications should be investigated by non-invasive methods such as MRCP, US and CT.

COMPLICATIONS OF HEPATIC HYDATID DISEASE: DIRECT RUPTURE

- Extremely rare complication.
- Leakage of hydatid material into the peritoneal or pleural cavity or hollow viscera.

Peritoneal seeding

- Due to spontaneous, asymptomatic microruptures of hepatic cysts into the peritoneal cavity.
- Peritonitis, implantation of scolices in several organs.

Pleural rupture

- Due to transdiaphragmatic dissemination.
- Pleural effusions, lung consolidation.

Hollow viscera

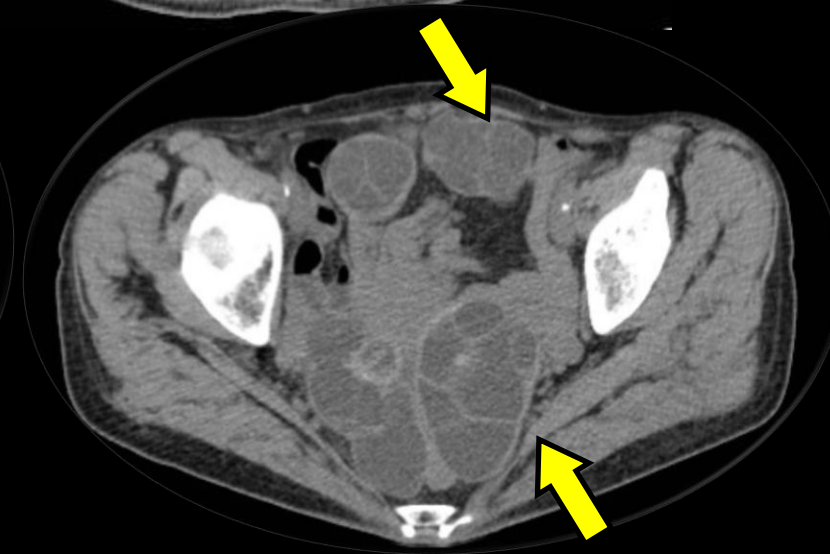
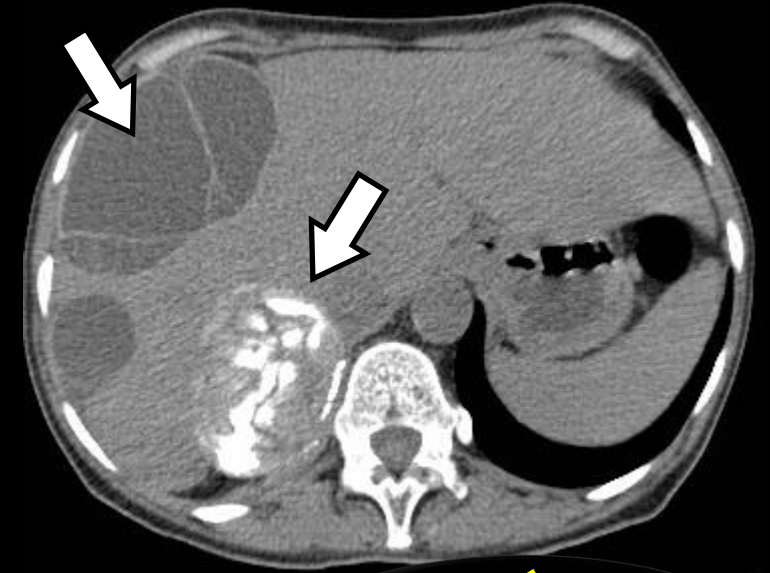
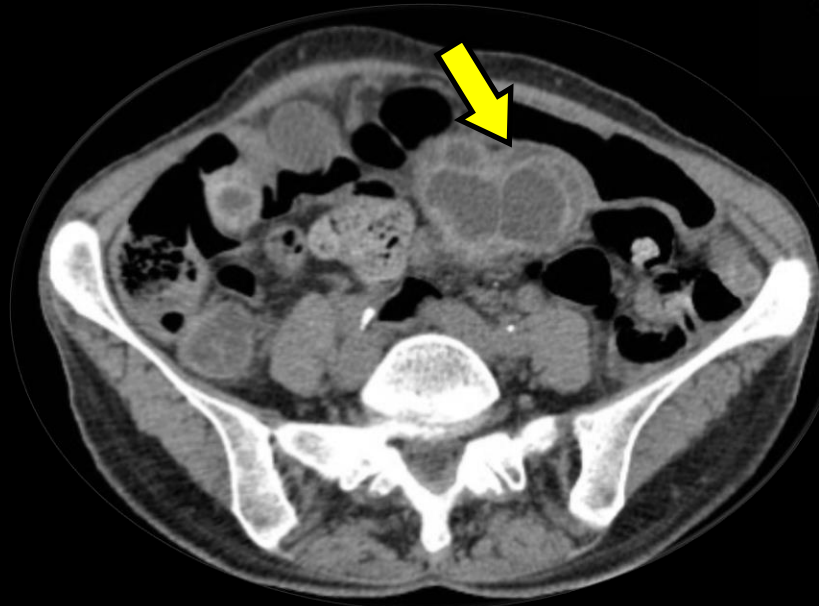
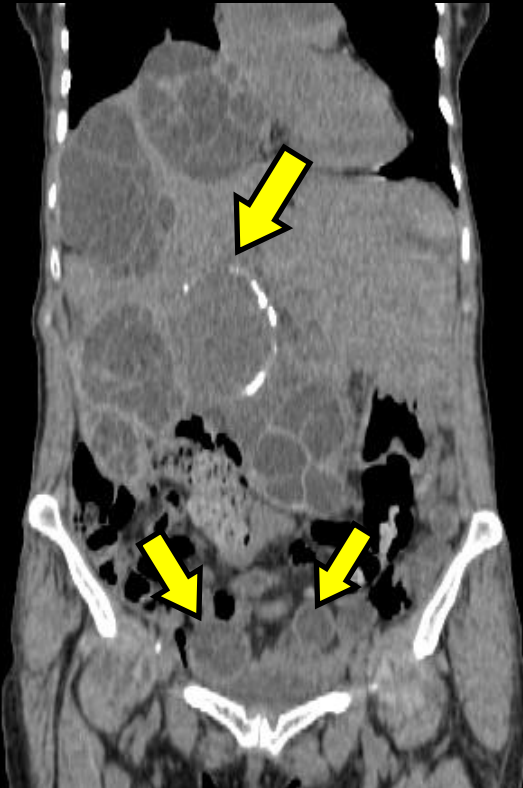
- Long-standing pressure over adjacent organs and inflammatory reaction of pericyst may cause dense adhesions and fistula formation.
- Abdominal pain with chronic diarrhea (cysto-colic fistula)

Potentially fatal
complication is
anaphylactic shock.

COMPLICATIONS OF HEPATIC HYDATID DISEASE: DIRECT RUPTURE

IMAGING FINDINGS

- Fluid effusions in the peritoneal cavity, fat stranding and thickening of the peritoneum.
- Implantation of scolices in several organs, leading to condition called “metastatic hydatidosis”.



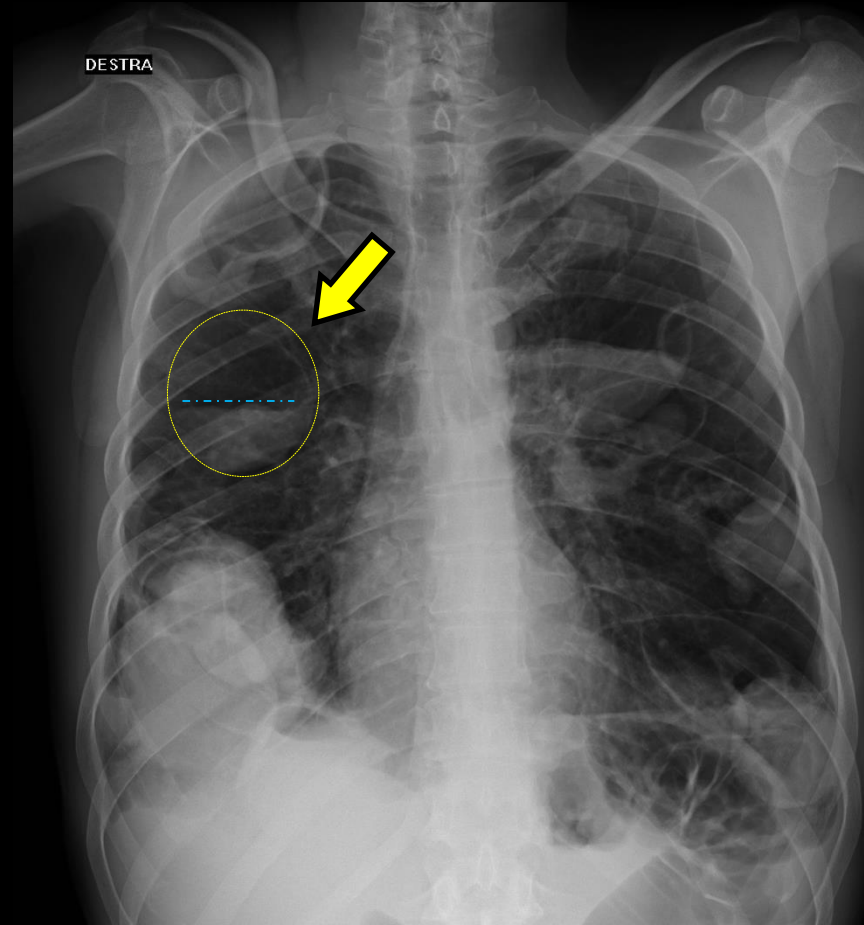
CT AXIAL SCAN AND CORONAL RECONSTRUCTION

Patient (F, 66 yo) with liver hydatidosis (white arrows) with intrabdominal diffuse dissemination (yellow arrows), due to direct rupture of liver cysts.

COMPLICATIONS OF HEPATIC HYDATID DISEASE: DIRECT RUPTURE

IMAGING FINDINGS

- Chest radiography: pleural effusion, elevation of the diaphragm, lung consolidation, or laminated atelectasis at the lung base. Occasionally, an hourglass-shaped lesion or a loculated pleural effusion similar to an empyema can be seen in the posterior thorax on the lateral projection.
- Intracystic air (communication with the bronchial tree).
- Pleural effusions, lung consolidation and atelectasis



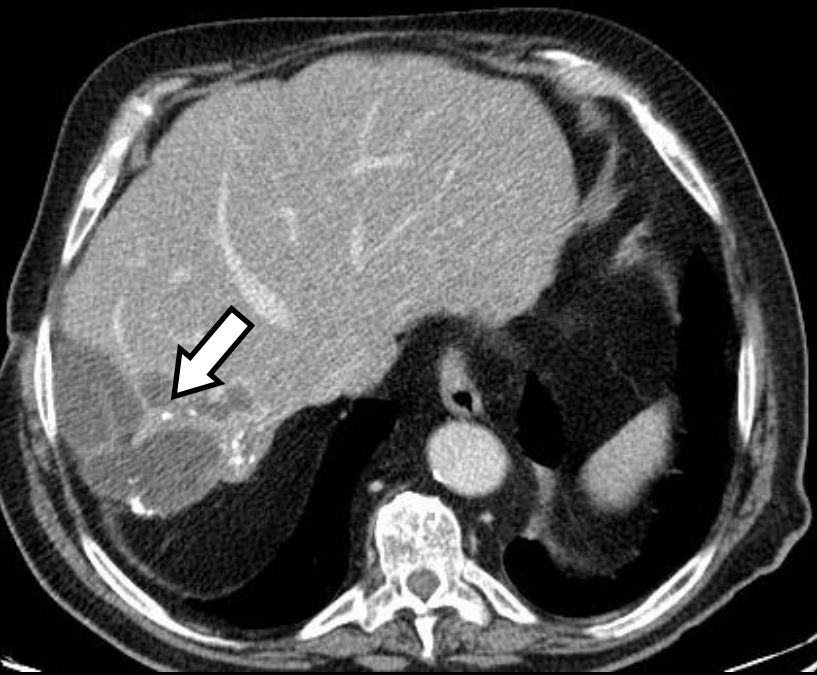
CHEST X-RAY

Patient (M, 75 yo) with liver hydatidosis and pleuropulmonary involvement secondary to transdiaphragmatic dissemination. Bilateral multiple circular cavitated lesions, with sclerotic borders, some of which with air-fluid levels (yellow arrow).

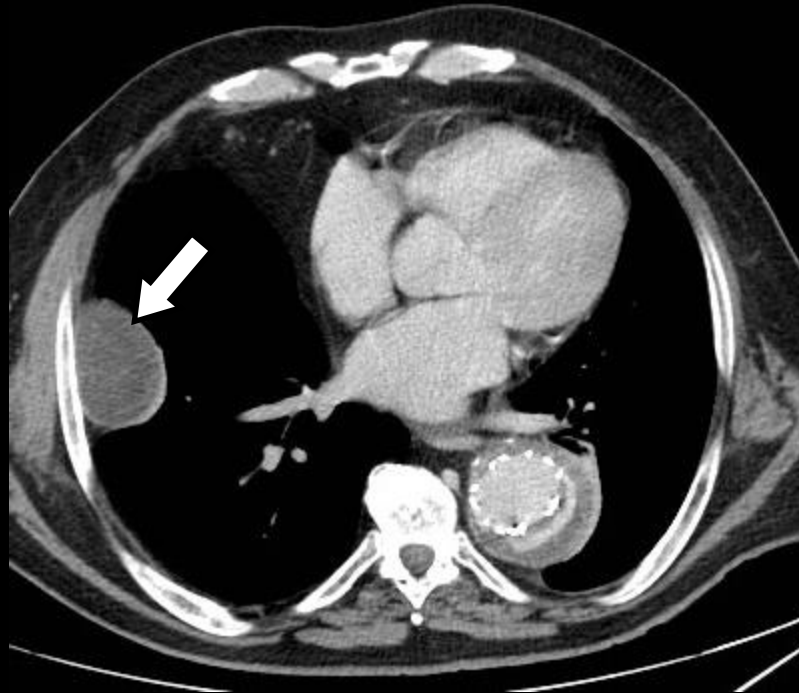
COMPLICATIONS OF HEPATIC HYDATID DISEASE: DIRECT RUPTURE

IMAGING FINDINGS

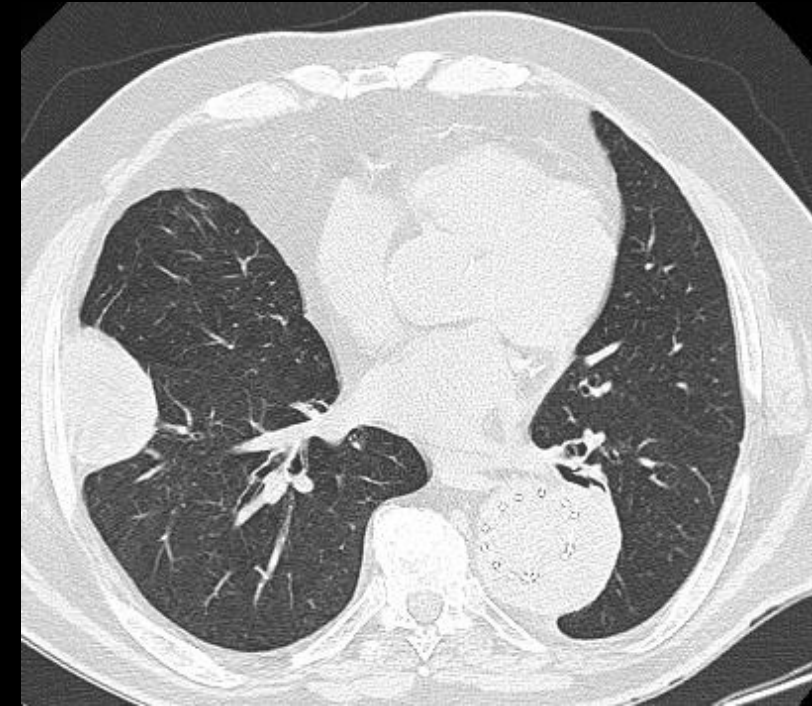
Pleural Rupture



a.



b.



c.

Patient M, 75 yo PVP CT: patient with pleural localization of hydatidosis, due to transdiaphragmatic transmigration of hydatid liver cyst.

a. Liver hydatidosis cysts on the VII hepatic segment: hypoattenuating ovalar lesions with peripheral calcification

b-c. The thoracic CT scan show a pleural ovalar lesion with the same features of the hepatic cysts

COMPLICATIONS OF HEPATIC HYDATID DISEASE: DIRECT RUPTURE

IMAGING FINDINGS

Cysto-colic communication

- intracystic air-fluid level (fistulization with small/large bowel)
- CT scan with the use of multiplanar reconstruction, is useful to demonstrate the hepatic origin of the cyst and its contiguity with the intestinal segment involved.

CONTRAST ENHANCED CT AXIAL AND SAGITTAL RECONSTRUCTION

Patient (F, 85 yo) with hydatid cysto-colic fistulization.

Large cystic hepatic lesion with peripheral wall calcification and air-fluid level, confluent with the right colon.



COMPLICATIONS OF HEPATIC HYDATID DISEASE: SUPERINFECTION

BACKGROUND

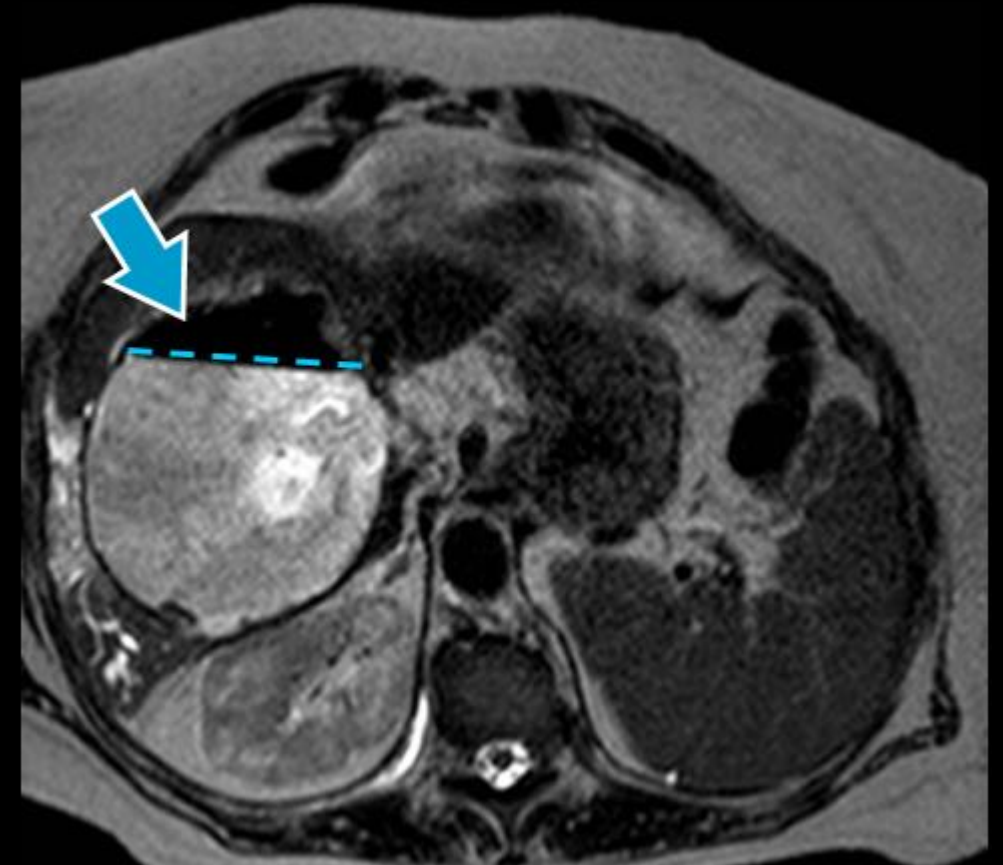
- Less common complication.
- It occurs only after rupture of both the pericyst and endocyst (communicating and direct rupture), which allows bacteria to pass easily into the cyst .

CLINICAL PRESENTATION:

- fever,
- hepatic abscesses.

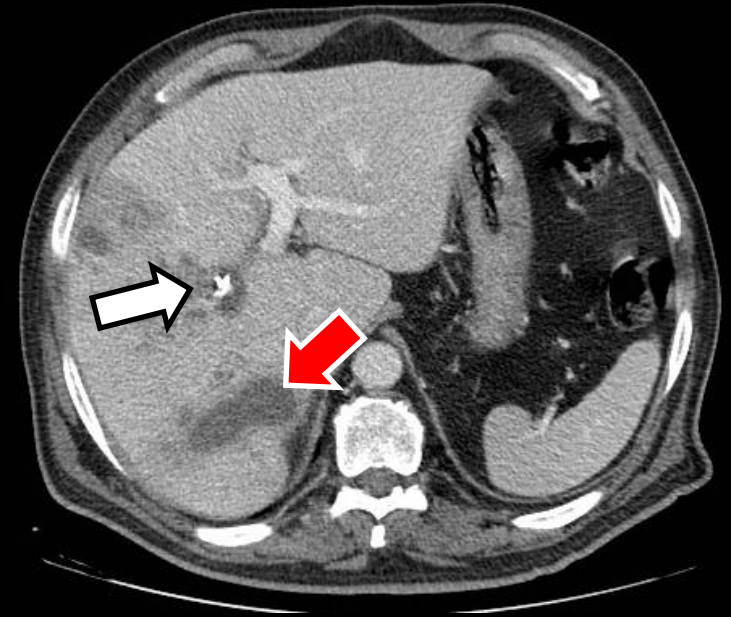
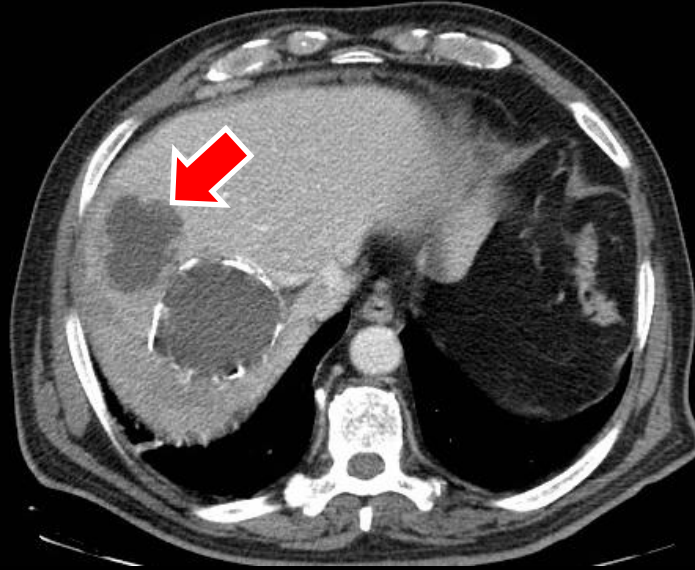
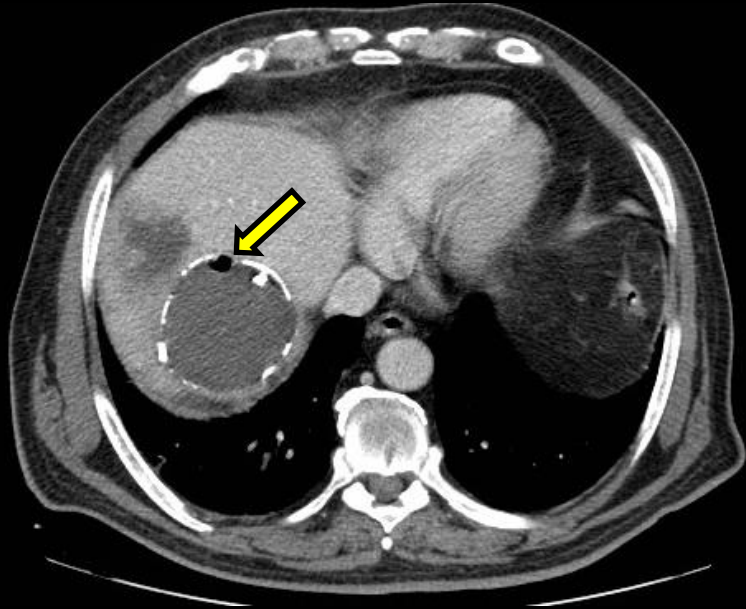
IMAGING FINDINGS

- Hydatid cyst with gas-fluid level.
- Multiple intrahepatic abscesses.
- Patchy areas of contrast-enhanced liver parenchyma in the vicinity of the lesion representing inflammatory changes.



Patient F, 66 yo **MRI T2W**
Inhomogeneous cystic lesion with peripheral wall calcification and **gas-fluid level** suggesting superinfection.

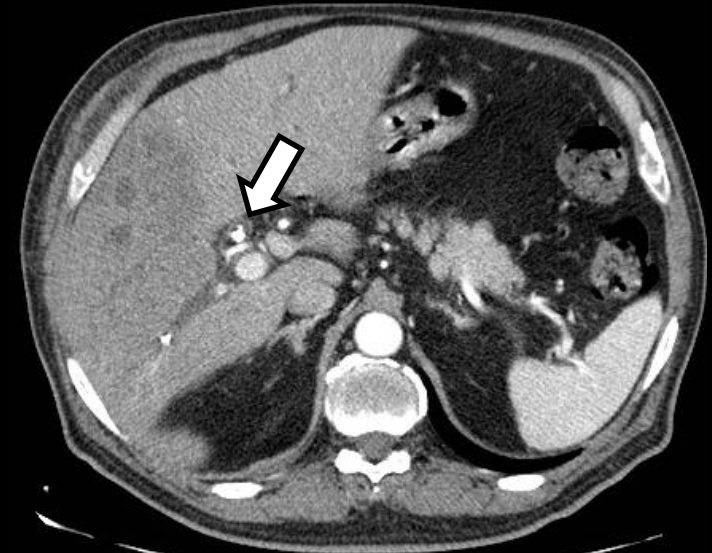
EXAMPLE OF SUPERINFECTION AND COMMUNICATING RUPTURE IN THE SAME PATIENT



Patient M, 72yo PVP CT at the time of hospital admission

IMAGING FINDINGS

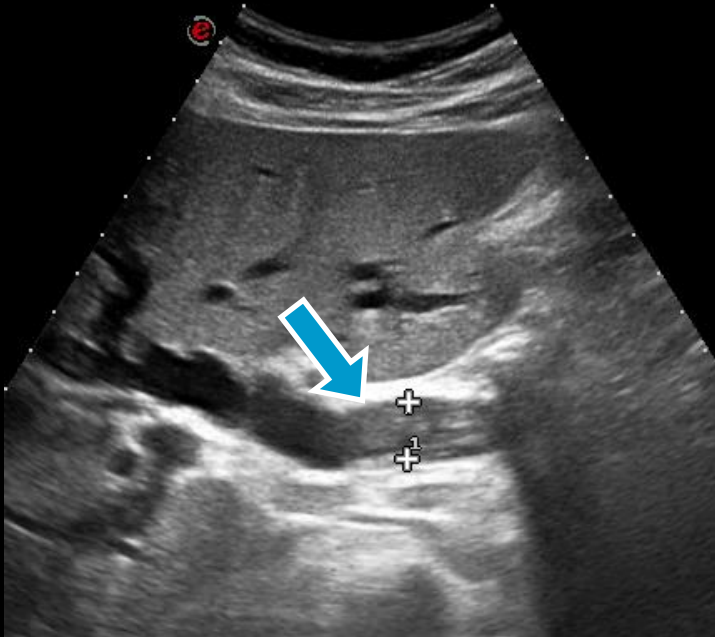
- multiple intrahepatic abscesses (red arrows ↙).
- Intracystic air content (yellow arrows ↘).
- Comparison between two CT scan with different timing demonstrates the intrabiliary migration of calcified fragments of wall cyst from the right intrahepatic duct to the CBD: indirect sign of communicating rupture (white arrows ↙).



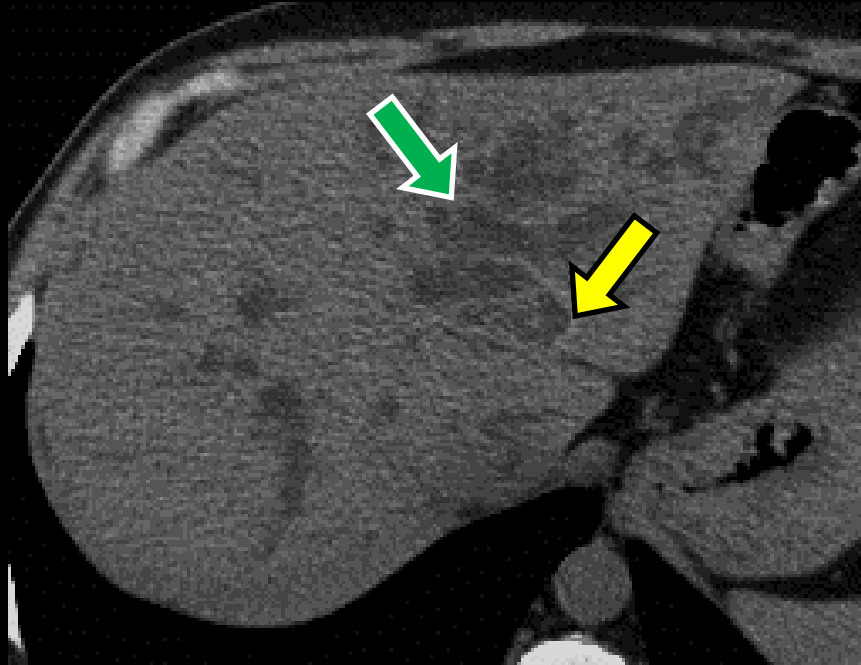
PVP CT follow up- 10 days later

Case quiz solution:

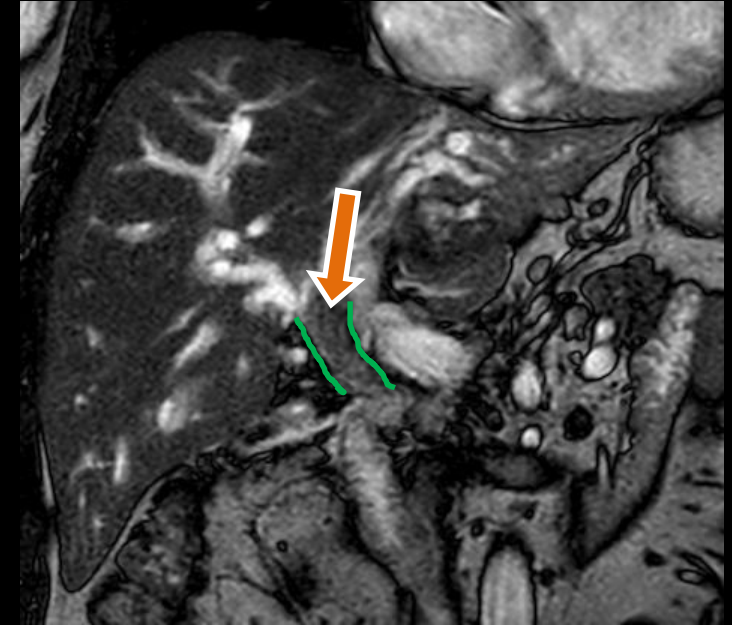
Liver hydatid cyst complicated with communicating rupture



US



CT axial

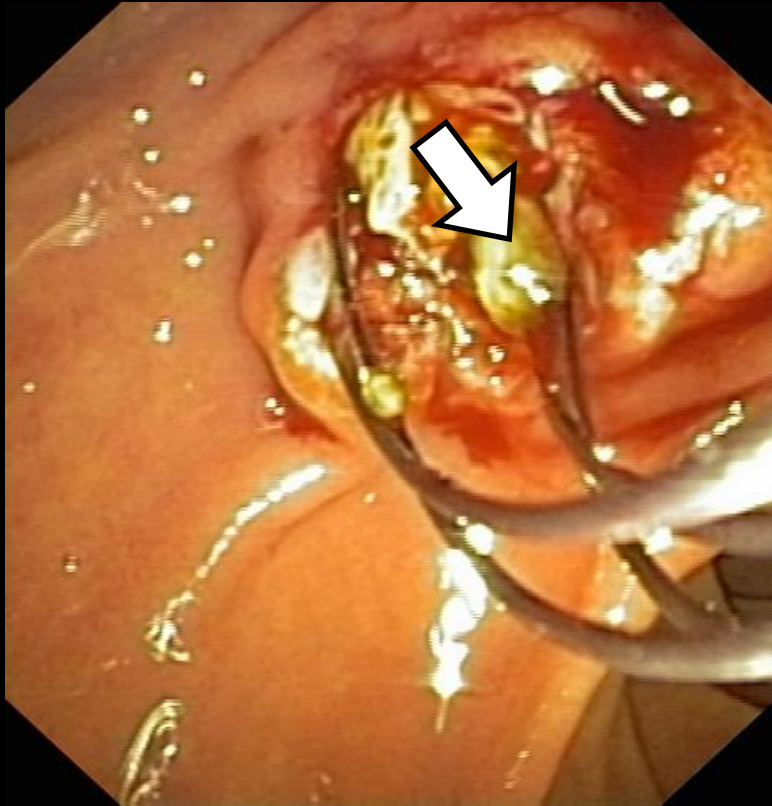


CORONAL BTFE MRI

- Dilated common bile duct with intraluminal **hyperchoic foci** without posterior shadowing.
- A cystic lesion with thin hyperattenuating peripheral contour (**hydatid cyst**) in contact with dilated left intrahepatic biliary ducts.
- **Endoluminal defect** into the common bile duct (between **green lines**).

Case quiz solution:

Liver hydatid cyst complicated with communicating rupture



ERCP: Hydatid membranes and daughter cysts were extracted from the distal common bile duct.

CONCLUSIONS

- Hepatic hydatid disease may rarely manifest with severe complications.
- Clinical diagnosis of complicated hydatid liver cyst is difficult because symptoms are aspecific and tend to mimic other pathologic conditions.
- Knowledge of typical multimodality imaging features of hepatic hydatid complications is crucial for an accurate diagnosis and prompts operative intervention.

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AUTHOR'S CONTACT INFORMATION

- Silvia Greco: silviagre90@gmail.com
- Roberto Cannella: rob.cannella@libero.it
- Giusy Pecoraro: giusypecoraro89@gmail.com
- Dario Giambelluca: dariojambo@hotmail.it
- Emanuele Battaglia: emabattaglia@gmail.com
- Francesco D'arpa: francesco.darpa@unipa.it
- Massimo Midiri: massimo.midiri@unipa.it
- Giuseppe Brancatelli: gbranca@yahoo.com

THANK YOU



*Teatro Massimo
Palermo, Italy*