

Hydatid Lung (Echinococcosis)

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Objectives

01
Definition

02
Organism

03
**Clinical
features**

04
Diagnosis

05
Management



Definition

1. It is a worldwide zoonosis produced by the larval stage of the Echinococcus tapeworm.

2. Currently recognized species :

3. • Echinococcus granulosus which commonly seen in the great grazing regions

4. of the world :

5. the Mediterranean region, Africa, South America, Australia and New Zealand.

6. • Echinococcus multilocularis

7. • Echinococcus vogeli

8. • Echinococcus oligarthrus



| | presentation | Definitive Host | Intermediate Host |
|--------------------------|----------------------------------|---------------------------|------------------------------|
| E. granulosus | Cystic echinococcosis | Dogs | Sheeps, cattles, pigs |
| E. multilocularis | Alveolar echinococcosis | foxes | Small rodent |
| E. Vogeli | Polycystic echinococcosis | dogs | Rodent |
| E. oligarthus | Unicystic echinococcosis | wild field animals | Rodent |

Morphology:

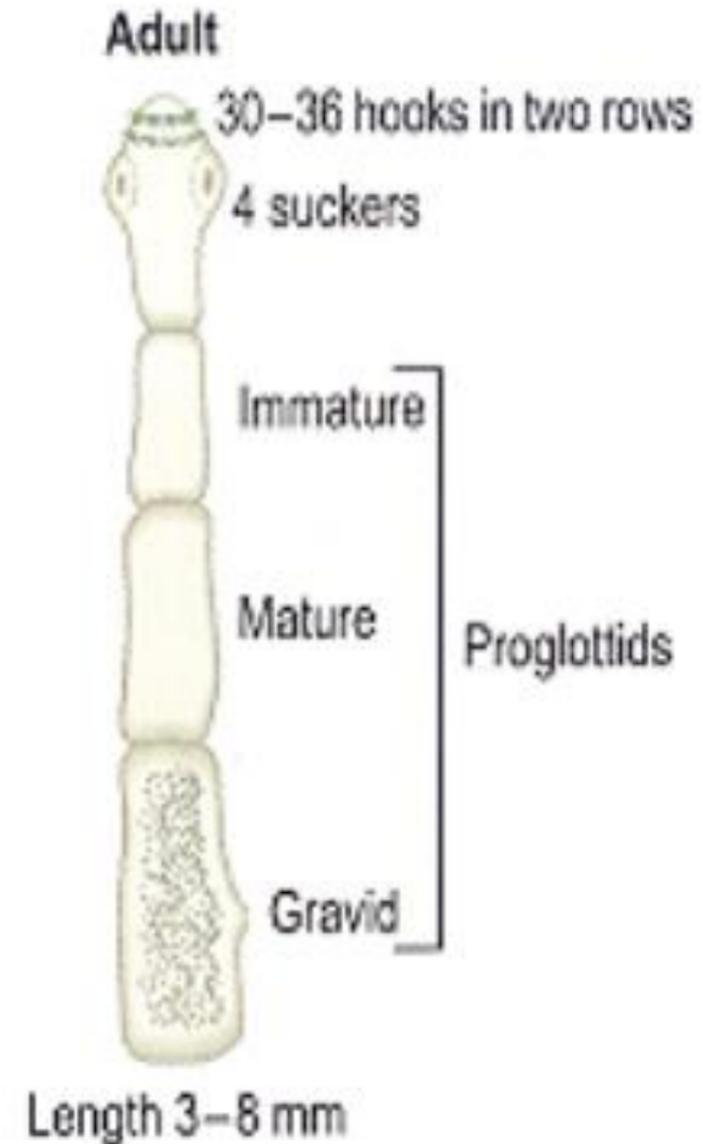
1. Adult worm

- **Adult worm length 3-8 mm**
- **Inhabits the small intestine of definitive host.**
- **Comprises of :**
- **Scolex:** four suckers with rostellum with two rows of hooks
- **Neck:** short and thick
- **proglottids :** 3 or 4 segments.

1st segment (Immature)

2nd segment (Mature)

3rd and 4th (Gravid)



Morphology

2.EGG

- **Hexacanth embryo oncosphere.**
- **Spherical in shape, brown in color , have 2 layers outer and inner**
- **Infective stage of the parasite**



Morphology:

3. Larva (Hydatid Cyst)

1. pericyst:

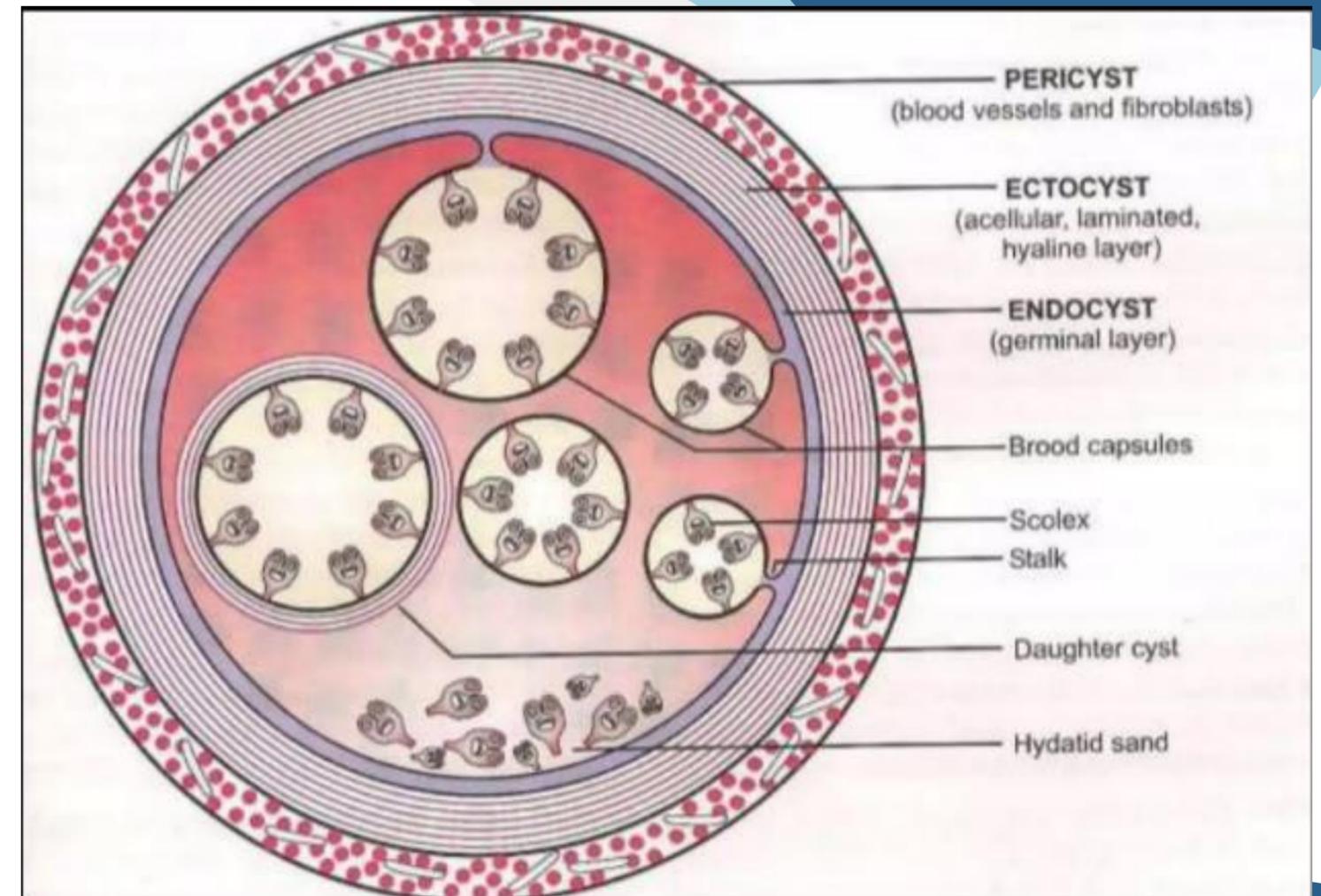
– composed of modified host cells that form a dense and fibrous protective zone. **(host derived)**

2. Ectocyst:

– which is acellular, allows the passage of nutrients and easily separable from pericyst. **(parasite derived)**

3. Endocyst:

– where the daughter cysts, hydatid fluid and the laminated layer are produced.



Morphology:

3. Larva (Hydatid Cyst)

4. Hydatid Fluid:

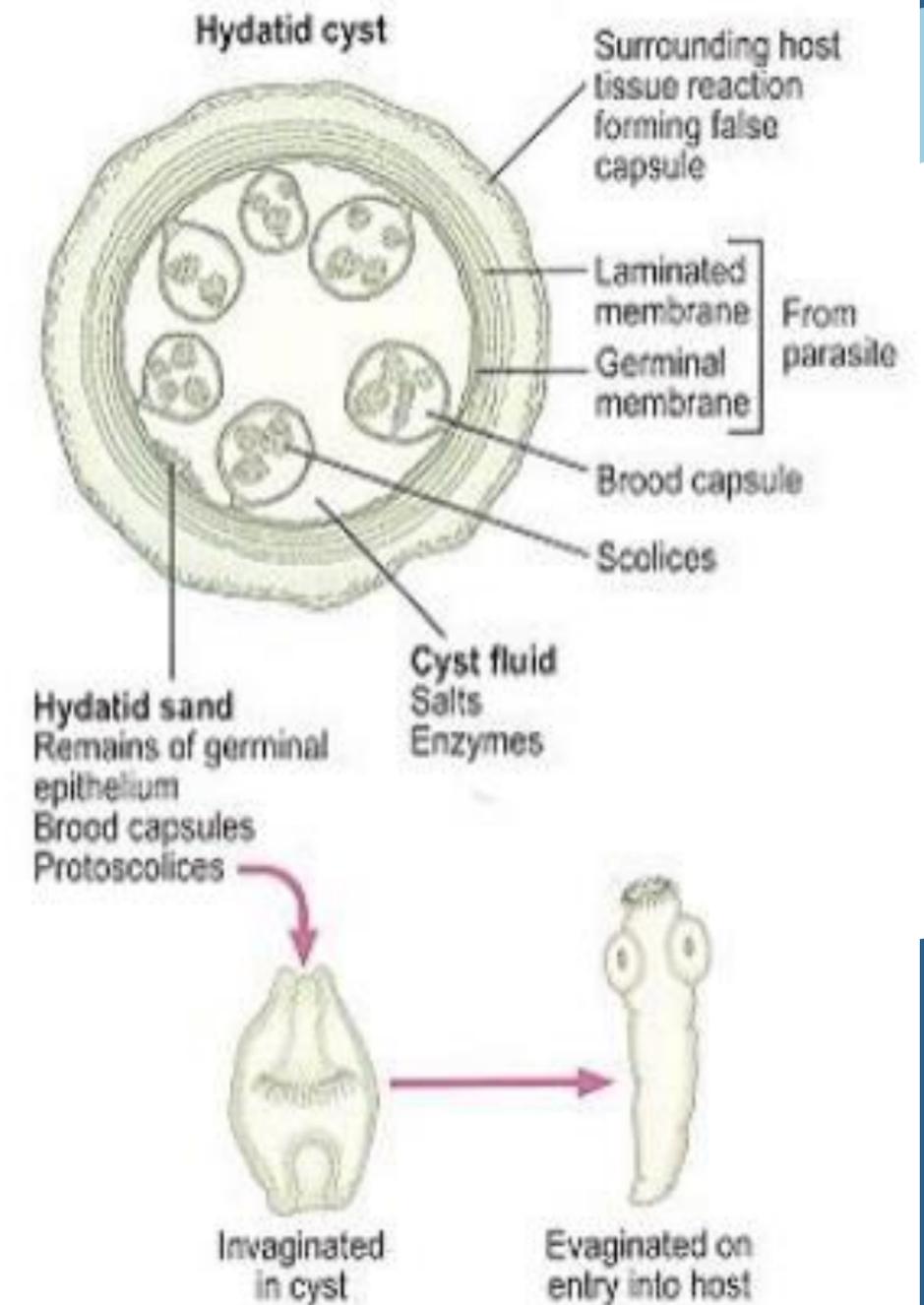
- clear, yellowish fluid with slightly acidic media.
- composed of many chemical substances such as **sodium chloride**, **sodium sulfate**, **sodium gluconate**, **sodium succinate** other nutritional components for the scolex.

it is highly **toxic and antigenic** thus when the cyst ruptures and the fluid leaks out it may induce **anaphylactic reaction**

5. Daughter vesicles :

Or brood capsules are small spheres that contain the protoscoleces

some grow into daughter cysts containing multiple protoscoleces, which if left untreated may cause recurrence by forming secondary cysts when they rupture.



Morphology:

3. Larva (Hydatid Cyst)

5. Hydatid Sand:

formed when the brood capsules and daughter cyst break off and their contents of protoscolex deposit down at the primary cyst

6. protoscolex

- Can differentiate in two ways:

- In the **definitive host**, the scolex becomes an **adult tapeworm**.

- In the **intermediate host**, including humans, each of the released scoleces is capable of differentiating into a new **Hydatid cyst**.



Life Cycle

Adult tapeworm in small bowel of definitive host

In 32 – 80 days

Protoscolices evagination and attachment to the intestine

Gravid proglottids release eggs which pass in **feces**
Ingested by intermediate host

Cyst eaten by the definitive host and protoscolices enter the intestine of DH

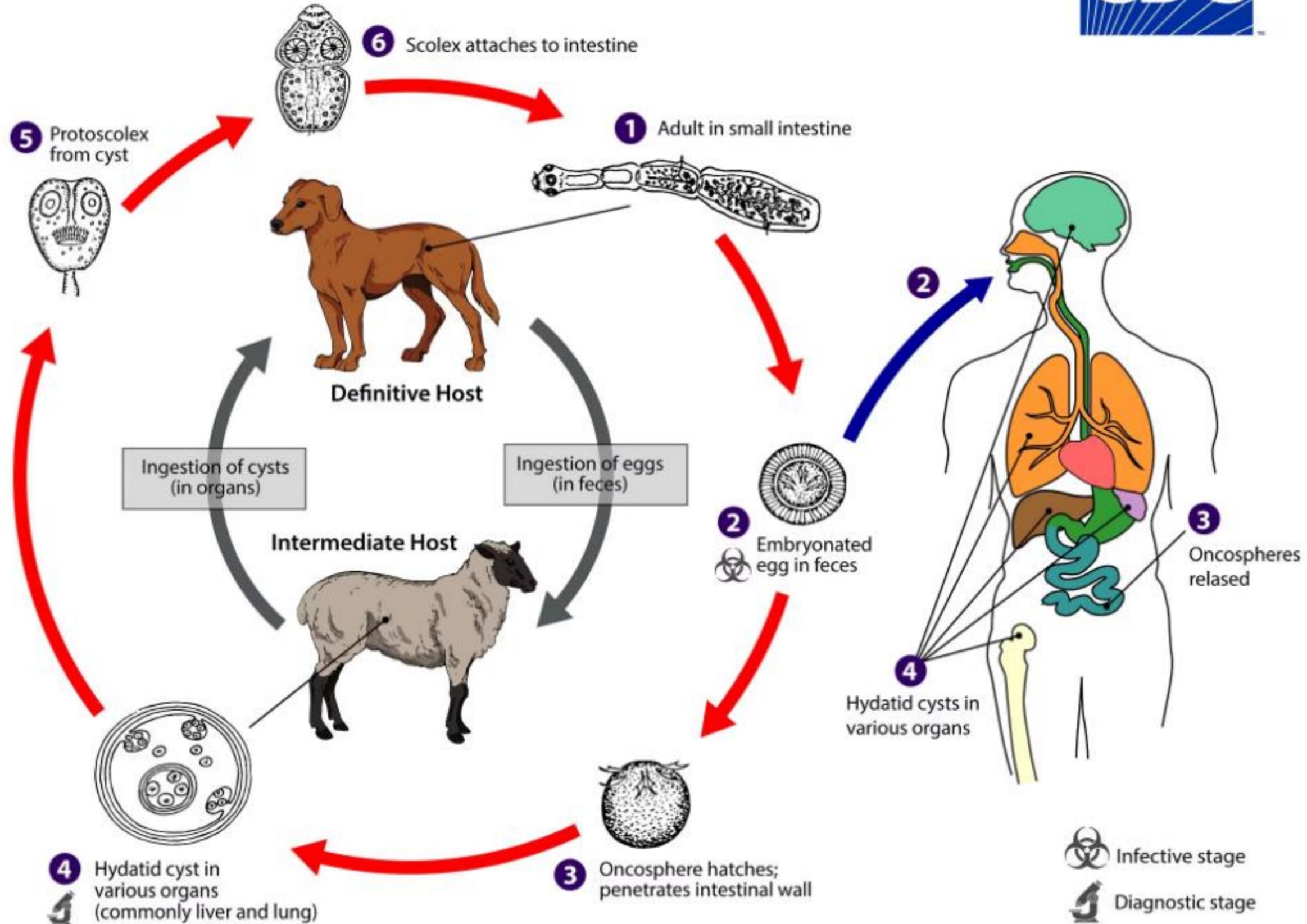
Egg hatches in small bowel of intermediate host to form oncosphere

Cyst
Contains protoscolices



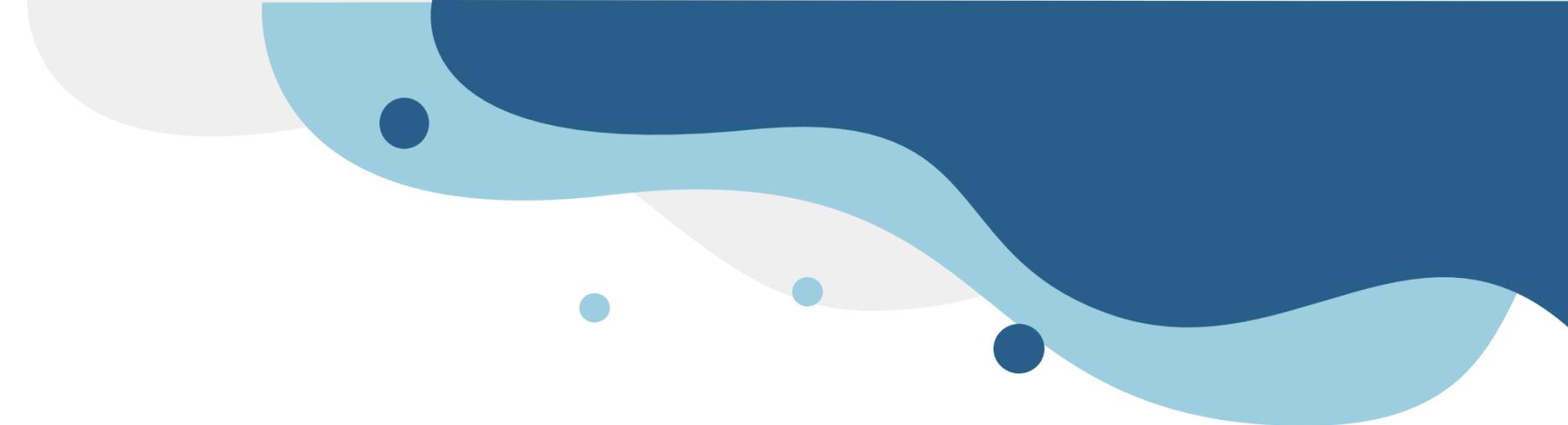
Cystic Echinococcosis

Echinococcus granulosus sensu lato



Mode of transmission:

- **Humans become infected either by :**
- direct contact : by petting or handling infected dogs . They shed eggs in their stool and their fur may be contaminated.
- by ingesting water, food, or soil contaminated with dog feces.
- **Humans** act as so-called **accidental intermediate hosts** in the sense that they acquire infection in the same way as other intermediate hosts, but **are not involved in transmitting the infection to the definitive host.**
- Human infection **does not occur** by the handling or ingestion of meat or viscera from infected sheep



- **Incubation period:**

- Month to years

20 to 30 years documented for cysts that grow slowly and are not in a critical location.

The cyst increase in size 1 cm per 6months

- **Clinical presentation:**

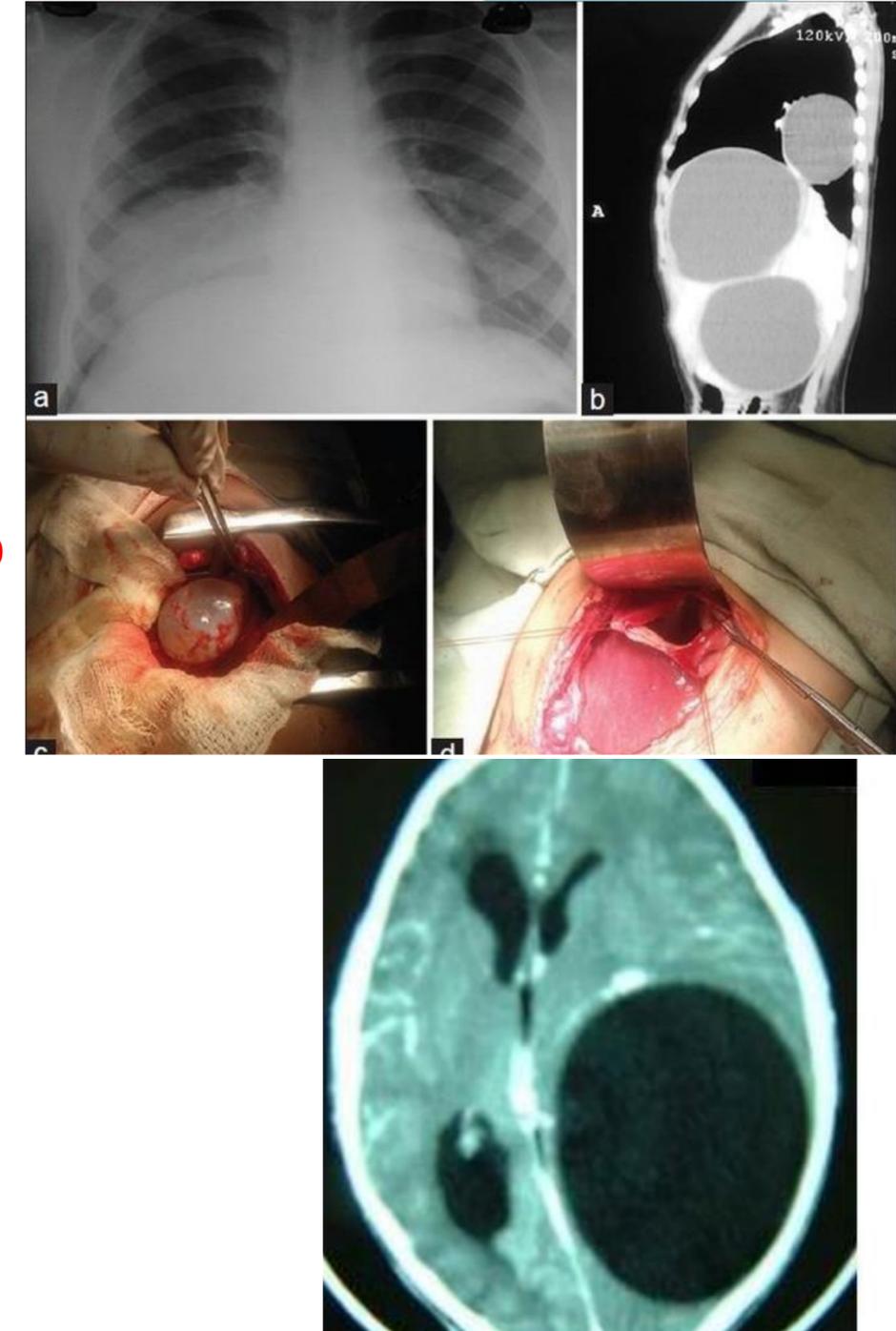
- asymptomatic: 75% of cases.

- Symptoms suggest compression. (2nd most common)

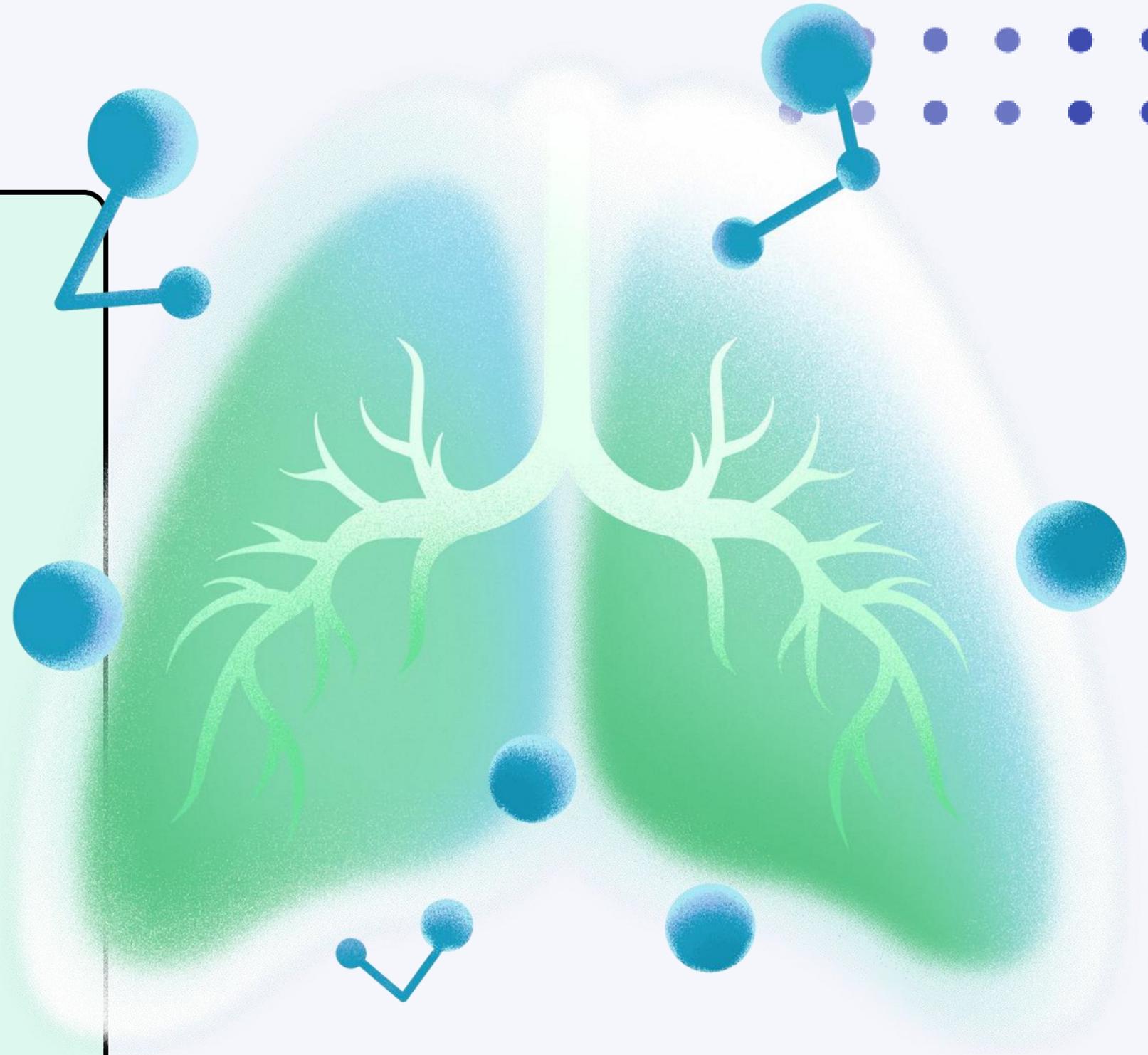
- Depends on size, number, location , potential complication (rupture), patient's general condition and associated bacterial or fungal infections.
- 

Organs Involved :

- Following ingestion of the eggs the cyst can be found in any organ (primary echinococcosis).
Secondary echinococcosis results from the spread from the primary sites.
- **liver is the most common** site of cyst formation (70% of cases)
- **lung in 10–30%** of cases
- other sites usually the spleen, kidney, orbit, heart, brain and bone. (10% of cases) .
- Pulmonary hydatid disease affects the **right lung in 60% of cases.**
- **30%** exhibit multiple pulmonary cysts and **20%** bilateral cysts
- **60%** are located in the lower lobes
- **20%** of patients who have pulmonary hydatid cyst do have their liver involved



clinical features



***The initial stages of pulmonary hydatid cysts are frequently
asymptomatic**

***Small, intact cysts are typically diagnosed *incidentally* and do not cause
significant symptoms**

***The literature commonly reports *cough (61%)*, chest pain (44%), dyspnea
(25%), expectoration of sputum (17%), and hemoptysis (12%) as the most
frequently encountered symptoms in cases of pulmonary hydatid cysts.**

***Less frequently, patients may experience fever, fatigue, nausea, and vomiting.**

*** In approximately 7% of cases, expectoration of cyst fluid or membranes (hydatoptysis) is the definitive symptom, indicating that the cyst has perforated and opened into the bronchus.**

***Acute hypersensitivity reactions, including fever and anaphylaxis, are the most definitive signs of a ruptured cyst**

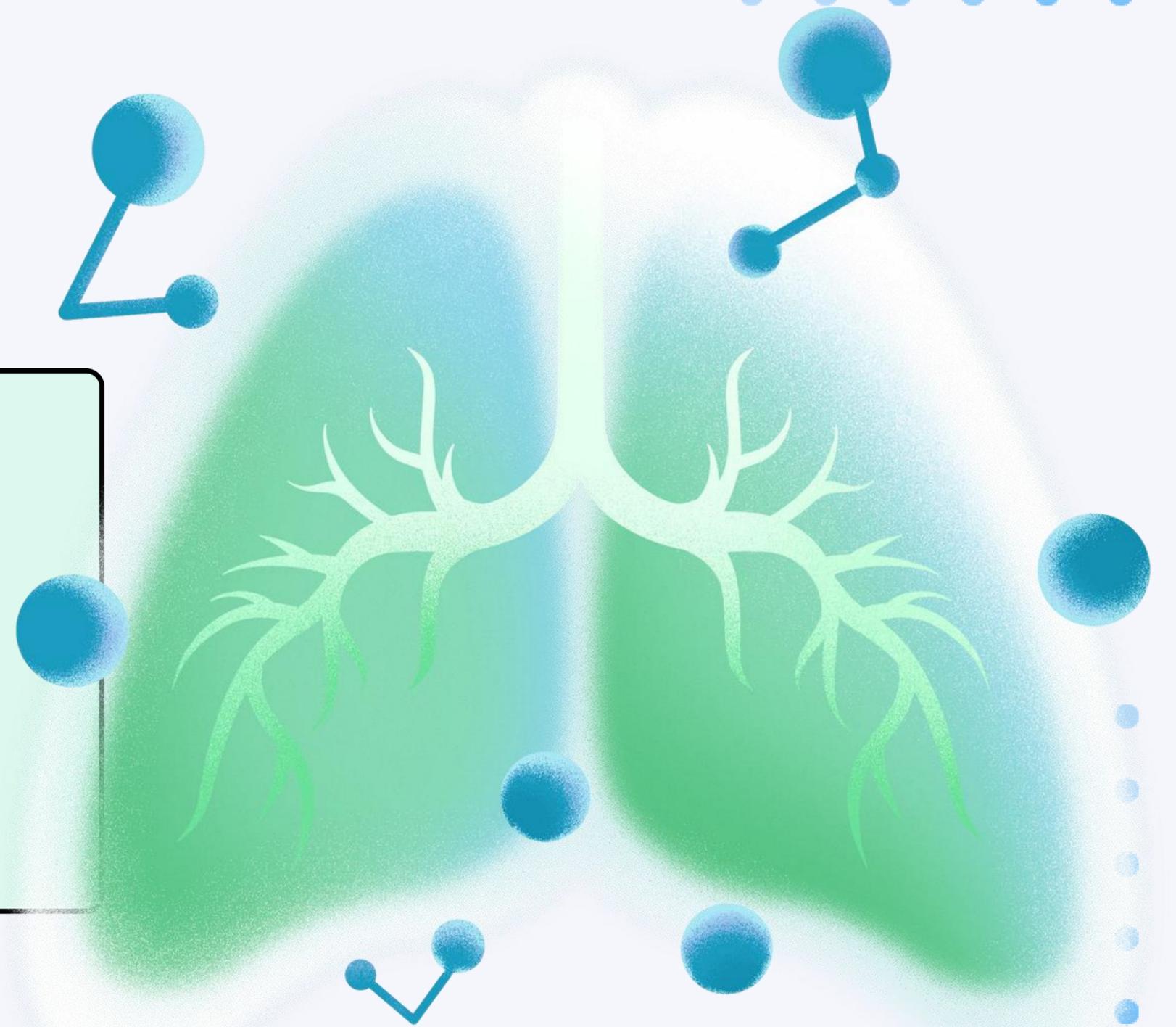
***Peripheral cysts may cause chest pain due to pleural irritation, as well as shoulder and abdominal pain due to diaphragmatic irritation.**

***If the cyst ruptures into the pleura, it can lead to pneumothorax, pleural effusion, empyema, and associated symptoms and signs.**

immune complex-mediated disease, **glomerulonephritis** leading to nephrotic syndrome, and secondary amyloidosis .

- Hydatid disease is a rare cause of **recurrent acute pulmonary embolism**. This complication may develop after invasion of the cardiovascular system or direct invasion of the inferior vena cava .

Diagnosis



Laboratory investigations

**** LEUKOCYTOSIS, EOSINOPHILIA, AND ELEVATED ERYTHROCYTE SEDIMENTATION RATE ARE NONSPECIFIC PARAMETERS OBSERVED IN PATIENTS WITH THIS INFECTION AND ARE NOT DIAGNOSTIC FEATURES**

****THERE ARE NO ROUTINE BLOOD WORKUPS THAT MAY BE USED SPECIFICALLY FOR IT.**

*****SEROLOGIC DIAGNOSTIC METHODS ARE USED TO SUPPORT THE RADIOLOGICAL DIAGNOSIS AND FOR FOLLOW-UP ASSESSMENT.**

******A NEGATIVE SEROLOGICAL TEST DOES NOT RULE OUT ECHINOCOCCOSIS.**

Laboratory investigations

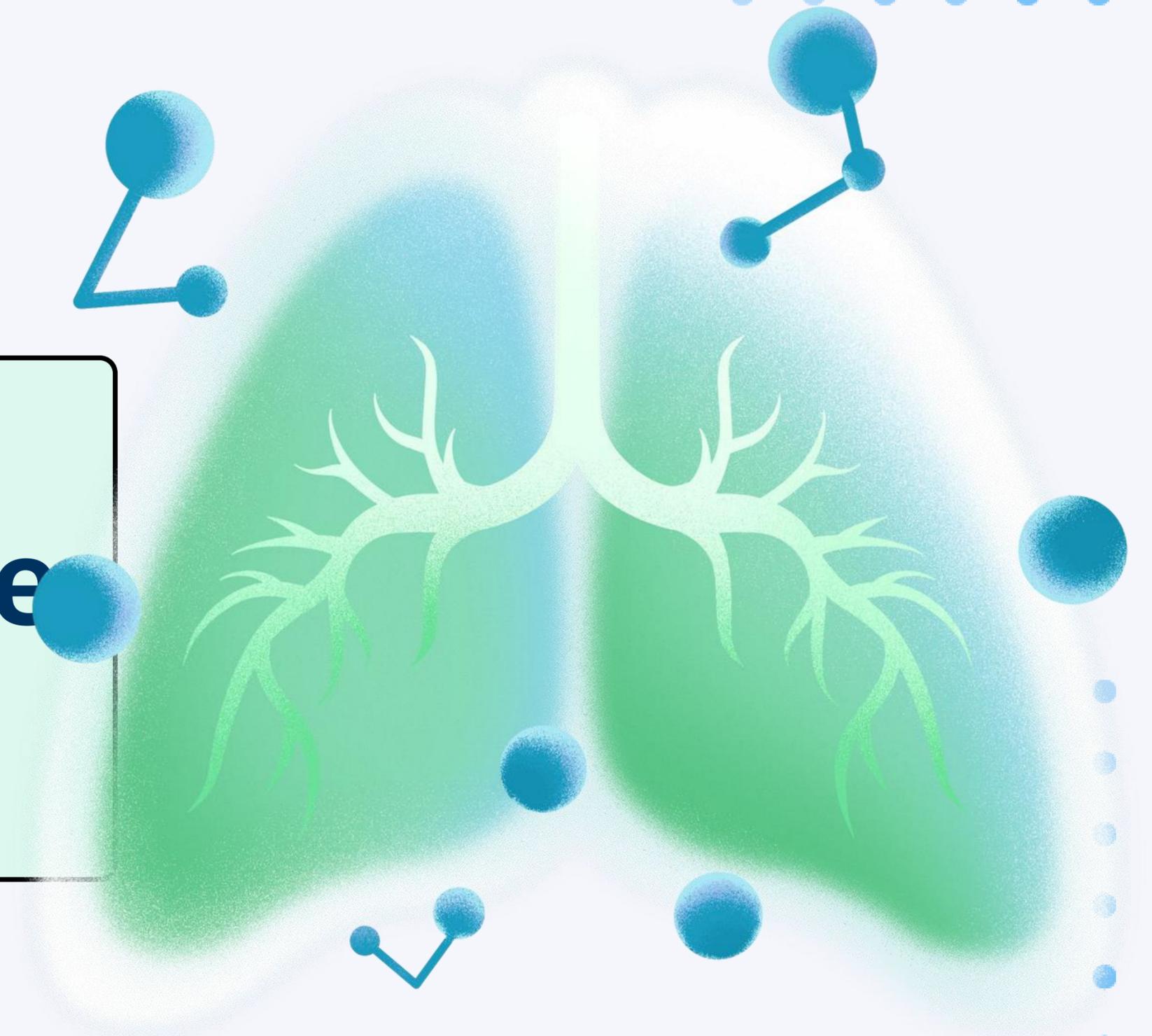
-SEROLOGIC TESTS SUCH AS **ELISA** AND **INDIRECT HEMAGGLUTINATION ASSAY (IHA)** REMAIN THE MAIN SCREENING TOOLS FOR HYDATID (ECHINOCOCCUS) INFECTION, WITH OVERALL **SENSITIVITY** AROUND 80–90% IN HEPATIC DISEASE BUT **SIGNIFICANTLY LOWER** (~40%) IN PULMONARY OR EXTRAHEPATIC INVOLVEMENT. SENSITIVITY VARIES WITH CYST STAGE, LOCATION, AND ASSAY TECHNIQUE.

-THE **CASONI INTRADERMAL** TEST, HISTORICALLY USED FOR DIAGNOSIS (SENSITIVITY ~70%), HAS BEEN **ABANDONED** DUE TO ITS LOW ACCURACY, POOR SPECIFICITY, AND RISK OF SEVERE ALLERGIC REACTIONS. DIAGNOSIS TODAY RELIES PRIMARILY ON IMAGING, WITH SEROLOGY USED AS AN ADJUNCT.

SOURCE :

- [MEDSCAPE: HYDATID DISEASE \(ECHINOCOCCOSIS\) – WORKUP](#)
- [PLOS NEGLECTED TROPICAL DISEASES, 2021 – META-ANALYSIS OF SEROLOGIC TESTS](#)
- [RADIOPAEDIA: CASONI SKIN TEST](#)

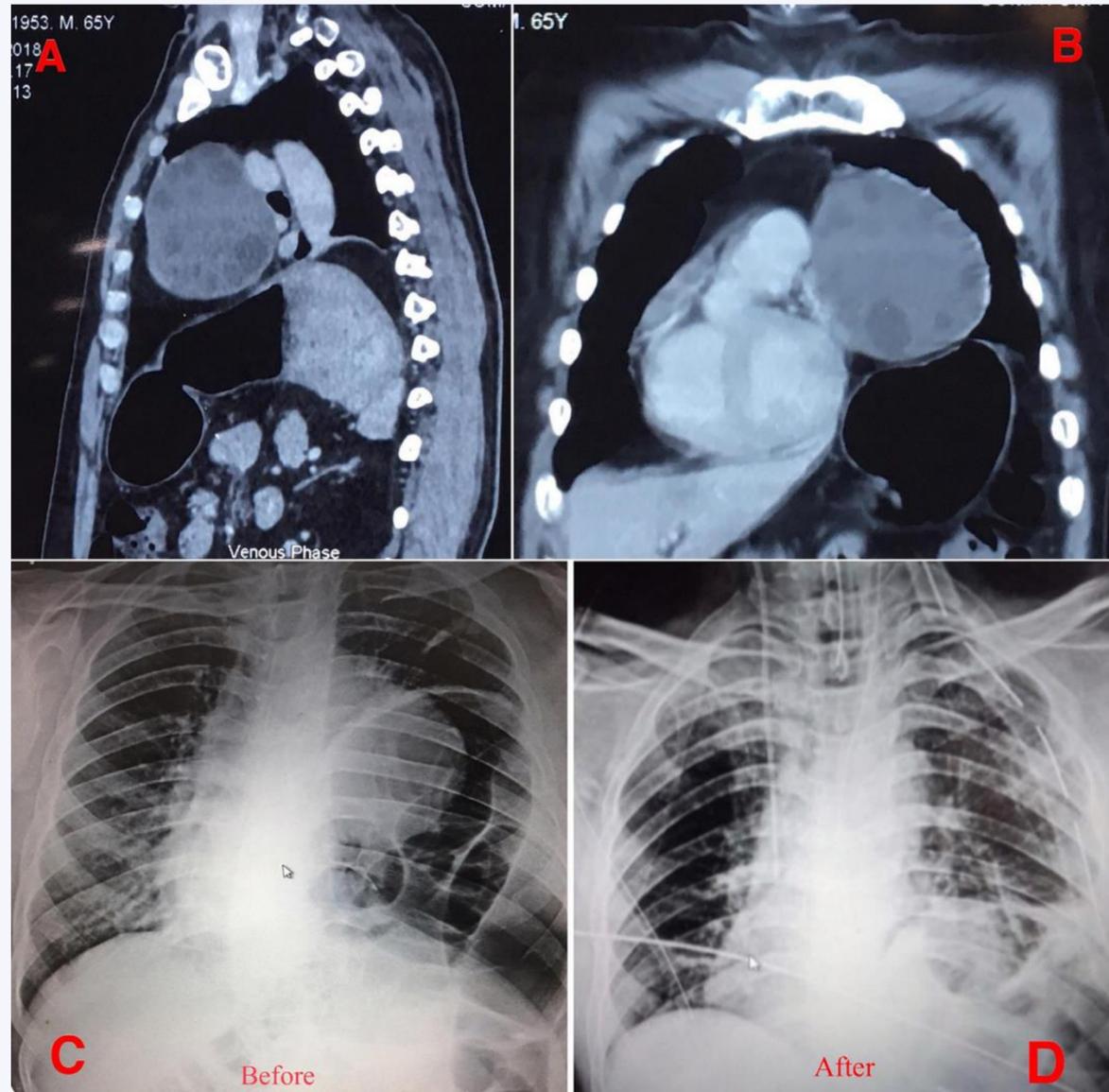
radiological image and signs



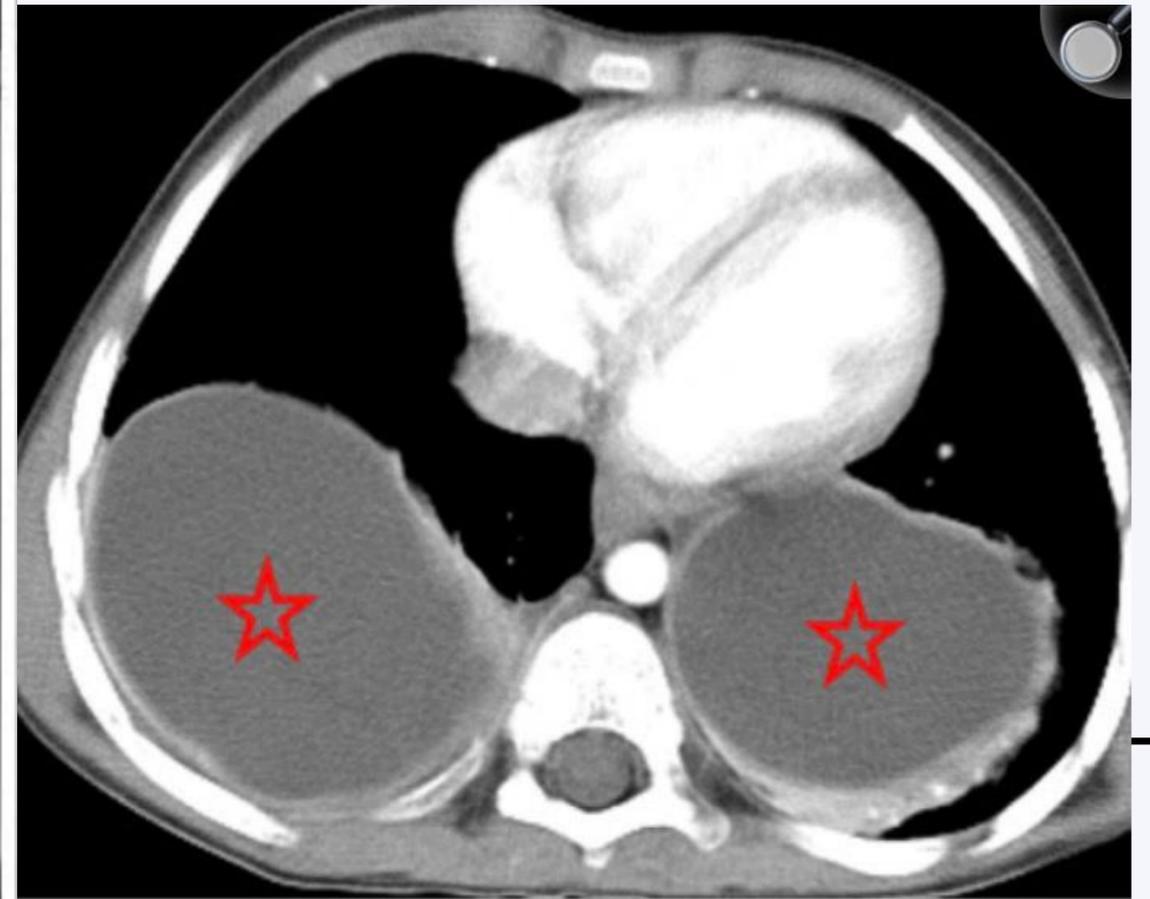
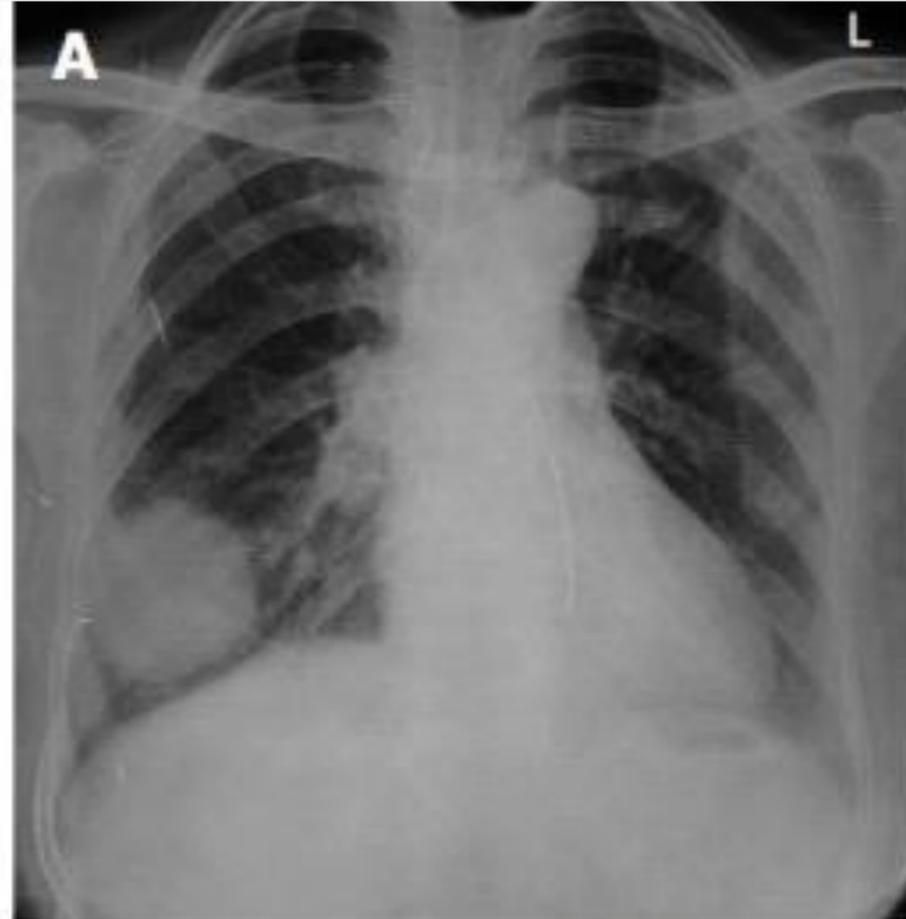
IMAGING

Chest imaging is the principal investigational modality for pulmonary hydatid cyst, backed up by CT as a diagnostic test.

Radiological presentation depends on whether the cysts are complicated or not



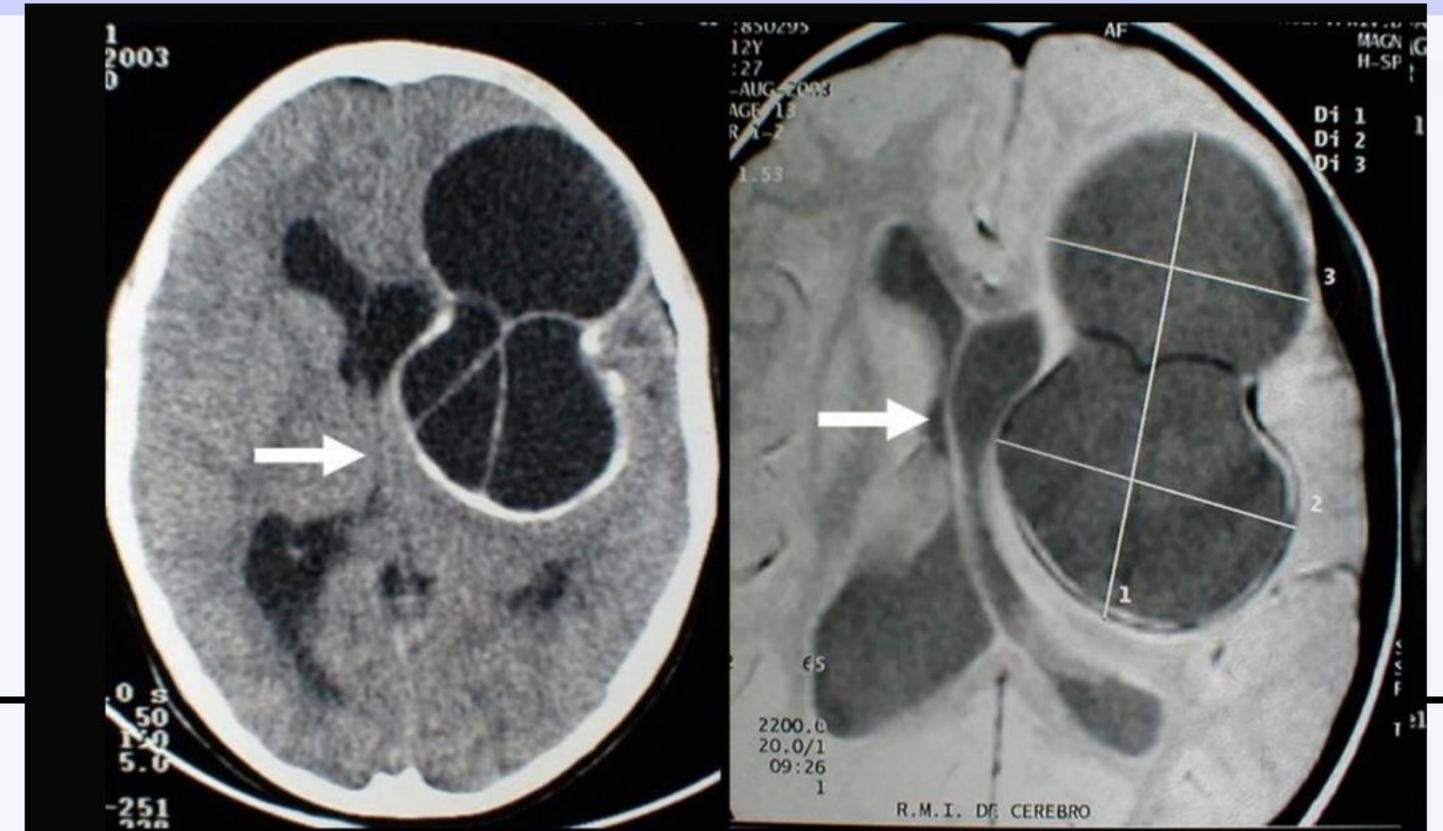
Uncomplicated hydatid cyst



CXR: One or more homogenous round or oval masses with smooth borders surrounded by normal lung tissue

CT: well-circumscribed fluid attenuation lesions with homogenous content ,smooth,hyperdense walls.

Uncomplicated hydatid cyst



polycyclic or bilobed appearance:

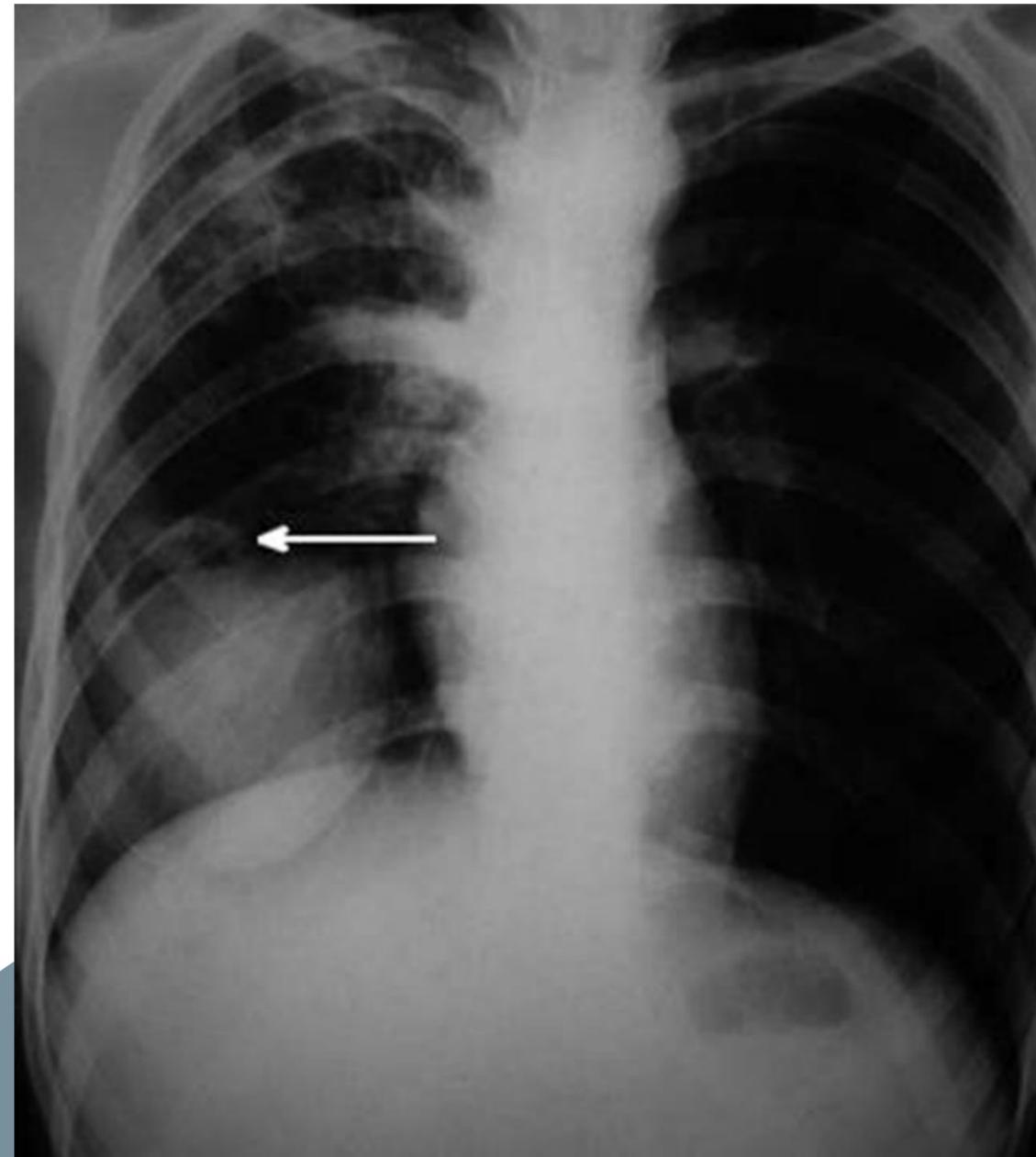
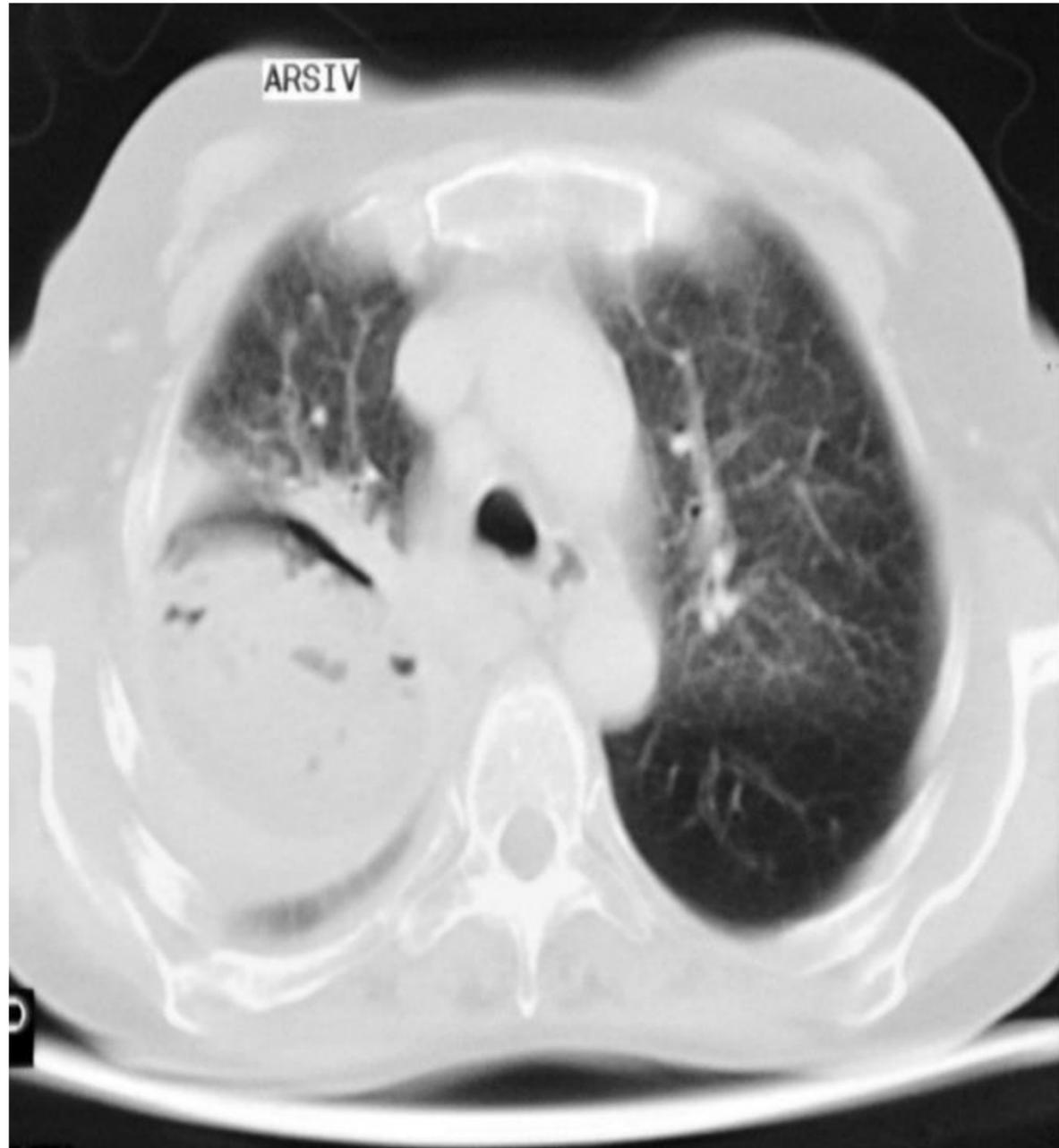
Cysts can assume polycyclic configuration due to pressure from adjacent structures, Notching can also occur in cysts, giving them a bilobed appearance

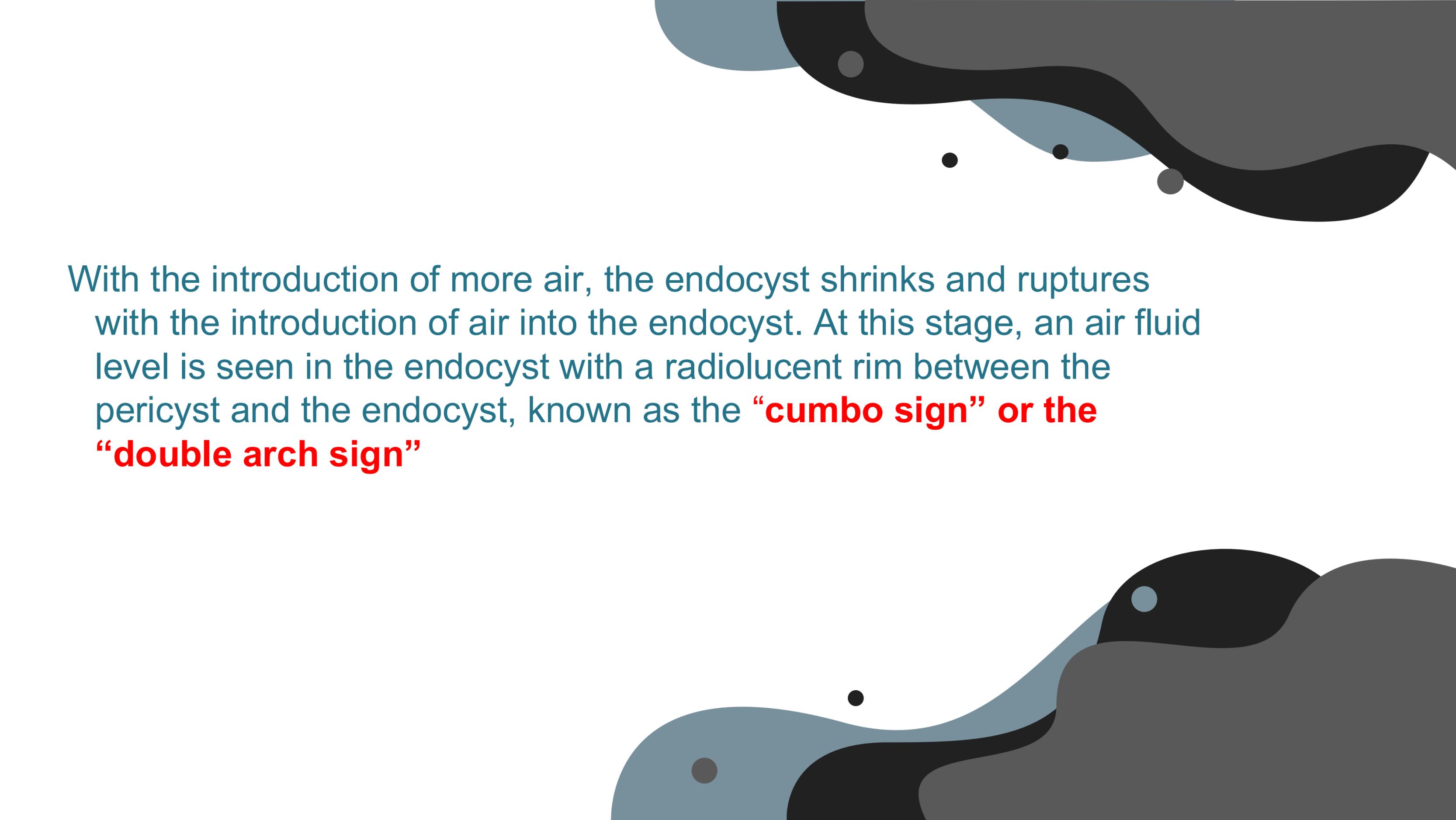
3) Slot sign (impending rupture): The loss of a spherical shape on an X-ray with the appearance of small depression

Complicated hydatid cyst

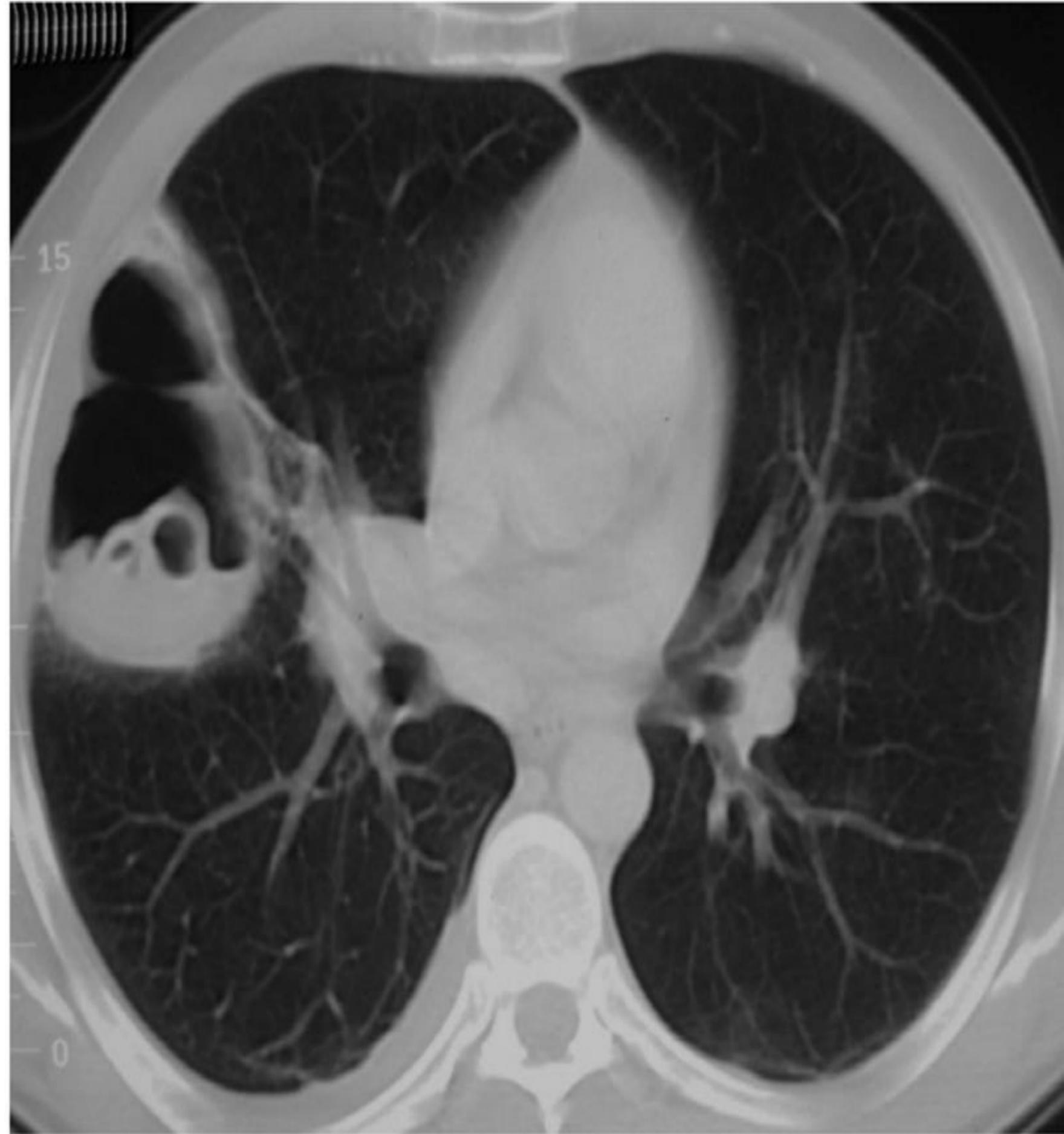
- Crescent sign
- Cumbo or double arch sign
- Water lily
- Rising sun sign
- Dry cyst sign

Erosion of the bronchioles results in air being introduced between the pericyst and the laminated membrane and gives a fine radiololucent crescent (**the 'meniscus or crescent sign'**)

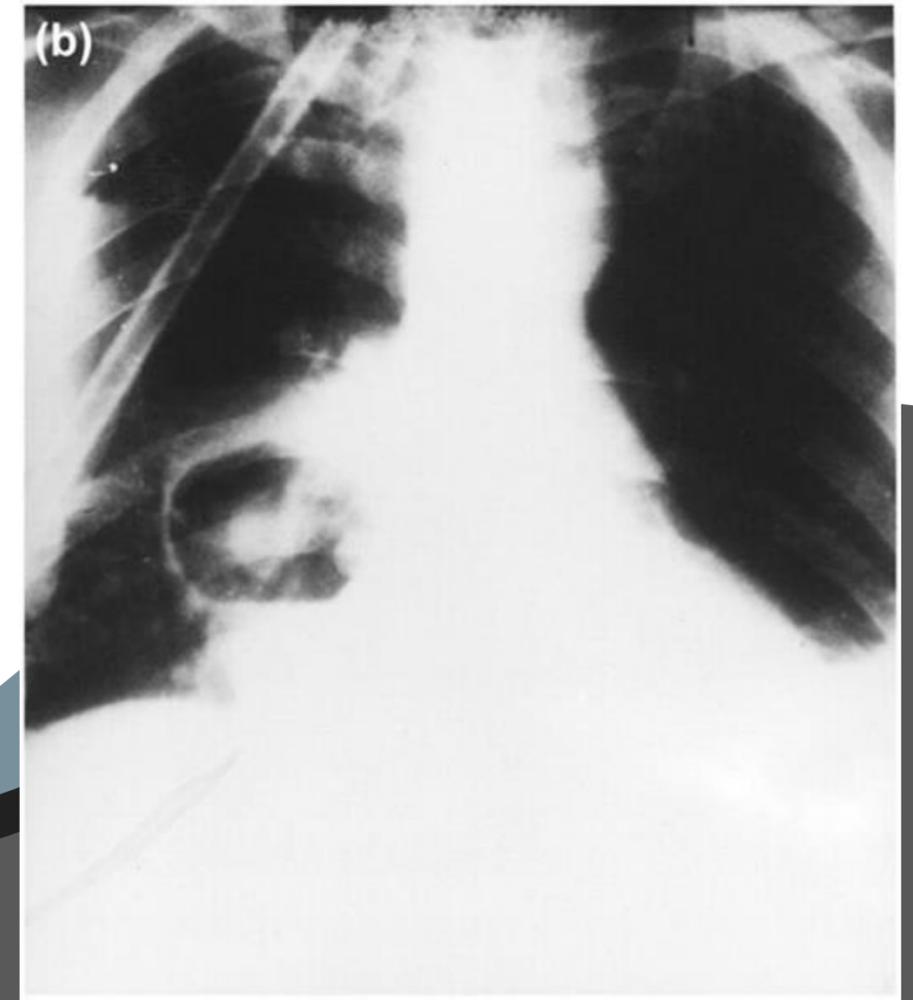
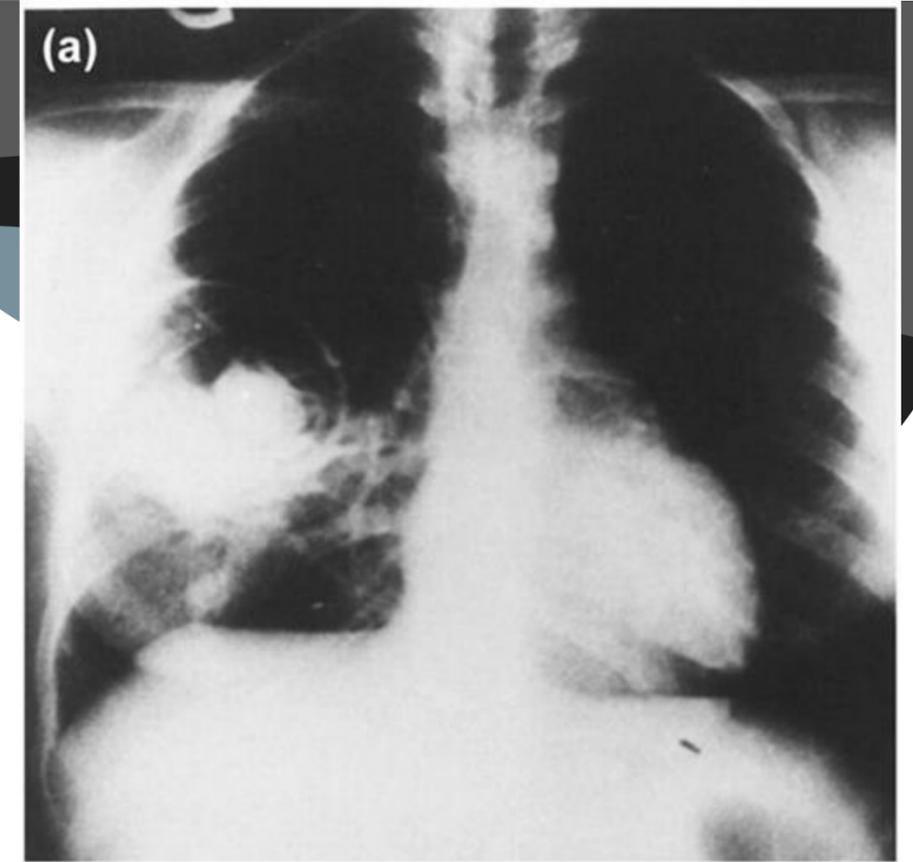
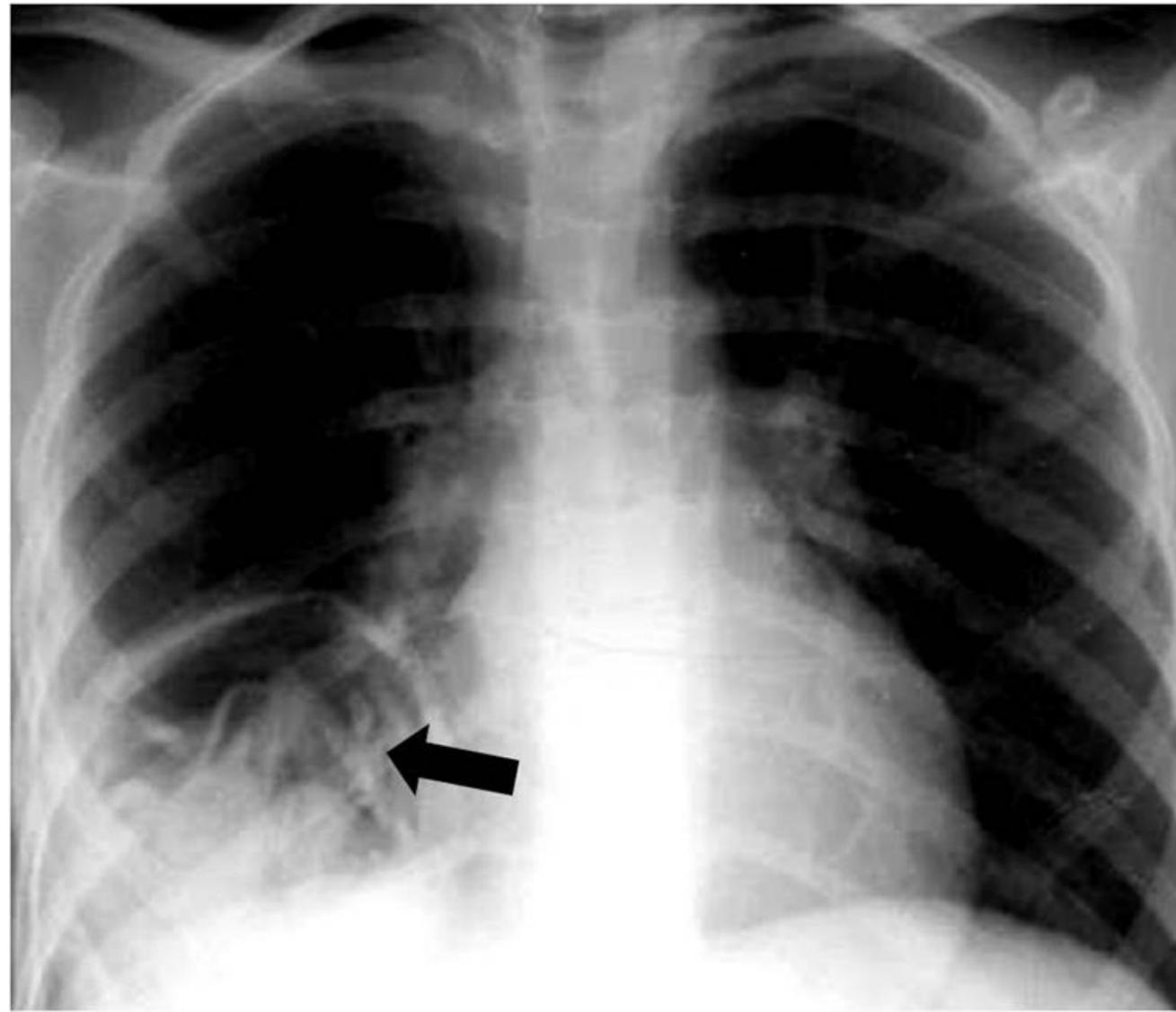




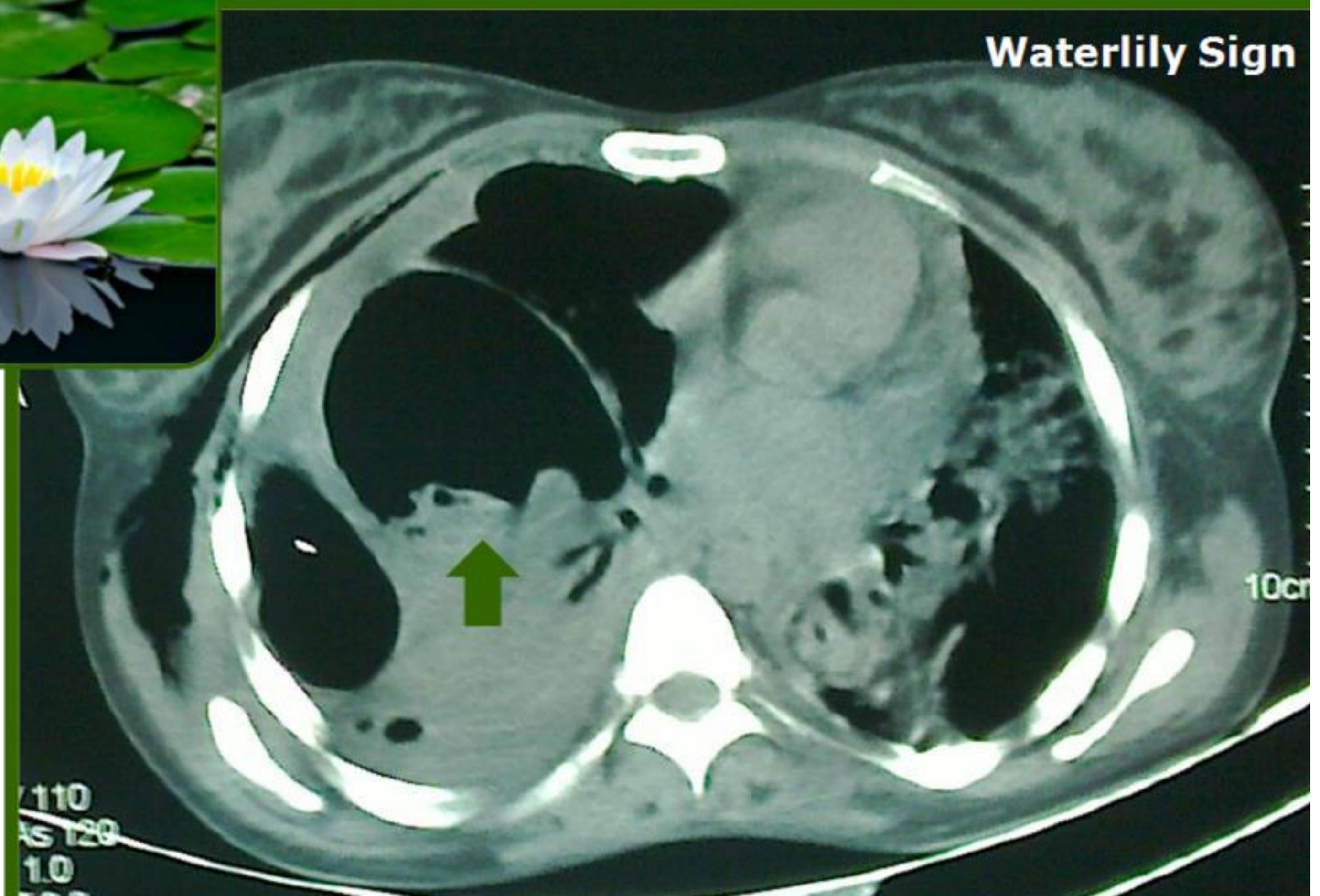
With the introduction of more air, the endocyst shrinks and ruptures with the introduction of air into the endocyst. At this stage, an air fluid level is seen in the endocyst with a radiolucent rim between the pericyst and the endocyst, known as the **“cumbo sign”** or the **“double arch sign”**



The water-lily sign, also known as the camalote sign, is seen in hydatid infections when there is detachment of the endocyst membrane which results in floating membranes within the pericyst that mimic the appearance of a water lily.



Waterlily Sign

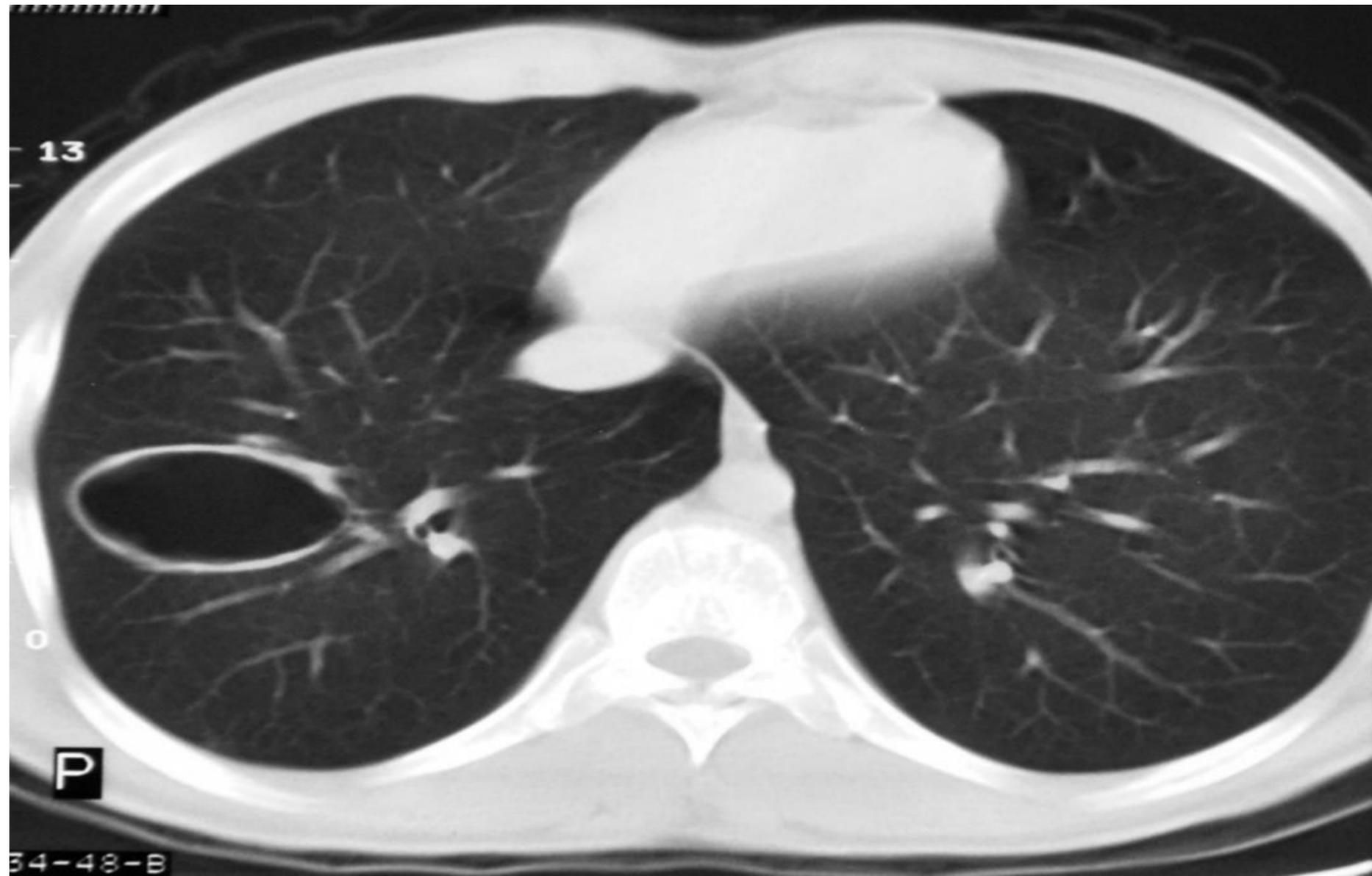


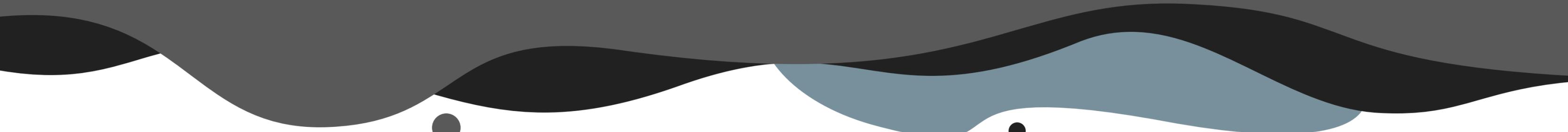
With the rupture of the endocyst, daughter cysts may appear as round radio-opacities at the bottom of cysts, giving them a **“rising sun”** appearance

- ruptured hydatid cyst (white arrows) and the collapsed parasitic ...
- Sun rising sign or sun set sign .
- (complete rupture)



With coughing out of membranes, the pericyst can become empty appearing as air-filled cysts (**the “dry cyst sign”**),





Cont

- ❖ **The double arch sign and the sign of the camalote are pathognomonic of a ruptured hydatid cyst.**



Complicated hydatid cyst

Uncomplicated hydatid cyst

Crescent sign

One or more homogenous round or oval masses with smooth borders surrounded by normal lung tissue.

Cumbo or double arch sign

Polycyclic and bilobed appearance: Cysts can assume polycyclic configuration due to pressure from adjacent structures, Notching can also occur in cysts, giving them a bilobed appearance

Water lily or camelotte sign

Slot sign (impending rupture): The loss of a spherical shape on an X-ray with the appearance of small depression (resulting in a reniform shape) may imply bronchial rupture and has been called the "slot sign"

Rising sun sign

Dry cyst sign



Management



Medical (pharmacotherapy)

Benzimidazol group of drug:

Albendazol 10-15 mg/kg/day (usually 400mg twice daily).

Mebendazol 40-50 mg/kg three times a day

* minimum 3-6 months



Indication of pharmacotherapy

- Smaller cysts
- recurrent cysts or multiple cyst
- poor surgical risk
- refusal for surgery
- multiorgan disease
- When there is intraoperative spillage of hydatid fluid



Contraindication of pharmacotherapy

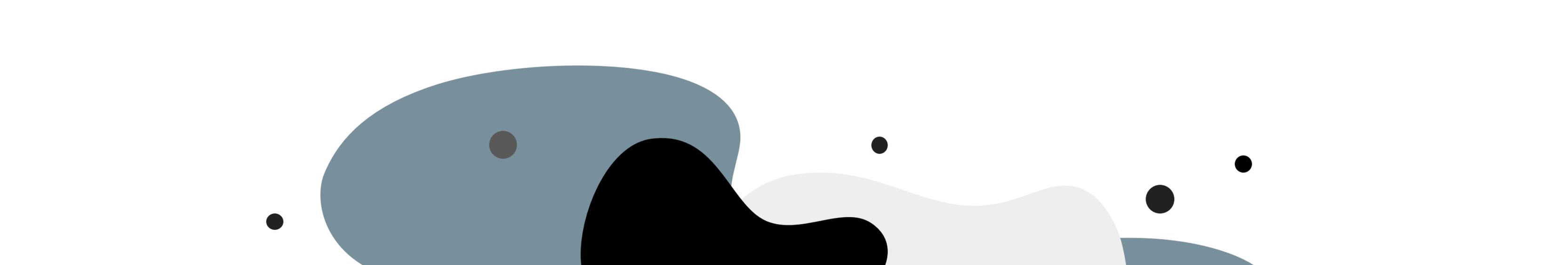
- Large cysts that are at risk of rupture
- Inactive or calcified cysts
- Bone marrow depression
- Pregnancy, specifically the first trimester of pregnancy.

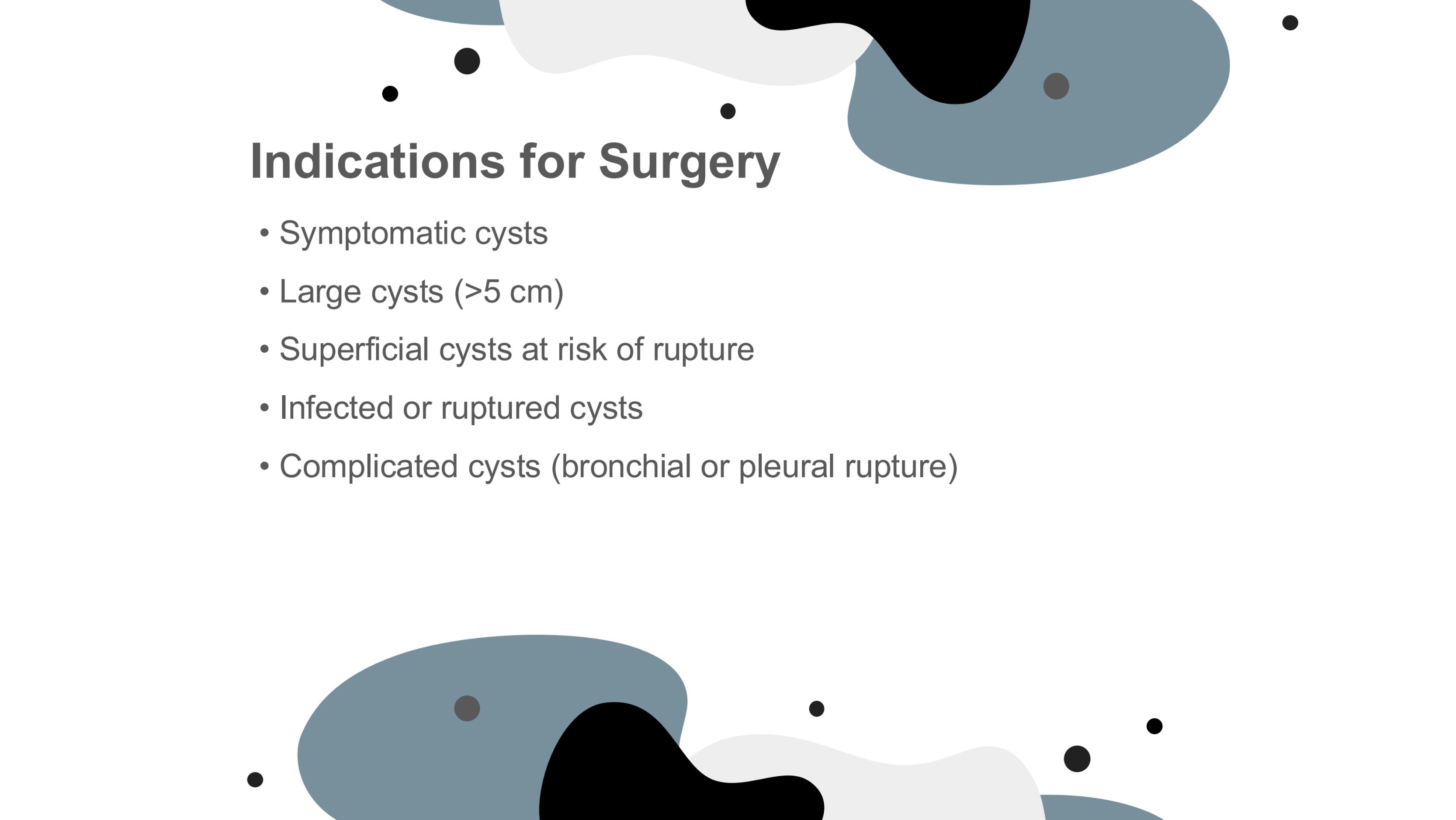


Surgical Therapy

*It's considered **the treatment of choice** since the parasite can be completely removed and the patient cured

***The aim of surgery is to remove the cyst completely while preserving the lung tissue as much as possible**





Indications for Surgery

- Symptomatic cysts
- Large cysts (>5 cm)
- Superficial cysts at risk of rupture
- Infected or ruptured cysts
- Complicated cysts (bronchial or pleural rupture)

Common Surgical Techniques

1. Cystotomy and Capitonnage (Barrett's Technique)

- Most commonly used.
- Procedure: Remove cyst contents → excise germinal membrane → close bronchial openings → obliterate residual cavity by folding and suturing (capitonnage).

2. Cystotomy without Capitonnage

- Some surgeons omit capitonnage to reduce air leaks.

3. Pericystectomy

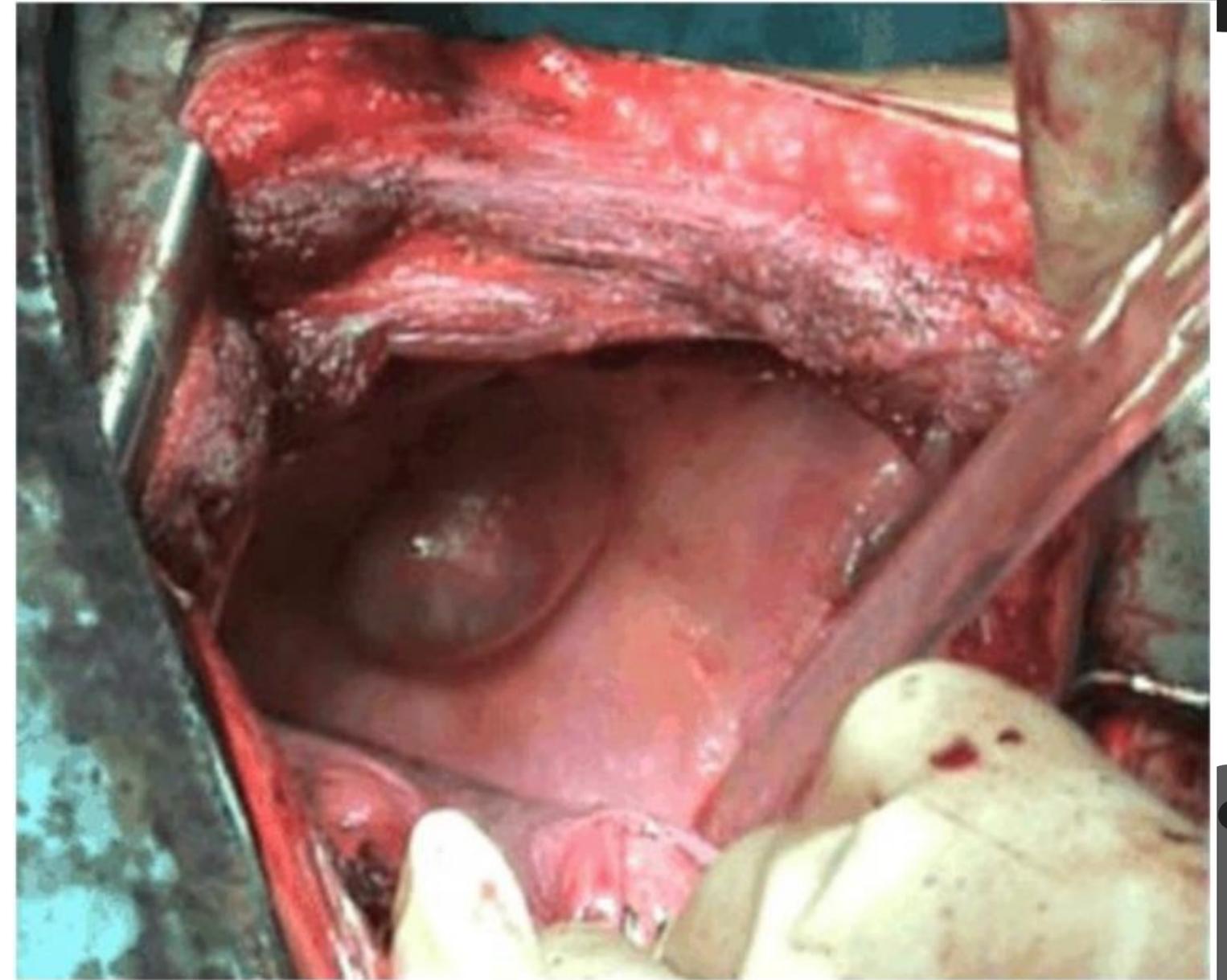
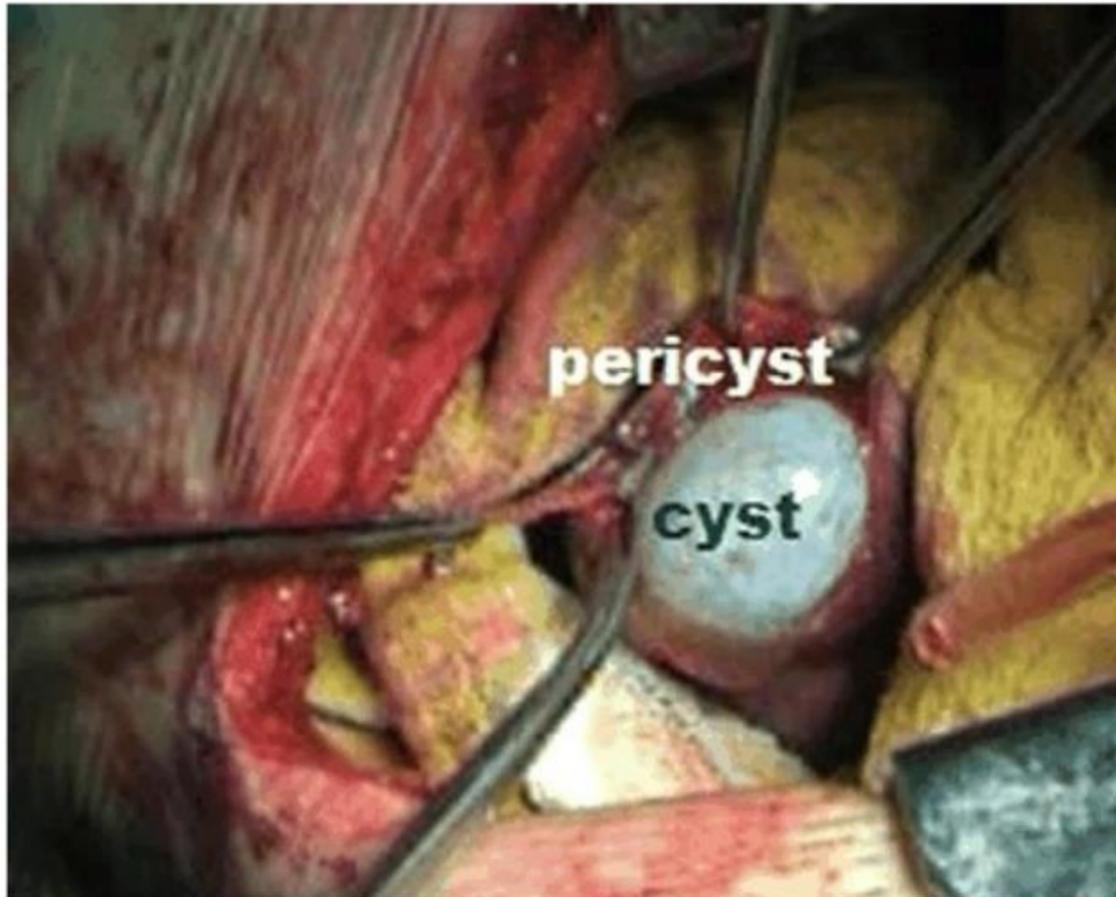
- Remove entire cyst and pericystic layer (if accessible).

4. Lobectomy / Segmentectomy

- Reserved for destroyed lung tissue, multiple cysts in one lobe, or infected/complicated cases.

5. Video-Assisted Thoracoscopic Surgery (VATS)

- Minimally invasive option for selected, small, and peripheral cysts.



The macroscopic appearance of the hydatid cyst in the lung

PIAR procedure

PAIR is an interventional radiology procedure introduced by the WHO as an alternative to surgery for selected hydatid cysts.

It is performed under ultrasound or CT guidance to aspirate the cyst, inactivate the parasite with a scolocidal agent, and then remove the fluid — thereby collapsing the cyst.

| | | |
|----------|--------------------|---|
| P | Puncture | Needle puncture of the cyst under US or CT guidance. |
| A | Aspiration | Controlled aspiration of cyst fluid to decompress and confirm diagnosis (via fluid appearance or microscopy). |
| I | Injection | Injection of a scolicidal agent (e.g. hypertonic saline 20%, ethanol 95%, or povidone-iodine) into the cavity to kill protoscolices. |
| R | Respiration | After 10–30 minutes, the injected agent and remaining cyst fluid are re-aspirated and the needle withdrawn. |

Thank You