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RESEARCH ARTICLE

CAUGHT IN TRANSIT: HEPATOPULMONARY HYDATID DISEASE CROSSING ANATOMICAL BOUNDARIES – A CASE REPORT

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Abstract

Hydatid disease, caused by Echinococcus granulosus, is a zoonotic infe ction primarily affecting the liver and lungs. Rarely, both organs are involved simultaneously, termed hepatopulmonary hydatid disease (HPHD) reported in less than 5–13% of all hydatid cases, posing diagnostic and therapeutic challenges. We report a 21-year-old female presenting with hemoptysis from a ruptured pulmonary hydatid cyst and concurrent hepatic hydatidosis. Diagnosis was confirmed via CECT, revealing characteristic pulmonary and hepatic lesions. This case highlights the role of early imaging and a multidisciplinary approach involving pulmonology, hepatobiliary and cardiothoracic surgery, and anesthesiology for optimal outcomes.

Introduction:-

Hydatid disease (echinococcosis) is a chronic parasitic infection caused by the larval stage of Echinococcus granulos us and occasionally Echinococcusmultilocularis. Humans are accidental intermediate hosts, acquiring infection through ingestion of eggs excreted by infected dogs or other canines.The liver (in about 60–70% of cases) and the lungs (20–30%) are the most commonly affected organs due to their filtration roles in the portal and systemic circulation. Simultaneous hepatic and pulmonary involvement, termed hepatopulmonary hydatid disease (HPHD), is uncommon—reported in less than 5–13% of all hydatid cases.Clinical manifestations depend on cyst location and complications such as rupture or infection. Pulmonary hydatid cyst rupture into bronchi may lead to hemoptysis, cough, or expectoration of cystic contents. Radiological imaging, particularly CECT, remains the cornerstone for diagnosis and surgical planning.The objective of this report is to present the clinical, radiological, and pathological features of hepatopulmonary hydatid disease (HPHD) in a patient with simultaneous hepatic and pulmonary cyst involvement, and to emphasize the role of contrast-enhanced computed tomography (CECT) in accurate diagnosis, preoperative assessment, and multidisciplinary management planning in this uncommon manifestation of echinococcosis.

Case Report:-

A 21-year-old female from Orissa, previously healthy, presented with two episodes of hemoptysis that occurred after vigorous laughter approximately two weeks prior to evaluation. She recalled a similar, less intense episode of hemoptysis two months earlier. There was no history of cough, fever, dyspnea, weight loss, appetite loss, or constitutional symptoms. Upon further questioning, she reported a significant zoonotic exposure four years earlier, when she frequently fed a sick dog with her bare hands—an exposure that would later prove clinically relevant.

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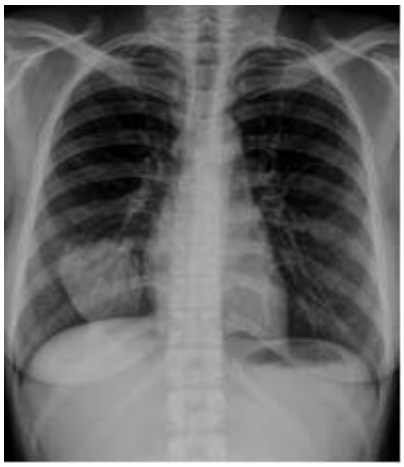
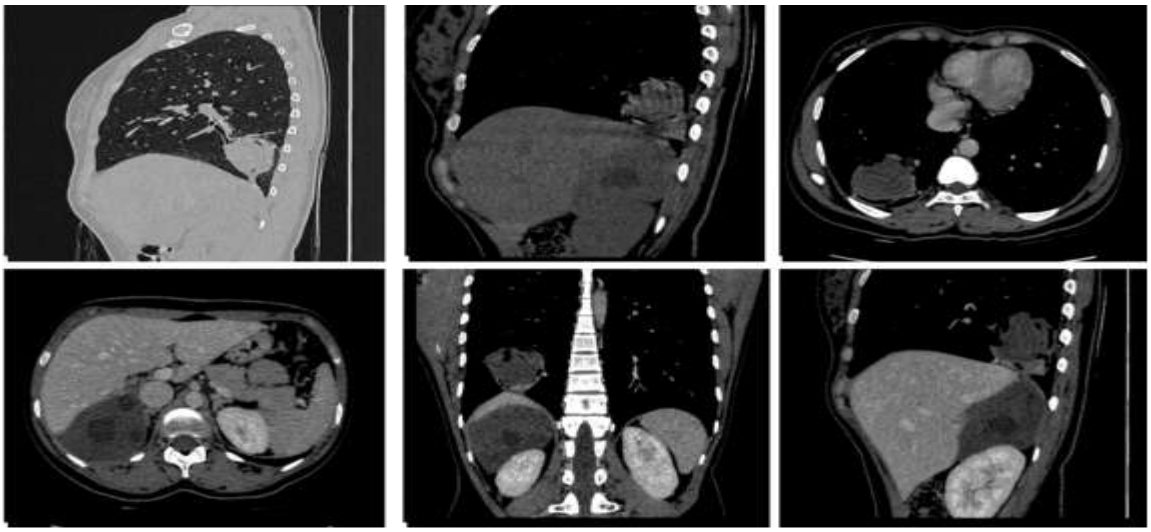
On admission, she was conscious and well oriented, with stable vital signs: pulse 90 beats/min, respiratory rate 18/min, blood pressure 120/70 mmHg, oxygen saturation 98% on room air, and a temperature of 98°F. General examination revealed no pallor, icterus, cyanosis, clubbing, lymphadenopathy, or pedal edema. Systemic evaluation was normal except for decreased breath sounds in the right infrascapular region. Cardiovascular, abdominal, and neurological examinations were unremarkable.Initial blood investigations showed a hemoglobin level of 11.4 g/dL and a total leukocyte count of 6600/cu mm with mild neutrophilia (67%). Sputum TRUENAT performed was negative for Mycobacterium tuberculosis. A chest radiograph revealed a right lower zone homogeneous opacity. Bronchoscopy performed on the same day showed normal airways with no endobronchial lesions.



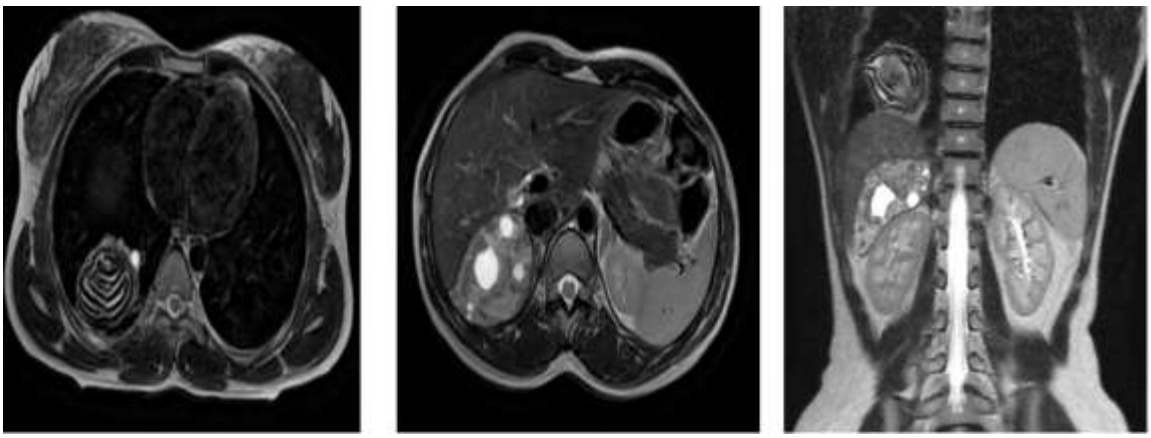
Frontal chest radiograph shows a well-defined, rounded homogeneous opacity in the right lower zone with relatively smooth margins and subtle internal lucencies.

Further evaluation with CECT of the chest, revealed a well-defined, smoothly marginated, oval, heterogeneous lesion in the posterior segment of the right lower lobe. The lesion displayed a thick enhancing pericyst, multiple internal air pockets, and curvilinear membranes consistent with a completely ruptured hydatid cyst displaying the classic serpentine sign. A smaller peripherally enhancing cyst was also noted, which communicated with posterior segmental bronchial branches. Concomitant CECT of the abdomen revealed a well-defined, subcapsular, posteroinferior hepatic cyst containing multiple non-enhancing daughter vesicles within a mother cyst, confirming hepatopulmonary hydatid disease.



Contrast-enhanced CT images demonstrate a well-defined, smoothly marginated heterogeneous lesion in the right lower lobe, showing a thick irregular enhancing pericyst with enhancing curvilinear membranes (serpentine sign) and internal air foci - consistent with a contained ruptured pulmonary

hydatid cyst with bronchial communication. Additionally, a well-defined subcapsular hypodense lesion in the right hepatic lobe with multiple daughter cysts - hepatic hydatid cyst.



MRI shows a well-defined cystic lesion in the right lower lobe with internal hypointense curvilinear membranes and peripheral rim (serpentine sign), suggestive of a ruptured pulmonary hydatid cyst. A subcapsular hepatic cyst in the right lobe demonstrates T2 hyperintense daughter cysts within a mother cyst ("cyst-within-cyst" appearance) - features consistent with concomitant hepatothoracic hydatid disease.

The patient was admitted under Pulmonology and started on albendazole therapy, along with bronchodilators and tranexamic acid. She improved symptomatically, with no further episodes of hemoptysis. A multidisciplinary team comprising Pulmonology, Gastrointestinal Surgery, Cardiothoracic and Vascular Surgery (CVTS), and Anesthesiology formulated a comprehensive management plan. CVTS recommended performing bronchoscopy before lung resection, which confirmed the absence of endobronchial involvement. She continued albendazole for 2 months and was planned for surgical intervention following adequate medical therapy and optimization. She underwent a pre-anesthetic evaluation and was deemed fit for surgery.During follow-up imaging after a period of albendazole therapy, the right lower lobe hydatid cyst was found to be stable, with a slight reduction in size. The smaller satellite cyst persisted without new complications. The hepatic cyst in segments VI and VII showed disappearance of previously seen daughter cysts and the development of peripheral calcifications, indicating therapeutic response or collapse. With stable disease and good clinical condition, she was scheduled for combined thoracic and hepatic surgical management.

She underwent right lower lobectomy and partial pericystectomy under general anesthesia with epidural analgesia. Intraoperatively, a large ruptured hydatid cyst measuring approximately 10 × 10 cm was seen occupying the right lower lobe, with significant parenchymal destruction, necessitating anatomical lobectomy. The liver harbored a 10 × 8 cm hydatid cyst with a thickened pericyst and dense adhesions involving the lesser omentum and adjacent structures. No intrathoracic or intra-abdominal dissemination or perforation was identified. The hepatic cyst was decompressed and partially excised with meticulous precautions to prevent spillage. Two right-sided intercostal drains and an abdominal drain were placed. The patient tolerated the procedure well and was shifted to the ICU for postoperative monitoring. Histopathological examination of both pulmonary and hepatic specimens confirmed hydatid disease, with laminated membranes and scolices characteristic of Echinococcus infection. During the postoperative period, she received serial chest physiotherapy, epidural analgesia, hemodynamic monitoring, and radiographic evaluation. The first intercostal drain was removed once satisfactory lung expansion was confirmed, the epidural catheter was discontinued a few days later, and the remaining chest and abdominal drains were removed sequentially after minimal output. She was transferred to the ward, where she resumed oral intake, mobilized comfortably, and remained pain-free.

At subsequent outpatient follow-up, the patient showed excellent recovery. Her surgical wounds had healed well, and clips were removed. She was clinically stable with no respiratory or abdominal symptoms. Laboratory evaluation demonstrated near-normal hematologic, hepatic, and renal parameters, along with a markedly reduced inflammatory profile. She continued albendazole therapy as advised and was scheduled for further follow-up with repeat blood investigations.With complete surgical excision, appropriate albendazole therapy, and regular follow-up,

the long-term prognosis of hepatopulmonary hydatid disease is generally excellent, with low recurrence risk and preserved hepatic and pulmonary function.

Discussion:-

Hepatopulmonary hydatid disease is a rare manifestation of Echinococcusgranulosus, and imaging plays the central role in diagnosis, staging, and management. Belete et al. reported a case of concomitant pulmonary and hepatic hydatid cysts in a young Ethiopian farmer, where imaging findings on chest radiograph, ultrasound, and CT demonstrated characteristic cyst morphology and calcifications, highlighting the key role of cross-sectional imaging in diagnosing dual-organ echinococcosis, particularly when serology was unavailable and follow-up was limited.
Ultrasound is the first-line modality for hepatic involvement and forms the basis of the WHO-IWGE classification, which categorizes cystic echinococcosis into active (CE1–CE2), transitional (CE3), and inactive (CE4–CE5) stages. USG demonstrates key features such as unilocular cysts with the double-line sign (CE1), multivesicular daughter cysts (CE2), detached floating membranes in CE3A (water-lily sign), and heterogeneous degenerative "ball-of-wool" contents in CE4, while CE5 shows calcified walls. This standardized classification guides treatment selection and monitoring.

CT remains the most comprehensive modality for evaluating both hepatic and pulmonary hydatid disease. It accurately identifies fluid-attenuation cysts, daughter vesicles, internal septa, peripheral calcification, and complications. CT also depicts hallmark signs including the water-lily/serpentine sign, meniscus (air-crescent) sign, and cumbo/onion-peel sign in cysts containing air, along with adjacent consolidation in ruptured pulmonary lesions. CT effectively assesses mass effect, biliary or bronchial communication, and cyst viability.MRI provides complementary characterization with low T1/high T2 signal and clear visualization of membranes and daughter cysts.Thus, USG-based WHO staging combined with CT characterization forms the cornerstone for accurate diagnosis, therapeutic planning, and follow-up in hepatopulmonary hydatid disease.Concurrent pulmonary and hepatic hydatid cysts managed with single-stage surgery, documented typical CT and MRI findings in both organs and demonstrated that simultaneous radical removal can be effective, emphasizing early radiological diagnosis.

Conclusion:-

Hepatopulmonary hydatid disease is a rare condition that can present with life-threatening complications such as pulmonary cyst rupture. Although more common in endemic regions, it may occur in otherwise healthy individuals with a history of zoonotic exposure. Early recognition, aided by characteristic radiological findings, preoperative medical therapy with Albendazole, and timely surgical intervention are crucial to achieving favorable outcomes.
Hepatopulmonary hydatid disease, though uncommon, carries a risk of life-threatening complications such as cyst rupture, anaphylaxis, and massive hemoptysis, and therefore requires heightened clinical suspicion and early radiological evaluation, particularly in endemic regions, to ensure timely diagnosis and appropriate management.
This case highlights the importance of imaging in diagnosis, treatment planning, and monitoring therapeutic response in complex dual-organ hydatid disease.

Teaching Points:-
Early recognition saves lives – Pulmonary cyst rupture may present subtly with hemoptysis; prompt imaging with CECT is crucial for diagnosis and surgical planning.

Combined therapy is key – Pre- and post-operative Albendazole, along with timely surgical cysto-pericystectomy or lobectomy, ensures cyst sterilization, reduces recurrence, and improves patient outcomes.

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- Special thanks to the radiology, critical care, and gastroenterology departments who were directly involved in the management of this case. Their dedication and collaboration exemplify the importance of multidisciplinary care in managing complex and life-threatening conditions.
- I also wish to acknowledge the family of the patient for their cooperation and understanding during this challenging medical journey, allowing us to learn and contribute to the medical literature.

- Finally, I am thankful for the contributions of past researchers and clinicians whose work laid the foundation for this study. Their findings have inspired the discussions presented here.

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MCQs:
Q1. Which of the following statements about hepatopulmonary hydatid disease (HPHD) is TRUE?
A) It is more common than isolated hepatic or pulmonary hydatid disease.
B) Simultaneous involvement of liver and lungs occurs in less than 5–13% of cases.
C) Humans are definitive hosts of Echinococcusgranulosus.
D) Pulmonary involvement never presents with hemoptysis.
Answer:B – Simultaneous hepatopulmonary involvement is uncommon, reported in less than 5–13% of hydatid disease cases

Q2. On CECT chest, which finding is most characteristic of a ruptured pulmonary hydatid cyst?
A) Ground-glass opacity with pleural effusion
B) Oval heterogeneous lesion with enhancing thick pericyst and intralesional air foci (serpentine sign)
C) Homogeneous consolidation without cystic features
D) Mediastinal widening with calcified hilar nodes
Answer:B – This describes the serpentine or water-lily sign, indicating endocyst detachment within the pericyst

Q3. Which of the following clinical features most strongly suggests pulmonary cyst rupture in hepatopulmonary hydatid disease?
A) Right upper quadrant abdominal pain
B) Hemoptysis with expectoration of cyst membranes (hydatid sand)
C) Mild dry cough with low-grade fever
D) Asymptomatic incidental lung opacity
Answer:B – Hemoptysis with expectoration of cyst membranes is the hallmark of pulmonary cyst rupture and can be life-threatening if massive.

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