

## MDCT as a storytelling modality - Delineating the road map taken by Echinococcus inside the human body: A case report.

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### Abstract:

Human echinococcosis is a zoonotic disease caused by tapeworms of the genus Echinococcus that infects humans globally. There are two main species of the Echinococcus tapeworm : Echinococcus granulosus and Echinococcus alveolaris/multilocularis. It can affect any part of the human body except for the skin, and most commonly affects the liver. The two most important forms in humans are cystic echinococcosis (hydatidosis) and alveolar echinococcosis. This condition gives rise to innumerable radiological signs which were clearly demonstrable in this patient. Here is a case of an 47 year old man with hydatid disease with associated pulmonary hydatidosis presented with mild cough, weight loss and diffuse mild abdominal pain. By multimodality approach we were able to not only diagnose but also delineate the road map taken by the parasite within the patient's body.

**Key Words:** Computed Tomography, Echinococcus, Hydatidosis.

### Introduction:

Human echinococcosis is a chronic zoonotic disease that results from infection with the larval stage of the dog tapeworm - Echinococcus granulosus. It still constitutes a serious public health problem in areas in which it is endemic. It is endemic in cattle grazing areas particularly India, Australia, New-Zealand, Middle East, Africa, South America, and Turkey. Although the liver and lung are the most commonly involved organs, hydatid disease can occur in all viscera and soft tissues <sup>1</sup>

Typically, the life cycle of this parasite involves a definitive and an intermediate host. Its life cycle has three stages that encompass adult tapeworm in a definitive host; eggs in the environment and metacestodes in the intermediate host (human) <sup>2</sup>. Humans are the incidental intermediate host. Larvae emerge from the eggs in the intestine; and after invasion to the blood vessels, they can migrate into almost every part of the body <sup>3</sup>. They invade the blood vessels of the portal tract to migrate to the liver. Sometimes, they pass through the liver and spread to the lungs and other organs of the intermediate host <sup>4</sup>. Larvae lodge in organs such as the liver (70% of cases), lungs (22% of cases) or others such as heart, brain, kidney, spleen, muscle, skeletal system, skin (8% of all cases

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in total)<sup>5</sup>. Simultaneous hydatid cysts are rare and constitute about 5-13% of all cases<sup>6</sup>.

The hydatid cyst consists of three layers – the outer pericyst also called as adventitial layer, the middle-laminated membrane or ectocyst and the inner germinal layer or endocyst. The pericyst, being the outermost zone of the hydatid cyst has a pivotal role in the sustenance of the hydatid cyst as it provides a constant nutritional supply, through the vascular channels within it.

Radiological imaging in the form of ultrasound or CT forms the cornerstone of diagnosis<sup>7</sup>.

### **Case Report:**

A 47-year-old man with no significant past medical history presented with symptoms of mild cough and weight loss since one month and mild right hypochondriac pain for the last twenty days which was dull and diffuse in nature. Vomiting was occasionally present with significant decrease in appetite. He had no respiratory, cardiovascular, or genitourinary complaints. However, he had past history of smoking 10 cigarettes per day since 20 years (10 pack year). He denied any history of alcohol abuse in the past. There was also no past history of Tuberculosis and diabetes. He was a labourer by profession in Uttar Pradesh, North India.

The patient was clinically suspected to have a primary or secondary lung malignancy and referred to GCRI (Gujarat Cancer Research Institute), Ahmedabad – A tertiary care cancer hospital in western India, for diagnosis and further management.

On physical exam he had blood pressure of 105/75mmHg, and a respiratory rate of 32 breaths per minute. His heart, lung and abdominal exam were within normal limits. On routine laboratory work up his complete blood count, serum biochemistry profile and tumour markers were unremarkable.

Clinical diagnosis by his physician was substantiated based on a preliminary chest X ray PA view revealed multiple well-defined soft tissue opacities in bilateral lung fields which was suggestive of a lung pathology which appeared as metastasis from an unknown source. To look for the cause of this dilemma, the patient was referred to the radiology department for a CT scan of the thorax, abdomen and pelvis region.

CT Abdomen demonstrated a well-defined hypodense fluid density lesion with multiple internal mildly enhancing thin septations in segment VIII and V of liver. On USG correlation, the lesion appeared as a well-defined anechoic lesion (mother cyst) with significant posterior acoustic enhancement with multiple echogenic floating septations (daughter cysts - spoke wheel appearance) within, suggestive of active hydatid mother cyst with multiple daughter cysts (type IIB). The segment VI of liver showed presence of a well-defined hypodense fluid-to-soft tissue density lesion in sub-capsular region which on USG correlation appeared as a well-defined echogenic lesion with few internal punctate calcific foci, suggestive of hydatid cyst (type IIC). Also, a calcified lesion was noted in liver adjacent to left hepatic vein which on USG appeared as well-defined echogenic lesion with few punctate calcifications suggestive of calcified dead hydatid cyst (type III).

**Image 1: CT Abdomen showing the path traversed (marked by yellow stripes) by the**

parasite in its journey inside this human body.

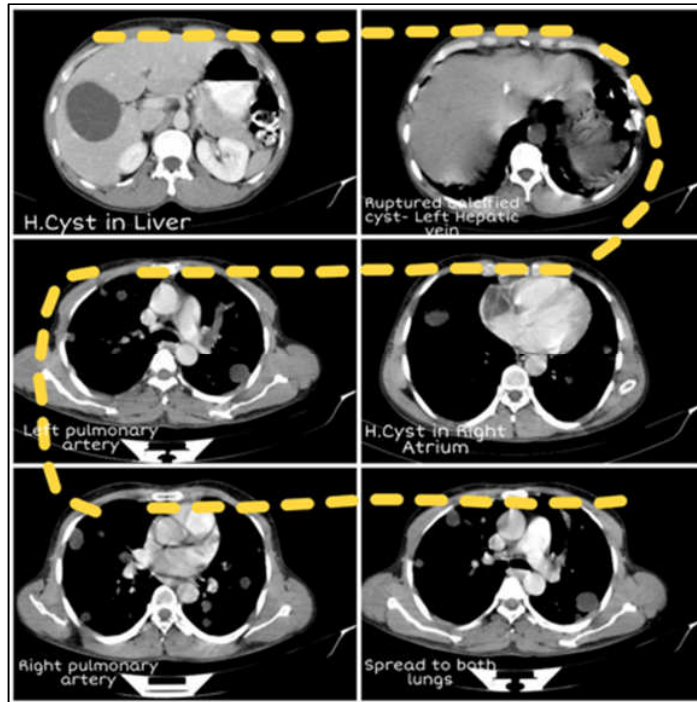
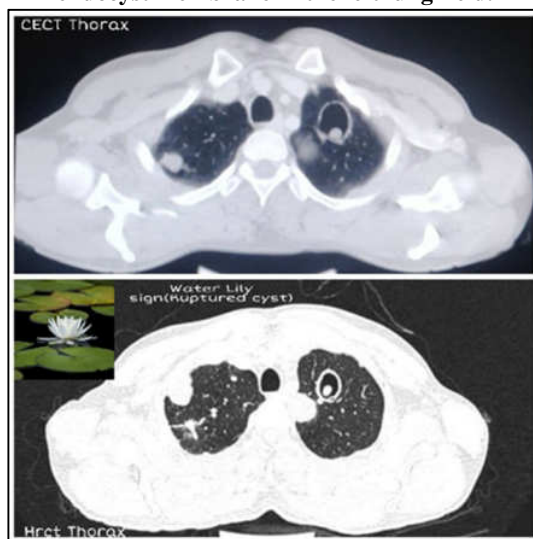
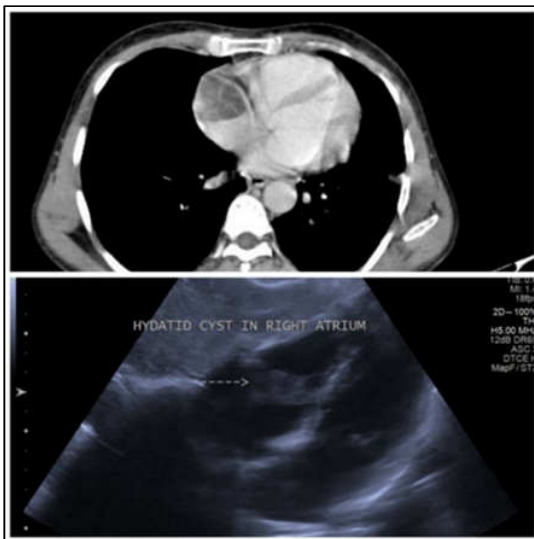


Image 2: CT scan and ECHO correlation shows formation of a cyst in the heart (right atrium) which came along its path

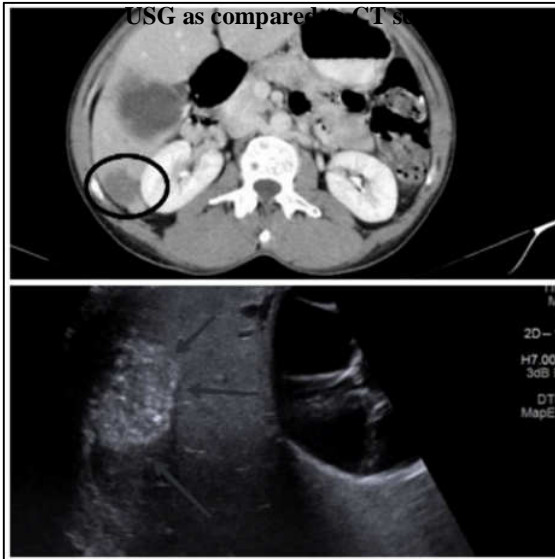
Image 3: CT scan Vs HRCT thorax - Revealing the typical “water lily sign / Camalote sign”- signifying the detached endocyst membrane in the left lung field.



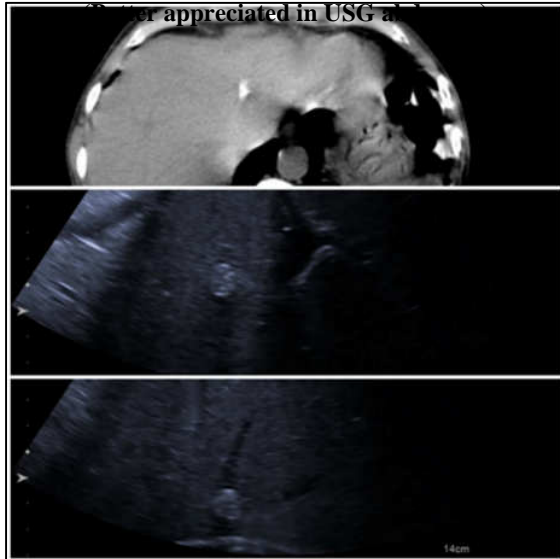
CT Thorax showed a well-defined hypodense fluid density lesion with internal septations in the right atrium which on 2D echo appeared as hydatid mother cyst with daughter cysts (type IIA). In the right main pulmonary artery and its segmental branches, a hypodense fluid density filling defect was noted suggestive of intravascular hydatid cyst rupture appears likely. The CT scan also revealed multiple well-defined hypodense fluid density lesions with internal septations (daughter cysts) in bilateral lung fields, many of which were pleural based. These lesions were later correlated on USG which appeared as well-defined anechoic lesion, many of which showing significant posterior acoustic

enhancement and few showing internal echogenic septations which are suggestive of pulmonary hydatidosis (type I + IIB). Also a few (4 in no), well-defined thin walled air containing cyst were noted in bilateral lung fields, more on left side, one of them showing well-defined peripherally attached hypodense nodule with wall calcification in apical segment of left upper lobe s/o walled off ruptured hydatid cyst ('water lily sign') (type IV). (Image 3)

**Image 4: CT and USG correlation showing hydatid sand which is much better visualised on USG as compared to CT scan**



**Image 5: Ruptured calcified cyst - pouring its contents into the adjacent left hepatic vein. The debris is better appreciated in USG as compared to CT scan**



The patient came to the radiology department to know the source of his malignancy but his CT scan revealed a picture which not only ruled out the possibility of any tumour but gave us enough evidence to substantiate that this is a case of hydatid disease with pulmonary hydatidosis.

But the beauty here is that with the help of multidetector CT, we were not only able to rule out malignancy but also were able to diagnose and delineate the road map taken by the parasite - *Echinococcus* within the patient's body.

### Discussion:

This case illustrates the cancer-like presentation of *Echinococcus granulosus*.

Echinococcosis produced by *Echinococcus granulosus* still represents an important medical problem in many countries. Hydatid disease is often manifested by a slow growing cystic mass. The liver and lungs are the organs most frequently involved. The cysts may be single or multiple; uni- or multiloculated, and thin or thick walled. More specific signs include visualization or calcification of the cyst wall, the presence of daughter cysts and membrane detachment; however, hydatid cysts with unusual localizations may cause serious problems in the differential diagnosis<sup>8,9</sup>. Hydatid disease remains a challenging surgical condition worldwide. Even though many infections are acquired in childhood, most cases of liver and lung involvement become symptomatic in adult patients because of the slowly

growing nature of the cysts. Echinococcosis in extrahepatic sites is usually asymptomatic unless the cyst causes symptoms due to pressure, as in our case, or ruptures to the peritoneal cavity<sup>10,11</sup>. The symptoms of hydatid disease are determined by the size, the site, and the condition of the cysts. Echinococcal cysts at unusual locations many times pose diagnostic dilemmas, and the diagnosis sometimes is made intraoperatively<sup>12</sup>.

The imaging methods used for diagnosis and evaluation of the extent of echinococcosis are ultrasonography (USG), computed tomography (CT), magnetic resonance imaging (MRI), and less commonly radiography and urography. USG is screening modality of choice and is also used to monitor the efficacy of treatment<sup>13</sup>. CT is an important diagnostic modality in detecting cyst wall or septal calcification, demonstrating internal cystic structure posterior to calcification, assessing complications<sup>14,15</sup>. Depending on the imaging appearance the hydatid cysts are classified into four types. Type I: simple cyst with no internal architecture, type II: cyst with daughter cyst(s) and matrix, type IIa: round daughter cysts at the periphery, type IIb: larger, irregularly shaped daughter cysts occupying almost the entire volume of the mother cyst, type IIc: oval masses with scattered calcifications and occasional daughter cysts, type III: calcified cyst (dead cyst), type IV: complicated cyst, e.g. ruptured cyst.

Four treatment options are currently available: surgical excision, PAIR (Puncture, Aspiration, Injection of protoscolicidal agent and Reaspiration), chemotherapy with an anti-helminthic agent (albendazole, mebendazole) or wait and watch for inactive and silent cysts<sup>16</sup>.

### **Conclusion:**

Hydatid disease should be considered in the differential diagnosis of all cystic masses in any anatomic locations, especially in regions where the disease is endemic. Also, this case proves that our technology can not only diagnose but also can tell us a story in the form of the path taken by a parasite.

### **Declaration:**

Written informed consent was obtained from the patient for the publication of this report, along with the USG and CT images.

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