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Imaging of Liver Hydatid cysts: (Review Article).

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ABSTRACT:
Hydatid cysts disease have been described in a number of historical manuscripts, including the Hippocratic Corpus, the Aretaeus, Galen and Celsus writings. The liver is the organ most frequently affected by the disease, according to all ancient writers.
Hydatid disease (HD) is a parasitic infestation that affects humans caused by Echinococcus Granulosus which is chronic endemic helminthic zoonotic disease. This parasite's life cycle alternates between its human host (intermediate) and dogs as its definitive host. HD is noted in liver in approximately 70% of resultant cysts in the human body.
Most of HD patients have no symptoms at first and gradually or rapidly become symptomatic as the cyst becomes bigger or develops complications or both. It causes different types of symptoms that dependent on many factors.
HD is endemic in some regions of the world like Middle East and it can happen in any age group.
Radiological pre-operative evaluation of liver H.cyst is mostly using ultrasound and computed tomography, they are very efficient at determining the location, size, and type of the cyst.

Introduction:
Hydatid cysts have been well mentioned in history and were detailed in numerous manuscripts such as the Celsus texts, of Galen, of Aretaeus and the Hippocratic Corpus. All ancient authors agree that the sickness most commonly affects the liver, however the lungs, brain, , and spleen have also been implicated(1).
Cystic echinococcosis (CE), also known as hydatid disease and/or hydatidosis, is a parasitic infestation caused by the larval cystic stage of the small taeniid-type tapeworm Echinococcus Granulosus, which can cause illness in intermediate hosts, primarily herbivorous animals and people who become infected accidentally. Hydatidosis is a chronic endemic helminthic zoonotic disease that affects humans (2).
This parasite's life cycle alternates between its human host (intermediate) and dogs as its definitive host (3).
Hydatidosis is referring to this type of particular infection and host. Approximately 70% of resultant cysts are discovered in the liver(4).
According to pre-operative radiological and intraoperative results, the hepatic H. cyst was the most common location, the lungs was second location, because the larva of E.granulosus reachs the portal venous system through the intestinal wall into the portal system and thus the majority of embryos settle in the parenchyma of the liver(5).
A few ova are settled in the lung and systemic circulation after passing through the liver parenchyma. As a result, the liver and lungs are the most common organs to be affected by this parasites and its cysts (4).

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Human hydatidosis has serious consequences for health of community. It is still causing significant multiple hospital visits, longterm hospitalization periods, mortality and morbidity as well as economic impacts on the areas affected (6).

Symptoms of hydatid disease are different and dependent on many factors, like the size, site, and stage of development of the cyst, whether the cyst is alive or dead, and whether complicated or not. Most hydatidosis patients have no symptoms at first and gradually or rapidly become symptomatic as the cyst becomes bigger or develops complications or both (7).

The most prevalent GIT symptom described was abdominal pain, which might be attributable to the streching of outer capsule of the liver and cyst's mass effect (7).

Hydatidosis treatment is either medical, Albandazole is drug of choice, which is the only drug with vermicidal, larvicidal and ovicidal effect (8)

Proper medical therapy with Albandazole prior to and following the surgery reduces the number of relapses, and some studies have demonstrated 0% recurrence rates in individuals medicated with albendazole before and after surgery (9,10).

In wait and see method, simple cysts can be monitored by ultrasonography for any changes over years, without any intervention (11).

Management of the hepatic Hydatidosis surgically is either radical or conservative and it is most successful therapy (12).

Deroofing with evacuation, pericystectomy, and partial organ removal were among the surgical procedures usually performed to hepatic H.cysts. This variance may be associated with the type of the cyst (whether it is an intraparenchymal hepatic cyst or adherent to surrounding tissues), where more invasive method might cause more surgical and post-surgical complication (13).

Liver H.cysts demography:

Hydatidosis has a global pattern of distribution, with a yearly occurrence rate of 1-200 per 100000 individuals (6).

This disease is endemic in geographical regions or countries where the cattle and sheep are raised like Middle East, South America, Eastern Europe and Mediterranean countries (7).

Liver Hydatid cyst infestation has been demonstrated to be a frequent condition that can affect any age, in the third and fourth decades of life, the highest number of cases was recorded, which may be due to the cyst growing slowly and causing symptoms to manifest over time (14, 15).

There is a female majority for HC than males in many studies since females have been proven that they are more vulnerable to the disease due to increased responsibility for interaction and cleaning of domestic animals and their sites, as well as pregnancy's pica (16,17).

Liver Hydatidosis was greater in prevalence in urban inhabitants than in rural residents. Such discovery was paradoxical and might be connected to migration of population to urban regions from rural regions (18).

Use of clinical imaging in hepatic H.cysts

Pre-operative evaluation of liver H.cyst is mostly based on radiological examinations such as ultrasound and Computed tomography, they are very efficient at determining the location, size, and type of the cyst (10).

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The usage of ultrasound was greater than that of CT scans. This might be due to the fact that ultrasound requires no ionizing radiation exposure, is less expensive, more widely available, faster, and easier to operate, also real time evaluatiun. Typically, CT is recommended when ultrasonography`s findings are insufficient and unclear (19).

Large size cysts (about 10 cm diameter) are the most common finding by radiological investigation. This finding may be due to the fact that tiny cysts are typically asymptomatic and can be found either during regular examination or if problems such as rupture or the cyst/s get infected (9,20).

Radiological classification of Hydatid cyst

US, CT scan, magnetic resonance imaging (MRI), and, less often, X-ray and intravenous urography are the imaging procedures used to diagnose and assess the type of hepatic H.cysts (11).

US are screening modality of choice and are also used to monitor the efficacy of treatment. It clearly demonstrates the hydatid sand, floating membranes, daughter cysts, and vesicles inside the cyst(12).

imaging of hepatic H.cysts with CT is highly sensitive, specific and useful in determining calcifications of wall or internal septations of the cyst, revealing internal structure of the cyst behind the calcification, evaluating consequences, showing possible osseous lesions, and in circumstances where US has limits like excessive intestinal gases, obesity and previous abdomenal surgery). For showing cyst wall defect, biliary communication, and brain involvement, MRI is better (11,12).

The imaging findings of hepatic H.cysts are determined by the host reaction, the stage of progression and maturity of the disease. The different findings results might range from pure cyst to solid masses. Cysts can be single or multiple, uni or multilocular, and calcified or not. The existence of daughter vesicles and internal membranes, as well as the presence of a peripheral wall or matrix calcification within , are all main features to exclude other possibilities than hepatic H.cyst and to define its type. Hydatid cysts of the liver are categorized into four groups based on their imaging appearance (12,13)**.**

Type I: Simple cyst with no internal architecture

It is the first and active phase of a hydatid cyst. W ell-defined cyst containing an echoic fluid with small echoes consistent with hydatid sands that change with patient position is shown by US (Figure 1).

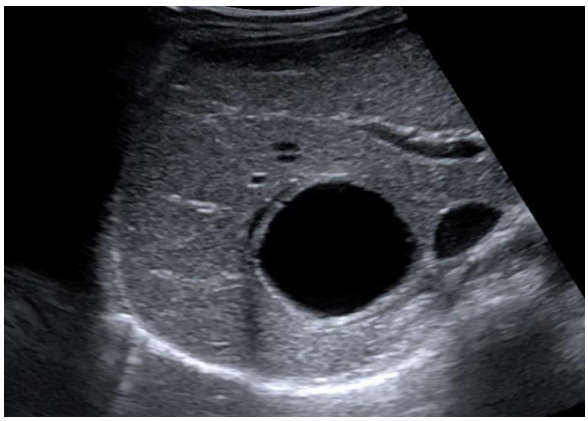

Figure 1: Ultrasound image of the Liver show HC type I (Liver Atlas: Diagnosis: Echinococcosis, Cystic (Hydatid), 2020)

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CT shows a simple cyst with well-defined boundaries and clear hypodense fluid (water attenuation). A homogenous cyst is shown by MRI (hypointense and hyperintense on T1 and T2-weighted images respectively). The existence of a hypointense rim at surrounding the cyst has been reported as characteristic of H. cyst (compared to other causes of liver cyst) feature, however it is not specific. This rim is fibrosis of pericystic host tissue and may appear in Type I cysts as a result of long-standing inflammatory reaction and minor calcifications inside the cyst wall (figure 2).

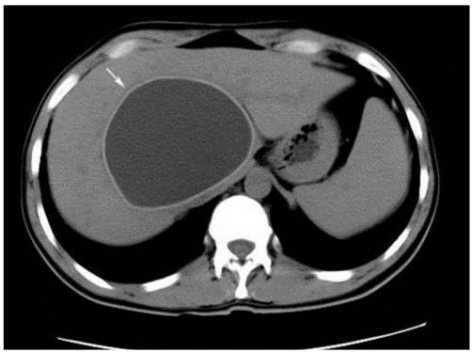

Figure 2: CT image (axial view) shows type I hepatic H. Cyst and the arrow referes to hypodense pericystic rim (Piccoli, 2014).

Type II: Cyst with daughter cyst(s) and/or matrix

In the parasitic life cycle, this type also represents the active phase of hydatid infestation. Although Type I H. Cyst cannot extend to the host parenchyma other than by outer rupture, Type II H. Cyst can spread to neighboring tissue by emerging a new cyst from the primary cystic cavity. A Type II cyst is classified based on the maturity and distribution of daughter cysts within the maternal cyst.

(1)

Type IIA: Multiple peripheral internal daughter cysts are seen at this type, with a high-density matrix at the centre of the cyst (spoke wheel appearance) (Figure 3).

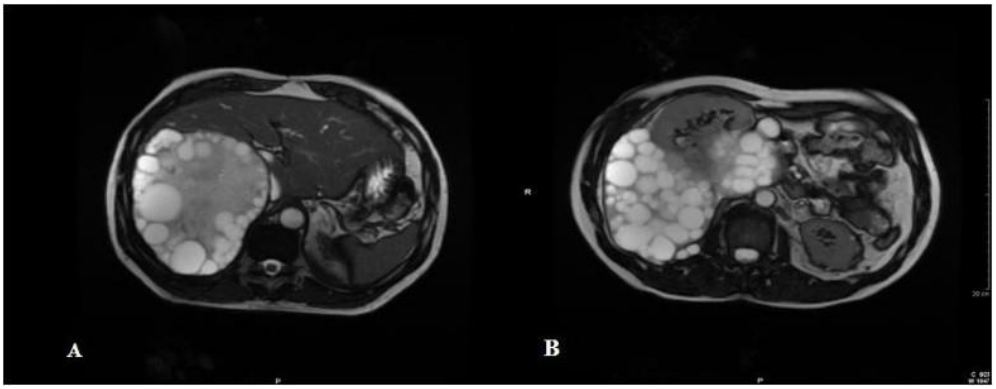

Figure 3: MRI T2 weighted images axial images showed typeIIA at hepatic right lobe H.cyst. Image A. showed spoke wheel appearance of the cyst and while image B. showed extra-hepatic H.cyst outpouching(Ettorre, 2012).

Type IIB: this type is characterized by larger irregular daughter cysts that almost filling the whole space of the primary cyst (rosette appearance) (figure 4).

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Figure 4: CT abdomen axial image of showing type IIB hepatic H.cyst (Liver Hydatid Cyst • Image • MEDtube.net, n.d.)

(3)Type IIC: this cyst is manifested as a complex cystic lesion of moderately increased density with occasional calcification and internal cysts (daughter cysts) indicating original cyst degeneration.

Type III: Calcified cyst

this phase of HD is considered dead cyst or inactive. In this stage, HD cannot disseminate and no surgery is needed unless there is a mass effect or other problems. posterior acoustic shadowing is strong on US. in CT scans, this phase of HD is presented as well-defined hyperdense lesion and CT scan is the ideal radiological tool for evaluating these forms of calcified HCs. MRI reveals hypointense lesions. (Figure 5).

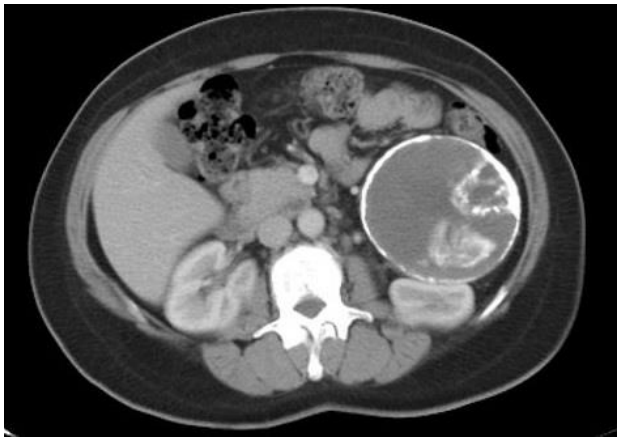

Figure 5: CT image showed densely calcificied retroperitoneal HC (*Abougazia, 2020*)

Type IV: Complicated hydatid cyst

All forms of HCs, with the exception of type III fully calcified cysts, can develop complications, that include any type of rupture (internal and exterior), secondary site involvement caused by the invasion of different anatomic barriers (such as the diaphragm), and secondary infection. There are three different categories of ruptures.

(a) C

ontained rupture, the detachment of endocyst from its pericyst showing floating membrane or curvilinear shape, this appearance is known as water-lily sign and this finding is highly diagnostic for ruptured HC. (Figure 6)

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Figure 6 : US image showed floating membrane within the liver H.cyst,*(Radiopedia, 2020)*

Communicating rupture, HC is ruptured and communicating with intrahepatic biliary radicles and bronchial tree (Figure 7).

Figure7 : CT axial image showed liver H.cyst surrounded by biliary focal dilatation denoting rupture of the cyst with biliary communication. *(Eurorad, 2020)*

HC is ruptured directly into adjacent cavity like peritoneum or spinal canal due to eruption of the endocyst and the pericyst (Figure 8).

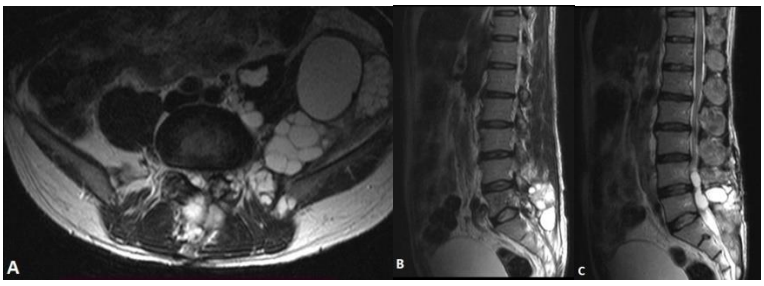

Figure (8): MRI images for a patient with chronic backache, (A) Axial T2 image showing HC with multiple internal daughter cysts extending from Iliacus muscle to the neural exit foramine. (B) and (C) sagittal T2 images showed similar radiological features extending to the spinal canal and posterior to it.

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