CT Evaluation of Liver Hydatid Disease

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Summary:

Background: *To elucidate distinctive CT imaging features that allows a diagnosis of hepatic hydatidosis.*
Patients and methods : *The computed tomographic (CT) findings of 58 patients with sonographically detected cystic liver lesions were prospectively analyzed. These patients were followed up until a final diagnosis was reached.*
Results : *By CT scanning we correctly localized and diagnosed 81 hepatic hydatid cysts in 50 patients. These were all proved by surgery or endoscopic retrograde cholangio-pancreatography (ERCP). Stage III and II hydatid cysts were the commonest types (29 % and 25 % respectively). 52 % of the cysts were 5-10 cm at presentation. At CT, we identified some ancillary imaging features that help in the diagnosis of unilocular type I hepatic echinococcal cysts.*
Conclusion : *Although no imaging feature can provide a definitive diagnosis of a unilocular type I hepatic echinococcal cyst, some ancillary imaging features may help in differentiating them from a non parasitic simple liver cysts. Types II, III, & V hydatid cysts, on the other hand, have characteristic imaging features that allow their confidant diagnosis.*

Introduction:

Echinococcosis is an infection of human caused by the larval stage of E.granulosus, E. multilocularis, and E. vogeli.

E. granulosus is hyper endemic in Iraq and the human infection constitute a serious health problem with around 500 cases of cystic echinococcus recognized annually [1].The liver is the organ most frequently involved.

Hepatic cystic echinococcosis may be classified into five types according to the widely accepted imaging classification of Gharbi et al [2], based on sonographic patterns. Type I consists of a pure fluid collection, i.e. a non complicated unilocular or monovesicular cyst. Type II is a fluid collection with a floating detached endocyst membrane. Type III is a cyst containing daughter cysts and septations, with a predominantly fluid component on sonography. Type IV is a cyst with a predominantly heterogenous solid echopattern consisting of thick membranes with few daughter cysts. Type V is a calcified cyst with thick reflecting walls, representing an involuted non-viable degenerated cyst.

Type II and III hepatic echinococcal cysts (HEC) have characteristic imaging features because of their composition consisting of fluid, detached membranes, daughter cysts and septations, with and without wall calcification; their radiological diagnosis is usually easy and straightforward. However, with type I and IV HEC, diagnostic difficulties may be encountered because type I HEC may be indistinguishable from other fluid filled lesions such as non parasitic simple epithelial cyst and others [3], while type IV HEC may not be distinguishable from other solid hepatic masses [4,5]. This has led to the belief that in all endemic areas, a univesicular liver cyst should be considered a possible E. granulosus lesion until proven otherwise [3].

Simple hepatic cysts are common lesions, lined by a single layer of epithelium. They may be solitary or multiple. The computed tomography (CT) appearance of simple hepatic cyst consists of a well- circumscribed, homogeneous mass with no discernible wall. It has near water attenuation value (< 20 HU), and shows no enhancement after intravenous contrast material administration [6]

Aim of Study

In order to characterize lesions of E. granulosus and reduce diagnostic errors, especially in endemic countries where hydatid disease is common.

Materials and Methods

During the period from January 2001 to February 2004 , 58 patients were examined by CT in 2 teaching hospitals. All these patients were reported to have cysts in the liver by US examinations performed in private clinics or general hospitals. They were referred to CT for further evaluation.

The CT examinations were performed using a helical scanner with 10 mm sections of the abdomen . both nonenhanced and intravenous contrast enhanced studies were performed in all

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patients. The imaging findings were studied in consensus by two experienced radiologists.
The final diagnosis was reached by surgery or endoscopic retrograde cholangio-pancreatography (ERCP) in patients with a final diagnosis of liver hydatidosis; or depending on absence of change in size along a period of 2-3 years in addition to absence of any radiological and serological findings suggesting hydatidosis in those with a final diagnosis of non parasitic simple liver cysts.

RESULTS

Out of the 58 patients, 50 patients proved to have hydatid cysts in the liver (table 1).

Table 1 : Frequency distribution of the study sample by final diagnosis :

Final diagnosis	No.
Liver hydatid disease	50
Intrahepatic & retroperitoneal hydatid cyst	3
Simple liver cyst	5
Total	58

By CT, we correctly localized liver hydatid cysts in 50 patients. In 3 cases, US localized the cysts as liver hydatid cysts. CT localized these as intraperitoneal HC in one patient and retroperitoneal HC in two patients which were later proved by surgery to be correctly localized at CT.

Age of patients ranged from 16-75 years. The commonest age groups were 21- 30 years& 31-40 years. Females were more commonly affected than males. Right quadrant pain was the commonest presenting symptom, followed by jaundice, fever, & abdominal distention. In 4 cases H.C of the liver was an incidental finding (table 2).

Table 2 : The frequency distribution of 50 cases with an established (final) diagnosis of liver hydatidosis according to age, gender, & presenting symptoms :

Age Group :	No.	%
11- 20 years	3	6 %
21- 30 years	14	28 %
31- 40 years	14	28 %
41- 50 years	10	20 %
51- 60 years	6	12 %
> 60 years	3	6 %
Total	50	100 %
Gender :		
Female	32	64 %
male	18	36 %
Total	50	100 %
Presenting symptoms :		
Pain	30	60 %
Jaundice and fever	11	22 %
Abdominal distention	5	10 %
Incidental finding	4	8 %
Total	50	100 %

Table 3 : Distribution of hydatid cysts in 50 patients according to number & distribution.

Finding	Number of patients	%
Number of cysts		
Solitary	37	74 %
Double	3	6 %
Multiple	10	20 %
Total	50	100 %
Distribution		
Right lobe	38	76 %
Left lobe	4	8 %
Both lobes	8	16 %
Total	50	100 %
Coexistent echinococcal cysts in other organs	9	18 %

Thirty seven patients had solitary cysts, 3 patients had double cysts, and ten patients had multiple cysts. Thus there were 81 cysts in 50 patients.

Table 4 : size, shape, and localization of 81 hydatid cysts in 50 patients

Findings	Number of cysts	%
Size (in cm)		
< 5	34	42 %
5- 10	42	52 %
> 10	5	6 %
Total	81	100 %
Shape		
Oval	62	77 %
Round	19	23 %
Total	81	100 %
Localization		
Subcapsular or superficial	48	84 %
Deep seated within liver parenchyma	27	16 %
Total	81	100 %

Most of the cysts were large; 42 cysts ranging between 5-10 cm, 5 cysts were more than 10 cm in diameter, the largest was 15 cm in diameter.

CT staging revealed high number of stage 3 cases among our patients (29%), 9 (11 %) stage V cysts were seen in our study (table 5) :

Table 5 : The frequency distribution according to CT staging.

CT staging	No.	%
Stage I	19	23 %
Stage II	20	25 %
Stage III	23	29 %
Stage IV	10	12 %
Stage V	9	11 %
Total	81	100 %

Among the 19 type I unilocular hepatic hydatid cysts, no characteristic imaging findings were observed in 6 patients, while one or more ancillary features were identified in the remaining 13 cysts (table 6).

14 (28 %) of our cases were previously operated upon for liver hydatid cysts within a period ranging from 5 months - 2 years.

Table 6 : CT findings among 19 unilocular type I cysts with an established (final diagnosis) of liver HC.

CT Findings	Number of cysts
Hypodense rim	6
Focal wall thickening	3
Pericystic biliary radicles dilatation	3
Satellite type II or III hepatic cysts	3
Atrophy of the right lobe with compensatory hypertrophy of the left lobe	3
Rim enhancement	12

Discussion:

By CT we detected all cysts found at US. We correctly localized 81 cysts in 50 patients as liver hydatid cysts, and 3 cysts in three patients as intra- or retro- peritoneal cysts. Detection of hepatic echinococcal cysts represent no challenge to cross sectional imaging, where the detection rate approaches 100 % [7,8]. These imaging techniques are highly sensitive but not specific especially for the diagnosis of the unilocular type I echinococcal cysts.

Age, gender, clinical presentation **:**The commonest age group in this study was the third and fourth decades. This is in agreement with Rose et al [9] and with Zahawi [10]. Females were more commonly affected than males. this is in agreement with many studies [9,10,11]. On the other hand other studies [12,13] found a male predominance. It seems that cultural variations affects sex distribution. In some cultures, women are responsible for animal breeding and agriculture and thus are in more contact and liable for infection. Right upper quadrant pain was the commonest presentation, followed by fever , jaundice, and abdominal distension. In 4 (8 %) of patients, hepatic echinococcal cysts were discovered incidentally. This is in agreement with previous studies [14,15]. Hepatic echinococcosis is said to be clinically silent at many instances [14], thus its incidental diagnosis is to be expected.

Number: hydatid cysts were solitary in 37 (74 %) of our cases. This is in agreement with Morel et al [16] study in which 2/3 of patients had solitary cysts. Multiple liver cysts were common in our study(20 %). This is in agreement with other studies [17]. It is not strange to find more than one stage in one patient especially since our hydatidosis is endemic in our country.

Site : The right lobe was more commonly affected than the left. This is obviously because the right lobe is larger than the left lobe and has more blood supply than the left lobe. This is in agreement with previous studies[10,11,18].

Size : At presentation, most hydatid cysts were large in size. In this study, 52 % of the cysts were 5-10 cm &6 % were >10 cm in diameter (table 4). This is obviously because HC of the liver is clinically silent [14] causing delayed diagnosis.

CT staging : HC staging is very important as it determines the pattern of treatment. Most stage I cases are now treated by aspiration and medical treatment, while stage III and IV are treated surgically[11,19]. stage II can be treated either ways depending on the presence of drainable contents. There was a high percentage of stage III and II cysts in this study, 29 % & 25 % respectively.

Stage II cysts were very easily diagnosed at CT by their characteristic appearance of a floating detached membrane appearing as a serpigenous shadow, hyperdense relative to the fluid contents within the cysts.

Stage III cysts were also easily diagnosed at CT by the characteristic appearance of the daughter cysts.

Stage IV cysts were inhomogeneous with predominantly soft tissue density components. Three of ten stage IV cysts were surrounded by a hypodense rim.

The diagnosis of type I unilocular hydatid cysts and their differentiation from non- parasitic simple hepatic cysts was more difficult than the diagnosis of the other types.

Unilocular type I HC is said to be the most common type (23- 46%) of all types of HC[5,7]. In this study, 19(23 %) of the 81 cysts in 50 patients were of this type. Most of these cysts were in the younger age group (second and third decades), while type II-V cysts were found in the older age group. This is to be expected when we take into consideration the natural evolution of echinococcal cysts[8A].

It is said that in approximately 2/3 of patients, ancillary signs (including a hypodense rim around a thick wall, pericystic biliary radicles dilatation, focal wall thickening, the presence of hepatic satellite typical type II and III echinococcal cysts, and the presence of extra hepatic hydatid cysts) may give clues to the diagnosis of type I hepatic unilocular echinococcal cysts.

In 6 of the 19 unilocular stage I cysts, no characteristic CT features were found to differentiate them from non parasitic simple liver cysts. However, the possibility of HC was raised at CT in two patients on account of the presence a typical type II splenic hydatid cyst in one patient, and a type II renal HC in the other. In the other 4 patients; the possibility of hydatidosis was raised on account of demonstration of a pulmonary HC shown at the upper sections of the CT scan in one patient, and on account of a previous surgery for removal of liver hydatid cysts in the other three patients. All of these cysts were later proved surgically to be hydatid cysts.

A hypodense rim was identified in 6 of the 19 type I unilocular cysts. This was also found in 25 of the 62 cysts of other stages. On the other hand , non of the 5 cases with a final diagnosis of non-parasitic simple liver cysts had this sign. This layer represents the outer layer of HC (the pericyst) which is a membrane rich in collagen formed by the host.

focal wall thickening was demonstrated in 3 of the 19 type I cysts. Focal or segmental wall thickening is attributed to a localized detachment or separation of the endocyst membrane formed by the parasite from the pericyst formed by the host, the so called " split wall sign"[2].

Pericystic biliary radicles dilatation: this was found in 3 of the 19 type I cysts and also in 20 of the 62 cysts of other stages. This was also identified in one patient with a large cyst (8 cm) with a final diagnosis of simple liver cyst. This may be secondary to the mass effect produced by large echinococcal cysts measuring > 5 cm in size, or secondary to communication with the biliary tree. There are two types of communication between the biliary tree and HC : frank intra biliary rupture which occur in 10 % of cases [6], and simple communication. In frank intra biliary rupture, elements of the cyst drain into the biliary ducts and cause intermittent or complete obstruction. Simple communications which are frequently seen during HC surgery can cause postoperative fistulae unless properly treated [21]. 11 of our 50 patients had jaundice. Biliary dilatation was present in three non jaundiced patients. This may be explained by simple pressure effect of the cyst or explained by simple communication.

The cysts' density ranged from (- 4HU to 32 HU). Montero [22] described fat content resulting from rupture into the biliary tree. another study [23] attributed the fat density to degeneration of hydatid membrane.

In type III cysts, the density of the mother cyst was always higher than that of the daughter cyst. This is in agreement with other CT studies [24] and was attributed to the earlier degenerative process occurred in the mother cyst.

Thus ; cyst size, shape, location, and CT attenuation values appear to be non specific signs for the diagnosis of hepatic echinococcal cysts ; since non parasitic simple hepatic cysts may have similar CT features[6,25].

Enhancement : 34 of 81 cyst in this study showed peripheral ring enhancement after intravenous contrast injection. Previous studies mentioned the ring enhancement pattern of HC and explained it by infection or compression of the hepatic tissue[14,26].

Extra hepatic abdominal HC found in association with hepatic HC were found in 9 patients. These cysts were in the spleen in 6 patients& in the kidney in 3 patients. The presence of extra hepatic abdominal HC found in association with hepatic HC is to be expected since hydatidosis is endemic in our country .

This study has some limitations : There was no pathological proof for the 5 cases with a final diagnosis of non parasitic simple liver cysts which have been proved to be hydatid cysts if were operated upon. However ; this study is basically concerned with evaluation of liver hydatid cysts rather than simple hepatic cysts. Besides; the imperceptible walls of these cysts, absence of a significant change in size over 2- 3 years 9 compared with previous US reports), together with absence of any characteristic imaging feature or serological evidence of hydatidosis ; are all in favor of simple liver cysts rather than hydatidosis [27] . Furthermore: it is not a common practice to operate upon a cystic liver lesion, assuming it to be a hydatid cyst, without any clinical, radiological, or serological evidence suggesting hydatidosis.

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