

Ultrasonographic findings of liver abscess

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Summary

The initial sonograms of 201 liver abscesses in 165 patients were reviewed. Most abscesses were in the right lobe (84%), round in shape (83%) and with well defined margins (70%). The abscess contents were either predominantly echogenic (11%), of mixed echoes (28%), predominantly hypoechoic (59%) and showed fluid — debris level (2%). Distal acoustic enhancement was noted in 90% of all abscesses. Abscesses with predominantly echogenic and mixed echo content can be misdiagnosed as hepatic neoplasms. When taken together with the appropriate clinical presentations, the presence of a round well defined hypoechoic mass with distal acoustic enhancement would be consistent with the diagnosis of liver abscess.

Key words: Ultrasonography, Liver Abscess

Introduction

For patients with clinically suspected liver abscess ultrasonography has become the initial examination of choice to confirm the diagnosis. However, it has been observed that the sonographic presentations of liver abscess are varied and non-specific¹⁻⁴, thus posing difficulties at initial interpretation. It is therefore imperative to appreciate the spectrum of sonographic patterns which can be manifested so as to avoid misdiagnosis. The aim of this study was primarily to determine the sonographic patterns of liver abscesses and also to identify any features which are helpful for correct diagnosis.

Patients and methods

One hundred and sixty five patients (133 males and 32 females) aged from 6 — 76 years seen over a period from January 1983 to December 1987 were included in this study. There were 57 Malays (34%), 45 Chinese (27%) and 67 Indians (39%). The methods of confirmation of liver abscesses are indicated in Table I. The study includes both amoebic and pyogenic liver abscesses. Patients were treated with Flagyl and a combination of one or two antibiotics.

The initial sonograms of the liver were reviewed and analysis was made on the number, site, echo, texture of the abscess contents, presence of acoustic enhancement and the character of the abscess margin. The echotexture refers to the strength, number and distribution of the echoes of the abscess content whereas acoustic enhancement is present when there is accentuation of the echo intensity distal to the abscess.

Table I
Confirmation of liver abscess

Method	No. of patients
1. Response to chemotherapy, both clinically and on follow up ultrasound examinations	99
2. Aspiration or drainage	65
3. Postmortem	1
Total	165

Ultrasonographic examinations were done using Philips Sonodiagnost static scanner with a 3.5 MHz transducer on 10 patients and Philips SDR 1500 real time scanner with a 3.0 MHz sector transducer on the remaining patients. Scans were conducted in various planes especially the sagittal and the transverse sections.

Table II
Echotexture of 201 liver abscesses

Type	No.	(%)
1. Predominantly echogenic	22	(11%)
Hyperechoic	9	
Isoechoic	13	
2. Mixed echogenic and hypoechoic	57	(28%)
3. Predominantly hypoechoic	118	(59%)
4. Fluid-debris level	4	(2%)
Total	201	(100%)

Results

Multiple abscesses were identified in 19 patients making the total number of abscesses under study 201. The majority of abscesses (84%) were in the right lobe and within this lobe they were commonly found in the subdiaphragmatic region (70%). The maximum transverse diameters of the abscesses measured from 2 to 16.5 cm with 80% of them being between 5 and 10 cm. Most abscesses (83%) were round in shape, although the larger ones were of oval configuration, and exhibited margins which were well defined (70%) and smooth (52%).

The echotexture of the abscess content was categorised into predominantly echogenic, mixed echogenic and hypoechoic, predominantly hypoechoic and exhibiting fluid-debris level according to the strength and distribution of the echoes (Table II). When the majority of the echoes have higher (hyperechoic) or similar (isoechoic) intensities as normal liver parenchyma, the texture was classified as predominantly echogenic (figures 1 and 2). Those abscesses containing echoes of lower intensities than normal liver were defined as predominantly hypoechoic (figure 3). An approximately equal mixture of echogenic and hypoechoic areas conformed to the mixed or complex pattern (figure 4). In abscesses containing fluid-debris level there was linear horizontal demarcation between echogenic debris in the dependent position and hypoechoic or anechoic fluid above it (figure 5).

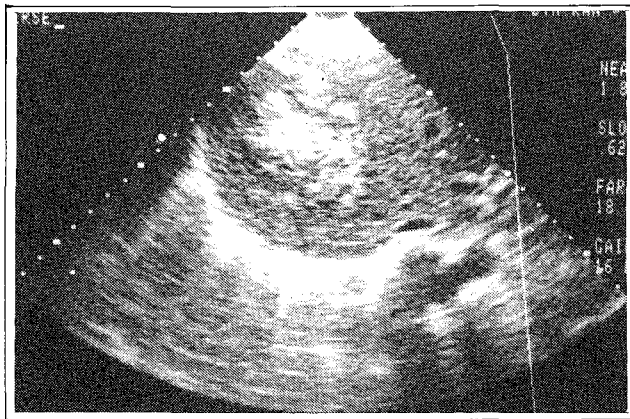


Fig. 1 Echogenic pattern. The echoes are of higher intensities than normal liver (hyperechoic).

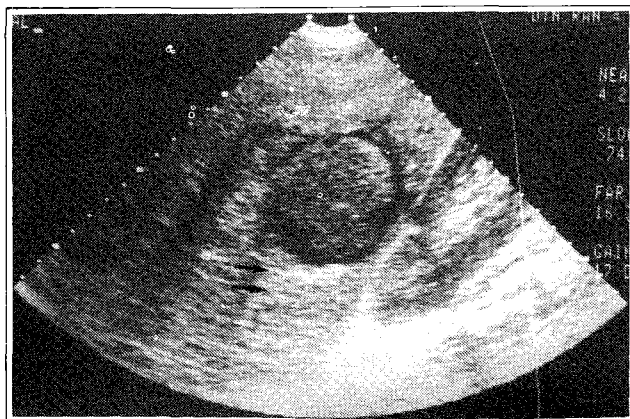


Fig. 2 Echogenic pattern. The echoes are of similar intensity as normal liver (isoechoic) with surrounding hypoechoic halo and acoustic enhancement (arrows).

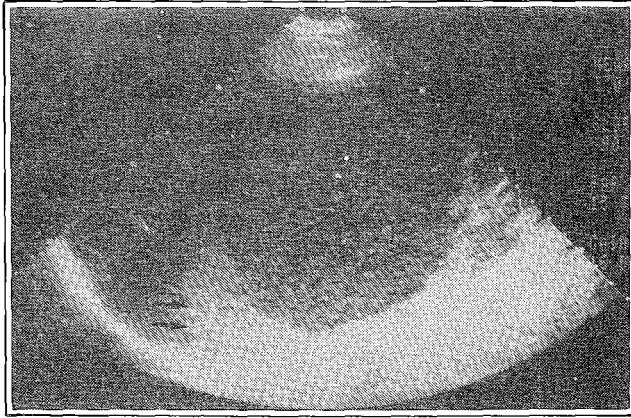


Fig. 3 Hypoechoic abscess with well defined margin and distal acoustic enhancement (arrows).

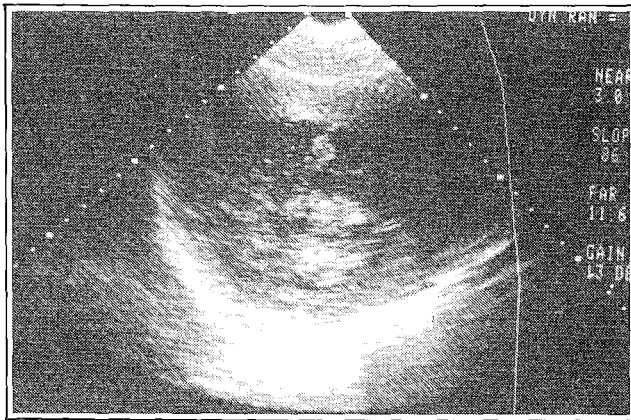


Fig. 4 Mixed or complex pattern. There is a mixture of echogenic and hypoechoic areas.



Fig. 5 Fluid debris level. There is a horizontal demarcation between the echogenic debris in the dependent position and the fluid anteriorly.

Distal acoustic enhancement of varying intensities was present in 90% of all abscesses. It was consistently seen in all abscesses with hypoechoic content. Acoustic enhancement signifies lack of attenuation of ultrasound as it passes through the abscess and this generally implies that the abscess content is fluid. Failure to appreciate this finding may lead to misinterpretation of an abscess with echogenic or mixed echopattern as hepatic neoplasma. In fact 6 abscesses showing the aforementioned patterns had been wrongly diagnosed initially as hepatomas. All abscesses with hypoechoic content were correctly diagnosed. Uncommon features encountered were the presence of a hypoechoic rim or halo surrounding an echogenic content in 10 abscesses (5%) and echogenic wall around a hypoechoic content in 4 abscesses (2%).

Discussion

The content of an abscess cavity changes during phases of development, organisation and repair. The morphology of the abscess cavity influences the echo pattern seen at the time of the ultrasound examination. Depending on the amount of necrotic tissue, debris, cellular elements and breakdown products such as deoxyribonucleic acid and nucleoprotein, the abscess may be focally or diffusely echogenic, hypoechoic or may contain fluid-debris level.⁵ Differentiation between amoebic and pyogenic abscess based on the echopattern is not possible as both exhibit variable sonolucency, acoustic enhancement and homogenous low level echoes.⁶ Location of the abscess may be significant in terms of aetiology, with amoebic abscesses almost always located peripherally and contiguous with the liver capsule.⁶

The incidence of echogenic liver abscess varies from 2 to 15%.^{1,7,8} The echogenic pattern is probably a feature of early abscess since on follow up ultrasound examinations these abscesses showed transformation into the hypoechoic variety. Similar changes were also noted with the echogenic areas in abscesses exhibiting the mixed pattern. In the early stages the necrosed liver cells are not yet liquefied⁹ and subsequent liquefaction results in the appearance of hypoechoic areas in the abscess. The abscess may even be anechoic or cystic when the content is thin and watery. Sedimentation of necrotic tissue and debris in such fluid content will create a fluid-debris level. It should be emphasised that echogenic texture does not invariably imply that the content of the abscess is still unliquefied, as this could be due to thick pus, high protein and lipid content and the presence of gas bubbles.¹⁰ Such apparently solid contents were seen in 4 patients where percutaneous aspirations revealed thick viscous pus.

Abscesses with predominantly echogenic and to a lesser extent mixed pattern, pose diagnostic difficulties, particularly when the clinical presentations are atypical of liver abscess. This is because hepatic neoplasms may show similar findings. Initial diagnosis of hepatoma was made in 6 patients in this series. In 4 patients pus was obtained following attempted biopsy of the liver, whereas in one patient surgical drainage was undertaken because of strong clinical suspicion of liver abscess despite the ultrasound impression of hepatoma. The remaining patient died two days after the ultrasound examination. The post-mortem finding on this patient was amoebic liver abscess which had ruptured.

When confronted with an equivocal diagnosis for lesions showing echogenic or mixed pattern it is advisable that the ultrasound examination be repeated after about one week to see change in the echotexture. The transformation of the echogenic areas into more hypoechoic pattern within this span of time suggest liver abscess. Alternatively, percutaneous diagnostic needle aspiration performed under ultrasound guide would be a quicker means to determine whether or not the lesion is an abscess.

Certain sonographic features are considered suggestive of liver abscess. This is when the lesion is hypoechoic, exhibits acoustic enhancement and shows lack of wall echoes.^{3,11} In this series, all abscesses showing hypoechoic texture with distal acoustic enhancement were correctly diagnosed and these can be regarded as diagnostic features when taken together with the clinical presentations. The hypoechoic texture was the most common finding observed in most series, with a frequency ranging from 80% to 90%.^{7,11} However, Ralls et al¹ and Newlin et al⁶ noted that all the abscesses in their series were hypoechoic. The difference between these observations is perhaps due to the timing of the examinations in relation to the stage of evolution of the abscess.

The presence of a hypoechoic rim or halo around an echogenic abscess content is an uncommon feature in this series, although other series reported an incidence of 30% to 33%.^{5,11} The exact explanation for the hypoechoic rim is unknown. It is thought to be due to edema,⁷ congestion of tissue around the abscess,⁹ inflammatory reaction and increased blood flow in the adjacent parenchyma.¹¹ Hepatoma and liver metastases have also been noted to exhibit this finding.¹² However, the halo or hypoechoic rim in metastasis was found to be significantly thicker than in abscess⁵ and there is also lack of detectable distal acoustic enhancement.¹¹

In conclusion, our results confirmed the variability in the sonographic appearances of liver abscess. However, in the appropriate clinical situation, the presence of a round well defined smooth hypoechoic mass exhibiting distal acoustic enhancement is consistent with the diagnosis.

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