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MR Imaging in Hydatid Disease of the Liver

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Abstract. We describe the appearance on MR of hydatid disease of the liver in 2 patients. The lesions were well demonstrated using spin-echo pulse sequences, and could be easily seen with either T_1 or T_2 weighting; however, maximum information was obtained using both. In these 2 cases, a thin, low signal boundary was noted around the cysts; this finding may prove useful in differential diagnosis.

Key words: Hydatid cysts, diagnosis – Liver, magnetic resonance imaging.

Echinococcal hepatic cysts are rarely encountered in the United States, but are more common in certain endemic parts of the world. Although the magnetic resonance (MR) appearances of common focal liver lesions have been described, to our knowledge the MR appearance of echinococcal cysts has not been demonstrated [1–8]. In this report we present 2 such cases. Although other imaging modalities are often sufficient to confirm this diagnosis, MR may be helpful in difficult cases. In addition, because these lesions are often asymptomatic, they will be found incidentally, and their distinction from other focal lesions is important.

Methods

Imaging was performed with a Diasonics MT/S system (Milpitas, CA) operating at 0.35 tesla, using nongated dual spin-echo pulse sequences. Repetition times (TR) were 0.5, 1.5, and 2.0 sec, and echo delay times (TE) were 28 and 56 msec. Relaxation times were obtained from intensity data using methods previously described [9]. Contrast-enhanced computed tomography was performed on General Electric 8800 and 9800 scanners.

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Case Reports

Case 1

A 16-year-old boy presented with a 24 hour history of abdominal pain, fever, and delirium. Six weeks prior to admission the diagnosis of echinococciasis was made on the basis of skin testing, indirect hemagglutination assay, and liver ultrasound scan.

Emergency laparotomy revealed a ruptured echinococcal cyst and multiple intrahepatic cysts. The ruptured cyst was sterilized and the others were left intact.

Contrast-enhanced computed tomography (CT) obtained postoperatively revealed 3 spherical low-attenuation regions in the liver (Fig. 1). The cysts were well-circumscribed and had a homogeneous internal appearance. No calcification was seen at the margins of the cysts, but high-attenuation rims could be identified in the cyst walls.

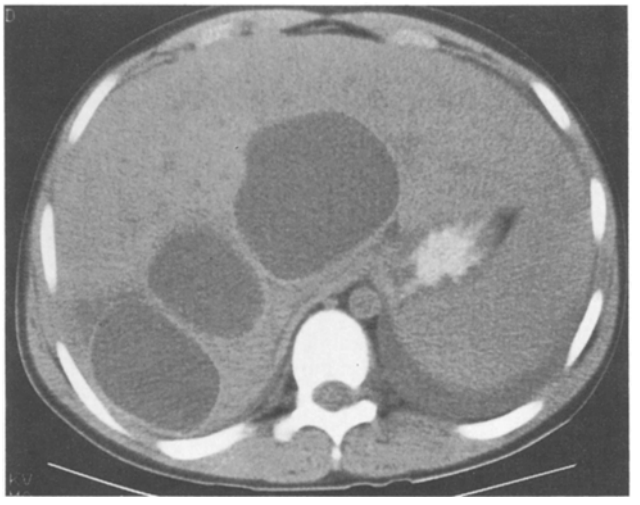

Fig. 1. *Case 1.* Contrast-enhanced CT shows 3 cysts with high-attenuation walls.

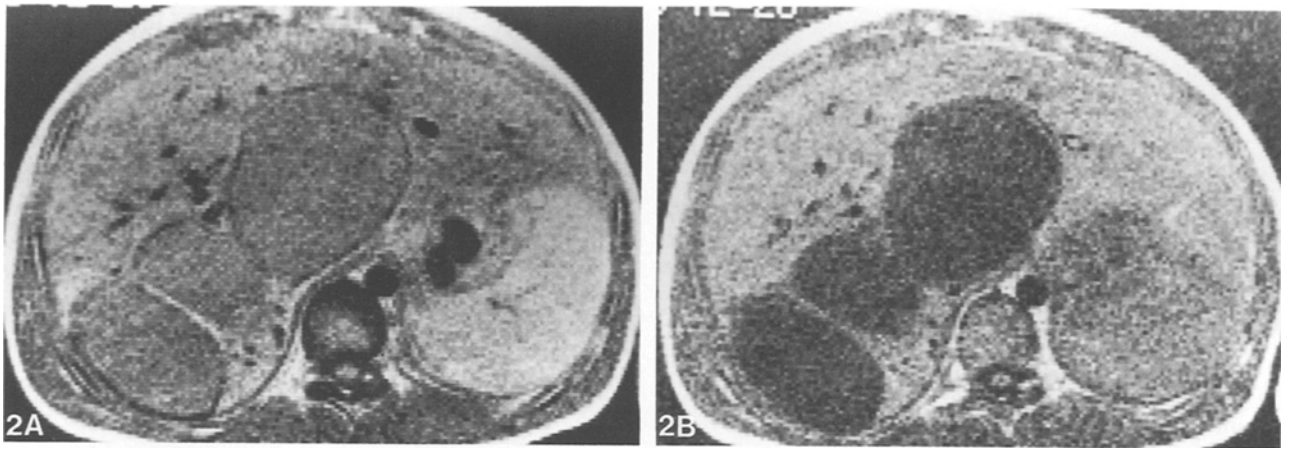

Fig. 2. *Case 1.* Note low-intensity rims surrounding cysts on MR images of the liver. **A** TR, 2.0 sec; TE, 28 msec. **B** TR, 0.5 sec; TE, 28 msec.

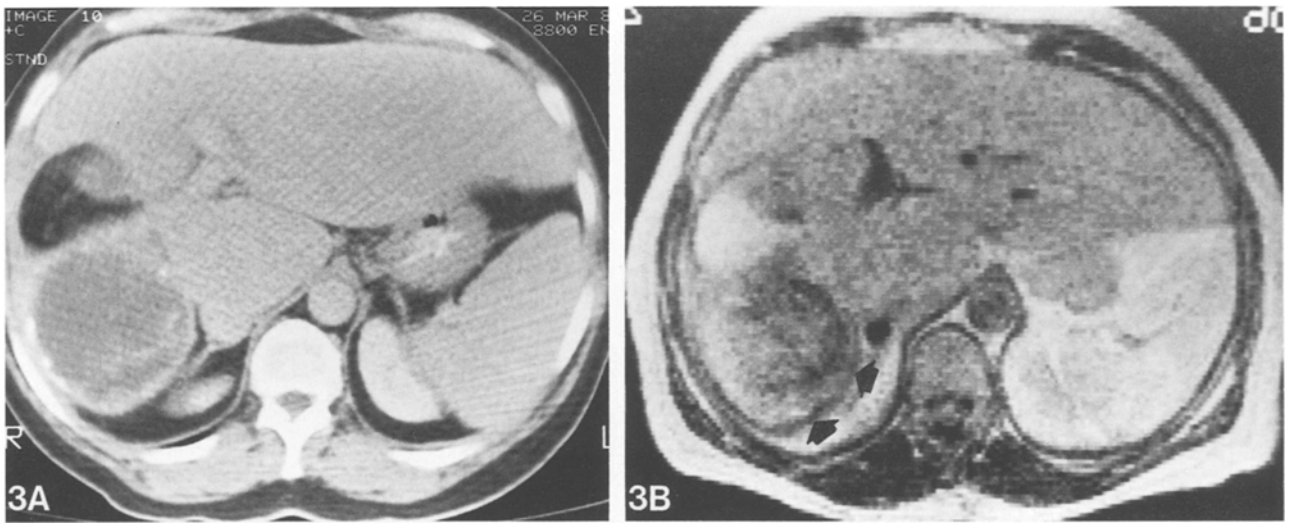

Fig. 3. *Case 2.* **A** Postcontrast CT demonstrates mixed-attenuation cyst with high-attenuation, partially calcified wall. Note adjacent fatty density representing prior cyst cavity packed with omental fat. **B** The heterogeneous intensity of the cyst is evident. Note the adjacent high-intensity fat-filled cavity and low-intensity rim (*arrows*) partially surrounding the lesion. TR, 1.5 sec; TE, 56 msec.

Magnetic resonance imaging also demonstrated three homogeneous lesions in the liver (Fig. 2). The greatest contrast between the cysts and liver was present on the relatively T_1-weighted (TR, 0.5 sec; TE, 28 msec) images. The cysts had both long T_1 (873 msec) and T_2 (152 msec) relaxation times compared to the surrounding normal liver (T_1, 223 msec; T_2, 49 msec). The cyst walls could be seen as thin, well-defined rims of very low intensity surrounding the lesions; they were best visualized on the most T_2-weighted pulse sequence (TR, 2.0 sec; TE, 56 msec).

After the initial laparotomy, 3 months of medical treatment was begun but failed to treat the cysts adequately. Repeat laparotomy was performed and 3 hepatic echinococcal cysts were resected.

Case 2

A 62-year-old woman presented with right upper quadrant and epigastric pain. Five years prior to admission an echinococcal cyst had been removed from the patient's right hepatic lobe and the cavity was packed with omental fat.

On admission a liver–spleen scan demonstrated several photopenic areas. A postcontrast CT scan showed a nonenhancing low-attenuation lesion in the right hepatic lobe. The lesion had heterogeneous attenuation and on some sections had localized air collections. The periphery of the cyst was found to have intermittent calcification along a definable high-attenuation wall consistent with recurrent enchinococcal cyst (Fig. 3 A). The omental fat-packed cavity could be seen adjacent to the cyst.

Magnetic resonance also demonstrated and localized the cyst (Fig. 3 B). The cyst had a heterogeneous internal morphology. T_1 of the lesion could not be accurately determined from available images; the lesional T_2 was found to be greater than that of the liver (cyst, 77 msec; liver, 50 msec). The internal structure of the lesion was well seen on the T_2-weighted sequence. There was a low-intensity rim similar to that seen in case 1. The calcification evident on CT could not be identified

on MR. The adjacent fat-filled cavity was seen as a high-intensity region.

A right hepatic lobectomy was performed. Pathologic examination revealed a partially calcified large hepatic echinococcal cyst containing several daughter cysts.

Discussion

Echinococcus granulosus is a cestode that occasionally infects humans. The liver is the most common site of infestation. The life cycle, transmission, and clinical manifestations of *E. granulosus* are well documented [10, 11].

Most cases are diagnosed after the onset of symptoms [12]. When combined with clinical data, ultrasound and CT findings often are able to confirm the diagnosis [13–16]. The infection is usually acquired in childhood, but most cases present in the third or fourth decade of life. Due to this long latent stage and the increasing use of tomographic abdominal imaging, an increasing number of asymptomatic cysts are likely to be found. Therefore it is important to document the appearance of echinococcal cysts, and, if possible, to identify any features that can be used to establish a specific diagnosis.

Hepatic MR has been used to identify many different focal liver lesions including metastases, hepatoma, adenoma, cysts, hemangioma, infarction, and localized fatty change [2, 4–8]. The sensitivity of MR in detecting focal hepatic lesions approaches that of CT [4, 5]. Information concerning the ability of MR specifically to characterize hepatic lesions is fragmentary [8].

Our data suggest that measurements of relaxation time will not prove to be of great value in specifically diagnosing echinococcal cysts. In case 1, involving multiple uncomplicated cysts, the calculated T_1 and T_2 relaxation times were considerably longer than those of normal liver. Prolonged relaxation times are found with other fluid lesions, such as simple hepatic cysts, as well as many solid lesions, particularly neoplasms [4]. In the second case, involving a complicated cyst, the lesion had a long T_2 relative to the liver. Chronic hemorrhagic and mucinous fluids have been noted to behave similarly [7].

The low-intensity rim surrounding the echinococcal cysts may be a useful differential diagnostic feature. No such wall has been described for either simple hepatic cysts or other focal liver lesions and we have not demonstrated this low-intensity rim in our examinations of a large number of other hepatic lesions. This rim does not appear to be a manifestation of the chemical shift artifact since the artifact would appear in only the direction of the frequency-encoding gradient [17, 18] and not surround the cysts.

This margin may represent all or some combination of the 3 layers of the echinococcal wall [10]. The innermost layer is a thin translucent endothelial membrane that is unlikely to produce any MR signal itself, considering the spatial resolution of the imager. The middle layer, called the laminated membrane, is the most characteristic structural component of the parasite. Chemically it is rich in mucopolysaccharides and considered to be hyaline in nature. This layer is usually no more than 2 mm thick. The outer layer is made by host fibroblasts that produce a distant capsule of fibrous and connective tissue elements, such as collagen. This layer is called the pericyst and is usually 2–4 mm thick. We postulate that the low-intensity rim seen using MR is due to the short T_2 of the fibrous capsule (pericyst), composed primarily of collagen. If this speculation is correct then one could anticipate that other fluid-filled hepatic lesions that have a collagen-rich wall (such as bile duct cysts [19]) might have a similar appearance to echinococcal cysts. Nevertheless, this low-intensity rim, if proven to be a consistent finding, may become important in the differentiation of echinococcal cysts from other focal liver lesions.

In summary, MR imaging can demonstrate hepatic echinococcal cysts. The calculated magnetic relaxation times of the cysts were not useful in diagnosis because of variable composition of fluid within the cysts. A very low signal intensity rim, which we believe represents the pericyst, was seen surrounding the cysts; this may be of value in identifying these lesions.

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