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Use of fluid-attenuated inversion recovery (FLAIR) pulse sequences for differential diagnosis of hepatic hemangiomas and hepatic cysts

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Abstract

Fluid-attenuated inversion recovery (FLAIR) imaging of hepatic hemangiomas (10 patients, 16 lesions) and hepatic cysts (8 patients, 10 lesions) was performed. All hemangiomas were hypointense on T1-weighted images and hyperintense on T2-weighted images. With Gd-DTPA (0.1 mmol/kg), all hemangiomas were enhanced but not all cysts. It was necessary to perform contrast enhanced imaging to differentiate hepatic hemangiomas from hepatic cysts. However, on FLAIR imaging, hepatic hemangiomas were strongly hyperintense and 9 of the 10 hepatic cysts were isointense. One of the hepatic cysts was slightly hyperintense. FLAIR images were useful in differential diagnosis of hepatic hemangiomas and hepatic cysts without using Gd-DTPA.

KEYWORDS: MRI, FLAIR, hepatic hemangioma, hepatic cyst

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Use of Fluid-Attenuated Inversion Recovery (FLAIR) Pulse Sequences for Differential Diagnosis of Hepatic Hemangiomas and Hepatic Cysts

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Fluid-attenuated inversion recovery (FLAIR) imaging of hepatic hemangiomas (10 patients, 16 lesions) and hepatic cysts (8 patients, 10 lesions) was performed. All hemangiomas were hypointense on T1-weighted images and hyperintense on T2-weighted images. With Gd-DTPA (0.1 mmol/kg), all hemangiomas were enhanced but not all cysts. It was necessary to perform contrast enhanced imaging to differentiate hepatic hemangiomas from hepatic cysts. However, on FLAIR imaging, hepatic hemangiomas were strongly hyperintense and 9 of the 10 hepatic cysts were isointense. One of the hepatic cysts was slightly hyperintense. FLAIR images were useful in differential diagnosis of hepatic hemangiomas and hepatic cysts without using Gd-DTPA.

Key words: MRI, FLAIR, hepatic hemangioma, hepatic cyst

In recent years, the use of fluid attenuated inversion recovery (FLAIR) imaging in neurology has been reported (1-4). However, the use of such imaging for intra-abdominal lesions has not been reported. It is difficult to distinguish hepatic hemangiomas from hepatic cysts using only T1- and T2-weighted images. The purpose of the present study was to examine the feasibility of using FLAIR imaging for differential diagnosis of hepatic hemangiomas and hepatic cysts.

Materials and Methods

FLAIR imaging was performed in 10 patients with hepatic hemangiomas (16 lesions) and 8 patients with hepatic cysts (10 lesions). All patients were examined with a 1.5-T superconductive magnetic system (Signa Advantage, GE Medical Systems, Milwaukee Wis, USA). All patients underwent T1-weighted (SE: TR = 500 ms; TE = 15 ms), T2-weighted (fast SE: TR = 3,500 ms; TE = 120 ms), Gd-DTPA (0.1 mmol/kg) enhanced T1-weighted and FLAIR (IR: TR = 6,000 ms; TE = 120 ms; TI = 1,700 ms) imaging. In all cases, field of view was 35 cm, matrix was 512 or 256 × 256, and slice thickness was 8 mm.

Results

All 16 hemangiomas were hypointense on T1-weighted images, strongly hyperintense on T2-weighted images, contrast-enhanced on Gd-DTPA images, and hyperintense on FLAIR images (Fig. 1). All except one of the ten hepatic cysts were hypointense on T1-weighted images, hyperintense on T2-weighted images, un-enhanced on Gd-DTPA images, and isointense on FLAIR images (Fig. 1). One cyst was hyperintense on T2-weighted images and unenhanced on Gd-DTPA images similarly to the other cysts (Fig. 2b, c). However, it was isointense on T1-weighted images, and mildly hyperintense on FLAIR images (Fig. 2a, d).

Discussion

FLAIR is a type of inversion recovery sequence designed to determine TI (inversion time) at the null point of the signal from a component with long T1 value (3, 4). When it is used with long TR (repetition time) and TE (echo time), this technique yields T2-weighted images with suppressed fluid signals. When it is used with long TR and short TE, proton images with suppressed fluid signals are obtained. Since this technique allows the

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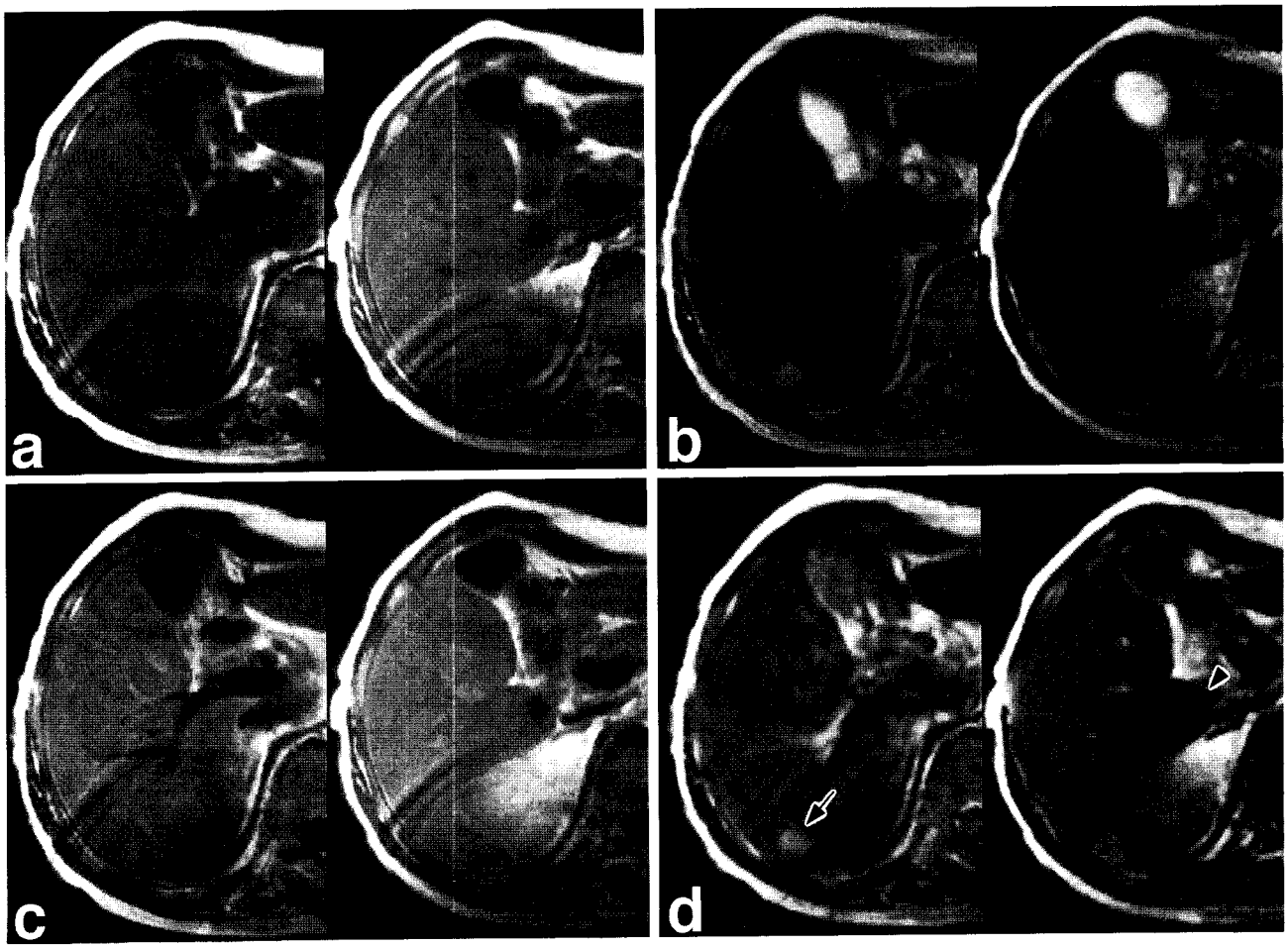

Fig. 1 MR imaging of the liver in a 43-year-old female patient.
Both a hepatic hemangioma and a hepatic cyst are hypointense on the T1-weighted image (**a**) and hyperintense on the T2-weighted image (**b**). However, only the hemangioma is enhanced on the Gd-DTPA image (**c**). On the fluid-attenuated inversion recovery (FLAIR) image (**d**), the hemangioma (arrow) is hyperintense and the cyst (arrow head) is isointense.

signals representing the cerebrospinal fluid in the intracranial region to be suppressed, images with high contrast of cerebrospinal fluid against cortical infarcts or contusions can be obtained, allowing easier detection of small lesions. Hepatic hemangiomas will be visible as hyperintense areas and hepatic cysts as hypointense areas on the images obtained with this technique.

Ultrasonography is simpler than any other diagnostic imaging technique when used for distingushing hepatic hemangiomas from hepatic cysts. However, ultrasound images of hepatic hemangiomas and hepatic cysts are sometimes difficult to obtain in patients with severe obesity or liver cirrhosis. MRI, on the other hand, allows images of hepatic hemangiomas and hepatic cysts to be easily obtained even in such cases, because of the high contrast of images yielded by MRI.

However, small lesions of hepatic hemangiomas and hepatic cysts have not been distinguished from T1-weighted and T2-weighed images. Morphologically, those lesions are round and have a similar intensity pattern on T1-weighted and T2-weighted images (hypointense on T1-weighted images and hyperintense on T2-weighted images). Thus, when this techique is used for differential diagnosis, contrast material to enhance the contrast of lesions is indispensable, as required in X-ray CT.

In the present study, all hepatic hemangiomas were strongly hyperintense on FLAIR imaging while cysts

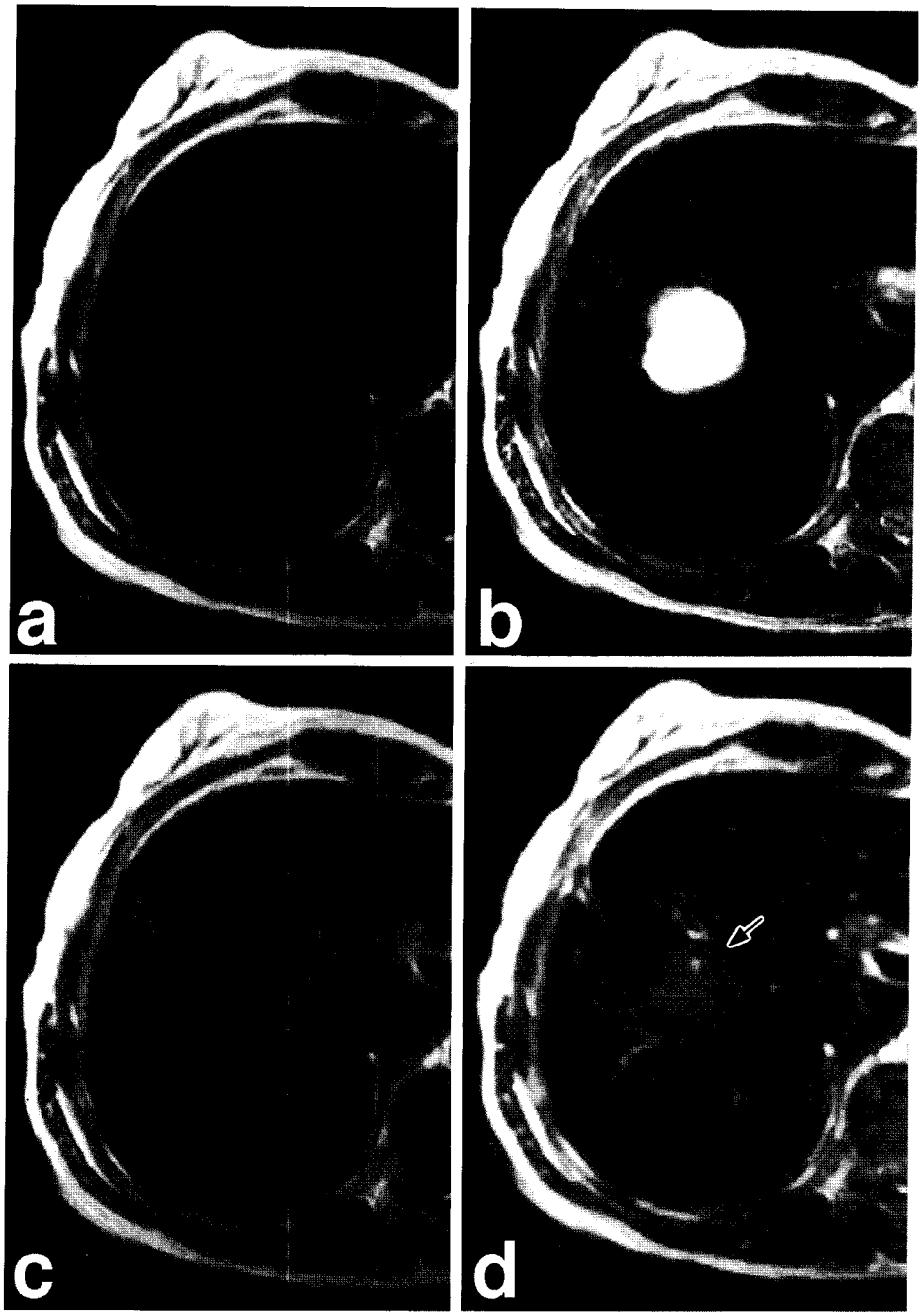

Fig. 2 MR imaging of the liver in a 51-year-old male patient.
A hepatic cyst displays isointensity on the T1-weighted image (**a**) and hyperintensity on the T2-weighted image (**b**). The cyst is unenhanced on Gd-DTPA image (**c**), and displays mild hyperintensity (arrow) on the FLAIR image (**d**). FLAIR: See legend to Fig. 1.

were hypointense or only mildly hyperintense. This result is in accordance with the observation that the water component is attenuated on FLAIR imaging. Thus, it was easy to distinguish hepatic hemangiomas from hepatic cysts based on intensity pattern using FLAIR imaging. However, caution must be exercised since hepatic cysts which have a hemorrhagic component will be hyperintense on FLAIR imaging. For example, foregut cysts have a

hemorrhagic component (6). Thus, FLAIR imaging is an adjuvant technique.

A relatively longtime (about 10 min) is required to obtain a FLAIR image. However, with development of a new MR system it should be possible to obtain FLAIR images using fast imaging techniques (4). One of the merits of FLAIR imaging is that it is not necessary to perform contrast-enhanced imaging. FLAIR imaging is potentially useful for differential diagnosis of hepatic hemangiomas and hepatic cysts in clinical practice.

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