Hepatic focal nodular hyperplasia in fatty liver in comparison to non-fatty liver: evaluation with plain in-phase and opposed-phase gradient echo and contrast enhanced dynamic MR imaging

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ABSTRACT: Our purpose is to clarify the usefulness of plain opposed phase (OP) imaging in the diagnosis of hepatic focal nodular hyperplasia (FNH). In 29 patients with FNH, we assessed the detectability of the lesions and the fatty change within FNH. OP imaging could detect more lesions than the dynamic MR imaging in 4 with fatty liver, and depict the fatty change within FNH in 3. In one patient, the fatty change disappeared during loss of weight. In fatty liver, OP imaging is useful for the detection of FNH. Fatty changes within FNH are not rare and may be reversible.

PURPOSE: (1) to clarify the usefulness of the opposed phase imaging in the diagnosis of hepatic focal nodular hyperplasia (FNH) in the fatty liver, (2) to clarify the incidence and features of fatty change in FNH.

MATERIALS and METHODS: The subjects were 41 consecutive patients who underwent dynamic MRI using Gd-DTPA and were diagnosed as having FNH from the characteristic images and clinical course. The patients were aged 15 - 75 years (mean, 41 years), consisting of 6 males and 35 females. Twenty seven patients had a single tumor, and the remaining 14 patients had multiple tumors. We underwent follow-up dynamic MRI in 6 patients. We included these follow-up MRI in this study if the status of the fatty change of the liver was different from the first examination.

The MR apparatus used was a Magnetom Vision 1.5T (Siemens, Erlangen, Germany). The protocol of MRI using Gd-DTPA was as follows. All imaging was performed at a slice thickness of 7-8 mm with 23 slices under the condition of breath holding. T1-weighted imaging of IP and OP was performed by SINOP sequence (TR = 175 msec, TE = 2.8 msec/5.5 msec), with which IP and OP can be simultaneously imaged. Before contrast imaging, T2-weighted imaging was performed by the HASTE sequence and by the TSE method with fat saturation. SINOP sequence and HASTE sequence were performed during single breath holding, however, T2 weighted TSE were performed under the quiet respiration. Before contrast imaging, we performed SINOP and HASTE sequence in all patients, and TSE with fat saturation sequence in 32 patients, and multiphasic dynamic contrast enhanced imaging was followed. Immediately before intravenous injection and 15 sec, 55 sec, 2 min, 5 min, and 10 min after injection of 0.1 mmol/kg Gd-DTPA at a rate of 2 ml/sec followed by 20 ml saline flush, imaging was performed by the FLASH sequence.

Signal intensities of the liver in IP and OP were visually compared, and classified into 3 groups. Livers with similar signal intensities in both phases and signal intensities on OP similar to or higher than those in the renal cortex were classified into the non-fatty liver group. Livers with visually lower signal intensities on OP and lower signal intensities than the renal cortex were classified into the fatty liver group. In the fatty liver group, livers with signal intensities between those in the renal cortex and those in the medulla were classified into the mild fatty liver group, and livers with signal intensities similar to or lower than those in the renal medulla were classified into the severe fatty liver group.

RESULTS: Thirty-four examinations were classified into the non-fatty group, 7 patients were classified into the mild fatty group, and 6 patients were classified into the severe fatty group. Of the 6 patients who underwent MRI twice, 4 patients was judged as having a non-fatty liver by both first and second MRI, and we excluded these 4 follow-up examination. Finally, our materials was 43 examinations (41 first examination and 2 follow-up examination).

There were no patients in whom more lesions were detected in the OP images than the images obtained 15 sec after intravenous injection of Gd-DTPA, but in 5 patients of the fatty liver group, more lesions were detected in the OP images than in the images obtained 15 sec after bolus injection of Gd-DTPA. Of these 5 patients, 2 had mild fatty livers, and the remaining 3 had severe fatty livers. All lesions which were not imaged after bolus injection of Gd-DTPA but in the OP images were smaller than 1 cm. The number of lesions was 1 in 3 patients, 3 in 1 patient, and many in 1 patient.

Of all the cases examined, only 3 lesions in 3 patients showed high signal intensities on the images produced by subtracting the OP images from the IP images, and were judged as steatosis. The distribution of steatosis was patchy in the 3 patients. Of these 3 patients, 2 had steatosis of the surrounding liver, but the other one did not. Each patient had only one lesion. T1-weighted IP imaging showed signal intensities similar to those in the surrounding liver in all 3 patients, however, T2-weighted imaging showed similar signal intensities in 2 patients and higher signal intensities in 1 patient. In the patient in the mild fatty liver group, the low intensity area in the tumor disappeared with improvement of fatty change in the entire liver as observed by follow-up MRI after 6 months.

CONCLUSIONS: In fatty liver, opposed phase is equivalent to arterial dominant phase for detection and characterization of FNH. Fatty changes within FNH maybe occurred in fatty as well as non-fatty liver, and condition may be reversible as well as fatty liver.