Is complex magnetic resonance imaging useful in diagnostics of chronic viral hepatitis?

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PURPOSE: To evaluate the additional capabilities of magnetic resonance imaging (MRI) in qualitative and quantitative evaluation of liver and biliary ducts in chronic viral hepatitis (CVH) patients.

MATERIALS AND METHODS: From September 2000 to June 2004 complex MRI was performed in 129 patients with chronic viral hepatitis (CVH), 23 of them suffered from CVH B and 106 were with CVH C (Male:Female=95:34; age range 19-46 years; mean age 28). The diagnosis of CVH is made on the basis of the clinical, biochemical, serological, virological and morphological examination (puncture biopsy of the liver was performed in all patients). The control group included 57 healthy persons. MR examination was performed on a 1.5T system (Magnetom Symphony). The patients were imaged in the supine position using the body array RF coil. A scout sequence (T1 weighted (w) FLASH) was initially acquired in all three orthogonal planes. A coronal breath-hold Half-Fourier Acquisition Single-Shot T2 w (HASTE: TR/TE - 1000/60ms, FOV - 350mm, one acquisition, slice thickness - 6 mm, acquisition time- 25 seconds (s)) was used for the further positioning. It was repeated in axial position. Further there were applied the following breath-hold acquisitions: Fast Low Angle Single-Shot T1 w (TurboFLASH: TR/TE - 1647/4.2 ms, flip angle - 15^{o}, FOV - 420 mm, scan matrix - 148X256, slice thickness - 6 mm, number of slices - 15, acquisition time - 23 s) in axial and coronal plane, T1 w TurboFLASH with fat saturation (TR/TE - 193.6/4.8 ms, flip angle - 75^{o}, FOV - 370 mm, scan matrix - 256X512, slice thickness - 6 mm, number of slices - 19, acquisition time - 25 s) and MRCP (T2_tse_cor_thick_slab: TR/TE - 4500/940 ms, flip angle - 165^{o}, FOV - 370 mm, scan matrix - 350X512, slab thickness – 20-60 mm, number of slab - 1, acquisition time - 4 s; T2_haste_cor_thin_slice: TR/TE - 1300/90 ms, flip angle - 120^{o}, FOV - 300 mm, scan matrix – 218x256, slice thickness - 4 mm, number of slices - 15, acquisition time - 19 s). The total examination time did not exceed 17 minutes. Qualitative evaluation of sequences was made by consensus of two experienced gastrointestinal radiologists.

RESULTS: On MRI data the liver had an equal contour, homogeneous and diffuse-non-uniform structure (Fig.1). Signal intensity (SI) from liver parenchyma on coronal T2-weighted images (WI) was a little bit lower than in the control group. Thus SI on axial T1-WI it was lower in 1,8 times than in the control group. The vertical size of the right lobe of liver in CVH patients was16,5$\pm$0,28 cm, left - 7,2$\pm$0,19 cm. The area of coronal section of a liver was 179,2$\pm$9,0, axial section - 189,8$\pm$10,5 sq. cm. Thickness of the right lobe of a liver was 16,5$\pm$2,07 and left one 7,05$\pm$0,2 cm. Liver width was 19,9$\pm$2,46 cm. The size of the right lobe, the area of sections and liver width statistically significantly exceeded similar parameters in the control group ($p<0,05$-$0,001$). Changes of the liver sizes and the area of sections were accompanied by characteristic changes in the form of a liver and they were connected with liver width increase. CVH patients revealed statistically significantly ($p<0,01$) dilatation of portal, splenic and superior mesenteric veins in comparison with the control group. Characteristic feature of CVH patients was the increase of their gallbladder size in its length, width ($p<0,05$) and especially heights ($p<0,001$). There also was dilatation of intrahepatic ducts and common hepatic duct ($p<0,001$-$0,05$). Diameter of the common bile duct in proximal part was increased and its middle third was a little bit more than in the control group ($p<0,05$) and distal part did not statistically significantly differ from the normal diameter (Fig.2). The comparative analysis of complex MRI results of the patients with CVH B and CVH C has shown that in patients with CVH B more expressed increase in the sizes of a liver ($p>0,05$) is marked, thus the area of coronal (222,1$\pm$7,85 sq. cm) and axial sections (238,1$\pm$8,2 sq. cm) in these patients was authentically ($p<0,05$) more than in CVH C patients (166,0$\pm$6,31 and 177,1$\pm$9,1 sq. cm accordingly). The liver width in CVH B patients changed from 18,5 up to 23,4 cm and was statistically significant higher ($p<0,05$) than in CVH C patients (19-20,5 cm). CVH C patients showed the tendency to increase the size of their gallbladder: sagittal area was 18,5$\pm$1,21 sq. cm and that is larger than in CVH B patients (14,4$\pm$1,46 sq. cm) ($p<0,05$). Diameters of bile ducts were larger ($p<0,05$) in patients with CVH C than in those with CVH B. Analysis of signal intensity from bile has shown that in CVH B patients SI from bile both in a bile ducts and in the gallbladder was less than in CVH C patients ($p<0,05$). Formation of cholesterol polyps and presence of bile stones in the bile ducts was marked only in patients with CVH B. Splenomegaly is revealed more often in CVH C patients (in 1,7 times) than in those with CVH B.

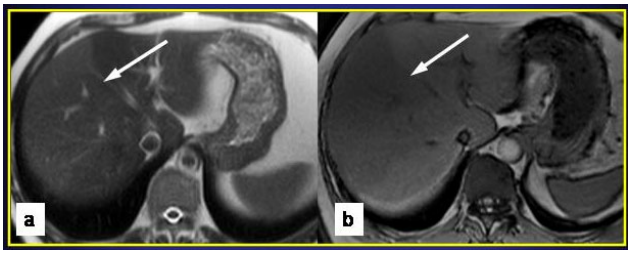

Fig.1. Chronic viral hepatitis. Axial T2-weighted HASTE image (a) and axial T1-weighted TurboFLASH image (b) show the equal contour and liver enlargement, diffuse-non-uniform signal intensity from liver parenchyma (arrow).

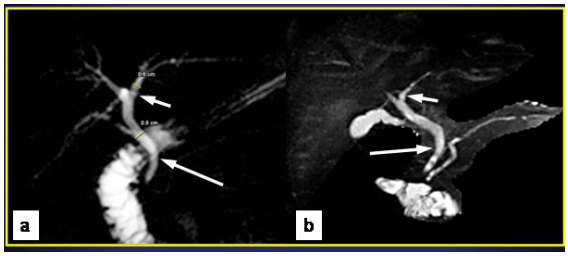

Fig.2. Chronic viral hepatitis C. MR cholangiopancreatogram (TSE MRCP (a) and 3D HASTE MRCP (b)) reveal dilatation of hepatic ducts (short arrow) and common bile duct (long arrow).

CONCLUSIONS: Our study showed that complex MRI is a non-invasive useful tool in diagnostics of CVH. CVH is accompanied by significant changes of the liver and biliary ducts. Complex MRI with application of quantitative criteria is supposed to be helpful and expedient in the course of CVH patients management and their follow-up.

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