Long Term Follow-up Results of T1 Hyperintense Nodules in Cirrhotic Livers

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Aims and objectives

Cirrhotic livers are characterized by advanced hepatic fibrosis and the formation of hepatocellular nodules such as regenerative nodules, low grade and high grade dysplastic nodules and hepatocellular cancer (HCC). Patients with cirrhotic livers undergo follow-up imaging studies for the detection and characterization of premalignant and malignant lesions. T1 hyperintense nodules without T2 hyperintensity or arterial phase enhancement during dynamic imaging are usually a diagnostic challenge. Although T1 hyperintense nodules usually indicate benign nodules such as regenerative or dysplastic nodules, it has also been reported that some HCC lesions may show T1 hyperintensity. The aim of this study is to investigate the results of long term follow-up of T1 hyperintense nodules in cirrhotic livers.

Methods and materials

We evaluated 139 cirrhotic patients with T1 hyperintense liver nodules who underwent dynamic MR imaging in our institution between October 2005-May 2013. Seventy five patients who did not have follow-up studies or who had too much respiratory artefacts on MR images, six patients who expired just after the initial MR examination, and eight patients who underwent liver transplantation without serial MR imaging were excluded. The follow-up time for the remaining 50 patients was between six months and six years (mean 32 months). There were 13 female, and 37 male patients with a mean age of 56.6 years. The etiology of cirrhosis was chronic viral hepatitis in 42 patients, autoimmune hepatitis in two patients, primary sclerosing cholangitis in one patient, primary biliary cirrhosis in one patient, alcoholic cirrhosis in one patient, cryptogenic cirrhosis in one patient, Wilson's disease in one patient, and steatohepatitis in one patient. MR imaging was performed with a 1.0 Tesla system (Signa LX Horizon, GE Medical Systems, Milwaukee, Wis) using phased array coil. T1 hyperintense nodules were defined as nodules with distinct margins on T1 weighted images which were isointense or hypointense relative to the liver parenchyma on T2 weighted images and which did not show contrast enhancement on dynamic series (figure 1, figure 2). The size of the nodules were measured. The size and the signal intensities of the nodules were compared on consecutive MR studies.

Images for this section:
Fig. 1: Figure 1: T1 hyperintense nodules in cirrhotic liver.
Fig. 2: Figure 2: Nodules in the cirrhotic liver which are hyperintense on T1 weighted image (fig 1) are isointense or hypointense relative to the liver parenchyma on T2 weighted image.
Results

There were solitary nodules in 15 patients and 35 patients had multiple nodules. The size of the nodules were between 3 mm and 30 mm (mean size 14 mm). There was no HCC development in 29 of the 50 patients (58%) but three of the 29 patients had concurrent HCC at the initial examination and two of the 29 patients had a history of locally treated HCC. There was no significant alteration in size or number of nodules in 20 of the 29 patients with no HCC development. The size and/or number of the nodules increased in three patients (figures 3,4) and decreased in six patients.

In 14 of the 21 patients who had HCC development during follow-up, malignant transformation of the T1 hyperintense nodule had occurred (figures 5-10). In four of the 21 patients, an extranodal new HCC developed. The histopathological examination of a T1 hyperintense nodule revealed well differentiated HCC in one patient whose nodule was considered as a stable high grade dysplastic nodule at the fourth month follow-up. One patient with no progression during 18 month follow-up period, underwent liver transplantation and histopathological examination revealed a well differentiated HCC. In one patient with a history of locally treated HCC, T1 hyperintense nodules could not be seen on sixth month follow-up MR images, but multifocal HCC was detected in 18 months.

In six of the 14 patients with malignant transformation of the T1 hyperintense nodule, T2 hyperintensity, rapid arterial enhancement and rapid wash out was seen on follow-up MR images without significant change in the size of the nodule. There was an increase in size of the nodule with rapid contrast wash out in seven patients, and in one patient with malignant transformation, the size of the nodule increased, T2 hyperintensity occurred and arterial enhancement with rapid wash out was seen on dynamic images. The mean time for malignant transformation of T1 hyperintense nodules was 30 months.

In nine of the 21 patients with HCC development there was a history of locally treated or excised HCC.

Images for this section:
Fig. 5: Figure 5: A hyperintense nodule is seen in segment 5 on axial T1 weighed image (arrow)
**Fig. 6:** Figure 6: Another hyperintense nodule is seen in the same patient just medial to the nodule in fig 5 on axial T1 weighed image (arrow)
**Fig. 7:** Figure 7: On the follow up MRI after 17 months, signal characteristics of HCC development have arisen in the nodule located in the lateral subcapsular area. T1 hyperintensity has slightly decreased (vertical arrow).
**Fig. 8:** Figure 8: Peripheral T2 hyperintensity has occurred.
**Fig. 9:** Figure 9: Contrast enhancement of the nodule in the arterial phase is seen. The medially located nodule is morphologically stable (oblique arrows in fig 7-9)
**Fig. 10:** Figure 10: There is a central wash out and capsuler enhancement in the venous phase.
**Fig. 3:** Hyperintense nodules are seen in segment 4 and 8 on T1 weighted axial image.
Fig. 4: Figure 4: In the one year follow up, the nodules in figure 3 enlarged (arrows) and serum #-fetoprotein levels increased. Although they were determined as dysplastic nodules on histopathological examination RF ablation was performed.
Conclusion

In our study malignant transformation of the T1 hyperintense nodule was seen in only 34% of the patients (17 of the 50 patients). On the other hand in four of the 50 patients (8%) an extranodal HCC developed during follow up, and in three of the 50 patients (6%) HCC was detected at the initial examination. Therefore this study confirms that most of the T1 hyperintense nodules are benign but patients with T1 hyperintense nodules in cirrhotic livers should be under follow up with MR imaging. The size, T1 and T2 signal intensities, and contrast enhancement of the nodules should be evaluated carefully and should be compared with previous studies. The rest of the hepatic parenchyma should also be examined carefully and should not be underestimated. It should also be kept in mind that a well differentiated HCC may show T1 hyperintensity and histopathological examination may be necessary before further follow up studies.

Personal information

References