Case report

Angiomyolipoma of the liver: ferumoxides-enhanced MR imaging

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Abstract. We report a case of angiomyolipoma of the liver with emphasis on the appearance at MRI after administration of ferumoxides. Post-contrast T1- and T2-weighted images showed a frank decrease of signal intensity in a rim on the margin of the tumor. This unusual finding was related to the presence of an increased number of CD68-positive histiocytic cells in the periphery of the lesion and in the adjacent liver parenchyma.

Key words: Liver – Tumors – MR imaging – Ferumoxides

Introduction

Angiomyolipoma is a mesenchymal tumor which infrequently occurs in the liver. The lesion is composed of a varying heterogeneous mixture of blood vessels, smooth muscle, and adipose cells. Hematopoietic elements are found [1, 2, 3]. At imaging, differential diagnosis with other fat-containing tumors is often difficult [4].

Ferumoxides are iron oxide particles which are taken up by reticuloendothelial cells in the liver and spleen, causing signal intensity decrease of these organs on T2-weighted MR images. We report a case of angiomyolipoma of the liver with signal intensity decrease in a peripheral rim after ferumoxides administration.

Case report

A 49-year-old woman complained of mild abdominal pain. Because an abdominal sonography showed a hyperechoic mass in the left lobe of the liver, she was referred to our institution for further investigation. Physical examination revealed mild hepatomegaly. Liver function tests were normal. Other test results, including serology for hepatitis B and C, were negative. The α-fetoprotein level was normal.

Computed tomography showed fatty infiltration of the liver and a 3-cm heterogeneous mass surrounded by a hyperattenuating rim in the left hepatic lobe. Single photon emission computed tomography (SPECT) following administration of technetium-99m sulfur colloid showed peripheral hyperactivity with a photopenic central area. Magnetic resonance imaging was performed on a 0.5-T unit (Gyrosan T5, Philips, Eindhoven, The Netherlands) with a wrap around surface coil. T1-weighted spin-echo images with and without fat suppression were obtained with a TR of 530 ms and a TE of 15 ms, and T2-weighted fast spin-echo images were obtained with a TR of 4000 ms, a TE of 120 ms, and an echo-train length of 8. Ferumoxides (Endorem, Guerbet, Aulnay-sous-Bois, France) was administered intravenously at a dose of 15 μmol Fe/kg body weight. Imaging was repeated 30 min after the end of the infusion. The signal intensity (SI) was measured by placing regions of interest in the tumor, the peripheral area, and the liver. Signal intensity was standardized relative to signal-to-noise ratio (SNR). The lesion-to-liver contrast-to-noise ratio (CNR) was obtained for each sequence using the formula (SIlesion−SIliver)/noise. The percentage of liver and tumor enhancement was defined as E = [(SNRpostcontrast−SNRprecontrast)/SNRprecontrast] × 100.

The lesion appeared heterogeneous and slightly hypointense relative to the surrounding liver on precontrast T1-weighted images (CRN = −6.95; Fig. 1a). Fat-suppressed T1-weighted images demonstrated signal decrease in the liver and the lesion. On T2-weighted images, the tumor was slightly hyperintense (CRN = 1.23) with a peripheral hypointense rim (CRN = −2.78; Fig. 1b). Postcontrast T1-weighted images showed moderate signal enhancement of the central part of the tumor (E = 9%) and revealed a definite decrease of signal intensity in the peripheral rim (E = −43%; Fig. 1c). Signal intensity decrease was seen in the lesion on T2-weighted images after ferumoxides administration.
(E = –18%), with frank decrease of signal intensity of the peripheral rim (E = –60%; Fig. 1 d).

Surgical biopsies of the lesion and surrounding liver were performed. The surrounding liver showed mild to severe macrovacuolar fatty infiltration. Only mild compression of the hepatic parenchyma adjacent to the tumor was detected. The tumor contained mainly smooth muscle cells, blood vessels, and adipose tissue. Myoid component consisted of sheets and bundles of spindle and epithelioid cells showing marked nuclear pleomorphism and hyperchromatism but no mitoses. These cells exhibited strong staining for HMB-45 and actin. No expression of cytokeratin was detected. Numerous thin-walled blood channels with few large tortuous vessels, well-visualized by immunohistochemical positivity for factor VIII, were scattered through sparse mature adipose tissue with some immature microvacuolated lipocytes. This aspect was considered typical for angiomyolipoma. Immunohistochemical staining was performed with CD68, in an attempt to locate the histiocytic cells. This morphological analysis was somewhat limited because the lesion was not resected and only surgical biopsies were available. Despite this limitation, a gradient of CD68-positive cells was observed within the tumor and adjacent liver parenchyma. There were more CD68-positive cells in the periphery of the lesion and in the peritumoral liver than in the center of the tumor and in the more distant liver, respectively.

Discussion

Ferumoxides are particles directed to the reticuloendothelial system of liver and spleen. Signal intensity decrease on T2-weighted images has been observed after ferumoxides administration in hepatocellular tumors containing Kupffer cells (adenoma, focal nodular hyperplasia, some well-differentiated hepatocellular carcinomas) and in hemangiomas with sluggish flow [5, 6, 7]. In hemangiomas, signal intensity increase is seen on postcontrast T1-weighted images. This has been explained by the extracellular location of ferumoxides in the vascular lakes [7]. A ring of increased signal on early T1-weighted images after ferumoxides administration has been observed in metastases, attributed mainly to a blood pooling effect [8, 9]. However, to the best of our knowledge, a rim of decreased signal intensity after ferumoxides administration on both T1- and T2-weighted images has never been reported.