Case Report

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Superparamagnetic Iron Oxide-Enhanced Magnetic Resonance Imaging in a Case of Spleen Hamartoma

Mesut Bulakci[a] Erdem Yilmaz[b] Aghakishi Yahyayev[b] Betul Bozkurt Bulakci[c] Ensar Yekeler[b]

[a]Department of Radiology, Haseki Education and Research Hospital, [b]Department of Radiology and [c]Family Medicine, Istanbul Faculty of Medicine, Istanbul, Turkey

Key Words
Spleen · Hamartoma · Magnetic resonance imaging · Superparamagnetic iron oxide

Abstract
Objective: To emphasize the contribution of superparamagnetic iron oxide (SPIO) contrast agent in the diagnosis of the splenic hamartoma. ***Clinical Presentation and Intervention:*** A 63-year-old female was admitted to our hospital with diffuse abdominal pain. An ultrasound examination revealed a 5 × 4 cm solid lesion in the spleen. Dynamic gadolinium-enhanced magnetic resonance imaging (MRI) of the abdominal findings was consistent with a splenic hamartoma. SPIO-enhanced MRI was then performed and it confirmed the diagnosis. The lesion showed a decrease of signal intensity on T2-weighted images. ***Conclusion:*** This case showed that SPIO-enhanced MRI was useful for establishing a noninvasive diagnosis of the splenic hamartomas.

Introduction

Splenic hamartomas are rare lesions that occur most commonly in adults; only about 14.3% of reported cases have occurred in pediatric patients [1]. Histologically, splenic hamartoma is composed of an aberrant mixture of the normal tissue components of the spleen [1]. Hamartomas are also known as splenomas, splenadenomas or nodular hyperplasia of the spleen [2]. Patients with splenic hamartomas are usually asymptomatic with a majority of lesions found incidentally [3]. Signs and symptoms generally associated with larger lesions are more common in female patients. Larger hamartomas may manifest with a palpable mass, splenomegaly or rupture [2]. A few of these lesions are associated with hematologic symptoms such as pancytopenia, anemia and thrombocytopenia [4]. Less commonly, fever, malaise and weight loss have been reported [4]. The lesions tend to be single, spherical and solid. Magnetic resonance imaging (MRI) of splenic hamartomas following the administration of gadolinium contrast agent has been demonstrated in several previous studies [1–3]. In this case, the main focus was on imaging splenic hamartoma following the administration of superparamagnetic contrast agents.

KARGER

E-Mail karger@karger.com
www.karger.com/mpp

Erdem Yılmaz
Department of Radiology
Istanbul Faculty of Medicine
TR–34093 Capa, Istanbul, Turkey
E-Mail yilmazerdem79@yahoo.com.tr

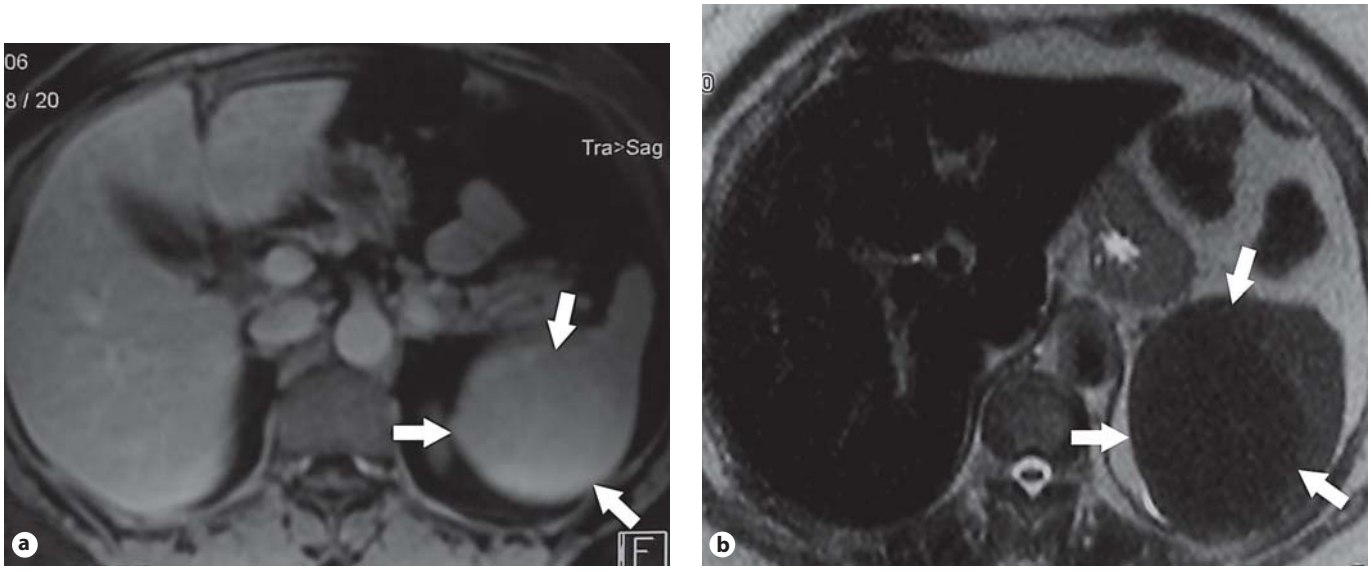

Fig. 1. Axial MR images show a 5 × 5 × 4 cm well-defined solid mass. **a** Gadolinium-enhanced MR images demonstrate a well-defined, uniformly enhanced lesion (arrows) originating from the medial aspect of the spleen during the hepatic venous phase. **b** Axial T2-weighted HASTE image following the administration of ferumoxide contrast agent demonstrates a splenic lesion (arrows) with a decreased signal intensity.

Case Report

An ultrasound examination of a 63-year-old female patient presenting with a diffuse pain in the abdomen revealed a 5 × 4 cm solid lesion in the spleen. Her hemoglobin, the number of white blood cells and platelets were normal. Urine and hepatic function tests were also normal. MRI of the abdomen showed a 5 × 5 × 4 cm well-defined solid mass with isointensity on T1-weighted images. The lesion demonstrated a diffuse heterogeneous enhancement on early images obtained after the administration of gadopentetate dimeglumine (Magnevist®, Bayer Schering, Germany) contrast medium at a flow rate of 10 ml/15 s and became more uniformly enhanced on the portal venous phase and hepatic parenchymal phase (fig. 1a) on T1-weighted images. The lesion showed mild hypointensity on T2-weighted images. MRI study with biphasic infusion (2 ml/min for 10 min and 4 ml/min for 20 min) and at a dose of 15 μmol Fe/kg of glucose 5% ferumoxide (Endorem®, Guerbet, France) contrast agent demonstrated a splenic lesion with a decreased signal intensity on a T2-weighted half-Fourier acquisition single-shot turbo spin-echo (HASTE) image which is the same intensity as liver parenchyma (fig. 1b). A 3-year follow-up showed no change in the dimensions or other characteristics of the lesion.

Discussion

Hamartoma of the spleen is a rare benign lesion [1, 3, 5]. Most patients do not have symptoms; they are incidental findings during imaging studies, laparotomy or autopsy [1, 2]. Imaging splenic hamartomas is important in order to distinguish them from malignant splenic lesions such as lymphoma and metastasis [2], as was the case here. An accurate preoperative diagnosis helps to obviate unnecessary surgery or biopsy and it finally decreases the overall patient morbidity. Splenic hamartomas are well-defined masses with smooth borders and no infiltration of the surrounding splenic parenchyma [2].

Fibrous and nonfibrous splenic hamartomas have different types of MR findings [1]. Nonfibrous splenic hamartomas are more common and isointense in T1-weighted images, heterogeneously hyperintense relative to the spleen on T2-weighted images and demonstrate heterogeneously diffuse enhancement on early postcontrast images and more uniform enhancement on delayed T1-weighted images [1–3, 5]. Fibrous splenic hamartomas may be hypointense in T2-weighted images [1]. In the case in our study, the lesion was seen as a mildly hypointense, well-defined solid mass on T2-weighted images. MRI findings of this lesion were compatible with a fibrous hamartoma.

Superparamagnetic iron oxide (SPIO) nanoparticles are new molecular imaging agents [6]. Ferumoxide (Endorem) is one of the SPIO preparations that has a long imaging time (30 min–6 h after infusion), and T2-weighted sequences can be performed [7]. Generally, ferumox-

ide contrast agents are used in the differential diagnosis of liver lesions because reticuloendothelial system (RES)-specific agents improve lesion detection by decreasing the signal intensity of background liver on T2-weighted MR images; thereby increasing the conspicuity of focal hepatic lesions with negligible reticuloendothelial cells (e.g. metastases) [8].

The liver, spleen and bone marrow are the major organs containing RES cells. SPIO particulate agents are selectively taken up by RES cells. As the SPIO-based contrast medium is targeted in the RES cells, it can be used to demonstrate the presence and function of these cells within the lesions [9]. This contrast agent causes a decrease in the intensity of the transmitted signals from reticuloendothelial tissues without producing any significant change in the signal intensity from lesions consisting of other cell types (i.e bowel metastasis or lymphomas) in T2-weighted MRI studies, due to the susceptibility effects of iron [8]. The decreased signal intensity of splenic hamartoma has been shown previously in T2-weighted MRI with SPIO agents [10]. In this case, an MRI study following the administration of ferumoxide contrast agent demonstrated a splenic lesion with a diminished signal intensity (the same intensity as liver parenchyma). These features indicate that the lesion is composed of reticuloendothelial cells, suggesting a diagnosis of splenic hamartoma. The patient did not accept any invasive procedure for the histopathologic diagnosis. Furthermore, her clinical and laboratory findings were not compatible with malignancy. A 3-year follow-up showed no change in the dimensions or other characteristics of the lesion.

Conclusion

This case showed that SPIO-enhanced MRI was useful in the diagnosis of the splenic hamartoma. We recommend further studies using a larger number of cases to investigate the SPIO-enhanced MRI findings of splenic hamartomas.

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