Available online at www.sciencedirect.com
ScienceDirect
Magnetic Resonance Imaging 26 (2008) 577–582
MAGNETIC RESONANCE IMAGING

Case report

Area of paradoxical signal drop after the administration of superparamagnetic iron oxide on the T2-weighted image of a patient with lymphangitic metastasis of the liver

Youkyung Lee[a], Jong Seok Lee[b,*], Chang-Min Kim[c], Jun Yong Jeong[b], Joon-Il Choi[b], Min Ju Kim[b]

[a]*Department of Radiology and Institute of Radiation Medicine, Seoul National University Hospital, Chongno-gu, Seoul 110-774, Korea*
[b]*Department of Radiology, National Cancer Center, Goyang, Gyeonggi 411-769, Korea*
[c]*Center for Liver Cancer, National Cancer Center, Goyang, Gyeonggi, Korea*

Received 5 June 2007; revised 25 September 2007; accepted 25 October 2007

Abstract

We report a geographic area of prominent hypointensity in T2-weighted images vs. normal adjacent liver parenchyma in a patient with cholangiocarcinoma and lymphangitic metastasis of the liver after superparamagnetic iron oxide (SPIO) administration. The area showing this prominent signal drop showed Kupffer cell proliferation and lymphangitic metastasis during a pathologic examination.

Keywords: Liver; MRI; SPIO; Kupffer cell proliferation; Lymphangitic metastasis

1. Case report

A 50-year-old male, a known hepatitis B virus carrier, was referred due to the detection of a liver mass by ultrasonography at a local clinic. During the physical examination, bilateral supraclavicular lymph nodes were found to be enlarged. His total serum bilirubin concentration was 1.5 mg/dl (normal value 0.2–1.2 mg/dl); serum aspartate aminotransferase, 63 IU/L (normal value 0–40 IU/L); serum alanine aminotransferase, 68 IU/L (normal value 0–40 IU/L); and alkaline phosphatase, 332 IU/L (normal value 40–129 IU/L). Hepatitis B virus surface antigen and anti-hepatitis C virus antibody were positive. Hepatocellular carcinoma should be suspected in this patient, but his alpha-fetoprotein level was 8.8 ng/ml (normal value 0–15 ng/ml); carcinoembryogenic antigen, 2.2 ng/ml (normal value 0–5 ng/ml); CA 19-9 99.9 U/ml (normal value 0–38 U/ml); white blood cell count, 5840/μl (normal value 4000–10,000/μl); erythrocyte sediment rate, 76 mm/h (normal value 0–9 mm/h).

CT was performed. Four-detector row CT with a Volume Zoom scanner (Siemens, Munich, Germany) was used. The collimation was 5 mm. Arterial phase was obtained 11 s after peak enhancement; portal phase, 65 s; delayed phase, 3 min.

Contrast enhanced CT showed a 3.5-cm-sized heterogeneously enhancing mass in the right lobe of the liver with mild capsular retraction and adjacent peripheral intraheptic bile duct dilatation (Fig. 1A). Multiple geographic patchy low attenuation lesions in both lobes, encompassing the portal triad, were notable (Fig. 1B). The geographic patchy low attenuation lesions on portal phase did not enhance on arterial phase either (Fig. 1D).

The right portal vein and the peripheral portal vein of the right lobe were thrombosed (Fig. 1C). Additionally, a thin linear area of low attenuation bordering and parallel to the portal branch was also visible; initially, this was considered to be periportal edema (Fig. 1C, D). Multiple enlarged lymph nodes with inner low attenuation were observed at the portocaval, hepatoduodenal ligament, retropancreatic, retrocaval, aortocaval and paraaortic regions, which are not common findings of hepatocelluular carcinoma, but rather favor cholangiocarcinoma. Precontrast CT images were not

* Corresponding author. Tel.: +82 31 920 1796; fax: +82 31 920 1171.
E-mail address: ljs@ncc.re.kr (J.S. Lee).

0730-725X/$ – see front matter © 2008 Elsevier Inc. All rights reserved.
doi:10.1016/j.mri.2007.10.012

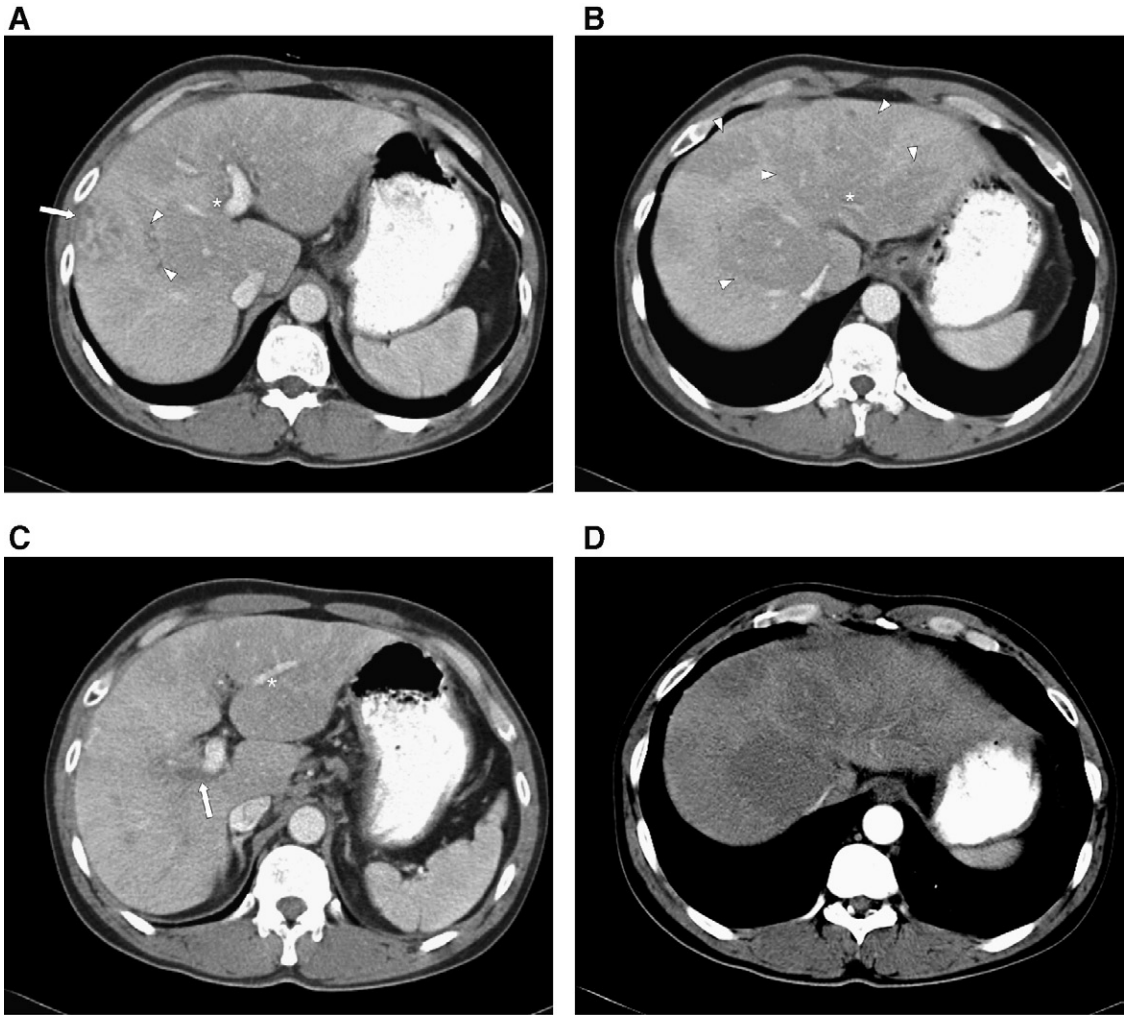

Fig. 1. Contrast-enhanced CT images of the 50-year-old male patient's liver; (A–C) portal phase; (D) arterial phase. (A) Contrast-enhanced CT scans showing a 3.5-cm-sized heterogeneously enhancing mass in the right lobe of the liver (arrow) with mild capsular retraction and adjacent peripheral intrahepatic bile duct dilatation (arrowheads). (B) Multiple geographic patchy low attenuation lesions in both liver lobes encompassing the portal triad (arrowheads). (C) Thrombosed right portal and peripheral portal veins of the right lobe (arrow). (D) Geographic patchy low attenuation lesions on portal phase did not enhance on arterial phase either. (A–C). Thin linear area of low attenuation closely bordering the portal branch (asterisks).

available. The differential diagnoses of the enhancing lesion in the right lobe were cholangiocarcinoma or hepatocellular carcinoma, and for the multiple hypoattenuated areas the differential diagnoses included uneven fatty change and other unknown causes.

MRI with gadolinium and SPIO was performed for a more accurate differential diagnosis. A 1.5-T Genesis Signa Advantage scanner (General Electric, Milwaukee, WI, USA) was used. The time interval between injection of SPIO and imaging of the T2* GRE sequence was 5 min. T2* GRE sequence was performed only after SPIO injection. SSFSE, FRFSE and FGRE were the breath-hold sequences. The slice thickness was 7 mm, and the gap was 2 mm. Total acquisition time of complete protocol including gadolinium-enhanced sequences was 40 min. The geographic hypoattenuated lesions on enhanced CT were found to be less enhanced than adjacent

Fig. 2. MRI. (A) The geographic hypoattenuated lesions on enhanced CT are less enhanced than adjacent normal liver parenchyma on gadolinium-enhanced, fat-saturated, T1-weighted portal phase 3D GRE images (arrowheads). (B) In-phase spoiled gradient echo image. (C) Out-of-phase spoiled gradient echo image when compared with the in-phase spoiled gradient echo image (B) reveals no micro fat accumulation. (D, E) On T2 fast spin echo, the right lobe mass and the multiple patchy geographic lesions are not well delineated. However, peripheral bile duct dilatation around the mass (arrowheads) and periportal linear high signal intensity are evident (asterisks). (F–H) SPIO-enhanced T2*-weighted GRE images. The geographic hypoattenuated lesions on gadolinium-enhanced images shows much lower signal intensity than adjacent normal liver parenchyma on SPIO-enhanced T2*-weighted GRE images (arrowheads). In addition to this 3.5-cm-sized mass in the right hepatic lobe, multiple smaller nodules suggestive of multiple metastasis are seen (arrows). The periportal area is of markedly higher signal intensity on SPIO-enhanced T2*-weighted GRE images and is considerably wider in diameter than that observed by enhanced CT (thin arrows). (J) Fifteen-minute delayed gadolinium-enhanced, fat-saturated, T1W 3D GRE images, showing delayed enhancement of the periportal area (thin arrows) compared with low signal intensity of periportal area in (K) (thin arrows). (K) Unenhanced, fat-saturated, T1W 3D GRE images.