Case Report
A round-shaped hepatic infarction detected in a diabetes patient: MRI findings and literature review

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Abstract: Hepatic infarction is a rare disease because of a dual blood supply in the liver. It is difficult to diagnose clinically without a histopathological examination and imaging examinations are useful. We report a case of a 45-year-old woman with diabetes who showed a single round-shaped hepatic infarction nodule in the right liver lobe, which was identified by magnetic resonance imaging (MRI) and histological examination. We suggest that hepatic infarction should be taken into consideration in clinical diagnosis when the imaging data show an atypical lesion that features a short blood supply in the liver.

Keywords: Hepatic infarction, magnetic resonance imaging (MRI), diabetes

Introduction
Hepatic infarction occurs infrequently because of a dual blood supply in the liver. A clinical diagnosis of hepatic infarction usually is difficult, unless there is histology available. Hepatic infarction is almost always a result of occlusion of the intrahepatic branch of the hepatic artery. In addition, it can occur with a significantly reduced hepatic blood flow under circumstances of shock, obstructive biliary disease, or excessive anesthesia during abdominal surgery [1, 2]. Moreover, the criteria for the clinical diagnosis of hepatic infarction have not been established, and there is a lack of specific clinical manifestations, indicating that hepatic infarction may be underrecognized. To diagnose hepatic infarction, imaging examinations are useful. Hepatic infarctions usually are wedge-shaped lesions in the periphery of the liver as shown by computed tomography (CT) [3]. However, there is little reference to the use of magnetic resonance imaging (MRI) for the diagnosis of hepatic infarction in the literature. Here, we report the MRI findings of a hepatic infarction in a patient with diabetes, which can be easily confused with other lesions in the liver.

Case report
The experimental protocol was established, according to the ethical guidelines of the Helsinki Declaration and was approved by the Human Ethics Committee of Jilin University, China. A 45-year-old female with type 2 diabetes for 7 years and complaints of intermittent right upper quadrant abdominal pain for 2 years, which was exacerbated in the past 2 months, was admitted to our hospital. She described her pain as dull, which was not associated with fevers or chills. She had a meningioma resection 2 years earlier. Laboratory tests were ordered, and the results showed an abnormal leukocyte count of 11.56 K/μL (normal: 3.5-9.5 K/μL), an aspartate aminotransferase level of 69 U/L (normal: 7-40 U/L), and a glucose level of 6.58 mM (normal: 4.1-5.9). The patient subsequently received imaging examinations. The ultrasound indicated a low echo nodule in the right liver lobe, so the patient then received an MRI for further investigation. T1-weighted images demonstrated a round-shaped lesion (3 cm × 2 cm) with diminished intensity in the anterior segment of the right lobe of the liver. The intensity of the lesion was increased on the T2-weighted images, with or without fat suppression. There was no obvi-
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**Figure 1.** MRI images of a 45-year-old female showing an increased signal on the T2-weighted images with or without fat suppression (A, B) and a decreased signal on the T1-weighted images with or without fat suppression (C, E). The DWI (b = 800) shows restricted diffusion (D), and an edgy enhancement is seen in the delayed phase (F). The pathological diagnosis of the surgically removed tissue was a hepatic infarcted nodule (G).
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Table 1. Summary of imaging findings from three reported cases in the literature

<table>
<thead>
<tr>
<th>Number</th>
<th>Shape</th>
<th>Location</th>
<th>T1WI</th>
<th>T2WI</th>
<th>DWI</th>
<th>MRI Enhancement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Multiple</td>
<td>Edge of the liver</td>
<td>Iso-signal</td>
<td>Slightly high</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>2</td>
<td>Single</td>
<td>Edge of the right liver</td>
<td>Slightly low</td>
<td>Slightly high</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>3/present case</td>
<td>Single</td>
<td>Round</td>
<td>Deep in the right liver</td>
<td>Slightly low</td>
<td>Slightly high</td>
<td>Slightly high</td>
</tr>
</tbody>
</table>

NA, not available; T1WI, T1-weighted image; T2WI, T2-weighted image; DWI, diffusion-weighted image.

Because the lesion featured a round appearance and a delayed edgy enhancement, it resembled other space-occupying lesions. To differentiate it from a malignancy, the patient underwent a laparoscopic procedure. Upon surgical exploration, an ovate, well-defined, and tenacious mass (approximately 3 cm × 2 cm in size) was discovered in the anterior segment of the right lobe. The mass was movable, so it was removed completely. The gross mass appeared grayish white in color with a clear boundary. Microscopic examination demonstrated an infarced parenchymal pathology in the mass. The pathological findings under low magnification (4 × 10) indicated the hepatic infarction with an inflammatory fibrinous capsule. While under high magnification (10 × 20), incomplete karyopyknosis and karyorrhexis in the coagulated lesion as well as solidly shrunk or wrecked cell nuclei were observed (Figure 1G). Additionally, the cells with tarnishing eosinophilic changes were spread; and a focal sheet, acute and chronic inflammatory cell infiltration, and granulated tissue were detected.

Discussion

We present a rare case of a patient with type 2 diabetes for 7 years and a recent hepatic infarction. There are two reasons for presenting this case. First, hepatic infarction as a complication of diabetes is very infrequently noted and diagnosed. Second, we found MRI and gadoxetate disodium-enhanced MRI to be helpful for the diagnosis of hepatic infarction.

Imaging techniques are known to be useful for diagnosing hepatic infarction. For instance, the CT features of hepatic infarction have been described [4], which usually are wedge-shaped lesions in the periphery of the liver that are low-attenuated. These lesions can also be isodense, in other words, have an equal density to the surrounding normal liver parenchyma. Contrast-enhanced CT images show that lesions are marked with low density because of a lack of blood supply.

There is little reference to MRI findings of hepatic infarction in the literature. In one case, the lesion was not observable on T1-weighted spin-echo images, but it was only seen on proton spectroscopic and T2-weighted images [5]. In another case, the hepatic infarcted lesion was well perceived on the T1-weighted images, and it was more conspicuous on the T2-weighted scan [6]. Thus, the MRI characteristics of hepatic infarction are relatively nonspecific. In this case, the MRI findings were similar to the second case: a diminished-intensity lesion was demonstrated in the T1-weighted images, while an increased intensity lesion was shown in the T2-weighted images, with or without fat suppression. Diffusion-weighted imaging (DWI) (b = 800) showed an increased signal for the lesion. However, there was no notable enhancement in the artery or portal phase, and an edgy enhancement was only detected in the delayed phase (Table 1).

In this case, MRI demonstrated unique properties of the lesion: one was a round shape. In general, the infarcted foci are shaped by the partially obstructed vascular supply that is usually one- or two-sided, resulting in irregular shapes such as a wedge or triangle. A possible reason for the round lesion is that the lesion was chronically formed and surrounded by hyperplastic fibrous tissue and contracture, which transformed the lesion from an irregular shape to a round one [7, 8]. The other unique property was the intensity of the lesion. Hepatic infarction usually occurs in multiple sites, leading to multiple lesions. Only a single lesion was detected in this case, a rare incidence in hepatic infarction.
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The pathogenesis of infarction is distinct because it is derived from a short blood supply. However, when a single infarcted lesion is round in shape, it is difficult to differentiate it from intrahepatic cholangiocarcinoma, an inflammatory pseudotumor, or hepatic tuberculosis using imaging tools. History, symptoms, signs, and laboratory examination should take into consideration for the diagnosis. In addition, a delayed edgy enhancement upon contrast imaging can be indicative of hepatic infarction.

We postulate that the hepatic infarction in this case could be attributed to diabetes. Diabetes is frequently associated with dyslipidemia, which can lead to angiopathy, including atherosclerosis of the hepatic artery and microangiopathy, which may cause occluding microcirculation of the liver. In addition, abnormalities of hemodynamics, endothelial dysfunction, and the hypercoagulable state may possibly induce increased thrombosis and decreased fibrinolysis, which have been found in diabetic patients with angiopathy [9].

A challenge for the clinical diagnosis of hepatic infarction is that there are no specific symptoms or signs for it. The common clinical manifestations of hepatic infarction include fever, abdominal pain, and malaise [10]. Laboratory tests only reveal nonspecific findings such as an elevated white blood cell count and liver enzyme levels. To make the diagnosis even more challenging, there are no definitive diagnostic criteria for hepatic infarction. Therefore, this case report will raise new awareness for hepatic infarction.

In conclusion, hepatic infarction may be more common than is currently recognized. In the diagnosis of disease based on imaging findings, we should take hepatic infarction into consideration if an atypical liver lesion is featured with a short blood supply.

Disclosure of conflict of interest

None.

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References