

Differences in CEUS and CE-MRI Appearance of HCC: A Case Report

Li Ma, MD^a, Wenzhao Liang, MD^b, Yupeng Zhu, MD^a, Yingqiao Zhu, MD^a, Dezhi Zhang, MD^{a,*}

^a Department of Abdomen Ultrasound, First Hospital of Jilin University, Changchun, Jilin, China; ^b Department of Neurology, China-Japan Union Hospital of Jilin University, Changchun, Jilin, China

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Abstract: Hepatocellular carcinoma (HCC) is the most common liver cancer, accounting for more than 90% of liver cancers. It results in between 250,000 and 1 million deaths globally per annum. Unlike other cancers, HCC can usually be diagnosed on imaging studies only, without tissue sampling confirmation. Nowadays, contrast-enhanced ultrasound (CEUS) is usually used to detect HCC in the clinic because it's more applicable for the characterization of a known lesion. But the sensitivity of CEUS is less than 50% for small tumors.

Key words: Hepatocellular carcinoma; Contrast-enhanced ultrasound; Contrast-enhanced magnetic resonance imaging

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Case report

A 62-year-old Chinese female was admitted to our hospital because of discovering a mass in the right lobe of the liver. She had a history of hepatitis C for 1.5 years. In the physical examination, there were no positive physical signs. Laboratory examination: AFP 6.01 ng/ml. Child-Pugh classification: A. In ultrasound, a hypoechoic nodule was visualized in the right posterior lobe of liver (Fig. 1). The size of the nodule was about 34mm×31mm. In order to judge the nodule's quality, the patient was referred to undergo CEUS and Contrast-Enhanced magnetic resonance imaging (CE-MRI). In CEUS, the nodule was highly enhanced in the arterial phase (<30 seconds) and isoechoic to the parenchyma during the portal phase. In the delayed phase, it was hypo-enhanced (Fig. 2). According to its appearances in CEUS we made the conclusion that it was likely to be HCC. The MRI was performed with 3.0 Tesla Siemens machine. A well-defined rounded abnormal signal intensity lesion was visualized. The lesion's size was about 30 mm. It was located in the right posterior lobe of liver. The nodule was isointense to gray matter on T1WI and hypointense on T2WI and DWI images. In CE-MRI, we saw the nodule was hyper-intense in the arterial phase but no

drop of the signal in the delayed phase (Fig. 3).

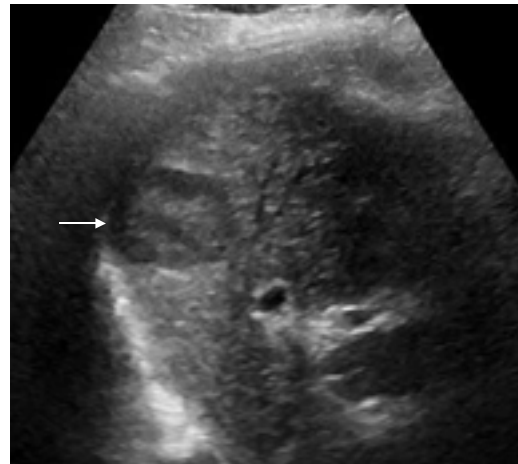


Figure 1 In the gray-scale ultrasonography showed a hypoechoic nodule in the right posterior lobe of liver.

Discussion

HCC is one of the most common cancers worldwide and most HCC patients have a history of chronic liver disease [1]. But unlike most other cancers, HCC usually can be diagnosed on imaging studies only, without tissue

* Corresponding Author: Department of Abdomen Ultrasound, First Hospital of Jilin University, 71 Xinmin Road, Changchun, Jilin, China.
e-mail: zhangdezhi1982@163.com

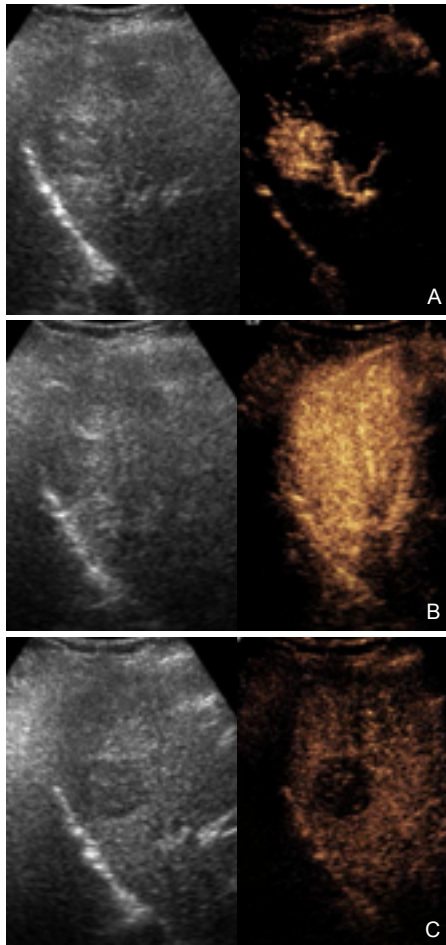


Figure 2 In the arterial phase of contrast enhanced ultrasound (<math>< 30</math> seconds), the nodule showed hyperenhancement (white arrows) and there were many blood vessels surrounding it? (A). The nodule was isoechoic to the parenchyma (white arrows) during the portal phase (B). In the delayed phase of contrast enhanced ultrasound, the nodule was hypo-enhanced over the surrounding parenchyma of liver (white arrows) (C).

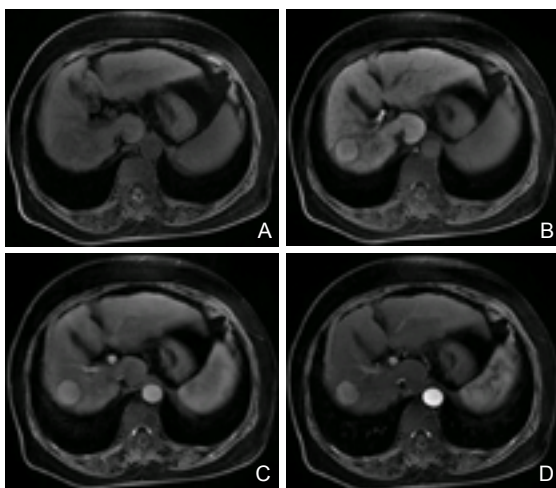


Figure 3 Abdomen contrast enhanced MRI. Post-contrast (A) T1-weighted image showing a isointense nodule (white arrow) in the right posterior lobe of liver and high enhancement (white arrow) in the arterial phase (B) and appears hyperintense (white arrow) on the delayed phases (C). In the hepatocyte phase (D), the nodule shows low uptake after intravenous Gd-EOB-DTPA injection. Features are not typical for HCC.

sampling confirmation [2]. MRI is the most accurate modality for the detection and characterization of HCC. The diagnosis of HCC is done using the imaging criteria of arterial phase hypervascularity and portal or delayed phase washout. Most HCCs have typical imaging performance but there are exceptions. The nodule in CEUS showed typical HCC. We can see the contrast enhanced agent was washed out in the delayed phase. It is well known that the hallmark feature of HCC on CE-MRI is low enhancement compared to liver parenchyma during venous or delayed phase. But this nodule was hyper-intense in the delayed phase of CE-MRI so that the interpreter thought it was not HCC because the diagnosis of HCC in CE-MRI is mainly based on the enhancement pattern on dynamic post gadolinium-enhanced scans. However, this nodule was pathologically confirmed as HCC (Fig. 4).

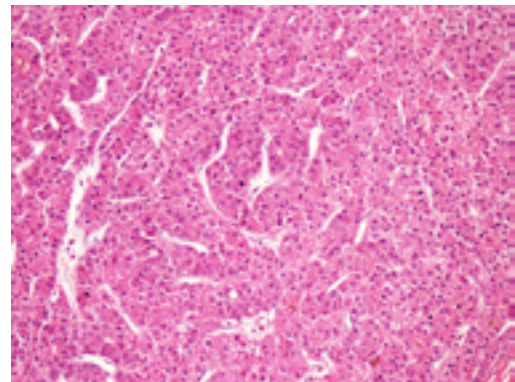


Figure 4 The histopathology's diagnosis is that the lesion was HCC and it was moderately differentiated.

The reasons for the different contrast enhanced appearance of HCC between CEUS and CE-MRI in the delayed phase may be as follows. First, the contrast agent is different between CEUS and CE-MRI. In this case, we used the extracellular gadolinium-based contrast agent on CE-MRI. This contrast agent distributes from the vascular space into the interstitial compartment. So, the CE-MRI may show prolonged enhancement due to contrast agent leakage into the tumor interstitium [3]. Unlike contrast agent used in CE-MRI, second generation contrast media (SonoVue) is used in CEUS. It can truly distribute intravascular without any interstitial phase. So, the contrast agent doesn't leakage into tumor interstitium and the result will be more accurate than CE-MRI. Second, the contrast enhanced agent (Gd-EOB-DTPA) in CE-MRI is taken up in normally functioning hepatocytes. However, sometimes Gd-EOB-DTPA is not only taken up in healthy hepatocytes, but also in HCC. Gd-EOB-DTPA is transported into hepatocytes via sodium-independent organic anion transporters (OATPs). Among OATP1A2, 1B1, 1B3, and 2B1, only OATP1B3

expression was found to correlate with the enhancement ratio on EOB-MRI, indicating that it transports Gd-EOB-DTPA into HCC cells [4]. In this case, we didn't see the signal drop in the delayed phase. It may be that more OATP1B3 was expressed in the membrane of this nodule. Third, CEUS provides real-time dynamic imaging that is useful to visualize a very early or late enhancement pattern of tumors that may not occur in the predetermined timing MRI scans. MRI may fail to find some lesions due to its wrong arterial contrast timing. The CE-MRI scan slices may not contain this nodule's washout time.

Conclusion

In conclusion, although the sensitivity of CEUS is less than 50% for small tumors, the accuracy of CEUS in the diagnosis of HCC is superior to CE-MRI in some cases. The prolonged uptake of Gd-EOB-DTPA in the delayed phase cannot exclude the diagnosis of HCC, so the imaging needs to be more carefully interpreted.

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Conflicts of Interest

The authors have declared no conflicts of interest. The funders had no role in study design, data collection and analysis, decision to publication, or preparation of the paper.

References

- [1] European Association For The Study Of The Liver; European Organisation For Research And Treatment Of Cancer. EASL-EORTC clinical practice guidelines: management of hepatocellular carcinoma. *J Hepatol* 2012;56:908-43.
- [2] Willatt J, Ruma JA, Azar SF, Dasika NL, Syed F. Imaging of hepatocellular carcinoma and image guided therapies - how we do it. *Cancer Imaging* 2017;17:9.
- [3] Jang HJ, Yu H, Kim TK. Contrast-enhanced ultrasound in the detection and characterization of liver tumors. *Cancer Imaging* 2009;9:96-103.
- [4] Yamashita T, Kitao A, Matsui O, Hayashi T, Nio K, Kondo M, et al. Gd-EOB-DTPA-enhanced magnetic resonance imaging and alpha-fetoprotein predict prognosis of early-stage hepatocellular carcinoma. *Hepatology* 2014;60:1674-85.