

Splenic Infarction Diagnosed by Contrast-enhanced Ultrasound in Infectious Mononucleosis – An Appropriate Diagnostic Option: A Case Report with Review of the Literature

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Abstract

Infectious mononucleosis is caused by Epstein-Barr virus (EBV) infection. Although typically self-limiting, complications such as splenic infarction and splenic rupture are described. A 17-year-old man presented in the emergency department due to a 3 days history of fever with chills, soreness, fatigue, and loose stool. Ultrasound examination showed a homoechogenic splenomegaly. Viral enteritis was diagnosed and the patient was dismissed. Six days later, he reassessed due to increasing left upper quadrant abdominal pain. Ultrasound showed inhomogeneous splenomegaly with irregular hypoechogenic subcapsular lesions. Contrast-enhanced ultrasound (CEUS) characterized the lesions as not perfused tissue until the late venous phase, compatible with spleen infarctions. Serologic studies were positive for EBV. In the literature, splenic infarction is considered under-recognized. Contrast-enhanced computed tomography (CECT) and magnetic resonance imaging are associated with costs and radiation (CECT). B-mode ultrasound examination is usually used as the first imaging modality, although showing a poor sensitivity in the question of splenic lesions/infarctions. CEUS has shown instead very good sensitivity and does not harm. Therefore, we recommend CEUS examination as the first imaging modality if suspicion of spleen infarction arises, especially when B-mode ultrasound is normal.

Keywords: Contrast-enhanced ultrasound, infectious mononucleosis, spleen infarction, ultrasound

INTRODUCTION

Infectious mononucleosis (IM) is a clinical entity most commonly caused by primary Epstein-Barr virus (EBV) infection, usually occurring during adolescence or early adulthood.^[1] There is evidence in seroepidemiologic surveys that over 95% of the adults worldwide are infected with EBV.^[1] The classical triad of presenting signs are pharyngitis (subacute in onset), fever, and lymphadenopathy. Splenomegaly is variably detected clinically in 15%–65% of IM cases.^[1,2] Most cases of IM are self-limiting diseases recovered by conservative treatment alone. However, splenic infarction and splenic rupture as feared complication are described in rare cases (0.1% to 0.5% of IM cases).^[1,3] Ultrasonography (US) is frequently used as the first imaging modality in such suspected cases,^[4,5] whereas contrast-enhanced computed tomography (CECT) or magnetic resonance imaging (MRI) is today's diagnostic standard.^[4] Contrast-enhanced

ultrasound (CEUS) is considered similarly accurate as computed tomography (CT) for detecting vascular defects of the spleen, but it is commonly underused.^[6] In Europe, it is still off-label for patients under the age of 18, but it is nevertheless recommended by the European Federation of Societies in Ultrasound and Medicine (EFSUMB).^[7]

CASE REPORT

A 17-year-old slender man presented in the Emergency department (ED) due to a 3 days history of fever with chills, soreness, fatigue, and loose stool. He reported a 12 h history of cramping pain in the whole abdomen. His past medical history and physical examination and vital sign were insignificant.

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Lab studies revealed pathological findings for C-reactive protein (CRP) of 33 mg/L (norm <8), ASAT 62 U/L (<40), and Lactate dehydrogenase 530 U/L (<265). Ultrasound examination (Philips EPIQ 5, B-mode @ 5 MHz, curvilinear probe) showed hypermotile small intestine without free fluid, consistent with enteritis. As secondary finding, a splenomegaly of 14 cm was seen [Figure 1]. Viral enteritis was diagnosed and the patient was dismissed with symptomatic therapy. Six days later, the patient reassessed due to similar symptoms with increasing abdominal pain, especially in the left upper quadrant and left shoulder. Physical examination revealed a tachycardia of 104 bpm with normal blood pressure and temperature. The abdomen was soft with mild tenderness in the left upper quadrant. In addition, there was bilateral cervical lymphadenopathy. CRP was increased to 93 mg/L, still normal Leucocytes count and *yet also* normal liver enzymes. Ultrasound (same machine has previously reported) showed again a splenomegaly of 15 cm length. Furthermore, it showed three irregular hypoechogenic subcapsular lesions [Figure 2]. CEUS (CEUS; SonoVue®, Bracco; 1 mL injection on the right cubital vein followed by 10 mL saline flush) characterized the lesions as not perfused tissue until the late venous phase (Mechanical Index: 0.06). With a size up to 4 cm, they showed up larger in CEUS than in B-mode US [Figure 3]. Serologic studies for EBV presented a positive result for acute primary infection (positive viral capsid antigen [VCA] immunoglobulin M, negative VCA immunoglobulin G [IgG], and NA-1-IgG). We diagnosed IM with resulting splenic infarction. The juvenile was admitted for supportive treatment and observation, including pain management. The hospitalist team obtained a CT scan with angiography 2 days after admission, which confirmed the nonperfused lesions compatible with infarctions. A subsequent evaluation for an underlying hypercoagulable state or myeloproliferative diseases was unrevealing. The hospital course was uneventful and he was discharged in good condition after 6 days.

DISCUSSION

Splenic infarction is a rare complication of EBV associated with IM. In literature, more than 20 cases are published.^[8] However, there is poor information about the diagnostic imaging modality used. Although US often is the first imaging modality used, sensitivity is low. Menozzi *et al.* examined 18 patients with endocarditis, of which 11 patients had suffered from splenic infarctions diagnosed with CEUS. Only three of these infarctions have been seen on B-mode US before, making a sensitivity of 27% for B-mode US.^[9] Interestingly Walczyk and Walas made a review about errors made in ultrasound diagnostic of the spleen and recommend CEUS in the assessment of focal lesions, including infarctions.^[10] Görg *et al.* could show that in patients with left upper quadrant pain and splenic inhomogeneous texture in US B-mode, CEUS revealed splenic abnormalities in 50% of the cases, mostly splenic infarctions.^[11] Although the advantages in the detection of splenic infarctions by CEUS are described, it is

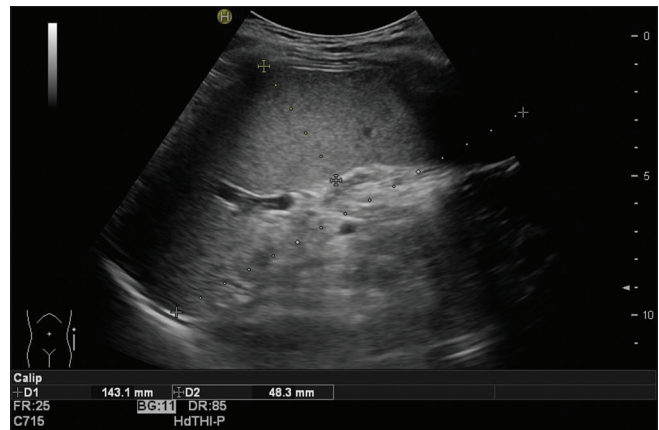


Figure 1: Splenomegaly (14 cm) at the first consultation

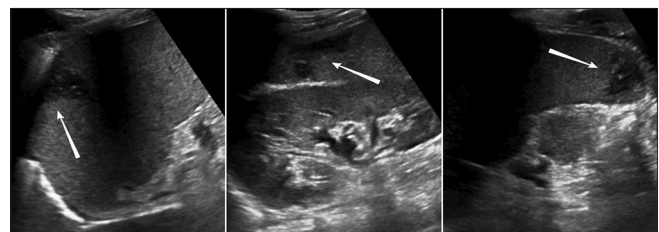


Figure 2: Hypoechogenic lesions (arrows) at the second consultation: Left image at the upper pole. Middle image at the middle portion (in front of the left kidney). Right image at the lower pole

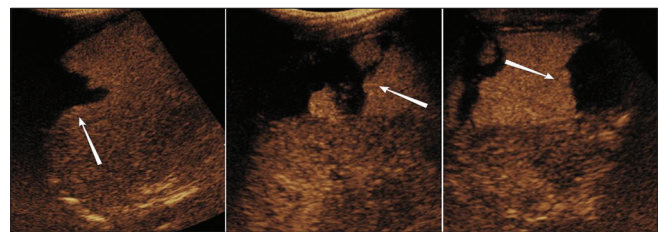


Figure 3: The same lesions (arrows) as in Figure 2 with contrast-enhanced ultrasound after 120 s of the injection. Note the absence of contrast agent (i.e., absence of perfusion) and the bigger size of the infarcted area in comparison with Figure 2, especially at the middle portion of the spleen

still rarely used. Li *et al.* described three cases of young men with splenic infarction and IM. All three cases were diagnosed with CEUS.^[12]

The use of CEUS in Europe for patients under the age of 18 is still off-label, while in 2016 the United States Food and Drug Administration approved SonoVue® for pediatric liver and intravesical applications. Patients (and/or parents) have to be informed accordingly. Indication for CEUS in children is basically the same as in adults, including evaluation for tumor, infection, injury, or ischemia in the affected organ.^[13] It has to be recognized that in the emergency setting, especially the difference between perfused and not perfused tissue is of utmost importance. While a specialist could characterize a tumor at the course, signs for infarction, hemorrhage, or abscess have to be interpreted correctly, because of the different immediate management. While an abscess in CEUS

would show an hyper-enhanced rim, it could be difficult to differentiate between an infarction and a hematoma. In these cases, the clinical context should be taken into consideration (e.g., trauma vs. nontrauma).

Our patient had symptoms for 3 days at the time of the first consultation. At that time, the spleen in B-mode US including color Doppler did not show any lesion. Texture inhomogeneity was not reported, but it could have easily been missed. After 1 week, lesions were present, resulting even bigger in CEUS than in B-mode US. Because the patient had reported abdominal pain already at the first consultation, it is possible to speculate that the CEUS examination might have detected splenic infarctions already by then. In addition, even after having seen the lesions in B-mode US, CEUS made it possible to characterize them and make the diagnosis of splenic infarctions.

In an autopsy series of 96 consecutive cases of splenic infarction of any reason done by O'Keefe *et al.*, only 10% of the splenic infarction had been suspected clinically, although this condition had contributed substantially to morbidity and mortality in 44% of the cases.^[14] This may underscore the importance of making the diagnosis during lifetime.

CONCLUSIONS

Although splenic infarctions generally, and especially on the bottom of IM are a rare incidence, in the literature, it is considered as strongly under recognized.^[15] This contributes to the importance of making an accurate diagnosis. CECT and MRI are standard for imaging the spleen, but are associated with costs and radiation (CECT). B-Mode US examination is usually used as the first imaging modality, although showing a poor sensitivity in the question of splenic lesions/infarctions. CEUS has shown very good sensitivity, is low in costs, widespread available, even at the bedside, and does not harm.

If suspicion of spleen infarction arises in EBV infection (i.e., pain in the left upper quadrant), especially when B-mode US is normal, we recommend CEUS examination as the first imaging modality independently of how long the symptoms have been present.

Declaration of patient consent

The authors certify that they have obtained appropriate patient's guardian consent form. In the form, the guardian has given the consent for the images and other clinical information to be

reported in the journal. The guardian understands that the name and initial will not be published and due efforts will be made to conceal the identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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