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Imaging Manifestations of Wandering Spleen with Torsion

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Abstract

Background: A wandering spleen (WS) is a rare clinical entity characterized by a spleen located in the lower part of the abdomen or the pelvic cavity rather than the normal anatomical site. The complications of a wandering spleen include splenic torsion, splenic infarction, and adjacent visceral injury. Case report: We present a case of a male patient admitted to the emergency department with vomiting, nausea, and persistent lower abdominal pain. Computed tomography and ultrasound were performed and were used to diagnose a wandering spleen with torsion leading to splenic infarctions. Subsequently, laparoscopic surgery and pathology confirmed this diagnosis. Why should an emergency physician be aware of this condition? Ultrasound and computed tomography scans play a significant role in diagnosing WS and its complications, allowing an emergency physician to establish treatment options

for WS.

Keywords

Wandering spleen, Ultrasonography, Computed tomography, Torsion, Infarction
introduction

A wandering spleen (WS) or ectopic spleen is a rare clinical entity characterized by the spleen being located in the lower part of the abdomen or in the pelvic cavity rather than the normal anatomic site (i.e., the left hypochondrium)(1). The incidence of WS is less than 0.2% in all patients undergoing splenectomies(2). Typically, the spleen is anchored to the left upper quadrant by the splenorenal, gastrosplenic, and splenocolic ligaments—the absence or laxity of the abovementioned peritoneal ligaments that attach to the spleen results in WS.

WS is classified as acquired or congenital based on the etiology. The acquired etiologies include abdominal muscle laxity resulting from hormonal pregnancy changes, multiparity, splenomegaly malaria, Hodgkin's disease, and Gaucher's disease(3, 4). The primary congenital etiology is the absence or underdevelopment of the splenic ligaments due to an incomplete fusion of the dorsal mesogastrium. (5, 6) Herein, we describe the imaging manifestations of a wandering spleen with torsion in a 17-year-old male patient.

Case Report

A 17-year-old male patient was admitted to the emergency department with a 3-day history of vomiting, nausea, fever, and persistent lower abdominal pain. Physical examination revealed lower abdominal tenderness without rebound

tenderness. Laboratory findings indicated that the hemoglobin concentration (Hb) was 110 g/L (normal range: 130 -175 g/L), the mean corpuscular hemoglobin (MCV) was 71.4 fL (normal range: 82 - 100 fL) , and the mean corpuscular hemoglobin (MCH) was 21.8 pg (normal range: 27 -34 pg) , suggesting microcytic hypochromic anemia. A leukocytosis of $18.88 \times 10^9/L$ (normal range: 3.5 to $9.5 \times 10^9/L$), a plasma C-reactive protein level of 179.58 mg/L (normal range: 0 - 6 mg/L) , and a platelet count of $556 \times 10^9/L$ (normal range: 125 - $350 \times 10^9/L$) were observed. Other biochemical tests were unremarkable. The patient underwent an abdominal ultrasound (US) examination using a Mindray DC-8 scanner (Mindray Medical, Shenzhen, China) with a 5.0-10.0 MHz convex array probe. The abdominal US examination was performed by a radiologist. Ultrasonography revealed that the spleen was not present in the left hypochondrium. Within the pelvic cavity and adjacent to the bladder, an enlarged wandering spleen measuring 14.2×4.3 cm (normal range in males: 12×4 cm) was detected (Figure 1A). The ultrasound of the spleen parenchyma was heterogeneous, and multiple hypoechoic zones with an unclear boundary were detected within the spleen. Color Doppler sonogram showed no color flow signal in the wandering spleen and splenic portal vein thromboembolism (Figure 1B and Video S1). At the distal side of the splenic hilum, a ‘whirled sign’ that was composed of splenic vessels rotating around the splenic pedicle strongly suggested a diagnosis of a wandering spleen with torsion. (Figure 1C-D and Video S2). Contrast- enhanced ultrasound (CEUS) was performed using a LOGIQ-E9 scanner (GE Healthcare, Milwaukee, USA) with a 5.0-10.0 MHz convex array probe. Conventional B-mode ultrasound revealed a

‘whirled sign’ mass composed of splenic vessels rotating around the splenic pedicle (Video S3). CEUS revealed no perfusion area on the spleen (Figure 2 and Video S4), suggesting the diagnosis of torsion in a wandering spleen with infarction. The computed tomography (CT) scan revealed that the spleen was not located in the left upper quadrant but in the pelvic cavity (Figure 3A-B). On the contrast-enhanced computed tomography (CECT) image, no spleen parenchyma enhancement was observed after the injection of the contrast medium. A ‘whirled sign’ was comprised of splenic vessels rotating around axes with mild enhancement (Figure 3C-D). These findings were consistent with the diagnosis of a wandering spleen with torsion. Subsequently, a laparoscopic splenectomy was performed, and we observed an enlarged spleen in the pelvis that appeared ischemic (Figure 4A). There was ascites present within the pelvis. The vascular structures appeared to be rotated 360° clockwise around the splenic pedicle (Figure 4B). The pathology results revealed splenic hemorrhagic infarction (Figure 5). The patient recovered well and was discharged six days after the procedure.

Discussion

The clinical manifestations of patients with WS are not specific, and the patients usually present with a palpable abdominal mass, acute or chronic abdominal pain, and anemia(1, 5-8). The mobility of the WS may result in a twisting of the vascular pedicle and can lead to splenic torsion or even adjacent visceral injury. The complications of WS include splenic torsion, splenic infarction, and adjacent viscera injury (pancreatic volvulus, acute pancreatitis, pancreatic necrosis, gastrointestinal

obstruction, and gastric varices)(1, 2, 5-13). Imaging procedures (ultrasound, computed tomography, and magnetic resonance imaging) play a significant role in diagnosing WS and its complications. The laboratory findings may indicate the affected viscera (anemia, high amylase, and lipase levels).

The treatment modality of WS depends on the patient's age, vascular status, degree of splenomegaly, condition of adjacent viscera, and splenic viability. The traditional surgical treatment for WS is splenectomy and splenopexy. A viable spleen can be fixated in its usual location by a splenopexy. In contrast, an infarcted spleen may eventually require a splenectomy (14). Due to the spleen serving a fundamental role in the reticuloendothelial system, splenopexy is better than splenectomy, especially in young patients(11). When WS is diagnosed, a careful search for the "whirled sign" is necessary for the confirmation of torsion. At the same time, a detailed evaluation of the spleen's viability and the condition of surrounding viscera is critical for preoperative assessment. In the present case, ultrasound and computed tomography were used to diagnose a wandering spleen with torsion. Moreover, CECT and CEUS were performed to assess the viability of the spleen. In the spleen, there were no perfusion areas on CEUS and there was absence of enhancement on CECT, indicating the diagnosis of splenic infarction. Subsequently, this diagnosis was confirmed by laparoscopic surgery and pathology.

Why should an emergency physician be aware of this?

Awareness of the imaging manifestations of WS with torsion is helpful in the early diagnosis and treatment before a splenic infarction occurs. A typical imaging

finding is a spleen located in the lower part of the abdomen or the pelvic cavity rather than the left hypochondrium. The “whirled sign” composed of the twisted pedicle is a characteristic radiographic appearance for torsion. CEUS and CECT can be used to accurately and precisely diagnose a wandering spleen with torsion and assess splenic infarctions or necrosis, allowing an emergency physician to establish treatment options for WS.

Date availability statement

The data used to support this study are available from the corresponding author upon request.

Acknowledgments

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Figure legends

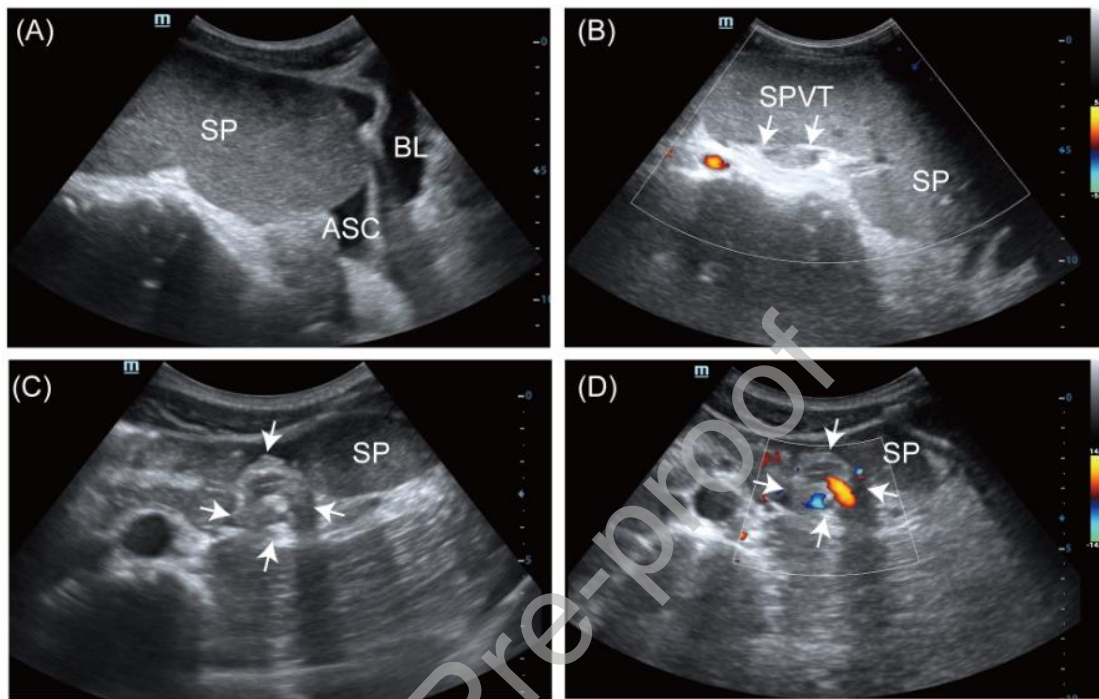


FIGURE 1 Ultrasonographic features of torsion of the wandering spleen. (A) An enlarged wandering spleen adjacent to the bladder was detected. (B) Color Doppler sonogram showed no color flow signal around or in the wandering spleen and splenic vein thrombosis. (C) A ‘whirled sign’ (white arrow) composed of splenic veins and arteries rotating around their axes was detected. (D) Color Doppler flow imaging revealed color flow signals in the ‘whirled sign’. SP, spleen; ASC, ascites; BL, bladder; SPVT, splenic portal vein thrombosis.

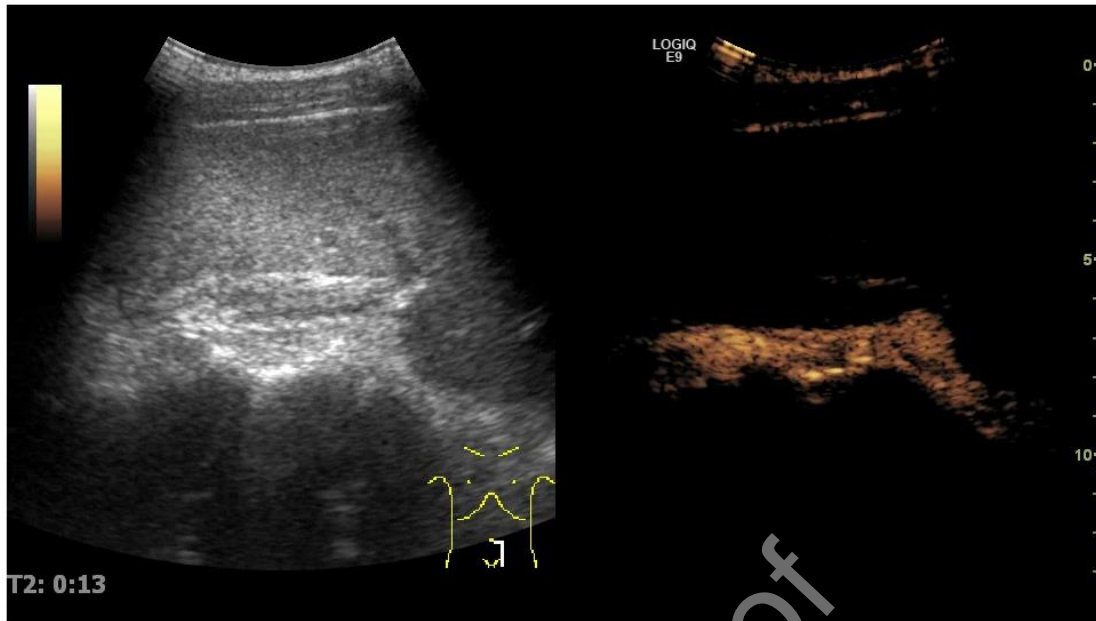


FIGURE 2 Contrast- enhanced ultrasound (CEUS) images of an infarction in a wandering spleen. CEUS revealed that the spleen was located in the pelvic cavity. There was no perfusion area in the spleen, indicating splenic infarction.

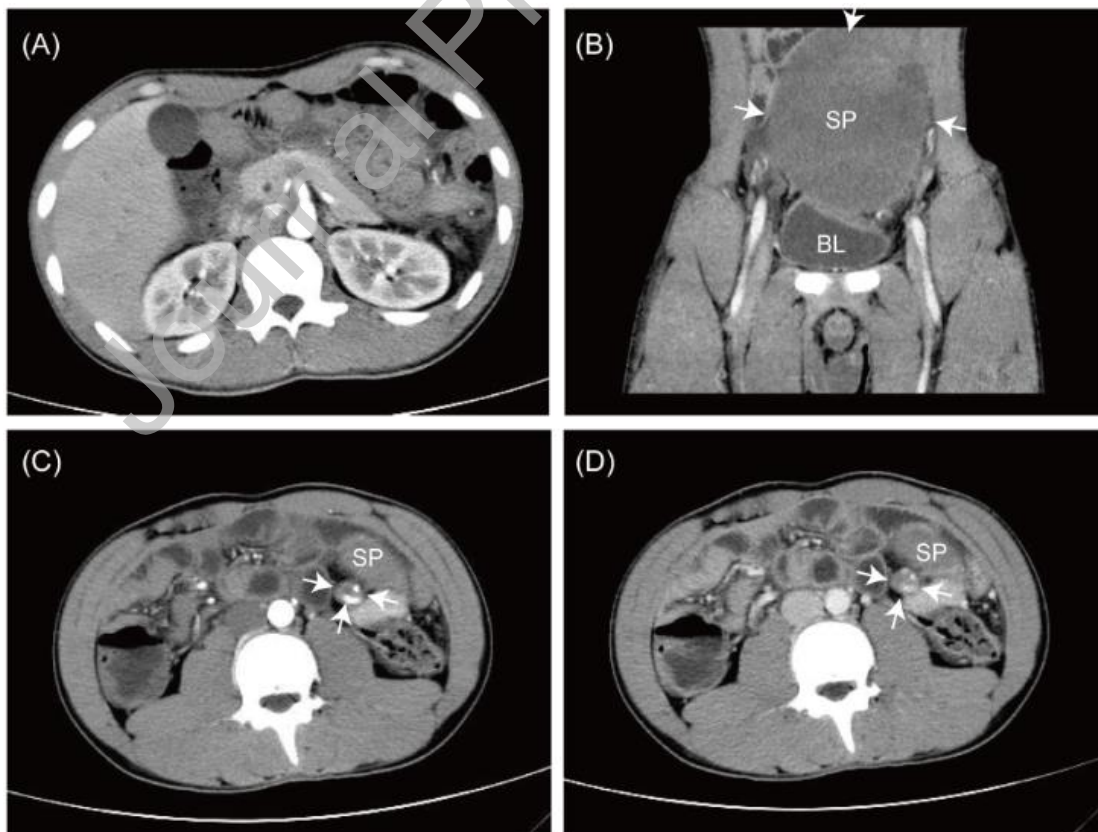


FIGURE 3 Contrast-enhanced computed tomography images of a wandering spleen

with torsion. (A-B) The CT scan in the axial plane (A) and the coronal plane (B) demonstrated that the spleen was not located in the left upper quadrant but in the pelvic cavity adjacent to the bladder. (C-D) The arterial phase (C) and portal phase (D) of the contrast-enhanced CT image in the axial plane demonstrated a “whirled sign” of the vascular pedicle containing an enhanced splenic vein and splenic artery. (white arrow). SP, spleen; BL, bladder.

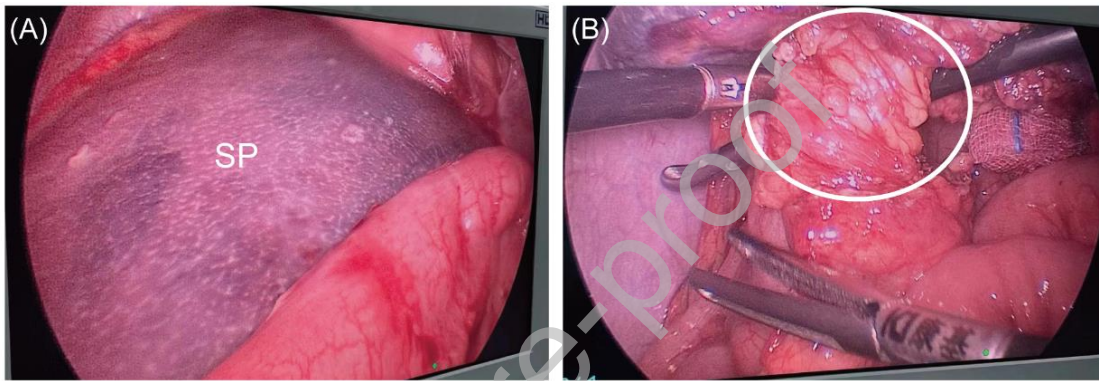


FIGURE 4 (A) The enlarged spleen in the pelvic area appeared ischemic. (B) The vascular structures appeared to be rotated 360° clockwise (white circle) around the splenic pedicle.

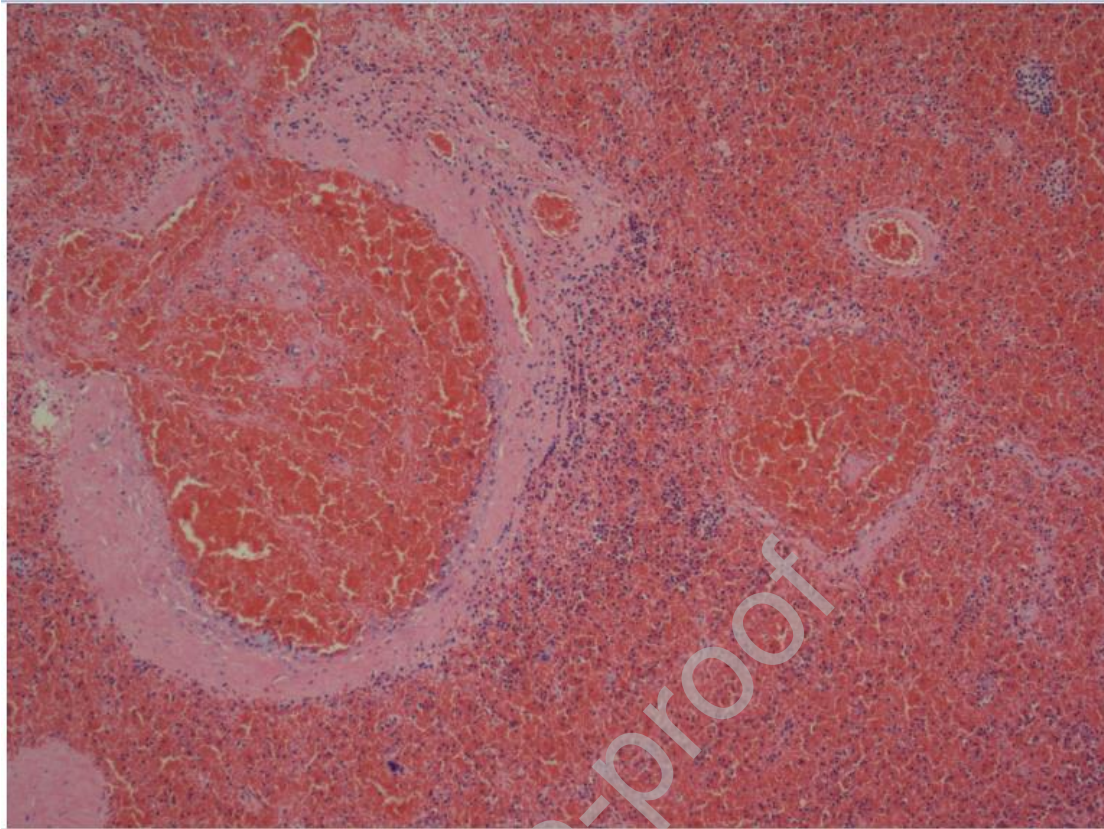


FIGURE 5 Hematoxylin and eosin (H-E) staining of the resected spleen confirmed splenic hemorrhagic infarction (magnification $\times 100$).

Video legends

Video 1 Color Doppler sonogram showed no color flow signal in the wandering spleen and splenic portal vein thromboembolism.

Video 2 At the distal side of the splenic hilum, a ‘whirled sign’ composed of splenic vessels rotating around the splenic pedicle was detected.

Video 3 A “whirled sign” composed of splenic vessels rotating around the splenic pedicle was detected, suggesting a diagnosis of a wandering spleen with torsion

Video 4 CEUS revealed no perfusion area on the spleen.