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CASE REPORT
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Splenic Artery Bleeding into the Extraperitoneal Space Mimicking Mesenteric Injury: A Rare Case of Blunt Trauma

Sang Hyun Seo, M.D.[1], Hyun Seok Jung, M.D.[1], Chan Yong Park, M.D., Ph.D.[2]

[1]Department of Radiology, Wonkwang University Hospital Regional Trauma Center, Iksan, Korea
[2]Division of Trauma Surgery, Department of Surgery, Seoul National University Hospital, Seoul, Korea

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Correspondence to
Chan Yong Park, M.D., Ph.D.
Division of Trauma Surgery, Department of Surgery, Seoul National University Hospital, 101 Daehak-ro, Jongno-gu, Seoul 03080, Korea
Tel: +82-2-2072-2817
Fax: +82-2-766-3975
E-mail: trauma-park@naver.com

Splenic injury is a common result of blunt trauma, and bleeding occurs mainly inside the splenic capsule and may leak into the peritoneal space. Herein, we report a case where active bleeding occurred in the splenic artery and only leaked into the extraperitoneal space. This is the first case of this phenomenon in a trauma patient in the English-language literature. Bleeding passed through the peritoneum, leaked into the anterior pararenal space, and continued along the extraperitoneal space to the prevesical space of the pelvis. Therefore, on the initial computed tomography (CT) scan, the bleeding appeared to be in the left paracolic gutter, so we suspected mesenteric bleeding. However, after the CT series was fully reconstructed, we accurately read the scans and confirmed splenic injury with active bleeding. If there had been a suspicion of bowel or mesenteric injury, surgery would have been required, but fortunately surgery could be avoided in this case. The patient was successfully treated with angioembolization.

Keywords: Splenic artery; Trauma; Bleeding; Extraperitoneal; Embolization

INTRODUCTION

If hemoperitoneum is observed due to a blunt abdominal injury, a variety of causes should be considered. Possible causes include injury of the liver, spleen, kidney, and mesentery [1]. Fluid collection by bowel perforation should also be included in the differential diagnosis. If there is bowel perforation or mesenteric vessel laceration, surgical treatment is necessary; therefore, it is important to identify the bleeding focus [2]. Herein, we report the case of a distal splenic artery rupture with mild perisplenic

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hematoma, which mainly leaked into the extraperitoneal space and mimicked mesenteric bleeding. This is the first report of active splenic bleeding observed only in the extraperitoneal space in a trauma patient.

CASE REPORT

A 60-year-old woman was admitted to a regional trauma center complaining of left chest pain and right lower extremity pain after being a passenger in a traffic accident. The patient's initial blood pressure was 130/80 mmHg, and her mental status was alert. Initial computed tomog-

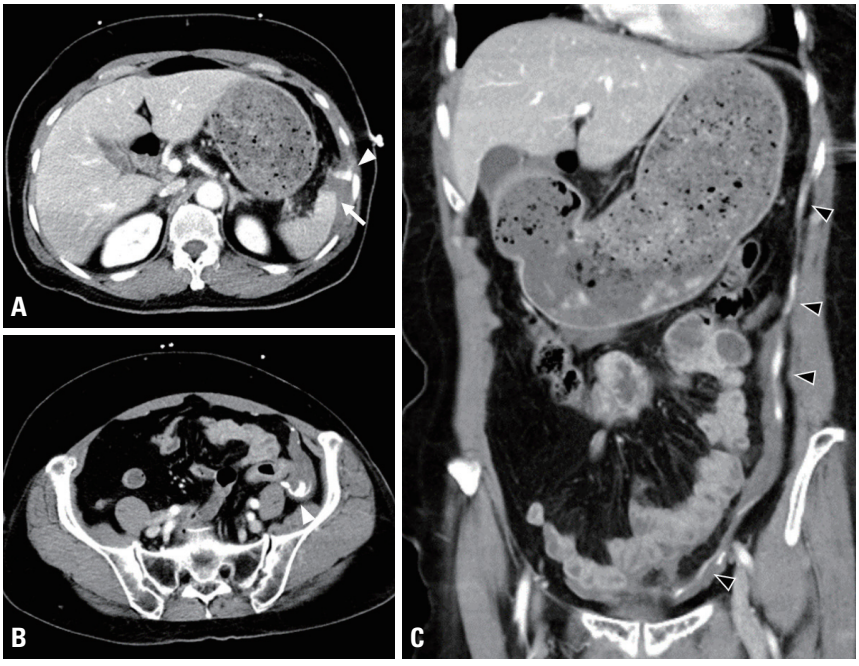

Fig. 1. (A, B) On abdominal computed tomography, axial images show contrast extravasation around the spleen to the left paracolic gutter (arrowheads). Focal splenic laceration was observed in the lower pole of the spleen (arrow of A). (C) A coronal scan image shows contrast extravasation continuing along the narrow track (black arrowheads), with hematoma observed around it.

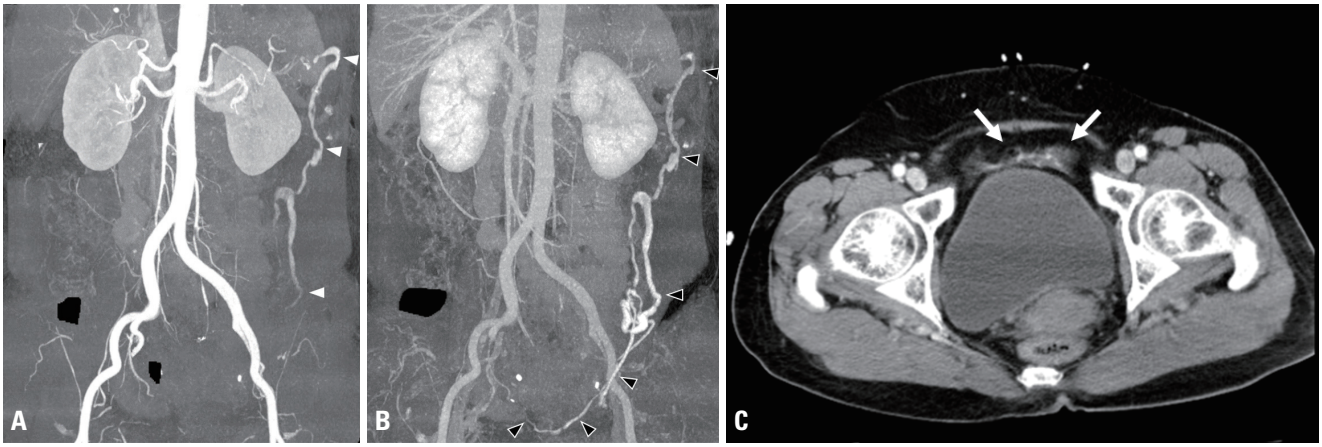

Fig. 2. (A) The maximum intensity projection image of the arterial phase shows contrast extravasation extending to the right paracolic gutter (arrowheads). (B) The maximum intensity projection image of the portal phase shows contrast extravasation extending up to the bladder (black arrowheads). (C) An axial scan image shows focal contrast extravasation in the prevesical space (arrows).

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raphy (CT) was performed 25 minutes after arrival, and abdominal CT showed serpentine acute contrast extravasation along the left paracolic gutter with loculated hematoma (Fig. 1). It also showed a focal splenic laceration with a small perisplenic hematoma, indicating an American Association for the Surgery of Trauma (AAST) Organ Injury Scale (OIS) grade II injury. The area of active bleeding did not show a direct connection with the spleen, so upon the first reading, we thought that the bleeding was due to a mesenteric injury.

However, after re-reading, we clearly determined that the bleeding originated from the spleen. The reasons for this are as follows. We compared the arterial phase images with the portal phase images. In the arterial phase, active bleeding was seen only from the spleen to the left paracolic gutter, but in the portal phase, it was observed that the extravasation extended to the prevesical space (Fig. 2). Considering the direction of the extravasation, it could be concluded that bleeding started in the upper part of the body. Furthermore, because extravasation was seen in the prevesical space, it could be determined that the bleeding leaked along the extraperitoneal space. The last reason was that a focal splenic laceration was seen at the starting point of extravasation and was adjacent to the anterior pararenal space.

We confirmed that the patient had a splenic injury and planned angioembolization to control active bleeding. Splenic angiography showed massive extravasation from the splenic artery, leaking out of the splenic capsule (Fig. 3A). Embolization was performed using a mixture of N-butyl cyanoacrylate and lipiodol, and extravasation was no longer shown after embolization (Fig. 3B). During the procedure, the patient's systolic blood pressure (SBP) decreased to 80 mmHg; however, her SBP normalized after the procedure. CT performed 1 week after the procedure showed no extravasation, and most of the spleen was preserved (Fig. 4).

DISCUSSION

Splenic injury is one of the most common types of injury

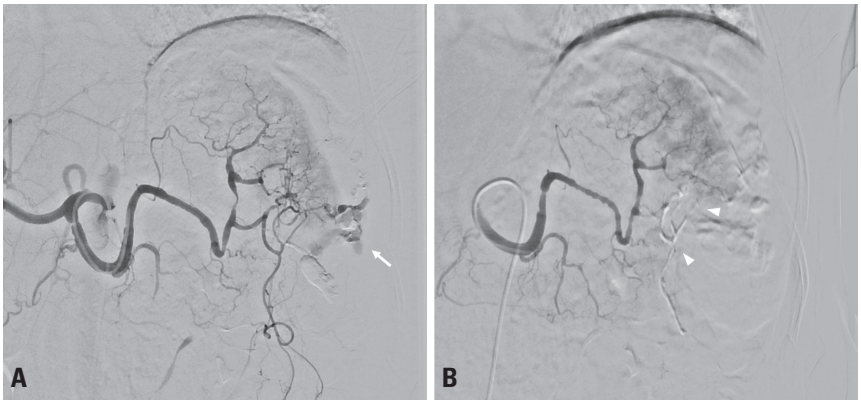

Fig. 3. (A) Splenic angiography shows massive contrast extravasation in the splenic artery of the lower pole (arrow). (B) This image was obtained after injection of N-butyl cyanoacrylate. Embolized blood vessels were observed on final angiography (arrowheads), and there were no other bleeding findings.

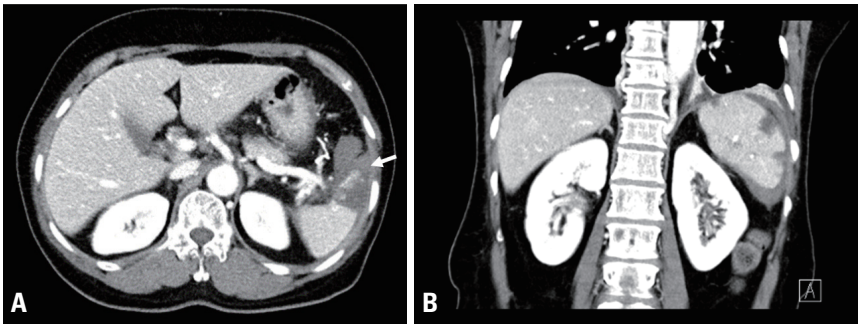

Fig. 4. (A, B) One week after angioembolization, abdominal computed tomography was performed. Some infarcts were seen (arrow of A), but most of the spleen was well preserved.

in cases of blunt abdominal trauma [3]. When the splenic artery is ruptured, active bleeding is usually confined to the splenic capsule or leaks into the peritoneal space, such as the perisplenic space, perihepatic space, or paracolic gutter [4]. However, in this case, a splenic injury occurred adjacent to the anterior pararenal space, and active bleeding was seen only in the extraperitoneal space through the peritoneum.

The extraperitoneal space is a potential space that surrounds the peritoneal cavity, and encompasses the retroperitoneal space, preperitoneal space, prevesical space, perivesical space, and perirectal space [5]. The retroperitoneal space includes the anterior pararenal space, perirenal space, and posterior pararenal space. The extraperitoneal space is generally well known as a path of disease spread, as has been proven through several cadaveric studies [6-8]. Mindell et al. [9] demonstrated that the anterior pararenal and posterior pararenal spaces communicated with the extraperitoneal spaces in the pelvis. In trauma patients, the importance of the anatomy of the extraperitoneal space has been overlooked, but it is necessary to know exactly how to evaluate the correct bleeding focus.

CT is an important diagnostic tool in trauma, and multidetector computed tomography (MDCT) is especially helpful for confirming the bleeding focus [10]. MDCT can provide a more accurate reading through multiplanar image reconstruction, multiple phase analysis, and maximum intensity projection images. Urgent situations often occur in trauma patients, but if possible, it is important to wait until all images have been reconstructed in order to make an accurate diagnosis [11]. The Regional Trauma Center of Wonkwang University Hospital has a 24-hour interventional radiology team. Therefore, an immediate reading by a radiological interventionist is possible for trauma patients. If a bleeding is identified on a CT scan, a radiological intervention can be performed without delay.

The AAST OIS is generally used to grade splenic injuries. According to the previous OIS, this case was only grade II. However, according to the 2018 AAST guideline, a classification according to the presence of active bleeding in splenic injuries was added [12]:

Grade IV: Any injury in the presence of a splenic vascular injury or active bleeding confined within splenic capsule.

Grade V: Any injury in the presence of splenic vascular injury with active bleeding extending beyond the spleen into the peritoneum.

Active bleeding was observed extending through the peritoneum to the extraperitoneal space, so this injury would be classified as grade V according to the modified OIS. The difference between the two grading systems has considerable significance in clinical applications [13]. In this case, the SBP decreased from 130 mmHg to 80 mmHg during the radiologic intervention.

Previously, surgical treatment was the principle for splenic injuries, but splenic embolization has been attempted more frequently in recent years [14]. Lee et al. [15] showed that distal embolization of AAST grade V splenic injuries is a safe and effective procedure for spleen salvage. In this case, bleeding was observed in the distal splenic artery, and embolization was possible only in a minimal area. Therefore, most of the splenic parenchyma was preserved on follow-up CT.

In conclusion, the most important lesson from this case report is the need to accurately read images to ensure that the correct bleeding focus is identified in trauma patients. When evaluating the bleeding focus on CT, the vascular flow or anatomic space should be considered comprehensively. As a result, unnecessary surgery can be avoided, and angiography may be used as a favorable tool for non-operative management.

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