

## Successful Management of a Symptomatic Splenic Artery Aneurysm with Transcatheter Embolization

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### Abstract

We describe a symptomatic splenic artery aneurysm (SAA) with occasional left-sided abdominal pain which was successfully treated with transcatheter embolization. A 65-year-old man was referred to a nearby clinic because of left shoulder and abdominal pain developing the day after blunt trauma to the shoulder and abdomen. Radiography revealed no fracture, and the patient went home. He stopped working for 7 months. Left-sided abdominal pain then developed several times after strenuous physical labor, and the patient was referred to a nearby hospital. The patient had a history of asthma and untreated hypertension; the use of iodinated contrast material was therefore avoided. Unenhanced computed tomography (CT) and magnetic resonance imaging (MRI) of the abdomen revealed a hematoma in the splenic hilum. The patient was referred to Nippon Medical School Hospital. His neurologic status was stable. Unenhanced CT of the abdomen at a nearby hospital revealed a low-density area in the splenic hilum. Fat-suppressed, T1-weighted images showed a hyperintense lesion adjacent to the splenic hilum. Fat-suppressed, T2-weighted images showed a dark hemosiderin rim, a bright ring, and an intermediate central core, which indicated a recurrent chronic hematoma in the abdomen. Dynamic contrast-enhanced MRI revealed a small hyperenhanced lesion adjacent to the hematoma, which appeared to be an SAA. After an injection of corticosteroids, selective splenic arteriography was performed. The splenic artery was catheterized via a right femoral approach. Arteriography showed an SAA, 1 cm in diameter with extravasation of contrast material. The neck of the SAA was catheterized with a microcatheter, and coils were placed successfully into the SAA to prevent recurrent bleeding. Postembolization angiography showed total occlusion of the SAA. The patient was discharged 7 days after embolization and has since resumed normal activities, with no residual symptoms.

(J Nippon Med Sch 2009; 76: 308–318)

**Key words:** posttrauma, splenic aneurysm

### Introduction

Most visceral artery aneurysms, including splenic

artery aneurysms (SAAs), are asymptomatic, but as many as 22% of patients present with rupture requiring emergency treatment<sup>1,2</sup>. SAAs with occasional symptoms rarely improve without

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Fig. 1 An unenhanced CT scan of the abdomen obtained at a nearby hospital, showing a low-density area in the splenic hilum.

treatment. We describe a case of SAA associated with occasional left abdominal pain which was successfully treated with transcatheter embolization.

### Case Report

A 65-year-old man was referred to a nearby clinic because of left shoulder and abdominal pain the day after sustaining blunt trauma to the shoulder and abdomen by a seatbelt in a traffic accident. Radiographic examination revealed no fracture, and the patient went home. He returned to the clinic 3 days a week to treat a contusion of the left shoulder. He stopped working for 7 months and then had had several episodes of left-sided abdominal pain after strenuous physical labor. After bed rest for a while, the abdominal pain resolved spontaneously. Left-sided abdominal pain then sometimes occurred after strenuous physical labor, and the patient was referred to a nearby hospital. The medical history included asthma and untreated hypertension; iodinated contrast material was therefore avoided. Initial unenhanced computed tomography (CT) and magnetic resonance imaging (MRI) of the abdomen revealed a hematoma in the splenic hilum.

The patient was referred to Nippon Medical School Hospital. The initial blood pressure was 150/100 mmHg. The hematocrit was 38.1%, and the hemoglobin level was 12.6 g/dL. Physical examination revealed mild tenderness in the left upper quadrant of the abdomen. The neurologic status was stable. Gastroduodenoscopy revealed mild

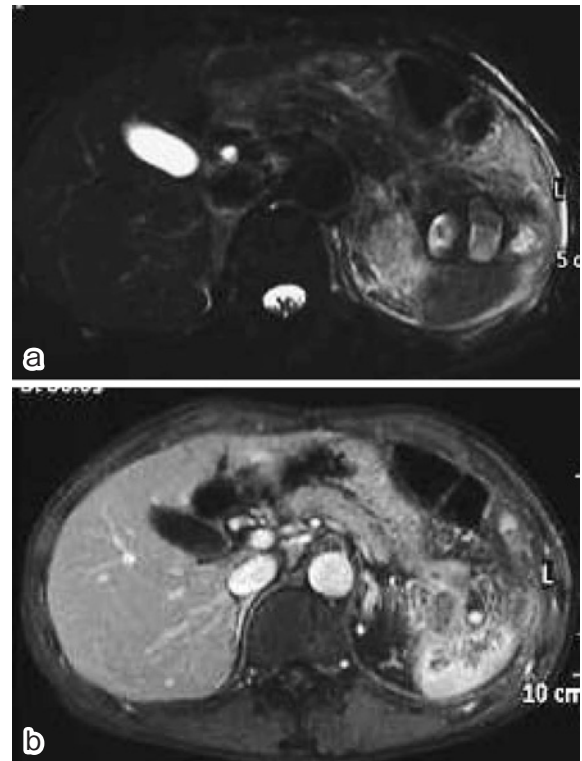


Fig. 2 Fat-suppressed T1-weighted images showed a hyperintense lesion adjacent to the splenic hilum. Fat-suppressed T2-weighted images showed a dark hemosiderin rim, a bright ring, and an intermediate central core, indicating a recurrent chronic hematoma in the abdomen (a). Dynamic contrast-enhanced MRI revealed a small hyperenhanced lesion adjacent to the hematoma, corresponding to the SAA (b).

erosive gastritis. Unenhanced CT of the abdomen, performed at a nearby hospital, revealed a low-density area in the splenic hilum (**Fig. 1**). Fat-suppressed, T1-weighted images showed a hyperintense lesion adjacent to the splenic hilum. Fat-suppressed, T2-weighted images showed a dark hemosiderin rim, a bright ring, and an intermediate central core, indicating a recurrent chronic hematoma in the abdomen (**Fig. 2a**). Dynamic contrast-enhanced MRI revealed a small hyperenhanced lesion adjacent to the hematoma, corresponding to the SAA (**Fig. 2b**).

After an injection of corticosteroids, selective splenic arteriography was performed. The splenic artery was catheterized via a right femoral approach. Arteriography showed a SAA, 1 cm in diameter with extravasation of contrast material. The neck of the SAA was catheterized with a

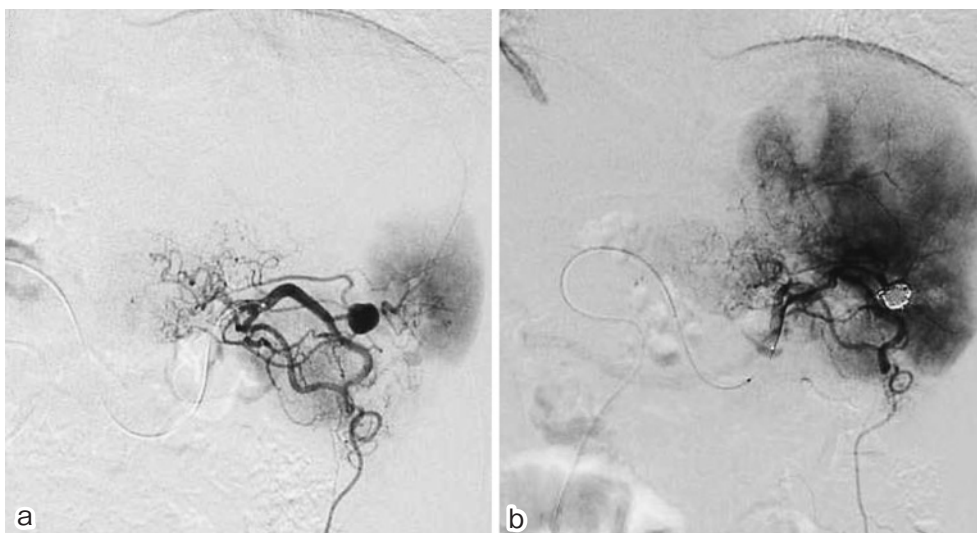


Fig. 3 After an injection of corticosteroids, selective splenic arteriography was performed. The splenic artery was catheterized via a right femoral approach. An SAA, 1 cm in diameter, was evident (a). The neck of the SAA was catheterized with a microcatheter, and coils were placed successfully into the SAA to prevent recurrent bleeding. Postembolization angiography showed total occlusion of the SAA (b).

microcatheter, and coils were successfully placed into the SAA to prevent recurrent bleeding. Postembolization angiography showed total occlusion of the SAA (**Fig. 3**). The patient recovered uneventfully, was discharged 7 days after embolization, and has resumed normal activities, with no residual symptoms.

### Discussion

SAAAs are the most common visceral-artery aneurysms, with a reported prevalence of 0.8% at arteriography and 0.04% to 0.10% at autopsy. SAAAs are usually small (<2 cm in diameter), circular, and located at a bifurcation in a middle or distal segment of the splenic artery. Most SAAAs are detected incidentally during diagnostic imaging for other indications. Rupture of SAAAs is rare but is associated with a high mortality rate if left untreated. Trastek et al.<sup>3</sup> have reported 3 cases of acute rupture among 100 SAAAs. They also followed up 34 asymptomatic aneurysms (mean diameter, 1.8 cm) in this series for a mean of 6.4 years; only 1 aneurysm ruptured (rupture rate, 3%). In symptomatic patients, the rupture rate ranges from 76% to 83%, but the time from the onset of symptoms to rupture has not been reported. The

mortality rate after rupture ranges from 10% to 25%<sup>1,3-6</sup>.

Blunt trauma is the most common mechanism of intra-abdominal injury. The liver and spleen are most commonly involved. In many trauma centers, patients who have solid-organ injuries and are in stable condition are treated conservatively with bed rest and serial hematologic monitoring. Patients with signs or symptoms of bleeding may undergo splenectomy or angiographic embolization if their condition is stable. Operative trauma, pancreatitis, and blunt abdominal trauma affecting the spleen are associated with pseudoaneurysms of the splenic artery. SAAAs have been found in 67% of adults with blunt splenic injury who did not respond to nonoperative treatment and can lead to delayed splenic hemorrhage<sup>7</sup>. Although most pseudoaneurysms resolve spontaneously, some gradually become larger and ultimately rupture<sup>8</sup>. SAA can be observed until spontaneous resolution<sup>9</sup> or treated with splenorrhaphy<sup>10</sup>, partial splenectomy, or splenic artery embolization<sup>11</sup>.

Active bleeding from SAAAs can cause intraparenchymal hematoma, as demonstrated with CT<sup>10</sup>, Doppler ultrasound<sup>9</sup>, or MRI<sup>11</sup>. CT has become the gold standard for the management of hemodynamically stable trauma because of its

widespread availability, rapid results, and sensitivity of 90% to 94% for the diagnosis of solid-organ, intra-abdominal injuries. In patients whose condition is stable, however, possible drawbacks of CT include nephrotoxicity and anaphylactic reactions due to iodinated contrast media. We performed only non-contrast-enhanced CT in our patient because he had asthma, potentially associated with an increased risk of adverse reactions due to iodinated contrast agents. Advantages of MRI over CT include higher sensitivity for hematoma, better soft-tissue contrast, no radiation exposure, and the greater safety of gadolinium-based contrast agents as compared with iodine-based contrast agents. Owing to these properties, MRI revealed the recurrent chronic hematoma as well as the aneurysm in our patient.

It is unknown why the presentation of some pseudoaneurysms is delayed, i.e., pseudoaneurysms may not be visualized on initial scans but appear on subsequent CT or MRI. Given that pseudoaneurysms develop because of deceleration with intimal fragmentation and weakening of the arterial wall, thrombolysis at sites of vessel-wall injury is most likely involved<sup>7</sup>. Visualization of a pseudoaneurysm may also depend on the exact timing of the bolus injection of contrast material, or patients may arrive at hospitals so quickly that the aneurysm has not yet “blossomed” when initial CT scans are obtained<sup>7,13</sup>. All of these factors are arguments for repeated scanning in patients with suspected splenic involvement.

Recently, nonsurgical transcatheter embolization of SAAs has been performed successfully as an alternative to splenectomy, especially in children, to preserve splenic immune function<sup>14-17</sup>. Splenic artery embolization has been used to treat portal hypertension, myeloproliferative disorders, and other chronic diseases<sup>27-29</sup>. After splenic artery embolization, splenic perfusion decreases substantially, but is preserved through collaterals from the short gastric arteries, left gastroepiploic arteries, and branches of the left gastric artery. Transcatheter embolization has been used to treat SAAs<sup>19-27</sup>. When SAA rupture is suspected, arteriography is useful for confirming the diagnosis, determining the exact location of the aneurysm,

screening for other lesions, assessing the feasibility of endovascular treatment, and inducing temporary hemostasis with an inflatable balloon catheter before surgery, if endovascular exclusion with embolization of the aneurysm is unfeasible or unsuccessful<sup>24,22</sup>. Newer and smaller angiographic catheters are now available. Such catheters can be successfully advanced into small arteries, allowing microcoils to be accurately placed with respect to the neck of the pseudoaneurysm. When a splenic pseudoaneurysm is diagnosed, we believe that an attempt at transcatheter embolization is indicated, even though spontaneous resolution can occur, because the procedure is safe and effective<sup>18</sup>.

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(Received, August 5, 2009)

(Accepted, September 11, 2009)