



A Rare Complication of Blunt Traumatic Injury: Posttraumatic Intrasplenic Arteriovenous Fistula and Treatment by Superselective Coil Embolization

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Abstract

Posttraumatic intrasplenic arteriovenous fistula is a very rare complication of blunt traumatic injury. Computed tomography angiography is a useful and noninvasive technique to follow up nonsurgically managed patients with posttraumatic splenic injury and has a vital role detecting delayed complications such as arteriovenous fistula. Endovascular treatment of a vascular complication prevents risk of surgery and splenectomy complications. We present a case of posttraumatic arteriovenous fistula in 39-year-old male which was diagnosed by computed tomography angiography and successfully treated by transcatheter coil embolization.

Key Words: CT angiography, splenic AVF, transcatheter embolization, blunt trauma

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Introduction

Splenic arteriovenous fistula (SAVF) is a very rare entity which can be either congenital or acquired [1]. Acquired SAVF develops commonly due to spontaneous rupture of posttraumatic or a pre-existing splenic artery aneurysm into an adjacent splenic vein or penetrating injury producing direct arteriovenous communication [1]. SAVF is rarely intrasplenic, but most are extrasplenic [2]. Splenic artery embolization is an accepted nonsurgical intervention for the treatment of a variety of clinical disorders including arteriovenous fistula [3]. To our knowledge only a few cases of posttraumatic intrasplenic arteriovenous fistula treated by transcatheter coil embolization reported in the literature. Here in, we report a case of posttraumatic intrasplenic arteriovenous fistula diagnosed by computed tomography angiography and successfully treated by superselective transcatheter coil embolization in 39-year-old male.

Case report

A 39-year-old male was admitted our emergency department after blunt abdominal trauma due to falling down from a tractor. His physical examination was remarkable for mild left upper abdominal tenderness. The patient's initial blood pressure was 90/50 mm Hg, and his pulse was 130 beats per minute. The hemoglobin level was 12.8 g/dl, and hematocrit level was 0.38. The patient's serum electrolytes, renal and liver function tests were all within normal limits. His neurologic status was stable. Initial enhanced computed tomographic scans of thorax and abdomen showed displaced fractures of 9th, 10th and 11th ribs associated with left-sided pneumothorax and a 4-cm laceration in the midbody of the spleen, involving hilus, with intraparenchymal and perisplenic fluid extravasation. These findings suggested grade 4 splenic injury. There was no other intraabdominal injury.

Following day an US examination was performed with 3.5 MHz linear probe on an Applio XG ultrasound machine (Toshiba Medical Systems, Otawara, Japan) to evaluate the splenic injury and perisplenic fluid. US examination showed numerous dilated structures surrounded by hypoechoic areas in the splenic parenchyma which was redolent of dilated vessels. Color Doppler US illustrated pulsatile venous flow and increased diastolic flow in the splenic

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parenchymal artery. This flow pattern of intrasplenic vessels was suggestive for an arteriovenous fistula.

Intrasplenic fluid and increased attenuation of this area in computed tomography and color Doppler ultrasonography findings guided our diagnosis to an intrasplenic arteriovenous fistula. Therefore we performed a computed tomography angiography examination with a 16-MSCT scanner (Aquilion 16 system, Toshiba Medical Systems Corporation, Japan). Examination parameters were as follows: collimation, 16x1mm; reconstruction interval, 0.5mm; tube rotation period, 0.4 sec, 120 kV, 350 mAs. Scanning area was defined as the space between diaphragm and aortic bifurcation. Patients lied on the examination tables in supine position, 18-20 G catheters were introduced to antecubital veins. Non-ionic, iodine containing contrast media were administered with an automated injector pump (Ulrich Medizintechnik Missori) at a rate of 4 ml/sec, to a total volume of 120ml's. A fistulous communication between a small distal branch of splenic artery and early enhancement of an adjacent vein demonstrated (Fig 1). During the ensuing 7 days after admission, the patient was observed in the general surgery unit. He remained hemodynamically stable and tolerated oral intake, and splenic injury was managed without surgery. Superselective splenic angiography and transcatheter coil embolization of the fistula scheduled to avoid late complications of SAVF, to maintain splenic immune function and to prevent the splenectomy and the surgery.

Under general anesthesia the splenic artery was evaluated by selective angiography. Initially celiac axis secondly splenic artery were catheterized with a 5F Cobra I (Obtitorque, Terumo Europe NV, Leuven, Belgium) via the right femoral approach which showed SAVF characterized by early splenic vein filling (Fig 2a). Superselection of a small middle pole branch was achieved by a microcatheter. Selective injections at this location demonstrated early filling of an adjacent vein and early splenic venous drainage, indicating an intraparenchymal arteriovenous fistula (Fig 2b). Successful coil occlusion of this splenic parenchymal branch performed. A postembolization angiogram demonstrated complete resolution of the arteriovenous fistula (Fig 3). Follow up computed tomography angiography scan 3 months after coil embolization illustrated homogenous splenic parenchyma without any infarction and confirmed successful total occlusion of SAVF.



Figure 1. A coronal 3-dimensional volume-rendering image, obtained with 16- MSCT scanner, a fistulous communication between a small distal branch of splenic artery and early enhancement of an adjacent vein demonstrated (arrows).



Figure 2. a, b. Splenic arteriogram (a) confirms the presence of arteriovenous fistula, takes its origin from a middle segmental arterial branch. Supraselective splenic artery injection (b) demonstrated early filling of splenic vein which is indicating an arteriovenous fistula.



Figure 3. Splenic arteriogram after embolization of the segmental artery related with arteriovenous fistula. Coils were placed into the middle segmental branch and total occlusion of arteriovenous fistula achieved.

Discussion

Most commonly injured organ after blunt abdominal trauma is spleen [2]. Current treatment of blunt splenic injury is conservative. Lacerations and hematomas can usually resolve with time [2]. But rarely an arteriovenous fistula may develop which is expected to place most likely extrasplenic. After abdominal blunt trauma intrasplenic arteriovenous fistula is a very rare entity which can be cause of a variety of delayed complications if the diagnosis and treatment is late. The common concern with nonsurgical management of splenic injury involves increased risk of delayed splenic complications such as hemorrhage, aneurysm, infection and arteriovenous fistula [4]. At that point ultrasonography and computed tomography angiography have a significant role.

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The development of SAVF after blunt abdominal trauma depends on the rupture of a pre-existing splenic artery aneurysm or a posttraumatic pseudoaneurysm into an adjacent vein. Clinical diagnose can be made by auscultation of a loud continuous systolic murmur in the left upper quadrant of the abdomen, and can be confirmed by imaging modalities. These SAVFs may be asymptomatic for an extended interval. However some of them is presented with delayed complications of arteriovenous fistula including portal venous hypertension with ascites, hepatportal sclerosis and upper and lower gastrointestinal hemorrhage. Diarrhea and chronic abdominal pain from bowel ischemia due to mesenteric steal syndrome have also been described in the literatures [2].

Color Doppler ultrasonography is simple, safe, readily available, non-invasive, rapid and relatively inexpensive method to evaluate the splenic injury and also useful to characterize the direction and velocity of blood flow in splenic parenchymal vessels [4]. In clinically suspicious patients color Doppler ultrasonography can be the first modality to diagnose SAVF. Pulsatile venous flow and increased diastolic flow in the splenic parenchymal artery is typical for arteriovenous fistula.

Computed tomography is safe, noninvasive and useful modality for the detection of splenic injury, vascular abnormalities and posttraumatic splenic complications [5]. To define the patients who will be managed nonsurgical and during the follow up these patients to private related complications computed tomography has a significant role. In our patient SAVF diagnosed timely by computed tomography and elective embolization of fistula was planned.

More recently, nonoperative management of SAVF by using transcatheter embolization has been performed successfully as an alternative to splenectomy for the preservation of splenic immune function and prevention postsplenectomy complications. In the series reported by Sclafani et al and Hagiwara et al, transcatheter embolization has successfully proven as an effective intervention for achieving splenic salvage [6,7]. Use of different embolic materials has been reported in the literatures such as coils, gelfoam and NBCA. The theory behind these similar studies was occluding proximal splenic artery and decrease blood pressure to the organ. However these techniques have complicated septicemia and splenic abscess due to infarction of large portion of the spleen. In the case of Salis et al superselective embolization of segmental branches in patients with arteriovenous fistula was provided the most efficient means to definitely occlude the lesion and prevent splenic sepsis. In the similar studies it has

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shown that the risk of sepsis significantly decreased when only the segmental branches occluded [8]. In this report superselective coil occlusion of segmental branch has been successfully performed with preservation of the splenic function.

In conclusion, due to the growing trend toward conservative management of the splenic trauma, the incidence of SAVFs may well increase. This case report illustrates the importance of adequate radiologic follow up in extensive splenic injury for early identification of complication such as SAVF. Computed tomography is very useful and noninvasive technique for the detection of complications in conservatively managed patients with splenic injury. To maintain splenic immune function and to prevent the risk of surgery and splenectomy complications, transcatheter coil embolization of segmental branches can be successfully used in patients with posttraumatic splenic arteriovenous fistula.

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