Splenic Artery Embolization and Balloon Occlusion Retrograde Alcohol Embolization in a Patient with Bleeding Gastric Varices

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ABSTRACT

We present a patient with a large spontaneous splenorenal shunt secondary to isolated splenic vein thrombosis who developed severe bleeding from fundal gastric varices. The patient was managed emergently with splenic artery embolization and balloon occlusion retrograde embolization of the varices with alcohol. We discuss the clinical presentation, embolization techniques, and a potential complication of the use of alcohol for this purpose.

KEYWORDS: Balloon occlusion retrograde embolization, splenic vein thrombosis, splenorenal shunt, portosystemic communications, gastric varices, splenic artery embolization, postembolization cardiovascular collapse

Objectives: Upon completion of this article, the reader should understand the methodology and indications for which splenic artery embolization and balloon occlusion retrograde embolization may be employed, gain knowledge about splenic vein thrombosis, and learn the complications of alcohol embolization.

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Although rare in comparison to portal vein thrombosis, isolated splenic vein thrombosis (ISVT) can occur in up to 20% of patients with pancreatitis. Other causes of ISVT include trauma, pancreatic cancer, lymphoma, sarcoma, retroperitoneal fibrosis, splenic artery aneurysms, gastric surgery, myeloproliferative disease, and hereditary thrombocythemia.[1] When ISVT occurs, pressure increases within the short gastric and gastroepiploic veins and causes sinistral, or left-sided, portal hypertension. The increase in pressure causes the blood flow to reverse in the short gastric veins and induces the formation of fundal gastric varices (Fig. 1). In some patients, the high pressure in the venous system around the stomach induces the formation of venous collaterals from these varices, most notably to the inferior phrenic vein and adrenal vein, with the latter being termed a spontaneous splenoral shunt (SSS). Characteristically in ISVT, the hypertensive short gastric and gastroepiploic veins empty into a normal portal vein via the left gastric vein, and thus these patients develop isolated gastric varices but not esophageal varices (Fig. 1). We describe a case of a patient with ISVT

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Case-Based Interventional Radiology; Guest Editors, Ron C. Gaba, M.D., Derek L. West, M.D., James T. Bui, M.D., Charles A. Owens, M.D.

Semin Intervent Radiol 2007;24:53–57.
DOI 10.1055/s-2007-971186. ISSN 0739-9529.

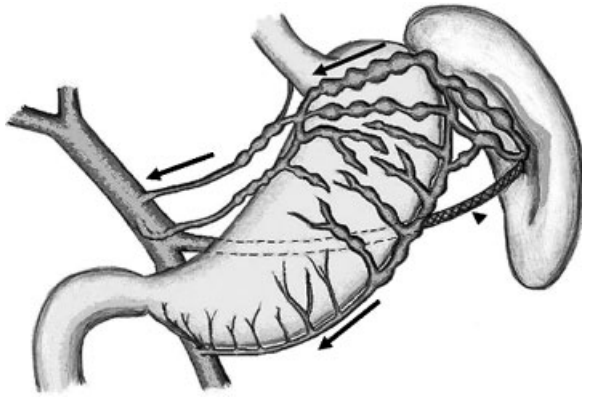

Figure 1 Schematic diagram demonstrating isolated splenic vein thrombosis (ISVT) and the formation of gastric fundal varices. Black arrows represent direction of venous blood flow. Arrowhead points to thrombosed splenic vein.

who presented with fundal variceal bleeding and was managed with splenic artery embolization in combination with balloon occlusion retrograde embolization of the gastric varices and SSS with alcohol.

CASE REPORT

A 49-year-old Hispanic woman with a history of hepatitis C, alcohol abuse, and probable pancreatitis presented with acute massive hematemesis and hemodynamic instability. Upper endoscopy demonstrated grade 4 oozing gastric varices in the gastric cardia with an overlying clot and fresh blood in the fundus. There were no esophageal varices. Octreotide therapy was immediately begun but did not slow the bleeding. The interventional radiology service was consulted to perform a transjugular intrahepatic portosystemic shunt (TIPS) procedure. However, in the face of isolated gastric varices, it was decided to proceed first with mesenteric arteriography to delineate the anatomy of the mesoportal and splenoportal systems. The celiac trunk was catheterized and a splenic arteriogram showed a patent splenic artery feeding an enlarged spleen. The venous phase demonstrated large gastric varices and a SSS (Fig. 2). The true splenic vein was not identified. A cobra catheter was selectively placed distally into the splenic artery, in close proximity to the splenic hilum, and embolization of the splenic artery was performed using 8 mm × 14 cm Nester coils (Cook, Bloomington, IN). The postembolization angiogram showed significant reduction of blood flow to the spleen with preservation of flow to an upper pole branch vessel (Fig. 3).

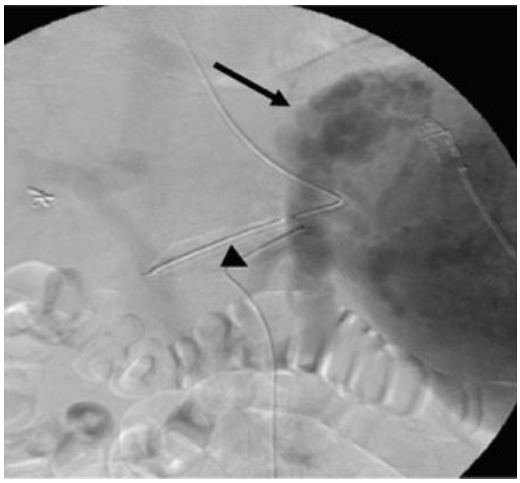

Figure 2 Venous phase of splenic angiogram demonstrates an enlarged spleen feeding large varices (arrow). Splenic vein not identified in expected position (arrowhead).

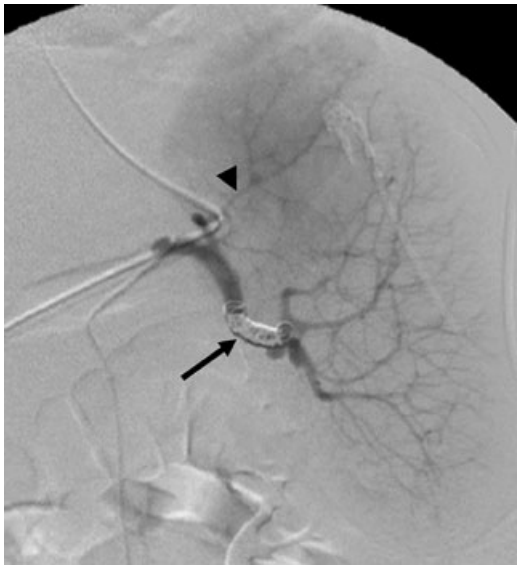

Figure 3 Control angiogram after splenic artery embolization. Arrow indicates coils in larger lower pole branch of splenic artery. Some splenic blood flow is preserved via upper pole branch artery (arrowhead).

Next, access into the femoral vein was obtained and selective catheterization of the left adrenal vein was performed through the left renal vein (Fig. 4). A 10F sheath was carefully advanced into the adrenal vein, and a 27-mm occlusion balloon was then selectively placed into the most caudal segment of the adrenal vein (Fig. 5). A retrograde balloon occlusion venogram demonstrated very large gastric varices directly communicating with the adrenal vein (Fig. 6). With the occlusion balloon inflated, retrograde embolization of gastric varices was performed using 15 mL of absolute alcohol. The alcohol was injected into the gastric varices while the balloon was kept inflated. Two to 3 minutes after alcohol injection, the patient had an episode of hypotension, bradycardia, and low oxygen saturation. The alcohol was immediately aspirated via the catheter, and a venogram documented no further leak of contrast and successful obliteration of the varices. Even after alcohol aspiration, the patient continued to be hypotensive and bradycardic, and she was given intravenous epinephrine by the anesthesia team.

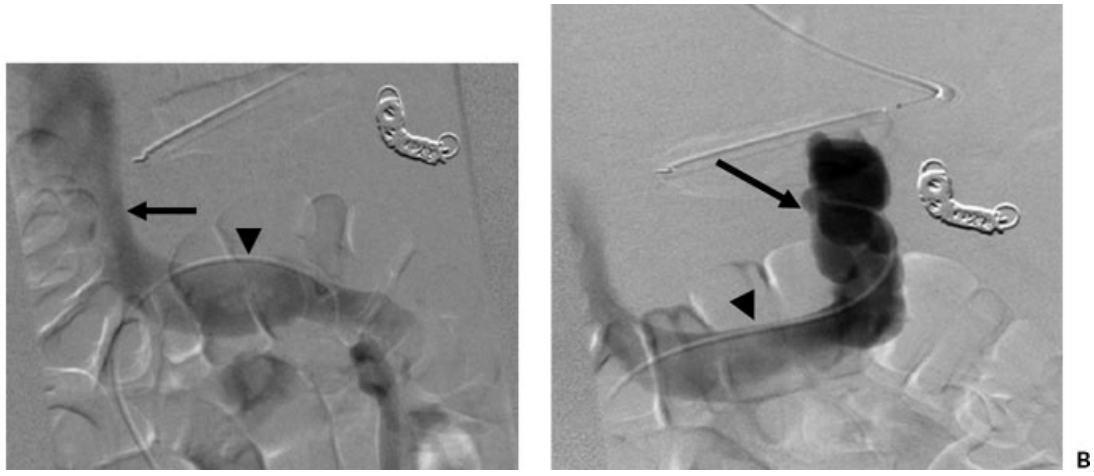

Figure 4 (A) Left renal venogram demonstrates patent renal vein (arrowhead) draining into patent inferior vena cava (arrow). (B) Left adrenal venogram demonstrates enlarged adrenal vein (arrow) draining into left renal vein (arrowhead).

Suspecting that the patient's physiologic response was suggestive of a massive pulmonary embolism, diagnostic pulmonary angiogram was performed. The occlusion balloon catheter was removed over a wire and exchanged for a MONT-1 catheter (Cook, Bloomington, IN) to perform catheterization of the pulmonary artery. The MONT-1 catheter was guided into the pulmonary artery, where pressure measurements revealed an elevated pulmonary artery pressure of 64/41 mm Hg. Pulmonary angiogram showed no evidence of acute pulmonary embolism (Fig. 7); however, diffuse pulmonary arteriovenous (AV) shunting was noted (Fig. 8).

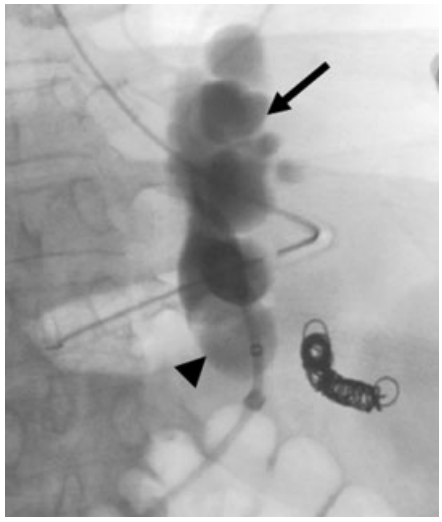

Figure 6 Digital subtraction balloon occlusion retrograde venogram. Arrow points to varices, and arrowhead indicates inflated occlusion balloon.

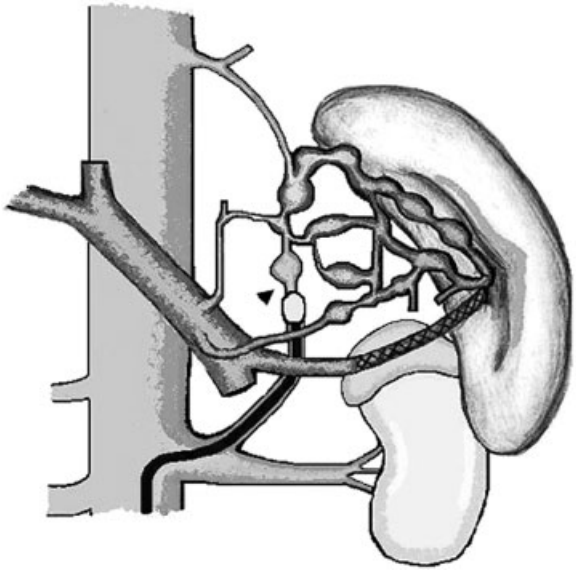

Figure 5 Schematic diagram of balloon occlusion retrograde variceal embolization. Ideal catheter placement is illustrated. Catheter advanced from left renal vein to adrenal vein and then into the spontaneous splenorenal shunt (arrowhead). Alcohol is injected while balloon is inflated.

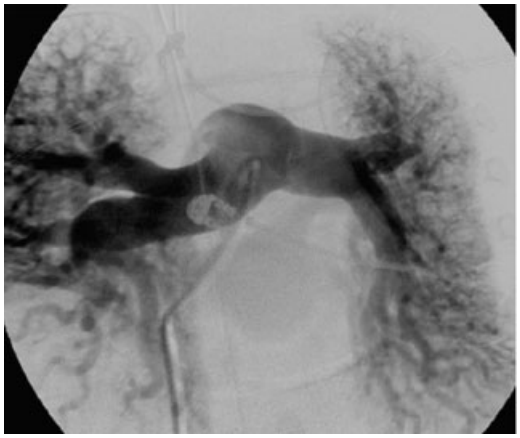

Figure 7 Pulmonary arteriogram demonstrates no evidence of pulmonary embolism.

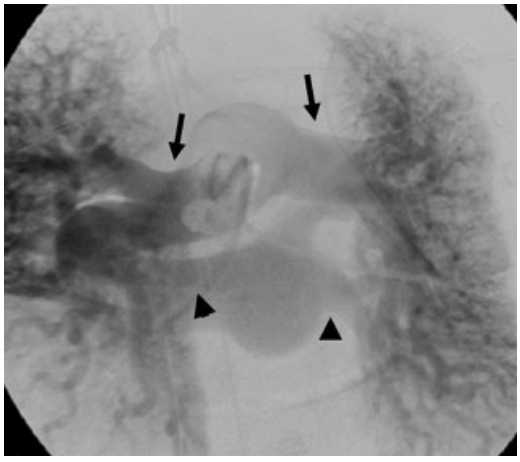

Figure 8 Pulmonary angiogram. Arterial phase of angiogram demonstrates early visualization of pulmonary veins (arrowheads) suggesting diffuse arteriovenous shunting. Arrows denote pulmonary artery.

The decompensation episode lasted ~10 minutes, after which the patient recovered spontaneously and remained stable thereafter. No further alcohol embolization was attempted, and the procedure was terminated. The patient remained in stable condition for the remainder of her hospital stay but was lost to follow-up.

DISCUSSION

This case illustrates three interesting teaching points: (1) The clinical evaluation of a patient with massive upper gastrointestinal bleeding is extremely important. Initially, this patient was referred to the interventional radiology service to perform a TIPS procedure. The history of large gastric varices with no esophageal varices suggests the possibility of splenic vein thrombosis. Performing a TIPS is this patient would most likely not control her variceal bleeding; (2) treating this patient with a combination splenic artery embolization and alcohol ablation of her gastric varices and SSS proved to be a better treatment option; and (3) the cardiopulmonary collapse that occurred during this patient's variceal ablation represents a very rare complication of alcohol embolization.

Splenic artery embolization is a fast and effective alternative to splenectomy in the treatment of bleeding fundal varices in the hemodynamically unstable patient.[2–4] The splenic artery is catheterized, a catheter is passed near the splenic hilum, and coils are deployed. The coils occlude the arterial flow to the spleen. This decreases venous return, thereby lowering portal pressure within the variceal collateral vessels, usually at the cost of some degree of splenic infarction.

Retrograde balloon occlusion with alcohol embolization was the second treatment option employed. This technique was described by Kanagawa et al in 1996, and it is commonly performed in Japan but seldom used in the United States.[5] Balloon occlusion with retrograde alcohol ablation of varices has been used to treat gastroesophageal varices arising from the coronary vein in addition to treating systemic arteriovenous malformations and occluding the arterial blood flow to tumors.

Splenorenal shunts are present in 20% of patients with portal vein thrombosis and in 36% of patients with both portal and splenic vein thrombosis.[6] Our technique was accomplished by passing a balloon occlusion catheter through the renal vein and into the adrenal vein, which communicated with the fundal varices through the SSS (Fig. 6). Balloon occlusion with retrograde embolization is effective in 85 to 100% of patients for the obliteration of gastric fundal varices.[7] The present case illustrates successful control of acute severe variceal bleeding with this technique.

Cardiopulmonary collapse after alcohol embolization of AV malformations is a very rare occurrence, and only a few cases have been reported in the literature. The proposed mechanism for this complication is the development of pulmonary artery spasm directly related to alcohol injection, causing increase in right ventricular afterload and decreasing right ventricular contractility. As a result there is a decrease in right ventricular output, left heart preload, and left heart output. This manifests clinically as bradyarrhythmia, hypotension, and, finally, cardiovascular collapse.

Our patient's increase in pulmonary artery pressure, low oxygen saturation, hypotension, and bradycardia is consistent with cardiopulmonary collapse secondary to alcohol embolization. The documented systolic pulmonary artery pressure of 64 mm Hg (normal, 20 to 30 mm Hg) that occurred immediately following the injection of alcohol is markedly higher than the average of a 5 mm Hg increase observed in a 2006 study by Mitchell et al.[8] Our experience is also in concordance with Mitchell's data that the larger the bolus of injected alcohol, the more dramatic the rise in pulmonary artery systolic blood pressure.[8] The exact cause of cardiovascular collapse after alcohol embolization still remains unknown.

CONCLUSION

The endovascular management of bleeding gastric varices has greatly expanded in the last few years with the use of retrograde balloon occlusion alcohol embolization. Our case illustrates the use of two different endovascular techniques to treat an acute variceal hemorrhage arising in a patient with portal hypertension and splenic vein thrombosis.

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