

# Multiple Splenic Artery Aneurysms in a Patient with Portal Hypertension

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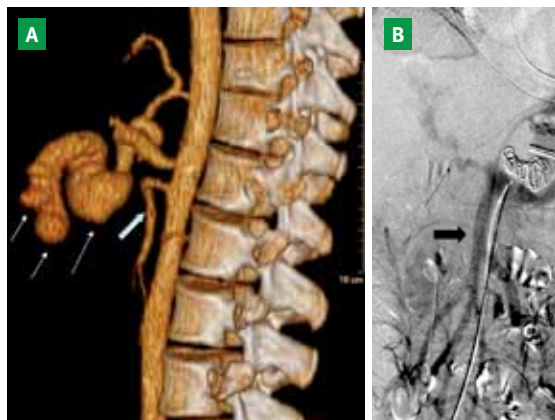
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The splenic artery is the most common site of visceral artery aneurysms. The incidence of splenic artery aneurysms is 0.1% in the general population. Portal hypertension appears to be a significant risk factor for the development of an SAA and is associated with a 50% increased risk of SAA development [1,2]. The most significant complication of SAA is rupture, which occurs in 3%–10% of cases and carries high mortality rates [1]. Mortality rates are reported to be higher in patients with PHTN than in patients

SAA = splenic artery aneurysm  
PHTN = portal hypertension

**[A]** Three-dimensional reconstruction of CT angiogram demonstrating multiple SAAs (thin arrows) and the superior mesenteric artery (bold arrow)

**[B]** Delayed phase of visceral angiogram demonstrating an atrophic portal vein (thin arrow) a patent superior mesenteric vein (bold arrow)



without such a history (56% versus 17%, respectively) [3].

Conventional treatment of ruptured SAA entails surgical ligation of the splenic artery with or without splenectomy. Endovascular repair of SAAs is being increasingly used in the elective setting but less so in the emergent setting. We report the case of a patient with PHTN and multiple SAAs who presented with rupture of one of the aneurysms and was treated with combined open and endovascular techniques.

## PATIENT DESCRIPTION

A 32 year old man with known PHTN due to portal vein thrombosis in childhood was admitted to the emergency room with acute onset of epigastric pain. On examination the patient was pale and agitated, hypotensive and tachycardic. His blood gases revealed metabolic acidosis (pH 7.317) and anemia (hemoglobin 7.92 g/dl). After initial resuscitation and stabilization of the patient’s status, emergency computed tomography angiography was performed, demonstrating multiple SAAs ranging from 2 to 2.5 cm in diameter [Figure A] and a large retroperitoneal hematoma that confirmed rupture of at least one of the aneurysms. The splenic artery was dilated, tortuous and irregular. Many large venous varicosities were seen throughout the abdomen.

The patient was taken urgently to the operating room where an exploratory laparotomy was performed. Upon opening of the peritoneal cavity almost 2 liters of fresh blood were seen in the lesser sac and active bleeding was noted, apparently from a ruptured SAA.

Multiple large varices of the splenic vein were noted. The arterial bleeding was controlled initially by supraceliac clamping of the aorta for proximal control, followed by suturing of a solitary bleeding splenic artery aneurysm. The splenic pedicle and vein were ligated and a splenectomy was performed. After the bleeding was controlled, the patient was transferred to the recovery room for further resuscitation. This “damage control” approach was taken due to the challenging location of the other aneurysms in the upper abdomen and his compromised hemodynamic status. No attempt was made to surgically treat the other non-bleeding SAAs as this would require extensive dissection and exposure in the upper abdomen, thereby prolonging the surgery and possibly increasing the morbidity of the procedure.

Following resuscitation in the recovery room, the patient was taken for an angiogram in order to treat the remaining SAAs. Angiography showed a large saccular proximal SAA that was successfully coil embolized. Completion arteriogram confirmed successful occlusion of the aneurysm sac with preservation of the common hepatic artery. Delayed images demonstrated an atrophic portal vein and a patent superior mesenteric vein [Figure B]. The patient was discharged home on postoperative day 17 in a stable condition.

## COMMENT

SAAs are the most common site of visceral artery aneurysms. Many risk factors for the development of SAAs have been described and include pregnancy, inherited vascular and connective tis-

sue disorders, congenital abnormalities of the vessels, vascular trauma, inflammatory processes, and degenerative arterial disease [2]. PHTN has also been described as a risk factor for the development of SAAs, but the causative association between PHTN and development of SAAs is not fully understood [3]. To the best of our knowledge this is the first report in the literature of multiple SAAs that developed in the presence of PHTN.

Commonly accepted indications for treatment of SAAs include symptomatic aneurysms, pregnancy (due to increased rupture risk), size > 2 cm, and increasing size during follow-up. The most significant complication of SAA is rupture, which occurs in 3–10% of cases and carries high mortality rates [4]. Patients typically present with severe epigastric pain and shock caused by intra- or retroperitoneal hemorrhage. Other bleeding patterns have been reported, such as spontaneous hemorrhage into the stomach, colon and pancreas [4].

In patients with PHTN, rupture of an SAA is associated with a higher mortality

than in patients without such a history (56% vs. 17%, respectively) [3]. Operative mortality after SAA rupture is 25–40% compared with 0–5% mortality for elective SAA repair [1,3].

The traditional treatment of ruptured SAA is open surgery with aneurysmectomy or ligation of the splenic artery with or without splenectomy. Transcatheter embolization is a previously described technique for the elective treatment of SAAs [5]. Current practice entails deploying several coils both distal and proximal to the splenic artery aneurysm to obtain complete devascularization. Another method is insertion of a self-expanding vascular plug for occlusion of the aneurysm sac [5]. Endovascular therapy as an isolated modality of treatment or as an adjunct measure after open surgery may offer a distinct advantage to conventional repair of SAAs and other visceral aneurysms. In the case reported here where several SAAs were encountered, the combination of open with endovascular therapy was particularly attractive. It minimized operative time and local

trauma from dissection and permitted treatment of the remaining aneurysms with minimally invasive techniques.

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### Capsule

#### Androgenetic haploid embryonic stem cells produce live transgenic mice

Haploids and double haploids are important resources for studying recessive traits and have large impacts on crop breeding, but natural haploids are rare in animals. Mammalian haploids are restricted to germline cells and are occasionally found in tumors with massive chromosome loss. Recent success in establishing haploid embryonic stem (ES) cells in medaka fish and mice raised the possibility of using engineered mammalian haploid cells in genetic studies. However, the availability and functional characterization of mammalian haploid ES cells are still limited. Li and co-scientists show that mouse androgenetic haploid ES (ahES) cell lines can be established by transferring sperm into an enucleated oocyte. The ahES cells maintain haploidy and stable growth over 30 passages, express pluripotent

markers, possess the ability to differentiate into all three germ layers in vitro and in vivo, and contribute to germlines of chimeras when injected into blastocysts. Although epigenetically distinct from sperm cells, the ahES cells can produce viable and fertile progenies after intracytoplasmic injection into mature oocytes. The oocyte-injection procedure can also produce viable transgenic mice from genetically engineered ahES cells. These findings show the developmental pluripotency of androgenetic haploids and provide a new tool to quickly produce genetic models for recessive traits. They may also shed new light on assisted reproduction.

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Eitan Israeli

**“It takes a great deal of courage to stand up to your enemies, but even more to stand up to your friends”**

J.K. Rowling (b. 1965), British novelist, best known for the *Harry Potter* fantasy books, the best-selling book series in history. She has led a ‘rags to riches’ life story, in which she progressed from living on social security to multi-millionaire status within five years, and is a notable philanthropist