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American Journal of Interventional Radiology

Vascular Interventions *Case Report*

Stent-assisted coil embolization of ruptured superior mesenteric vein aneurysm: A case report

Yamini Katamreddy[1], Christine Garabetian[1], Asaad Hakim[2], Peyman Borghei[3]

Departments of [1]Internal Medicine, [2]Pulmonology and Critical Care, [3]Interventional Radiology, West Anaheim Medical Center, Anaheim, California, United States.

***Corresponding author:**
Yamini Katamreddy, Department of Internal Medicine, West Anaheim Medical Center, Anaheim, California, United States.

yamini.16.94@gmail.com

Received : 19 February 2023
Accepted : 06 April 2023
Published : 02 May 2023

DOI
10.25259/AJIR_10_2023

Quick Response Code:

ABSTRACT

Visceral venous aneurysms are uncommon and account for 3% of all venous aneurysms, the most common being portal and mesenteric aneurysms. We present a case of an idiopathic superior mesenteric vein aneurysm in an elderly male with severe gastrointestinal bleeding due to a ruptured venous aneurysm.

Keywords: Anatomy, Aneurysms, Gastrointestinal bleeding, Portal vein aneurysm, Portal vein, Superior mesenteric vein aneurysm, Superior mesenteric vein, Visceral venous aneurysm

INTRODUCTION

Superior mesenteric vein (SMV) aneurysms are usually diagnosed incidentally during abdominal imaging.[1] Complications of SMV aneurysms include thrombosis, phlebitis, obstructive symptoms, and rupture.[2] Rupture is a rare but fatal complication, occurring in only 2.2% of visceral venous aneurysms.[3]

CASE REPORT

We present a case of an 87-year-old male with a past medical history of hypertension, hyperlipidemia, and type 2 diabetes mellitus who presented with melena for 3 days. His hemoglobin on admission was 5.6, and Prothrombin Time(PT)/International Normalized Ratio(INR) was 10.4/1.02, respectively.

The patient's mental status worsened during the course, and he was intubated due to severe anemia, metabolic acidosis, and for airway protection. He was hypotensive due to continued melena and required vasopressors due to unstable hemodynamics. The patient received a total of three packed red blood cells (RBC) and two fresh frozen plasma transfusions and started on proton pump inhibitor and octreotide drip.

Gastroenterology was consulted for the upper and lower gastrointestinal (GI) endoscopy, which did not reveal the source of active hemorrhage. Due to continued GI bleeding, a tagged RBC scan was performed, which showed evidence of radiotracer extravasation from the duodenum and movement of the radiotracer into the mid-distal small bowel. Follow-up triple phase computed tomography (CT) abdomen (non-contrast, arterial, and venous phase) showed a 2.2 cm × 3 cm venous aneurysm adjacent to the 4th portion of the duodenum arising from branches of the SMV [Figure 1a-c].

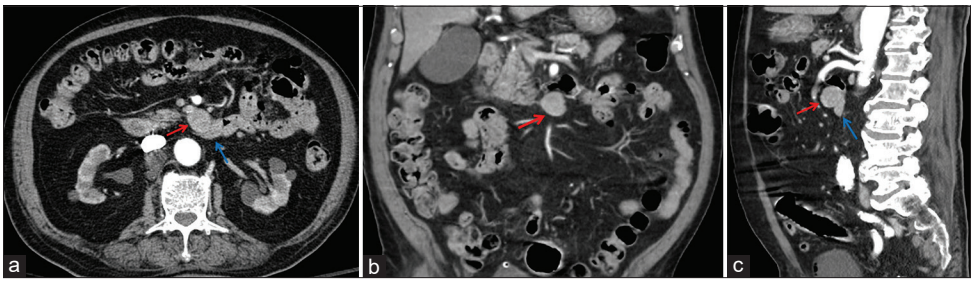

Figure 1: An 87-year-old male who presented with bloody bowel movements diagnosed with superior mesenteric vein (SMV) aneurysm. (a) Contrast-enhanced computed tomography (CT) scan of the abdomen axial view showing a 2.2 cm venous aneurysm (red arrow) of the SMV branch with the aneurysm located anterior to the 4th portion of the duodenum (blue arrow). (b) Contrast-enhanced CT scan of the abdomen coronal view showing a 2.2 cm venous aneurysm (red arrow) of the SMV branch with the aneurysm located anterior to the 4th portion of the duodenum (blue arrow). (c) Contrast-enhanced CT scan of the abdomen sagittal view showing a 2.2 cm venous aneurysm (red arrow) of the SMV branch with the aneurysm located anterior to the 4th portion of the duodenum (blue arrow).

A mesenteric angiogram was done to evaluate for possible arteriovenous fistula. Although no direct arteriovenous communication was found, a decision was made to embolize the terminal arteries around the venous aneurysm to prevent future potential arteriovenous fistula. A super-selective embolization of the terminal branches of the inferior pancreaticoduodenal arteries (arising from the superior mesenteric artery) feeding the area of venous aneurysm around the 4th portion of the duodenum using 1 mm and 2 mm concerto coils (Medtronic-Minneapolis, MN).

Then, a percutaneous transhepatic portal and mesenteric venogram were performed, which demonstrated a 2.2 cm × 3 cm fusiform venous aneurysm arising from the midportion of the first medial side branch of the SMV [Figure 2]. Direct contrast extravasation was not seen during the angiogram and venogram.

Stent-assisted coil embolization of the venous aneurysm was done using a 6 mm × 37 mm Visi-Pro medtronic balloon expandable stent (Medtronic-Minneapolis, MN) followed by deployment of three 4 mm × 20 cm penumbra ruby and four 60 mm packing coils (Penumbra-Alameda, CA) through an angled 2.6 Fr penumbra lantern microcatheter (Penumbra-Alameda, CA). The microcatheter was placed first within the aneurysm sac; then, the stent was deployed over the microcatheter [Figure 3]. A balloon expandable bare metal stent was used to ensure satisfactory positioning of the stent and to prevent potential migration. Although a longer stent could be utilized, the decision was made to match the size of the stent with the aneurysm size with precise measurements. A follow-up venogram showed interval thrombosis of the venous aneurysm while patency of the vein was maintained [Figure 4].

Following the procedure, no further bleeding episodes were reported, and his hemoglobin remained stable. He became

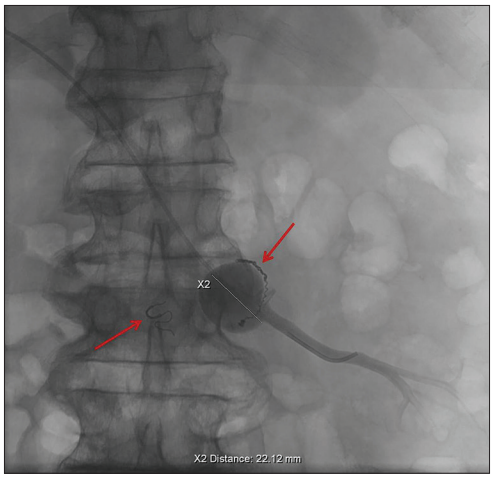

Figure 2: An 87-year-old male who presented with bloody bowel movements diagnosed with superior mesenteric vein (SMV) aneurysm. Percutaneous transhepatic venogram through a 5 Fr catheter shows a 2.2 cm venous aneurysm arising from a medial branch of the SMV. Please note previously embolized arteries going toward the venous aneurysm using coils (red arrows).

hemodynamically stable and was successfully extubated on the following day. The post-operative course was unremarkable, and he was discharged to a skilled nursing facility on day 3 post-procedure.

The patient's initial presentation with melena, significant acute blood loss, and the follow-up tagged RBC scan also showed evidence of bleeding from the duodenum, concordant with the CT findings of a venous aneurysm. Since the clinical presentation and imaging findings are concordant, no other abnormality was found with the CT scan or upper/lower GI endoscopy, and vital signs and

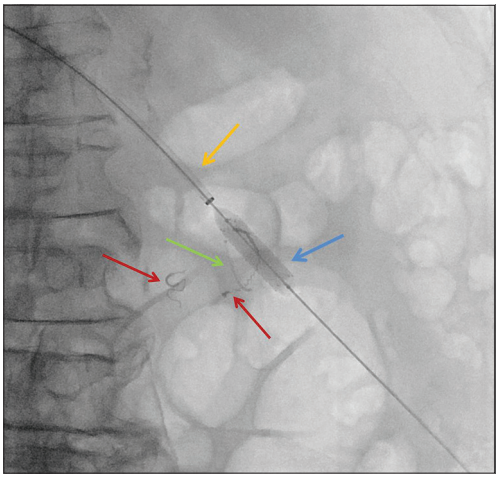

Figure 3: An 87-year-old male who presented with bloody bowel movements diagnosed with superior mesenteric vein aneurysm. Configuration of stent-assisted coil embolization of the venous aneurysm. A 6 mm × 37 mm balloon expandable stent (blue arrow) is deployed over the area of venous aneurysm through a 6 Fr sheath (yellow arrow). Please note that before deployment of the balloon expandable stent an angled 2.4 Fr microcatheter is placed within the aneurysm sac (green arrow). Red arrows demonstrate previous arterial coils.

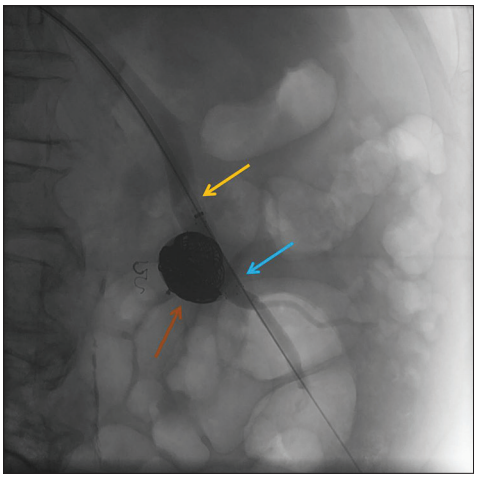

Figure 4: An 87-year-old male who presented with bloody bowel movements diagnosed with superior mesenteric vein aneurysm. Final venogram through the 6 Fr sheath (yellow arrow) post stent-assisted coil embolization showing patency of the draining vein and stent (blue arrow) while the aneurysm is totally excluded and filled with coils (brown arrow).

clinical presentation improved following treatment; a ruptured venous aneurysm is considered the culprit for the bleeding episode.

DISCUSSION

Venous aneurysms and pseudoaneurysms are rare vascular malformations compared to arterial aneurysms, commonly affecting the neck and lower extremities.[2,4] Aneurysms of the portal system account for 3% of all venous aneurysms.

Portal venous aneurysms are classified as extrahepatic or intrahepatic, based on location.[2] Extrahepatic aneurysms are usually more prominent than intrahepatic aneurysms due to a lack of growth inhibition by the liver parenchyma.[4] Extrahepatic portal venous aneurysms involve, in descending order, the porto-splenic-mesenteric confluence, main portal vein, and portal bifurcation.[4] Age and gender do not affect the formation or location of portal venous aneurysms.[2]

The average diameter of the portal vein in healthy adults ranges from 0.64 cm to 1.21 cm, and the SMV measures 1.2 cm in diameter. SMV aneurysm is defined as when the diameter exceeds 1.4 –1.5 cm in normal liver function and more than 1.9–2 cm in cirrhotic patients.[5-9] SMV is one of the veins that drain most of the abdominal cavity's organs. It is lateral to the superior mesenteric artery and embryologically descends from the vitelline vein. Three anastomoses form between the right and left vitelline veins during embryonic development, and a complex process of involution and interconnection of these vitelline veins results in the portal vein. A portal vein aneurysm can form if the portal venous system develops abnormally. A portal vein aneurysm can develop from incomplete regression of the distal right vitelline vein or a variant branching pattern of the portal vein. A diverticulum formed by incomplete regression of the distal right vitelline vein develops into an aneurysm in the proximal SMV.[10]

Small tributaries that drain blood from the small intestine and colon form SMV in the mesentery. It connects with the splenic vein to form a portal vein posterior to the neck of the pancreas. The right colic and middle colic veins collect blood from the large intestine up to the splenic flexure, the appendix through the ileocolic vein, the pancreas through the inferior pancreaticoduodenal veins, the transverse colon through the middle colic vein, the stomach through the right gastroepiploic vein, and the small intestine (jejunum and ileum) through numerous venous plexuses.[2]

SMV aneurysm is the rarest of all portal venous system aneurysms.[1,2] According to a literature review, mesenteric vein aneurysms without portal vein involvement are rare conditions that primarily affect women.[9] So far, <15 cases have been reported. It can be either congenital or acquired. Hereditary forms are caused by abnormal development of the vitelline veins during the embryonic period or by an inherent weakness in the vessel wall. Congenital aneurysms are more common than acquired aneurysms.[2] Some possible etiologies include chronic liver cirrhosis, portal

hypertension, gastric cancer, post-liver transplantation, venous sclerosis, and acute causes such as abdominal trauma or surgery (cholecystectomy).[2,4,5]

The inflammatory response associated with pancreatitis and local degenerative diseases, as well as the release of lytic enzymes, may weaken the vessel wall and leads to the formation of an aneurysm.[4] Aneurysms in these structures may also occur in people with no predisposing factors. About 80% of reported aneurysms are intrahepatic, with the majority occurring at vascular bifurcations, a potentially weak site. Most extrahepatic portal vein aneurysms form at the junction of the superior mesenteric and splenic veins. SMV aneurysm presents with the right upper quadrant abdominal pain, GI bleeding, or compression of the extrahepatic bile duct causing elevated liver function tests and obstructive jaundice. Given the location of the venous aneurysm within the mesentery next to the 3rd–4th portion of the duodenum, the aneurysm ruptures into the hollow lumen, given the lower pressure. Some patients remain asymptomatic, and an aneurysm can be found incidentally during abdominal imaging.[2] As venous aneurysms are usually incidental and managed conservatively with annual surveillance, surgical resection or endovascular embolization can be considered if they rupture or demonstrate a continuous increase in size.

CONCLUSION

With the increasing use of sonography, CT, and magnetic resonance imaging in evaluating abdominal complaints, incidental portal, and SMV aneurysms are discovered more frequently. As a result, the radiologist must be aware of these aneurysms and their imaging characteristics. However, these aneurysms might also present with fatal complications such as rupture leading to hemorrhagic shock. The symptomatic aneurysms require immediate intervention through surgical or endovascular interventions.

Acknowledgment

I thank Dr. Peyman Borghei and Dr. Asaad Hakim for their expertise and assistance throughout and for their help in writing the manuscript.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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How to cite this article: Katamreddy Y, Garabetian C, Hakim A, Borghei P. Stent-assisted coil embolization of ruptured superior mesenteric vein aneurysm: A case report. Am J Interv Radiol 2023;7:11.