International Journal of Clinical and Experimental Medical Sciences
2023; 9(5): 75-78
http://www.sciencepublishinggroup.com/j/ijcems
doi: 10.11648/j.ijcems.20230905.11
ISSN: 2469-8024 (Print); ISSN: 2469-8032 (Online)

Endovascular Management of Pseudo-Aneurysm of Hepatic Artery Arising from Superior Mesenteric Artery

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To cite this article:

Rajeev Bhardwaj, Rajesh Nandal, Ranjana Gupta, Tania Pruthi, Saurav Mittal. Endovascular Management of Pseudo-Aneurysm of Hepatic Artery Arising from Superior Mesenteric Artery. *International Journal of Clinical and Experimental Medical Sciences*. Vol. 9, No. 5, 2023, pp. 75-78. doi: 10.11648/j.ijcems.20230905.11

Received: September 7, 2023; **Accepted**: October 12, 2023; **Published**: October 28, 2023

Abstract: Background: Visceral artery aneurysms occur in 0.01–0.2% of the population. Splenic artery is the most common affected followed by hepatic artery. However, pseudoaneurysm is more common in the hepatic artery. The symptoms are vague and most of the times, it is incidentally diagnosed on ultrasound or CT scan of abdomen. Ruptured pseudoaneurysm has high mortality. Hence, timely intervention is of paramount significance. Case information: We present a 48-year-old male who presented with pain epigastrium and jaundice and had been diagnosed with chronic pancreatitis. CT abdomen showed well defined round partially thrombosed right hepatic artery pseudo-aneurysm in relation to head of pancreas. The aberrant right hepatic artery was arising from super mesenteric artery. This hepatic artery pseudoaneurysm was managed successfully by implant of covered stent. Discussion: The treatment of visceral artery aneurysms involves either early surgery or endovascular treatment. Open surgical repair has very high mortality and morbidity. Open surgical repair is preferred in patients who are hemodynamically unstable and require emergency surgery. Conclusion: Hepatic artery pseudoaneurysm can be successfully managed by endovascular interventional techniques. Excluding pseudoaneurysm from parent artery by covered stent is a feasible option with high success rate and patency of feeding artery.

Keywords: Pseudo Aneurysm, Replaced Hepatic Artery, Endovascular, Embolization

1. Introduction

There are two types of visceral aneurysms; Visceral artery true aneureurysms (VATAs) or visceral artery pseudoaneurysms (VAPAs). Both types are clinically significant, and patients can present with life-threatening bleeding, post rupture. Visceral artery aneurysms present with rupture 22% of the time and mortality in 8% [1]. VAPAs occur most commonly due to chronic inflammation caused by conditions such as pancreatitis, infection or vasculitis, blunt, or penetrating trauma or iatrogenic etiologies such as surgery or percutaneous procedures. All visceral artery pseudoaneurysms should be treated, regardless of size, due to their high-risk of rupture [2]. The most common site for VAPAs is the hepatic artery and if ruptured result in high rate of mortality. The treatment involves early surgery or endovascular treatment.

We present a case of hepatic VAPA (arising from aberrant hepatic artery arising from super mesenteric artery.

2. Case

A 48 years male patient presented to our surgery department with pain in epigastrium for the last one month. Pain was moderate to severe in intensity, associated with nausea. Pain was continuous, but used to increase after meals and on turning in bed. There was no history of (H/O) fever. Bowel habits were normal. He also gave history of yellowish discoloration of urine and eyes for three weeks. There was no H/O hemoptysis or melena. He was non diabetic and non hypertensive. He was chronic smoker and habitual drinker.

For the past three years, he had H/O episodes of epigastric pain, radiating to back, moderate in intensity, lasting for a few hours. These episodes used to occur every 4-6 weeks. He took treatment from district hospital. He was subjected to coronary angiography and one stent was implanted. Patient did not have details of that report, but he did not have any relief. Finally he was diagnosed as a case of pancreatitis.

Investigations:

Hb	9.1 gm%
PCV	28.4%
TLC	5.26x1000/cubic mm
Polymorphs	53.4%
Lymphocytes	27,4%
Eosinophils	9.3%
Monocytes	9.1%
Basophils	0.8%
Serum bilirubin	8.6mg%
Conjugated bilirubin	6.8mg%
SGOT	85.4 U/L
SGPT	124.3 U/L
Alkaline phosphatase	810U/L
Total proteins	7.54gm%
Albumin	3.63 gm%
Blood urea	17.3mg%
Serum creatinine	1.13mg%
HBs AG	non reactive
HIV	non reactive
HCV	Reactive (30.8)

3. Contrast CT Triphasic Study of Abdomen

Figure 1. *CT scan showing Replaced hepatic artery arising from superior mesenteric artery (SMA), partially thrombosed pseudo aneurysm.*

Pancreas was atrophic in size, showed fuzzy outline with homogenous enhancement. Pancreatic duct was dilated and tortuous in the region of neck, body and tail. There was evidence of replaced right hepatic artery arising from superior mesenteric artery (SMA). There was evidence of well-defined round partially thrombosed pseudo-aneurysm (PA) in relation to head of pancreas measuring 3.3x3.1 cm (Figure 1). It was causing mass effect over the adjacent part of proximal common bile duct (CBD)/ distal common hepatic duct (CHD) with upstream biliary dilatation. There was relative atrophy of left lobe of liver. Right lobe measured 14.2 cm. Common hepatic duct (CHD) measured 12mm at porta and showed smooth narrowing likely due to extrinsic compression by PA. Gall bladder was distended and showed small hyperdense calculi in its lumen. Spleen was enlarged, measuring 14.3 cm.

Patient was taken up for endovascular management of PA. Right femoral artery approach was taken. Celiac arteriography showed large splenic artery, normal left gastric artery and a small left hepatic artery. Right hepatic artery (RHA) was not arising from celiac artery (Figure 2). Superior mesenteric arteriography showed origin of RHA from SMA, there was evidence of PA arising from RHA (Figure 3). Right Judkin's guiding catheter was used to hook SMA. Wire BMW.014 inch, was repeatedly entering the PA. Whisper wire could be negotiated across PA into the distal part of RHA (Figure 4). Covered stent graft master of size 4.8x26 mm was deployed across the PA (Figure 5), which was now totally excluded and RPA was seen filling well. (Figure 6)

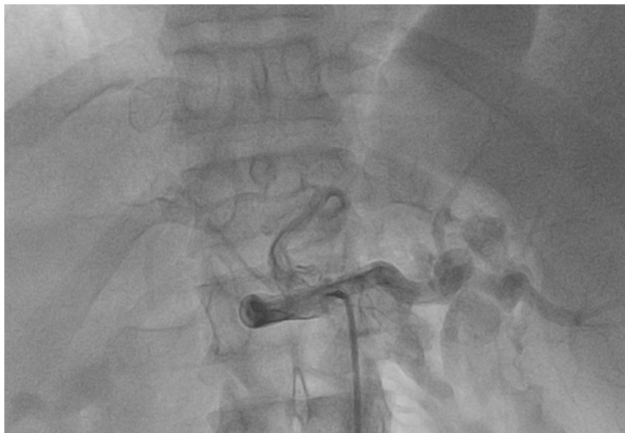

Figure 2. *Celiac artery angiography, showing large splenic artery, left gastric artery but a small left hepatic artery.*

Figure 3. *Angiography of SMA showing replaced hepatic artery, with PA arising from it.*

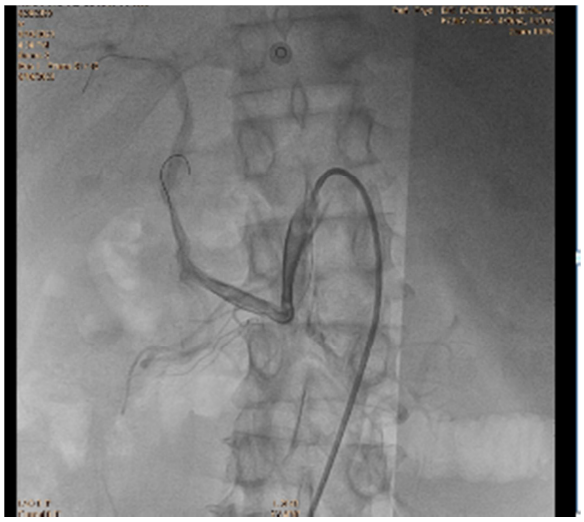

Figure 4. *One wire crossed across the PA, other in PA.*

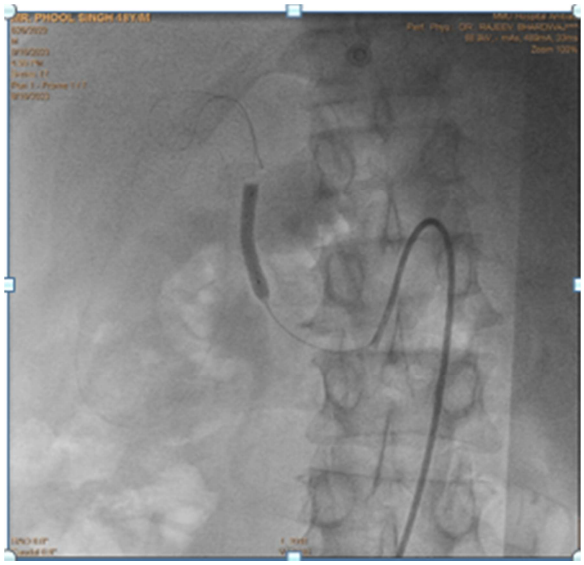

Figure 5. *Inflation of covered stent across the PA.*

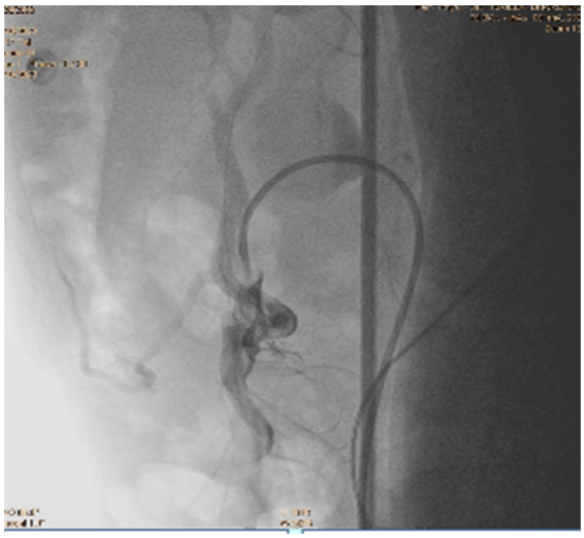

Figure 6. *Angiography of SMA showing complete oxclusion of PA with good flow into the distal hepatic artery.*

Pain disappeared after one day. Hepatic enzymes normalized in one week.

4. Discussion

Hepatic artery is the second most common artery (20% cases), after the splenic artery, to be affected by VAAs. Celiac and mesenteric arteries are involved in around 10% cases [3].

Risk factors for VAAs are atherosclerosis, pregnancy, Marfan syndrome, portal hypertension, liver transplantation, Kawasaki disease and fibromuscular dysplasia. Risk factors for VAPAs include Iatrogenic injury from instrumentation and blunt and penetrating abdominal trauma.

Most of the patients are asymptomatic and are accidentally diagnosed on CT scan or CT angiography [4]. Those patients who are symptomatic but have unruptured VAAs, have vague pain in abdomen, nausea or vomiting or malaise. Symptoms of ruptured VAAs are pain in abdomen due to expanding hematoma, gastrointestinal bleed or signs of hemodynamic collapse. Since VAAs are deep seated, the physical examination is usually not helpful. If size of VAAs is more than 4 cm, it may be palpable, especially in thin built patients [5]. Due to increase in the number of percutaneous biliary procedures and liver transplantation as well as non operative treatment modalities of trauma, the incidence of VAPA of hepatic artery has increased. making it the most common visceral artery responsible for pseudo aneurysm (PA) formation [6, 7]. Around 80% of hepatic artery aneurysms (HAA) are extra hepatic; 60% are present in common hepatic artery, 10% in right hepatic artery and 5% in left hepatic artery. HAA may also present with multiple visceral and non visceral aneurysms [8].

Elective definitive treatment of VAAs is usually advocated to avoid the risk of rupture. Rupture has mortality of around 10-25% for splenic artery aneurysm and even higher for other VAAs [9]. Rupture rarely occurs in VAAs of < 2.5 cm in size and so conservative management may the initial line of treatment. However, HAA have a higher risk of rupture (80%) compared to other sites [10]. All VAPAs require urgent intervention regardless of the size, as it is a contained rupture, constrained only by fibrous capsule, because all three layers of arterial wall are disrupted. PA has a higher risk of overt rupture and the mortality associated with PA rupture varies from 25-70% [11].

Goal of treatment is exclusion of aneurysm from systemic circulation and preservation of flow to the end organ. If this cannot be done, then aneurysm may be excluded. For VAAs affecting vessels that supply an end organ with multiple sources of flow (native or collateral), the aneurysm can be ligated surgically or embolized percutaneously. For VAAs affecting vessels that supply an end organ that does not have multiple sources of flow (native or collateral), blood flow to the organ will need to be preserved either through the aneurysm lumen using a stent or stent-graft, or surgical revascularization (like, bypass). Open surgical repair is preferred in patients who are hemodynamically unstable and

require emergency surgery [12]. Endovascular repair is preferred approach in HAAs. Open surgical repair has very high mortality and morbidity [13]. Endovascular approach is very useful for hepatic artery pseudo aneurysms, in which previous abdominal surgery and medical co morbidities are usually associated. In such cases, when unruptured, the endovascular approach is successful in 88-100% cases. In ruptured HAAs also good results are obtained but repeat embolization is required in around 30-40% cases [7]. For endovascular approach, different options can be used, including coils, glue, stents, and detachable silicone balloons.

Normally hepatic artery arises from celiac artery. It then divides into gastro duodenal artery and proper hepatic artery, later then divides into right and left hepatic artery. However this typical arrangement is present in only around 55% of population [14]. In 10-20% of population, right hepatic artery (RHA) arises from superior mesenteric artery (SMA) [15]. This may exist as an accessory branch secondary to a RHA originating from the common hepatic artery, or as a replaced branch providing the exclusive blood supply to the right liver lobe [16]. Presence of accessory or replaced RHA (A/R RHA) can complicate interventions, surgery and liver transplantation. 4% of all emboli lodge in SMA. In case A/R RHA is present, liver necrosis may occur, when SMA is occluded due to emboli.

Our patient had A/R RHA and had PA arising from it. Patient presented with pain in abdomen and jaundice secondary to compression of bile duct. The PA was successfully excluded with covered stent keeping the hepatic artery patent. Patient had uneventful course.

5. Conclusion

Hepatic artery aneurysms are the second most common VAAs, accounting for approximately 20% of cases. Approximately 50% are VAPAs occurring secondary to prior surgery, liver transplantation, or percutaneous intervention; Most VAPAs can and should be treated by endovascular interventional techniques.

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