Emergency transcatheter embolisation of superior mesenteric arteriovenous fistula complicated by recurrent haematemesis

Lau K Y, Lo S W S, Sy N L A

ABSTRACT

Arterioportal fistulas are rare. Superior mesenteric arteriovenous fistula is uncommon and usually observed in patients who have abdominal trauma or have undergone abdominal surgery. If untreated, mesenteric arteriovenous fistula is potentially fatal due to portal hypertension with potential complications such as massive variceal bleeding or progressive liver failure. We report a 50-year-old Chinese man who had a history of abdominal surgery and presented with recurrent haematemesis. He was diagnosed by multidetector computed tomography to have a superior mesenteric arteriovenous fistula. Subsequently, he presented with acute bleeding oesophageal varices. Emergency transarterial embolisation was successfully performed to arrest the bleeding.

Keywords: angiography, bleeding oesophageal varices, emergency transarterial embolisation, haematemesis, mesenteric arteriovenous fistula, multidetector computed tomography

Singapore Med J 2009;50(1):e12-e15

INTRODUCTION

Extrahepatic arterioportal fistula is a rare disorder of the hepatic vasculature that is characterised by anomalous communication between the mesenteric artery and the portal vein system. Though a mesenteric arteriovenous fistula may be congenital, it more often results from abdominal trauma or iatrogenic damage induced by abdominal surgery with bowel resection and tumours.[1] Arterioportal fistula may cause portal hypertension which may lead to gastro-oesophageal variceal bleeding, refractory ascites, diarrhoea and hepatic encephalopathy. Hence, prompt diagnosis and treatment are important to prevent such potential catastrophic complications. We report a case of mesenteric arteriovenous fistula in which the diagnosis was made by multidetector computed tomography (MDCT). The patient later presented with bleeding varices and was treated successfully by emergency transcatheter embolisation.

CASE REPORT

A 50-year-old Chinese man had a history of carcinoma of the sigmoid, with a sigmoidectomy done four years ago. The operation was uneventful. Recently, he was started on chemotherapy due to para-aortic nodal relapse. The patient also had end-stage renal failure and was placed on haemodialysis. Two months ago, he was admitted for fresh haematemesis (about 200 ml) and perrectal bleeding of altered blood. The haemoglobin level on admission was 7.2 g/dL. Upper gastrointestinal endoscopy was performed and showed multiple engorged gastric varices at the gastric fundus and cardia. A sclerosing agent (isobutyl 2-cyanoacrylate) was injected by the endoscopist and haemostasis was achieved.

A week later, the patient developed acute confusion. Urgent computed tomography (CT) of the brain was performed and the findings were normal. Blood test showed an elevated ammonia level of 121 μmol/L, suggesting that he was suffering from hepatic encephalopathy. Urgent contrast CT of the abdomen and pelvis revealed a hypertrophied ileocolic artery with direct fistulous communication with the grossly dilated superior mesenteric vein (Fig. 1). Diffuse thickening of the ascending colon with intramural gas and perifocal free fluid was noted, which raised suspicions of ischaemic bowel changes. Prominent gastro-oesophageal varices were noted. The patient was then discharged after conservative treatment. Five days after discharge, he was re-admitted due to recurrent haematemesis. The patient was referred to us for emergency transcatheter embolisation of the mesenteric arteriovenous fistula.

After informed consent was obtained, selective superior mesenteric arteriogram was performed via the right femoral approach under local anaesthesia using 5 French vascular sheath initially and 5 French Cobra 1 catheter (Cook, Bloomington, IN, USA). Superior mesenteric arteriogram demonstrated a markedly hypertrophied ileocolic artery with direct shunting of contrast agent into the superior mesenteric vein. This high-flow arteriovenous shunt was similar in size to the hypertrophied ileocolic artery and there was marked aneurysmal dilatation of the shunted superior

Department of Radiology, Pamela Youde Nethersole Eastern Hospital, 3 Lok Man Road, Chai Wan, Hong Kong

Lau KY, MBBS, FRCR, DABR
Consultant

Lo SWS, MBBS, FRCR
Associate Consultant

Sy NLA, MBBS, FRCR
Associate Consultant

Correspondence to:
Dr Sherwin SW Lo
Tel: (852) 2595 6183
Fax: (852) 2975 0432
Email: sherwinlo@gmail.com

Fig. 1 Multiplanar reconstruction of (a) axial, (b) coronal and (c) volume-rendered CT images show the mesenteric arteriovenous fistula (arrow) – direct shunting between a markedly hypertrophied ileocolic artery and markedly hypertrophied and dilated superior mesenteric vein.

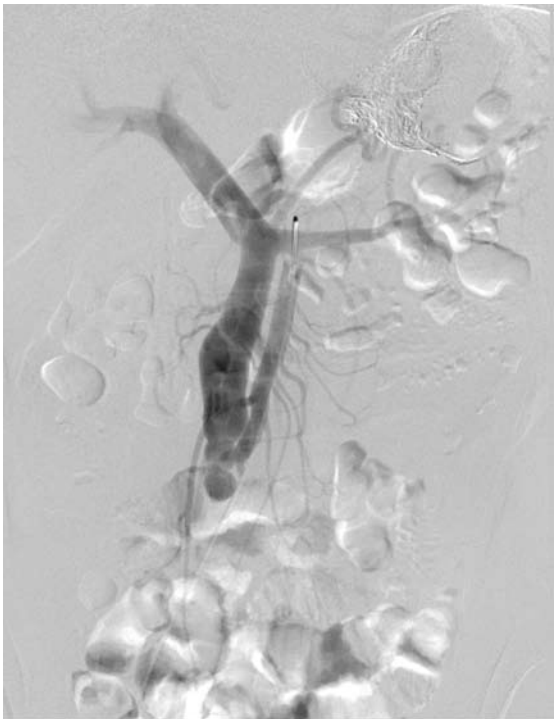

Fig. 2 Superior mesenteric arteriogram in the early arterial phase shows a markedly hypertrophied ileocolic artery with direct shunting of contrast into the superior mesenteric vein. This high flow arteriovenous shunt showed aneurysmal dilatation of the proximal superior mesenteric vein with poor opacification of the rest of the superior mesenteric artery circulation, early and dense venous filling of the portal system.

Fig. 3 Frozen image (left anterior oblique 70° view) after coil deployment shows the long vascular sheath-catheter system *in situ* and coils had already been deployed at the mesenteric arteriovenous fistula.

mesenteric vein. The rest of the superior mesenteric artery circulation and the other branches of superior mesenteric vein were poorly opacified. Early dense venous filling of the portal system was noted, and there was neither opacification of the splenic vein nor of the gastro-oesophageal varices (Fig. 2). These were likely due to marked arterioportal shunting.

As the superior mesenteric artery sustained an acute angle with the abdominal aorta, further advancement of the Cobra catheter close to the arteriovenous fistula was attempted, but the catheter was not in a stable position for coil deployment. Thus, with the help of a Terumo

Fig. 4 Post-embolisation superior mesenteric arteriograms show (a) coils in place and occluded mesenteric arteriovenous fistula and opacification of the superior mesenteric arterial branches in the arterial phase; and (b) superior mesenteric vein as well as the main portal vein and its branches in the venous phase.

stiff guidewire, a 6 French 55 cm long vascular sheath (Cook, Bloomington, IN, USA) was then advanced into the mid superior mesenteric artery and the 5 French Cobra 1 catheter was then positioned just proximal to the fistula. This long vascular sheath-catheter system facilitated deployment of the first coil in the correct position while achieving a desirable configuration of the coil. As the arterial side just proximal to the fistula was about 8.6 mm in diameter, a 10 mm × 7 cm stainless steel coil was deployed first in order to form a 'nest' to facilitate further coil embolisation. Subsequently, three additional 10 mm × 7 cm and one 8 mm × 5 cm stainless steel coils were then deployed successfully and none of the coils passed through the fistula into the portal circulation (Fig. 3). A non-heparinised dilute contrast agent was used in test injections between coil deployments in order to achieve a quick and successful embolisation. Post-embolisation arteriogram showed that the fistula was successfully embolised and closed. The superior mesenteric arterial and venous branches, including the portal vein, were all well opacified in a normal fashion (Fig. 4). The duration of the entire procedure was 80 minutes.

The patient was placed under close observation. No more haematemasis or perrectal bleeding was noted. Post-procedural recovery was uneventful. The patient was discharged two days after the procedure and experienced neither abdominal pain nor evidence of gastrointestinal bleeding five weeks after embolisation. Up to 17 months after the embolisation procedure, the patient has had no recurrence of haematemesis or perrectal bleeding.

DISCUSSION

Arterioportal fistulas and superior mesenteric arteriovenous fistulas are rare. Though superior mesenteric arteriovenous fistula may be congenital, the most common cause is due to stab or blunt abdominal trauma, followed by prior abdominal surgery such as bowel resection and reanastomosis,[1-3] as in our case. Mesenteric arteriovenous fistulas may take days[2] or years[3] to manifest, as in our case. Arterioportal fistulas carry a substantial risk of morbidity and mortality. Because of high flow, the fistula may result in portal hypertension leading to potential complications including ascites, variceal bleeding and progressive liver failure due to fibrosis and fatty infiltration.[1] The overall mortality rate of untreated mesenteric arteriovenous fistula has been reported to be approximately 25%.[1] MDCT, a noninvasive imaging modality, is useful for the prompt evaluation and accurate diagnosis of abdominal pathology. To the best of our knowledge, this was the first reported mesenteric arteriovenous fistula diagnosed by MDCT.

As surgical treatment of mesenteric arteriovenous fistulas carries an operative mortality of 18%,[1] and may lead to further bowel resection which is critical in a patient with prior bowel resection, endovascular therapy is the appropriate treatment.[2-5] Embolisation can either be done via the transarterial approach[3-5] or

transvenous approach.[2] The transvenous approach can be considered and tried if there are multiple arteriovenous fistulas,[2] or if technically unsuccessful embolisation via the transarterial approach. However, the transvenous approach requires percutaneous puncture of the liver which carries the potential risk of haemoperitoneum, bile peritonitis or hepatic haematoma. Hence, caution must be exercised with the transvenous approach, especially in patients with deranged liver function and impaired coagulation parameters. Under such circumstances, embolisation of the percutaneous hepatic tract after transvenous embolisation has to be considered.

There are several advantages of using coil as the embolic agent in the embolisation of mesenteric arteriovenous fistulas, namely: (a) ready availability of different diameter and length of coils for appropriate vessel size, (b) coils can be manipulated and deployed to the target vessel as long as the catheter is in a stable position, (c) successful deployment of the first coil will provide a secure base for further coil deployment and prevent migration of other coils into the portal circulation, (d) alternatively, a microcatheter can be used to tackle a markedly tortuous parent artery but microcoils have to be used instead, and (e) a permanent embolic agent.

The amplatzer vascular plug (AVP) is an occlusion device that can be placed very precisely and may therefore be an attractive alternative to coils, or may be used in combination with coils, especially when only a short vascular segment can be used for occlusion. The plug has the flexibility to advance through the fistula into close proximity with the arterial inflow, where it serves its protective function.[6,7] The availability of a detachable balloon of appropriate size is a serious limitation of its use, especially in an emergency, as the detachable balloons are almost obsolete nowadays. Gelfoam and isobutyl 2-cyanoacrylate are not suitable for the embolisation of mesenteric arteriovenous fistulas because of a risk of migration of the embolic agent into the portal vein.

In our case, we noticed that the 5 French catheter was not stable for coil embolisation during selective cannulation of the ileocolic artery because the superior mesenteric artery sustained an acute angle with the abdominal aorta. To prevent catheter recoil which might lead to coil migration or inadvertent non-target embolisation, we advanced a 6 French long vascular sheath to the mid superior mesenteric artery to secure the 5 French Cobra catheter in place prior to coil deployment. Of course, a 5 French long vascular sheath can be used instead if this is available. Such a long vascular sheath-catheter system was very useful for the appropriate manipulation and positioning of the coils to the correct target position, as the partially deployed first coil tended to form a straight configuration which may point and move to the portal circulation via the dilated and patent fistula. Using such a long vascular sheath-catheter system has an additional advantage, as 0.035 coils can be used instead of more expensive microcoils that also require a more expensive microcatheter to deliver.

In conclusion, clinicians and radiologists should be aware of this rare disease entity, especially in patients with a clinical history of abdominal trauma or surgery. Mesenteric arteriovenous fistula can be accurately diagnosed by MDCT. With a slight modification in angiographic technique, prompt transcatheter embolisation of mesenteric arteriovenous fistula using coils is a safe, concise, complete and quick life-saving measure to prevent potential fatal complications. We believe that transcatheter embolisation should be the first treatment of choice in patients suffering from a similar disease entity. However, the effectiveness of using AVP in the embolisation of mesenteric arteriovenous fistula requires further evaluation.

REFERENCES

1. Van Way CW 3rd, Crane JM, Riddell DH, Foster JH. Arteriovenous fistula in the portal circulation. Surgery 1971, 70:876-90.
2. Cekirge S, Ozmen M, Akata D, et al. Endovascular treatment of a superior mesenteric arteriovenous fistula by a transhepatic portal venous approach. Am J Roentgenol 1998; 171:1283-4.
3. Uflacker R, Saadi J. Transcatheter embolization of superior mesenteric arteriovenous fistula. Am J Roentgenol 1982; 139:1212-4.
4. Hennessy OF, Gibson RN, Allison DI. Use of giant steel coils in the therapeutic embolization of superior mesenteric artery-portal vein. Cardiovasc Intervent Radiol 1986; 9:42-4.
5. Desai SB, Modhe JM, Aulakh BG. Percutaneous transcatheter embolization of a large proximal posttraumatic superior mesenteric arteriovenous fistula. J Trauma 1987; 27:1091-3.
6. Idowu O, Barodawala F, Nemeth A, Trerotola SO. Dual use of an amplatzer device in the transcatheter embolization of a large high-flow renal arteriovenous fistula. J Vasc Interv Radiol 2007; 18:671-6.
7. Cil B, Canyigit M, Ozkan OS, Pamuk GA, Dogan R. Bilateral multiple pulmonary arteriovenous malformations: endovascular treatment with the amplatzer vascular plug. J Vasc Interv Radiol 2006; 17:141-5.