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Early TIPS failure in association with left mesenterico-gonadal spontaneous portosystemic venous shunt; a case report☆

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ABSTRACT

Transjugular intrahepatic portosystemic shunt (TIPS) periprocedural thrombosis rates have fallen significantly since the introduction of polytetrafluoroethylene-covered stent grafts. We present a case of a cirrhotic patient with portal hypertension presenting with early TIPS thrombosis in association with an underlying competing spontaneous left mesenterico-gonadal venous shunt, an uncommon variant of spontaneous portal systemic shunt (SPSS). The patient presented with bleeding distal duodenal varices refractory to endovascular therapy, and although a successful TIPS procedure was performed for this indication, early thrombosis was determined by follow-up abdominopelvic computed tomographic angiography (CTA) scan. Despite undergoing a standard TIPS revision procedure, blood flow through the TIPS remained hepatofugal. During a TIPS revision, portal vein angiography revealed competing large inferior mesenteric vein (IMV) varices shunting into the left renal vein via the left gonadal vein. The initial abdominal CTA was later reviewed by a non-invasive cardiovascular radiologist, and the presence of the competing left mesenterico-gonadal shunt was retrospectively identified. Radiologists interpreting CTA exams should be aware of SPSS generally and mesenterico-gonadal shunts specifically. Pre-procedural knowledge of underlying SPSS can affect post procedural outcomes and should be emphasized in the final CTA report.

1. Case report

A 43-year-old male with Child-Pugh grade C liver cirrhosis, secondary to alcohol abuse and hepatitis C virus, was transferred to our medical center from an outside institution for further management. The patient presented with a history of gastrointestinal bleeding as evidenced by frequent episodes of melena during the preceding days. His past medical history also included peptic ulcer disease, gastroesophageal reflux disease, and pancreatitis. Furthermore, labs from the outside institution were significant for hemoglobin of 7.6 g/dL, increased blood urea nitrogen to creatinine ratio of 38.6, AST/ALT ratio compatible with alcoholic pattern, and an international normalized ratio of 1.29.

Soon after admission, an esophagogastroduodenoscopy (EGD) was performed revealing grade B esophagitis without bleeding. Both the gastric body and duodenum showed mildly congested mucosa without active bleeding. However, the following day the patient developed hematochezia severe enough to require blood transfusion. An abdominopelvic contrast enhanced computed tomography (CT) scan was performed which demonstrated large periduodenal varices (Fig. 1). These findings prompted a request from the clinical team for a TIPS procedure.

During the TIPS procedure, a Viatorr (Gore, Flagstaff, AZ, USA) TIPS stent was inserted from the right hepatic vein to the right portal vein (Figs. 2–3). The procedure was technically successful, with a reduction of the portosystemic gradient from 19 mm Hg to 5 mm Hg. However, during the following 2 days the patient continued to experience intermittent hematochezia requiring the administration of more blood products. On day five of his hospital course a second EGD was performed but was negative for any acute findings. On day six, during a third EGD, a duodenal varix began to bleed and was treated with direct endoscopic n-butyl cyanoacrylate injection. Despite this therapy, the patient experienced recurrent hematochezia requiring additional transfusion. The Gastrointestinal service next requested a two-phase (arterial and portal) abdominopelvic computed tomographic angiography (CTA) scan which, when performed, demonstrated a TIPS stent occlusion.

On day seven, a TIPS revision procedure was performed. Initial portal vein angiography demonstrated near total occlusion of the TIPS

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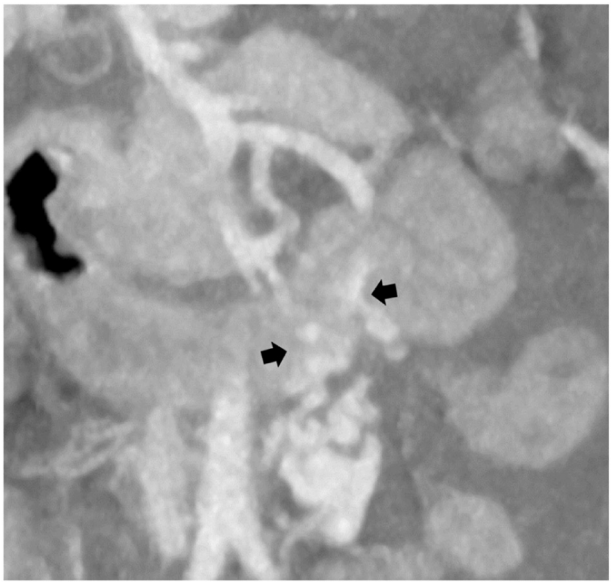

Fig. 1. Thickened (10 mm), averaged, curved planar reformation with softening filter, showing duodenal wall varices (black arrows).

Fig. 2. Initial portal vein angiography to establish TIPS shunt tract demonstrates very small coronary varices and prominent reflux into the inferior mesenteric vein (black arrow).

stent with thrombus extending distally into the splenic vein and superior mesenteric vein confluence. Prominent portosystemic shunting was observed via the left renal vein (Fig. 4, Cine 1). To resolve the occlusion, aspiration thrombectomy was performed using a 10 French guiding catheter, followed by maceration thrombectomy using a 12 mm × 6 cm angioplasty balloon. Moderate amounts of thrombus were aspirated. Due to ongoing hemorrhage, thrombolytics were not administered. Post thrombectomy portal vein angiography demonstrated moderate improvement in the luminal caliber of the TIPS and unanticipated hepatofugal flow.

A 14 mm self-expanding bare metal stent was deployed in the TIPS and portal vein to resolve residual thrombus related stenosis. The cause of persistent hepatofugal flow was then sought with superselective catheterization and angiography of portal venous tributaries, which

Fig. 3. Portal vein angiography performed immediately after TIPS creation demonstrates hepatopetal flow through TIPS stent.

revealed a competing left SPSS. This SPSS was comprised of large IMV varices shunting into the left renal vein via the left gonadal vein (Fig. 5, Cine 2). Coil embolization of the portal end of the shunt was then performed using multiple detachable coils, ranging in size from 10 mm to 14 mm (Fig. 6, Cine 3). After embolization hepatopetal flow was restored (Fig. 7, Cine 4). A final portosystemic gradient of 10 mmHg was achieved. Between his successful discharge and six-month follow-up, the patient did not experience any recurrent bleeding.

After the TIPS revision, the initial abdominopelvic CT and the subsequent CTA, both of which had been reported by on-call general radiologists, were retrospectively reviewed by the non-invasive cardiovascular radiology service. Although the contrast to noise ratio of the axial image sets did not allow for creation of useful 3D renderings, curved planar reformation images were created from the venous phase CTA data which clearly delineated the inflow and outflow veins of the left mesenterico-gonadal shunt (Fig. 8).

Fig. 4. TIPS shunt occlusion (white arrow) with filling defect in the Stent and the portal vein and prominent portosystemic shunting to the left renal vein (white asterisk).

Fig. 5. Selective catheterization of the inferior mesenteric vein (white arrow) demonstrates competing mesenterico-gonadal venous shunt.

Fig. 6. Selective angiogram of inferior mesenteric vein shows complete cessation of flow within mesenterico-gonadal shunt after coil embolization.

2. Discussion

SPSS serve as non-physiologic communications between branches of the systemic and portal venous systems allowing excess flow to bypass the liver, and are a common finding in portal hypertension. Potential etiologies of these shunts include congenital, sequelae of portal venous hypertension, or liver trauma [1]. Portosystemic should be classified are by etiology and by anatomical location, and, if possible, by direction of flow [1–4]. Almost any vein in the abdomen can serve as a conduit into the systemic circulation [2,4]. The number and size of collateral passages directly correlates with the duration and severity of portal hypertension [2]. The gastroesophageal and lienorenal shunts are the most common SPSS variants [3,4]. Less common, usually clinically irrelevant, mesenterico-systemic shunts can involve other systemic venous efferents, specifically the retroperitoneal (aka veins of Retzius), pelvic or superficial veins. These shunts, are usually right sided, for example from the ileocolic vein to the right gonadal vein [2,3]. Reports of left mesenterico-gonadal shunts are sparse. A diligent literature search returned reports of only a handful of cases [5].

Fig. 7. Re-TIPS and mesenterico-gonadal shunt embolization completion (white arrow) portal vein angiography shows reestablishment of hepatopetal flow within the TIPS stent.

In this case, the left mesenterico-gonadal shunt caused TIPS thrombosis within the first week by shunting blood flow away from the TIPS stent. Recurrent bleeding ensued. The initial reduction in portosystemic pressure gradient, normally considered an indicator of success, was falsely reassuring. This observation merits further investigation, as it does not appear to be described in the TIPS literature. If the criterion of a low pressure gradient is incompletely reliable as an exclusionary criterion for clinically significant SPSS, the importance of careful interpretation and post processing of pre-TIPS CTA is heightened, as is intraprocedural venography with superselective vessel catheterization.

In retrospect, the optimal pre-procedural evaluation for this patient would have included a review of the initial contrast enhanced CT and the subsequent CTA by a subspecialty non-invasive cardiovascular radiologist, in consultation with the interventional radiology service. Diagnostic radiologists who participate in preprocedural planning for vascular procedures should be acquainted with cardiovascular CT scanning and reconstruction protocols. Most SPSS can be acceptably characterized by careful post processing of data from routine gastrointestinal bleeding protocol CTA. In our experience, if CTA is performed specifically for TIPS planning, an increased dose (150–200 ml) of high iodine content contrast media (≥350 mgI/ml) injected at a high rate

Fig. 8. A) Curved planer reformation of gonadal vein (black arrow) and mesenterico-gonadal shunt (white arrow). B) Curved planer reformation of inferior mesenteric vein (black arrowhead) and mesenterico-gonadal shunt (white arrow).

($\geq$4 ml/s) with an 85 s delay to scanning is preferable. For all CTA exams, axial image reconstruction protocols should require slice thickness $\leq$ 1.0 mm, with a reconstruction interval of $\leq$0.5 mm to improve z-axis resolution during post processing. To improve in-plane resolution, the reconstructed field of view should be limited to the dimensions of the peritoneal and retroperitoneal spaces, with exclusion of superficial fat.

In addition to a discussion of hepatic and portal venous size, configuration, and patency, pre-TIPS CTA reports should note the presence or absence of gastroesophageal, lienorenal, and all mesenterico-systemic SPSS. The anatomy of any shunt which is present should be described in detail including, at a minimum, a discussion of the primary afferent and efferent vessels as well as the caliber and complexity of the varices which are present.

3. Conclusion

Pre-procedural CTA can be a valuable tool for planning a TIPS procedure with the potential to decrease fluoroscopy times and improve outcomes. However, with suboptimal protocolling, scanning, reconstruction, post-processing, or interpretation, the value of this modality is diminished. Radiologists interpreting CTA exams should have specific competencies covering the above aspects of CTA. Most importantly, they must be aware of and report all SPSS variants, even those which are uncommon.

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