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# A successful endovascular repositioning of migrated transjugular intrahepatic portosystemic shunt (TIPS) stent☆,☆☆,★

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ABSTRACT

The transjugular intrahepatic portosystemic shunt (TIPS) procedure is performed to create an intrahepatic tract between the hepatic and portal veins which helps to shunt blood away from the hepatic sinusoids. This shunt decreases the portal venous pressure and secondary morbidities, including variceal bleeding and recurrent ascites. However, stent migration is a known complication of TIPS stent placement which may occur both during the procedure or postprocedural. We present a case of a 58-year-old male with history of liver cirrhosis in the setting of alcohol abuse and chronic hepatitis C infection who presented with melena and hematemesis. Esophagogastroduodenoscopy showed 4 columns of large grade IV esophageal varices with stigmata of recent bleeding. Despite endoscopic variceal banding, the patient had persistent episodes of hematemesis and became hemodynamically unstable requiring pressor support. The decision was made to proceed with emergent transjugular intrahepatic portosystemic shunt placement. After obtaining transhepatic portal access and initial stent deployment, the stent migrated from the TIPS tract into the main portal vein. While maintaining through-and-through wire access, the stent was successfully mechanically retracted using an angioplasty balloon and it was appropriately repositioned within the original TIPS tract. The stent was then further secured in place with a slightly larger stent which was deployed within the hepatic portion of the initially migrated stent. This technique was successful and obviated complete removal of the stent and follow-up imaging demonstrated patent flow and adequate positioning several months after the procedure.



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## Introduction

Approximately 50% of patients with newly diagnosed cirrhosis have gastroesophageal varices, with the prevalence of esophageal varices increasing as the severity of liver disease increases [1,2]. Patients with persistent variceal hemorrhage despite appropriate medical and endoscopic therapy with nonselective beta-blockers, such as propranolol and nadolol, and esophageal variceal ligation should be considered for transjugular intrahepatic portosystemic shunting (TIPS) with polytetrafluoroethylene stents [3]. The TIPS procedure is performed to create an intrahepatic tract between the hepatic and portal veins which will shunt blood from the hepatic sinusoids. The subsequent decrease in portal venous pressure decreases secondary morbidities, including variceal bleeding and recurrent ascites [4].

Despite the benefit from TIPS placement in the management of acute variceal bleeding, complications may arise both during and after placement. Stent migration is a known complication of TIPS stent placement which may occur during or after the procedure. There have been many devices and endovascular techniques designed to modify malpositioned or misplaced objects. Techniques such as using a loop snare, basket, grasping forceps, tip-deflecting wire, pincher device, and oversized catheter or sheath have been previously described for retrieval of foreign bodies and adjusting migrated stents [5–10]. We present a case of using balloon angioplasty to reposition a migrated stent during a TIPS procedure with subsequent follow-up with favorable outcomes.

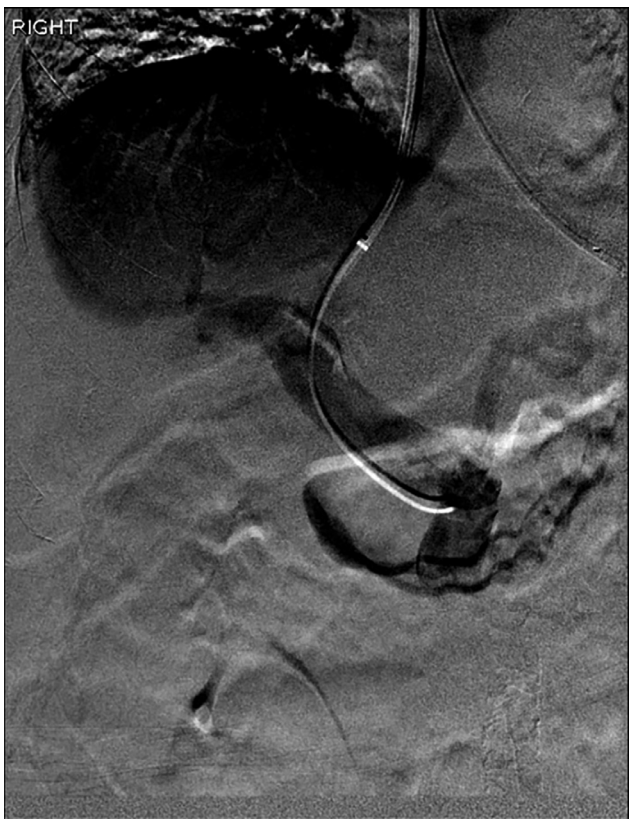


**Fig. 1 – Prior to stent deployment, intravascular venogram demonstrates an angled catheter and Amplatz wire advancing to the superior mesenteric vein. No areas of stenosis or obstruction are observed.**

## Case presentation

A 58-year-old male with liver cirrhosis in the setting of alcohol abuse and chronic hepatitis C infection presented to the emergency department with melena and acute hematemesis. This was preceded by several days of nonproductive cough and generalized fatigue. An esophagogastroduodenoscopy performed 6 months prior showed 4 columns of large nonbleeding grade IV (kissing) esophageal varices, with one column (at 12 o'clock position in neutral station) containing a platelet plug. Other findings included portal hypertensive gastropathy and old blood retained within the fundus and cardia of the stomach. A total of 6 bands were deployed over the 3 largest columns starting in the distal esophagus and into the mid-esophagus. On presentation, the patient was hemodynamically stable (blood pressure 124/72 mm Hg and heart rate 88 beats per minute), with a hematocrit of 35.4%, international normalized ratio 1.29, platelets 151,000, and Model for End-Stage Liver Disease score of 9. An esophagogastroduodenoscopy demonstrated grade IV esophageal varices and a total of 6 bands were deployed over the 3 largest columns of esophageal varices. The patient, however, had persistent


**Fig. 2 – A 10 mm X 6 cm X 2 mm Gore Viatorr stent (white bracket) was deployed within the TIPS shunt and was subsequently dilated using an 8 mm X 4 cm ConQuest balloon. Notably, there is an area of focal stenosis causing stent impingement (red arrow).**

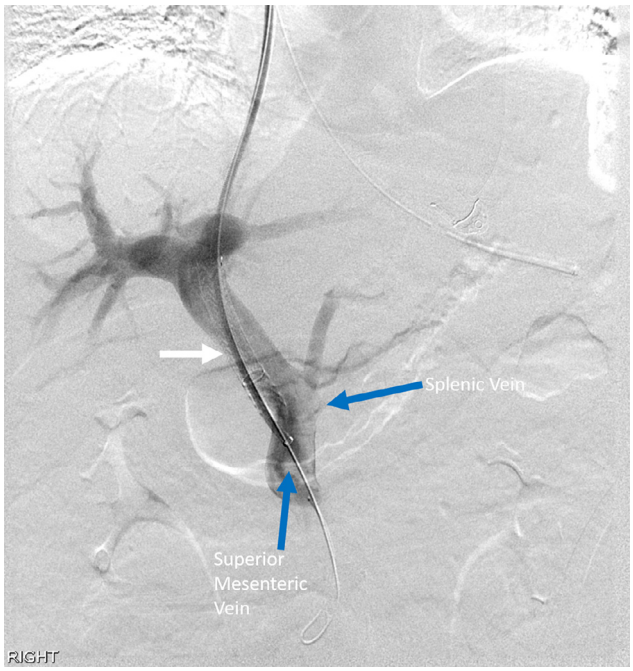


**Fig. 3 – The stent (white arrow) migrated retrograde to the superior mesenteric vein at the level of the splenic junction.**

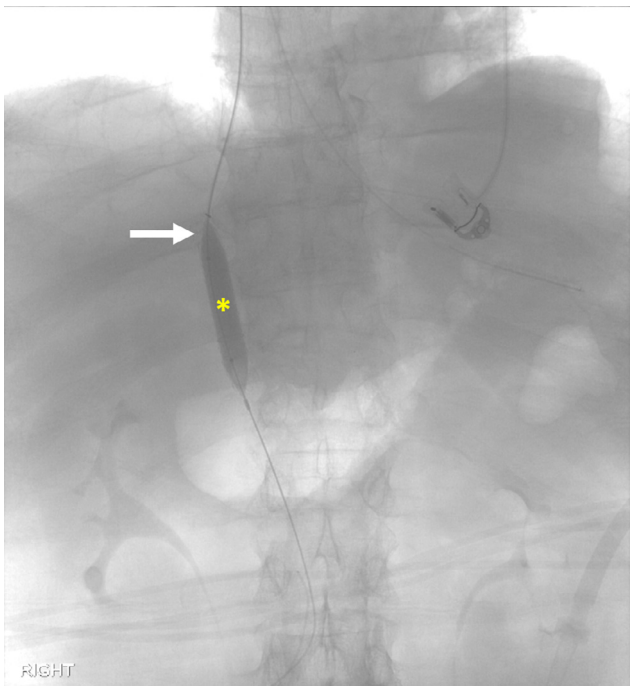


**Fig. 4 – Still image of an inflated balloon (yellow asterisk) and stent (white arrow) that were retracted under fluoroscopic guidance and positioned within the original TIPS tract.**


**Fig. 5 – A second, slightly larger caliber stent (Viabahn VBX 11 mm X 39 mm) was deployed within the original Viatorr stent.**

bouts of hematemesis and became hemodynamically unstable. Interventional radiology was consulted for an emergent TIPS placement.

Access to the portal system (Fig. 1) was successfully obtained via transhepatic approach with the Rosch-Uchida kit (Cook Medical, Bloomington, IN). After successful deployment of a 10 mm x 6 cm x 2 cm Gore Viatorr TIPS Endoprosthesis stent (W.L. Gore & Associates, Flagstaff, AZ), confirmation of adequate flow was visualized without filling of collateral vasculature (Fig. 2). The stent was successfully dilated to 10 mm using an endovascular balloon without migration at that time. Repeat portal pressure showed a decrease from 29 mm Hg and 10 mm Hg in the right atrium and a decrease in the portosystemic gradient from 20 mm Hg to 19 mm Hg. The stent was dilated to 10 mm Hg to reduce the portosystemic gradient.

During advancement of the vascular sheath to remeasure the pressure, the stent was inadvertently dislodged into the

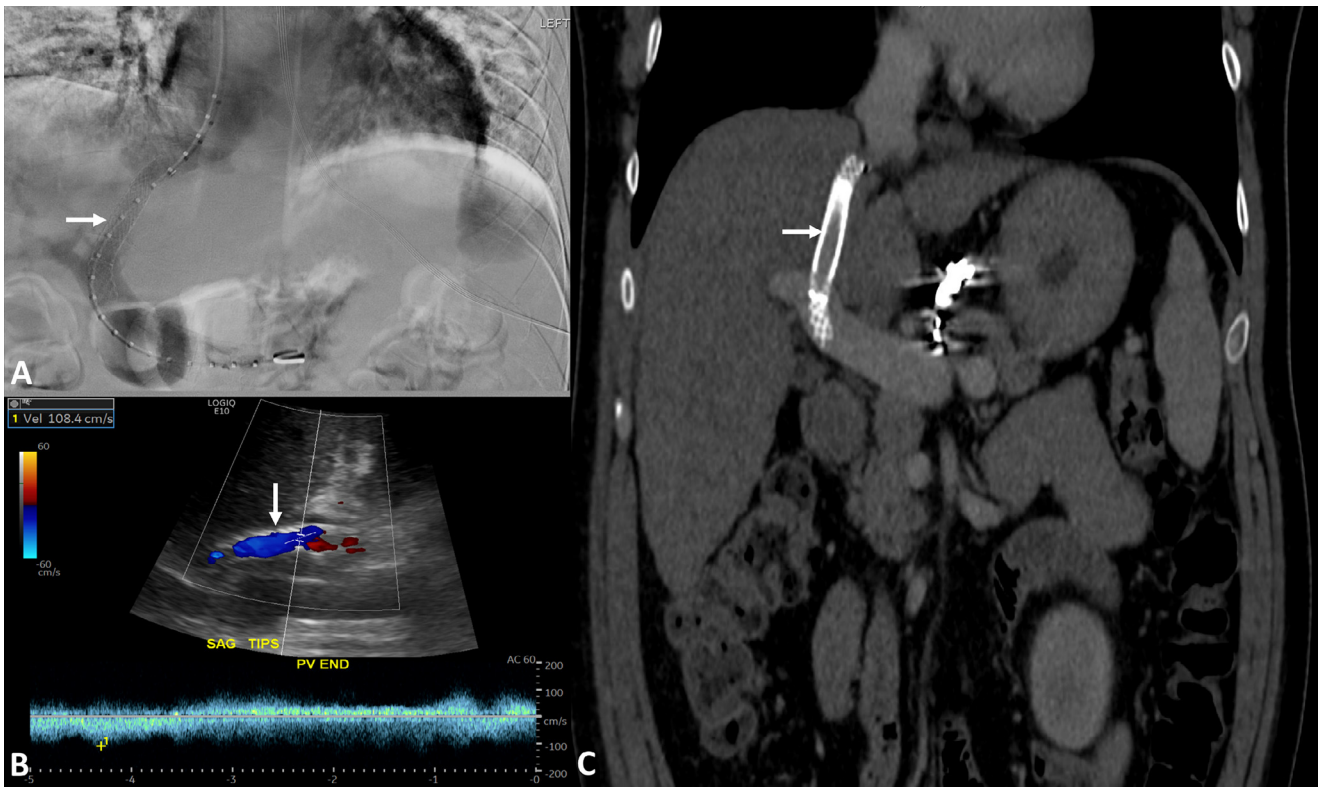


**Fig. 6 – Follow-up images from IR venogram, doppler ultrasound, CT abdomen/pelvis at 2 weeks, 10 weeks, and 13 weeks postoperation demonstrating adequate position and patency of the stented TIPS shunt.**

main portal vein (Fig. 3). Rather than electing for endovascular or surgical stent retrieval, the tract was dilated using a 10 mm balloon and then was advanced over the wire and inflated within the stent (Fig. 4). The inflated balloon and stent were successfully retracted as a unit under direct fluoroscopic guidance until repositioned within the original/appropriate TIPS tract. In order to secure the catheter/stent, a slightly larger caliber stent, the Viabahn VBX (W.L. Gore & Associates, Flagstaff, AZ) 11 mm x 39 mm stent, was advanced to the sheath and deployed within the covered portion of the Viatorr stent (Fig. 5). Final angiographic images demonstrated good flow through the stents in the intended location with a final portosystemic gradient of 15 mm Hg.

Following the procedure, the patient was transferred back to the intensive care unit. The patient was monitored for hepatic encephalopathy in the intensive care unit. He did not have any episodes of hematemesis after the TIPS procedure and was discharged to home after 7 days. Ultrasonography with doppler showed mild reversal of flow and a subsequent catheter-directed venogram which showed partial thrombosis of the left gastric vein. Interventional radiology performed a transjugular venous measurement of the gradient from the main portal vein and right atrium at 18 mm Hg. The decision to perform angioplasty and coil left gastric vein after which the pressure gradients were acceptable (12 mm Hg). After 7 months of routine follow-up, the patient is alive, has had no incidents of re-bleeding, and the stent is patent (Fig. 6).

## Discussion

Variceal bleeding secondary to portal hypertension is a severe complication of liver cirrhosis. It is estimated that about 70% of all upper gastrointestinal (GI) bleeding episodes are due to varices [11]. Variceal bleeding is diagnosed based on direct observation of bleeding varices or stigmata of a recent bleed, as well as the presence of varices without other potential sources of the upper GI bleed [12]. Despite standard pharmacotherapy and endoscopic treatment, many (15%-20%) patients with acute variceal bleeding will either continue to bleed or rebleed within 5 days [13]. Patients with a hepatic venous pressure gradient of ≥20 mm Hg are at high-risk for failure of standard therapy and TIPS placement within the first 24 hours of the bleeding has been shown to have better clinical outcomes [14–16].

Despite the benefit from TIPS placement in the management of acute variceal bleeding, complications may arise. Stent migration is known complication of TIPS stent placement. While in our case the stent migrated retrograde into the portal system, the stent may also migrate centrally to the heart or even to the pulmonary arteries thereby potentially leading to additional considerations and complications including but not limited to, arrythmias, pulmonary artery occlusion, or perforation of the cardiac chamber with hemopericardium, cardiovascular fistula formation, and/or valvular injury [17–19].

Additionally, complications may arise from both superior and inferior stent embolization in the advent of necessitated liver transplantation as the case becomes more complex and technically difficult (where reconstruction of the main portal vein and potential reconstruction of the superior mesenteric vein and splenic vein may be required). Furthermore, stent migration may negate a patient's candidacy for liver transplantation [20–22]. As with our case, Viatorr stents are prone to inadvertent dislodging of the stent and thus, caution should be practiced when advancing or retracting devices and balloons should be completely deflated prior to manipulation [21].

Though the definitive treatment for stent migration is surgical removal, there are multiple published manners to address such complication. One such method is placing a snare over the struts of the stent and using this to resheath. In some cases, snaring may require balloon angioplasty tract dilatation to allow for the stent to be retracted [23]. In our case, we present a favorable outcome to a patient that required repositioning using balloon angioplasty and a secondary, slightly larger stent within the previously deployed and repositioned stent. We recognize there are potential complications to repositioning with dilated balloons, such as resulting from overinflation of the balloon causing vascular rupture and vascular wall damage due to frictional force. It is critical to avoid overinflation of the balloon and use the minimum intraluminal pressure needed to reposition the stent. We used a second stent of a slightly larger caliber after repositioning to ensure the stent remained patent and that future embolization, especially antegrade embolization, did not occur. However, after almost 1 year following the procedure, the stent maintained its proper positioning.

## Conclusions

Esophageal varices is relatively common in patients with chronic liver disease. Patients who fail medical and endoscopic management may be considered for a transjugular intrahepatic portosystemic shunt. One complication that may arise, as with our case, is migration of the stent. We provide a case demonstrating a successful mechanical repositioning of a retrograde migrated stent into the portal venous system by utilizing an endovascular balloon to angioplasty the TIPS tract followed by mechanical retraction of the stent with same balloon. Our technique was successful and obviated complete removal of the stent which was then further secured in place with a slightly larger stent which was deployed within the hepatic portion of the initially migrated stent. Radiologic imaging following stent deployment several months later demonstrated satisfactory positioning of the stent.

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