

# Recanalization of an Occluded Intrahepatic Portosystemic Covered Stent via the Percutaneous Transhepatic Approach

Chih-Yang Chan, MD, PhD<sup>1</sup>  
Po-Chin Liang, MD<sup>2</sup>

A 41-year-old woman with liver cirrhosis had recurrent portal hypertension and bleeding from esophageal varices due to complete occlusion of a previously inserted transjugular intrahepatic portosystemic shunt stent. Because recanalization of the stent by the transjugular approach was unsuccessful, ultrasound-guided entry to the splenic vein and portal vein was used. After catheter-directed intrathrombus thrombolysis, successful opening of the stent was achieved and a stent was placed. We herein report a rare case in which thrombolysis and recanalization of a TIPS stent were performed via a percutaneous transhepatic approach.

## Index terms :

Transjugular intrahepatic portosystemic shunt  
Percutaneous transsplenic recanalization  
Thrombolysis  
Portal hypertension  
Thrombosis

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<sup>1</sup>Department of Surgery, National Taiwan University Hospital, Taipei 100, Taiwan;  
<sup>2</sup>Department of Medical Imaging, National Taiwan University Hospital, Taipei 100, Taiwan

## Address reprint requests to:

Po-Chin Liang, MD, Department of Medical Imaging, National Taiwan University Hospital, No.7 Chung San South Road, Taipei 100, Taiwan.  
Tel. 886-2-2312-3456 ext. 62570  
Fax. 886-2-2322-4552  
e-mail: 007351@ntuh.gov.tw

**T**ransjugular intrahepatic portosystemic shunt (TIPS) is now considered the procedure of choice for managing portal hypertension and variceal bleeding, and especially in patients who are not candidates for surgery (1). TIPS has shown a 90% success rate for decompressing the portal circulation (2, 3). However, stent dysfunction is one of the major drawbacks of TIPS, and this raises concerns regarding its use. The weakness of the TIPS procedure is the frequent need for endovascular reintervention to ensure stent patency. When it is required, recanalization is typically performed via a transjugular approach. Yet this technique is not always successful. We report here a rare case in which recanalization and thrombolysis of a TIPS stent were performed through a transhepatic approach.

## CASE REPORT

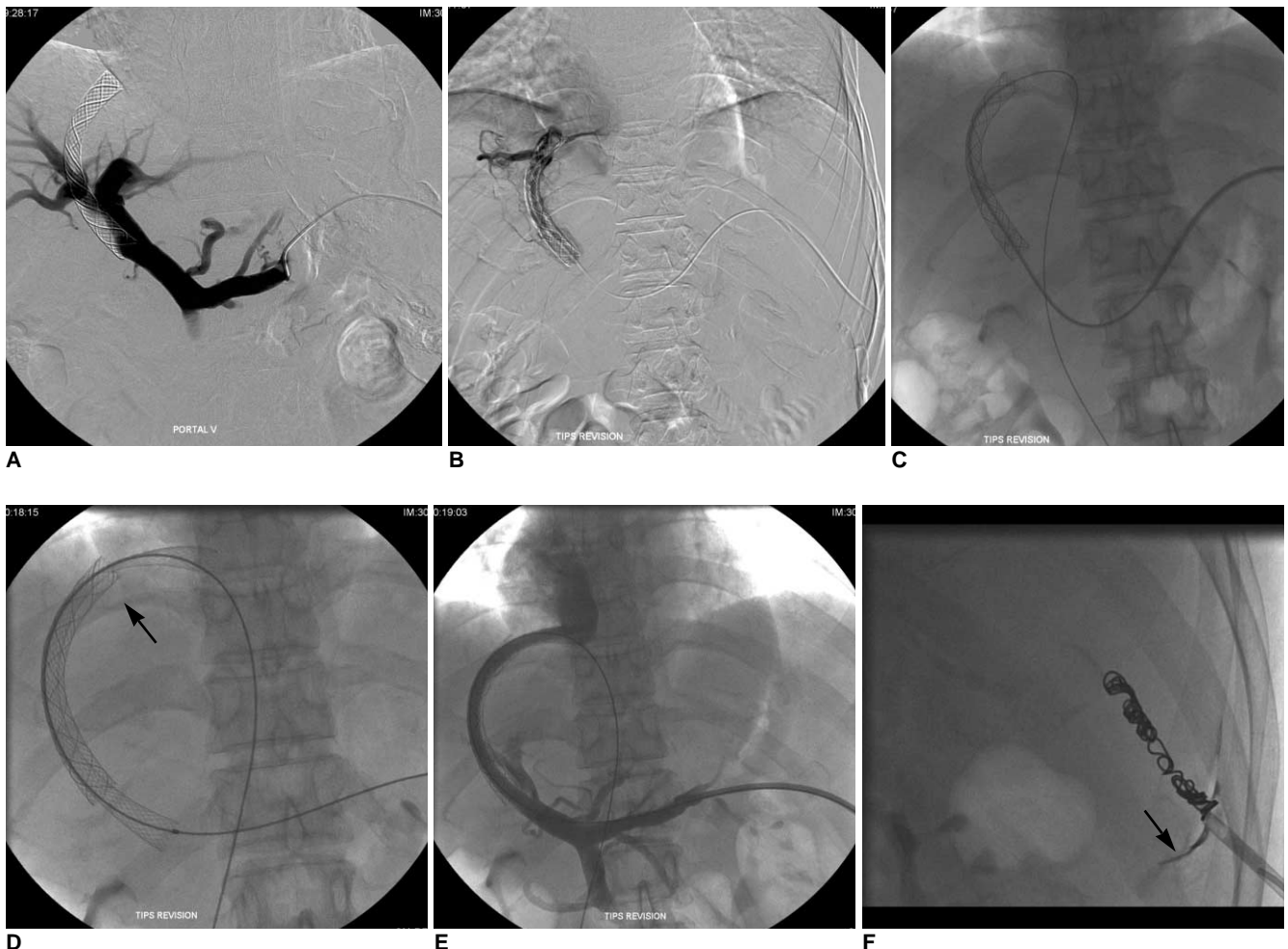
A 41-year-old woman with a history of liver cirrhosis presented with recurrent portal hypertension and bleeding from esophageal varices. Three months prior to this admission, a TIPS was created with a 10 mm × 7 cm Wallgraft (Boston Scientific, Natick, MA). However, the stent's anticoagulation was inadequate (international normalized ratio [INR]: 1.02–1.21) after placement. The Doppler ultrasonography on admission revealed complete occlusion of the stent.

The initial attempts at recanalization of the completely occluded stent via the transjugular approach were unsuccessful. Therefore, a percutaneous transsplenic approach guided by ultrasound was used to gain entry to the splenic vein and portal vein for catheterization of the occluded stent. To perform the ultrasound guided puncture of the splenic vein through the spleen, we used a Skater<sup>®</sup> Introducer set (Angiotech, PBN Medicals, Denmark). A 22-gauge Chiba needle was introduced into the splenic vein, then a 0.018 inch guide wire was placed through the Chiba needle into the splenic vein, and a 6-Fr dilator system was placed over the wire. We then exchanged the 0.018 inch guide wire with a 0.035 inch guide wire, followed by a 5-Fr

introducer sheath and a 4-Fr KMP catheter (Cook Medical Inc., Bloomington, IN). However, residual thrombosis of the stent was noted in combination with occlusion of the hepatic vein (Fig. 1A, B). So, we performed catheter-directed intrathrombus thrombolysis with urokinase (Taiwan Green Cross Co., Taipei, Taiwan). In brief, the distal end of a 4 Fr RC1 catheter (Cook Medical Inc., Bloomington, IN) with home-made side holes (n = 10, made by needle-sticks into the distal 5-cm segment of the catheter) was wedged into the thrombosed TIPS stent. Then, catheter-directed intrathrombus thrombolysis with a solution of 48 vials of Urokinase (60,000 U/vial) in 500 mL normal saline at a drip rate of 21 mL/hr (i.e., 2 vials/hr = 2,000 U/kg/hr) was administered for 24 hours.

Recanalization was performed in the following day and a Wallstent endoprosthesis (14 mm × 9 cm, Boston Scientific, Natick, MA) was placed, resulting in the successful opening of the shunt (Fig. 1C-E). The catheters were removed and the transsplenic tract was embolized with 4 serial coils (MWCE-35-8/4-Tornado, Cook Medical Inc., Bloomington, IN), as shown in Figure 1F.

The patient recovered uneventfully without significant splenic bleeding. She was discharged eight days after recanalization. The evaluation by ultrasonography showed the stent was patent. The patient's warfarin dosage was adjusted and her INR on discharge was 1.92. She is doing well five months after discharge and an ultrasound study indicates that the stent remains patent.



**Fig. 1.** Recanalization of occluded intrahepatic portosystemic covered stent.

**A.** Direct portography performed from transsplenic catheter showed occluded intrahepatic portosystemic covered stent. Superior mesenteric vein filled in retrograde direction and gastric collaterals were also observed.

**B.** With advancing catheter into covered stent, incomplete recanalization was obvious with residual thrombosis and outflow hepatic venous occlusion.

**C.** Wire was successfully negotiated through hepatic vein into caval vein.

**D.** New stent placed through covered stent (arrow) and hepatic vein into caval vein.

**E.** Portography at completion of procedure showed that shunt is now patent.

**F.** Coil embolization of transsplenic tract upon removal of final sheath. Subcapsular lining of spleen (arrow) and tip of sheath are observed.

## DISCUSSION

Transjugular intrahepatic portosystemic shunt is now considered the procedure of choice for accessing the portal system for management of refractory variceal bleeding. Certain complications, including a high reintervention rate due to occlusion of the stent, have raised concerns regarding its application (2, 3). Yet recent reports have suggested that using a covered prosthesis improves the TIPS patency to longer than two years (4, 5).

Although a covered stent had been employed in the patient presented here, thrombosis occurred early (i.e., within 3 months). Recanalization was necessary, but the transjugular approach could not be used.

Transjugular intrahepatic portosystemic shunt failure requires recanalization of the stent or placement of serial or parallel stents (6, 7). Neointimal hyperplasia at the ends of the stent may completely occlude the outflow hepatic venous tract (1) and this can make reintervention difficult. As in this case, an alternative route is needed when attempts at recanalization via a conventional transjugular approach fail.

The splenic vein drains directly to the portal vein, and its size and straight route make this approach an ideal option (5, 8). In addition, this route provides the requisite forces for handling wires and catheters. The transsplenic approach has been used for other indications, as reviewed by Tuite et al. (8), but we are unaware of any other report of using the percutaneous transsplenic approach to recanalize an occluded TIPS stent. Additionally, we believe that the overnight infusion of a thrombolytic agent contributed to successful recanalization in our case (9).

Concerns regarding post-procedural splenic bleeding and the reported difficulty some clinicians have experienced negotiating the pathway have limited the use of the transsplenic route. A cautious, image-guided approach reduces the risk of splenic hemorrhage (5, 8) and obliteration of the transsplenic tract with coils upon completion of the procedure also assists in preventing post-procedural bleeding (8). No significant splenic bleeding occurred in our patient, despite her liver impairment, during or following the intervention.

Subtherapeutic anticoagulation (INR < 2) probably contributed to the thrombosis and subsequent occlusion in this patient. There is no routine anticoagulation protocol to follow for TIPS patients. We prescribe anticoagulation for only the patients with TIPS dysfunction; however, there is no reference available for the effectiveness of this regime. As a general rule for preventing thromboembolism,

chronic oral anticoagulant therapy with a vitamin K antagonist is administered and the dose is adjusted to achieve an INR of 2.0 to 3.0 (10).

In summary, we have reported on a rare case of using the transsplenic approach for recanalization of a TIPS stent by thrombolysis. Transsplenic entry to the portal system is useful in recanalizing a stent that is difficult to reach through the usual transjugular route.

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