# Technical Challenges in TIPS Creation via the Right Subclavian Vein

**Sohail G. Contractor, MD, Alex Merkulov, MD, Pranay C. Uppuluri, MD, Waseem Bhatti, MD, and Tej Phatak, MD**

**This report describes a 64-year-old man with Laennec cirrhosis requiring a transjugular intrahepatic portosystemic shunt (TIPS) to alleviate ascites before surgical mesh repair of a large symptomatic umbilical hernia. During the procedure, both internal jugular veins and the right external jugular vein were found to be occluded. The right subclavian vein was accessed and a TIPS was successfully created. Some of the technical challenges encountered in performing the procedure from the right subclavian vein are described.**

**J Vasc Interv Radiol 2008;** 19:1777–1780

**Abbreviations:** EJV = external jugular vein, IJV = internal jugular vein, IVC = inferior vena cava, PV = portal vein, RHV = right hepatic vein, SVC = superior vena cava, TIPS = transjugular intrahepatic portosystemic shunt

TRANSJUGULAR intrahepatic portosystemic shunt (TIPS) creation has been indicated for sequelae of end-stage liver disease and portal hypertension, including gastric and esophageal variceal bleeding, refractory ascites, hepatic hydrothorax, and hepatic venous outflow obstruction (1). Ascites is a common sequela of cirrhosis; patients with ascites experience numerous symptoms including bloating, early satiety, and respiratory distress. Inguinal and umbilical hernias are also seen secondary to increased intraabdominal pressure. Initial medical management of ascites includes sodium restriction and use of diuretic agents. For patients in whom medical therapy fails, treatment options include serial paracentesis, placement of an indwelling peritoneal catheter, surgical portosystemic shunt creation, and TIPS creation.

The standard technique for creation of a TIPS involves access to the right internal jugular vein (IJV) followed by selective catheterization of the right hepatic vein (RHV). This is followed by puncture of a branch of the right intrahepatic portal vein (PV) and placement and expansion of a stent to connect the portal and systemic circulations. Case reports of TIPS created from the left IJV, external jugular vein (EJV), and femoral vein have been published (2–4). Herein we present a patient who underwent successful TIPS creation from a right subclavian vein approach because of occlusion of the IJV and EJV. The presence of a large hernial sac over the groin prevented a femoral vein approach.

## CASE REPORT

Institutional board review approval was obtained for this retrospective case report. A 64-year-old Hispanic man with Laennec cirrhosis was referred to our service for TIPS creation for treatment of refractory ascites. The patient was admitted for elective surgical repair of a large nonreducible umbilical hernia, which was causing a 4-cm × 3-cm area of overlying skin discoloration and ulceration. On admission he was afebrile and denied abdominal pain, nausea, or vomiting. Computed tomography (CT) of the abdomen and pelvis revealed a hernial sac measuring 13 cm × 10 cm × 12 cm that contained nonobstructed loops of small and large bowel bathing in ascites (**Fig 1**). The main and right PVs were patent; the left PV had partial thrombosis. The patient's medical history included hypertension, anemia, chronic liver disease, ascites, and portal hypertension. He had two earlier episodes of esophageal variceal bleeding 4 months apart that were treated with endoscopic variceal band ligation; the last episode was 2 years prior to this admission. The patient had no history of encephalopathy or jaundice and had required large-volume paracentesis at least three times in the previous year. He admitted to imbibing at least three cans of beer three to four times per week and was not a liver transplantation candidate because of active alcohol intake.

The patient's Model for End-stage Liver Disease score on admission was 10 (serum bilirubin level of 0.9 mg/dL, International Normalized Ratio of 1.4, serum creatinine level of 0.5 mg/dL), which correlated with a Child-Pugh class of B (serum bilirubin level of 0.9 mg/dL, albumin level of 3.1 g/dL, International Normalized Ratio of 1.4,

From the Department of Radiology, University of Medicine and Dentistry of New Jersey–New Jersey Medical School, H108, University Hospital, 150 Bergen Street, Newark, NJ 07101. Received January 22, 2008; final revision received and accepted September 2, 2008. **Address correspondence to** S.G.C.; E-mail: sohailcontractor@hotmail.com

None of the authors have identified a conflict of interest.



**DOI: 10.1016/j.jvir.2008.09.001**

**Figure 1.** Axial abdominal and pelvic CT images obtained before the creation of TIPS demonstrates marked ascites and a large ventral hernia measuring 13 cm × 10 cm × 12 cm.

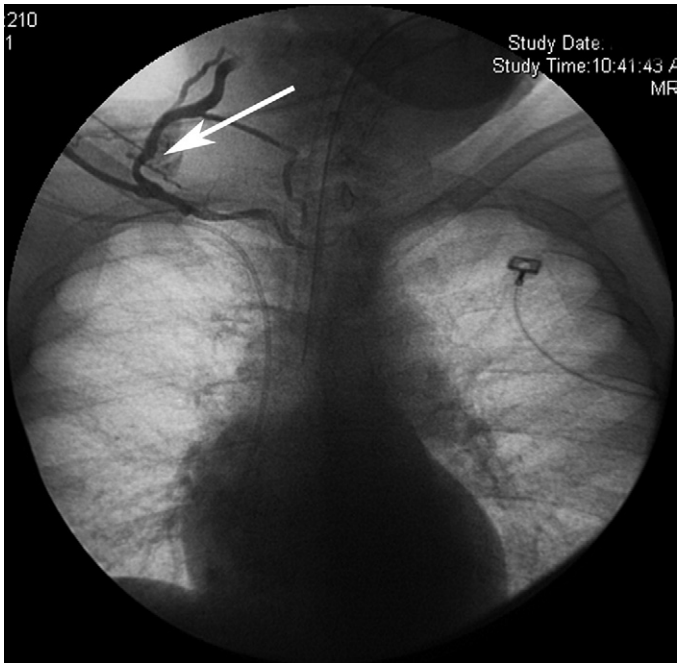


**Figure 2.** Venogram via micropuncture sheath in the right EJV demonstrates occlusion distally. The patient also has a peripherally inserted central catheter in the right arm.

tense ascites, no encephalopathy). Medical optimization, which included sodium restriction to 5 g/d, spironolactone 60 mg two times per day, furosemide 80 mg two times per day, electrolyte regulation, nutritional status control, and use of antibiotics, failed to substantially reduce ascites. The patient was given antibiotics because his ascitic fluid had revealed an increased white blood cell count (ascitic neutrophil count >250/mL) on a previous paracentesis. TIPS creation to decrease ascites and optimize the patient for surgery was scheduled.

At the time of the TIPS procedure, the patient had tense ascites. Patency of the portal and hepatic veins were documented with a preprocedural Doppler ultrasound (US) examination. However, US of the neck revealed bilateral occlusion of the IJV, as well as an occlusion of the left EJV. Access was gained into a patent right EJV with a micropuncture needle; however, the microwire and catheter would not advance into the superior vena cava (SVC). A venogram through the micropuncture sheath demonstrated occlusion of the vein central to the point of puncture with extensive collateral vessels seen in the lower neck (**Fig 2**). Options for performance of the TIPS procedure included recanalization of the occluded right IJV, subclavian access, or femoral access. Because of the uncertain duration (and likely chronicity) of occlusion seen on the venogram, recanalization was not attempted. The femoral vein approach was considered unsuitable because of the extensive hernia overlying the right groin. Surgical shunts, including a transmesenteric TIPS, were discussed with the surgeon, who preferred an attempt at TIPS creation from the subclavian access.

The right subclavian vein was patent on US and was accessed infraclavicularly with use of real-time sonographic guidance with a micropuncture kit (Ministick; Boston Scientific, Natick, Massachusetts). A 0.035-inch Amplatz wire (Cook, Bloomington, Indiana) was passed into the inferior vena cava (IVC) and an 11-F sheath (Pinnacle; Terumo, Somerset, New Jersey) was placed with its distal tip in the SVC. A Rösch-Uchida transjugular hepatic access kit (Cook) was used to access the RHV. A selective right hepatic venogram and a wedged hepatic venogram with carbon dioxide gas were obtained, which confirmed main PV patency. A right PV branch was selected as a visual target for needle passes. The outer metal sheath for the RUPS needle was then passed through the sheath over the Amplatz wire; however, the 14-gauge solid-bore RUPS transjugular needle would not pass through the set and buckled the access sheath out of the hepatic vein on two occasions. This was likely because of the two-point turn from the right subclavian vein into the RHV (**Fig 3**). The entire system was then replaced over an Amplatz wire positioned in the RHV, and a 30-cm 10-F Check-Flo II sheath (Cook) was first passed into the RHV. A Ring transjugular hepatic access set (Cook) was then passed into the RHV over the Amplatz wire (**Fig 4a**). This set has a hollow-bore 16-gauge needle (Colapinto needle) that can be passed over a wire. An acute angulation was made to the end of the Colapinto needle, and it was successfully passed over the wire into the RHV.

Attempts to turn the needle anteriorly to access the right PV were then made; however, the needle would not turn, again likely because of the two-point turn into the hepatic vein from the right subclavian vein. Subsequently, the entire set was pulled back close to the orifice of the RHV off the IVC. The needle could then be turned anteriorly, and access was successfully gained into an intrahepatic branch of the right PV (**Fig 4b**). A 0.035-inch Glidewire (Terumo)