# Transjugular Intrahepatic Portosystemic Shunt (TIPS)

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Surgery for portal hypertension began in 1877, with Nicolai Vladirmirovich who performed the first portacaval anastomosis. There was little clinical success until Blakemore and Whipple between the 1920's and 1940's: the mortality rate ranged from 25-40%. Hepatic encephalopathy was a clinical problem. In 1960, Warren and collegues performed a distal splenorenal shunt, which reduced the incidence of hepatic encephalopathy to an acceptable level.[1] Other complications after undergoing successful portacaval anastomosis included ammonia toxicity, responsible for the neuropsychiatric changers seen in patients with impending hepatic coma[2] and progressive hypersplenism, inducing thrombocytopenia and leucopenia which can become life-threatening after a shunt procedure.[3] Transjugular intrahepatic portosystemic shunt (TIPS) is a less invasive, non-surgical procedure basis which minimizes complications in the treatment of portal hypertension.[4] The procedure is mostly performed by Interventional Radiologists (IR) and is effective in selected cases of cirrhosis and portal hypertension.

**Case Report**

A 51-year-old man, a known case of alcoholic cirrhosis, was hepatitis B virus (HBV), hepatitis C virus (HCV), human immunodeficiency virus (HIV) positive with CD4 normal, and gastric varices. The abdomen showed a small liver with ascites. There was evidence of gastric varices. The previous operations included gastric surgery. He underwent glue injections on more than one occasion. The computed tomography (CT) of the whole abdomen showed liver cirrhosis with multiple varices postop multiple glue injections of gastric varices (Figure 1). It showed patency of hepatic vein, portal vein and inferior vena cava (IVC). There was evidence of splenomegaly and large amount of ascites, as well as multiple gallstones and some sand stones. Patient was referred to IR for consideration to undergo TIPS to correct previous failures to control upper gastrointestinal bleeding and refractory ascites. TIPS was performed under digital subtraction angiography (DSA) via the right internal jugular access with 12-F introducer sheath. After identifying the right branch of the hepatic vein, the venography was done with wedge injection technique to demonstrate both right hepatic vein and right portal veins. Using the Rosch-Uchida needle system, the branch of the right portal vein was punctured after multiple attempts. Finally, the portal vein was reached by the guide wire and a new tract between the hepatic vein and portal vein was created. Balloon dilatation was done using the Angioplasty balloon, 10 mm diameter and 6 cms long. Then the wall stent (Nitinol endoprosthesis, 12x90 mm) was inserted. Post stenting, balloon dilatation was done again. The venography was done through the newly created shunt and showed blood flow from the main portal vein via the shunt into the hepatic vein and systemic circulation with no delay or obstruction. The patient tolerated the procedure well.

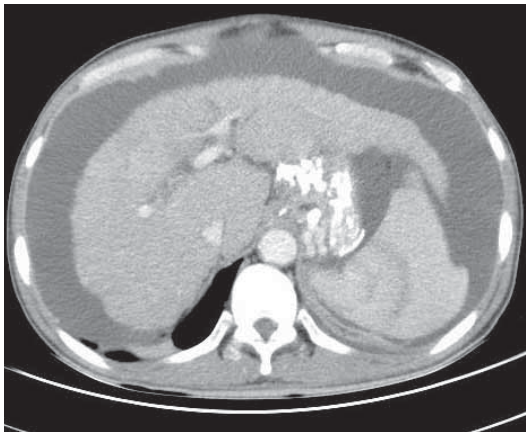

***Figure 1:*** *CT of the whole abdomen shows liver cirrhosis with multiple gastric varices post multiple glue injections.*

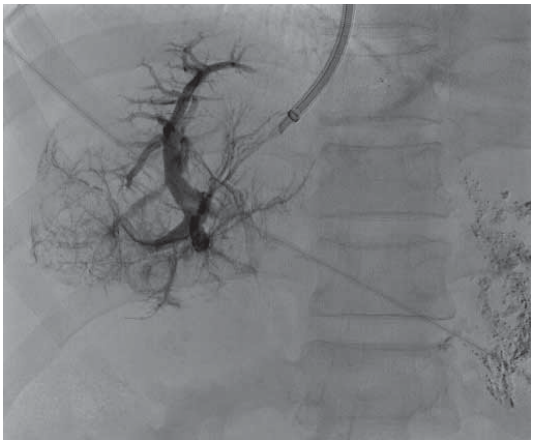

***Figure 2:*** *Transjugular to the right atrium, the catheter tip is in the right middle hepatic vein. Well demonstrated right middle hepatic vein and its distribution.*

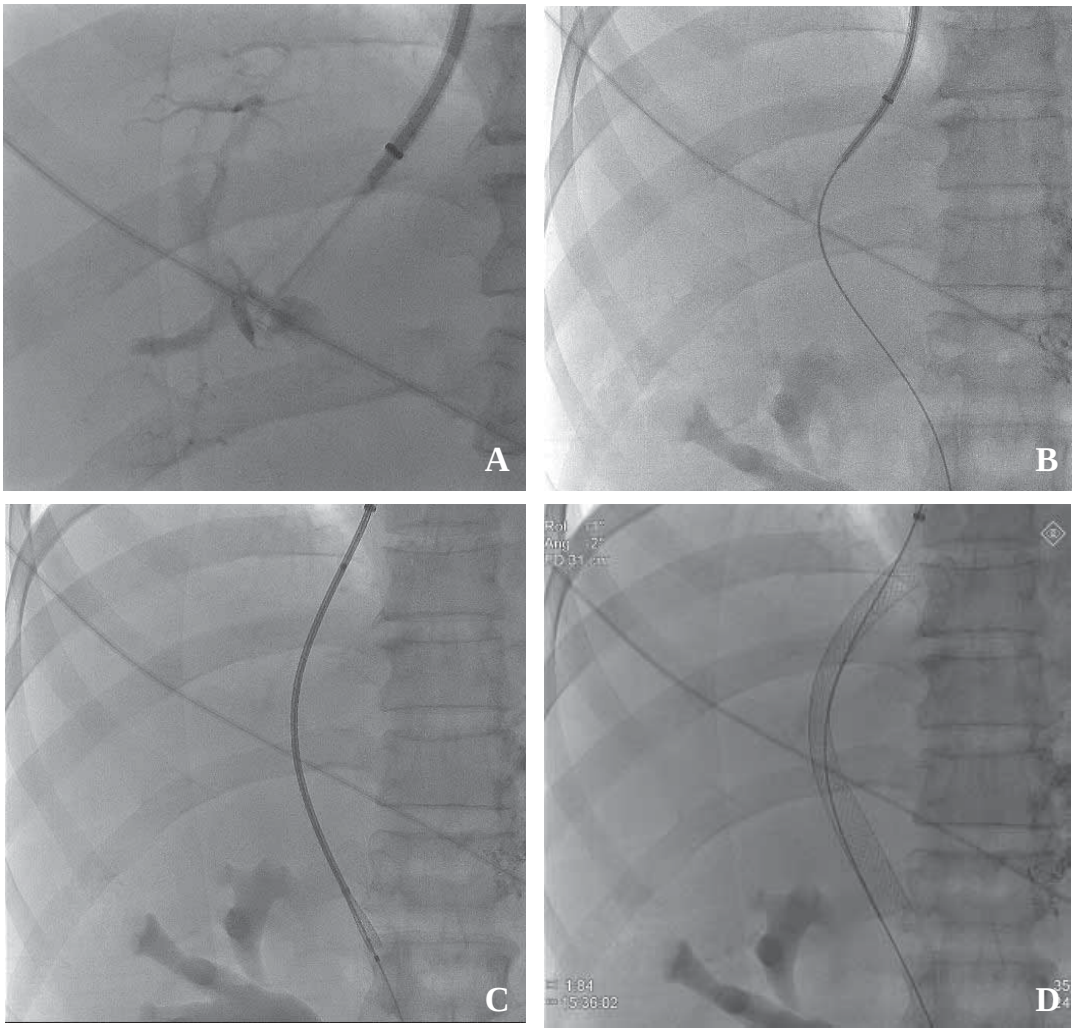


***Figure 3:*** *A. Needle punctured the hepatic vein and tipped in branch of portal vein. Venogram of intrahepatic portal veins are well visualized.*
*B. The guide wire passed through the catheter under fluoroscopy. The guide wire passed into the portal vein.*
*C. The intraluminal stent is inserted then the catheter and distal end of the stent is in the portal vein. The proximal end is in the right middle hepatic vein.*
*E. The 12 mm diameter stent is deployed in the proper position after balloon angioplasty was done.*


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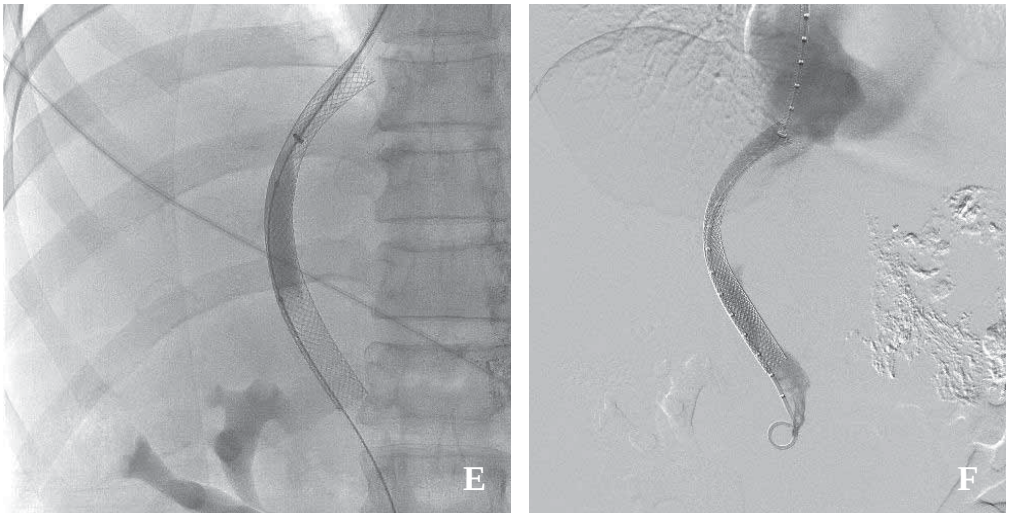


***Figure 3:*** *E. The stent is again expanded using 10 mm balloon dilatation.*
*F. The contrast of the whole stent is well visualized. The contrast flows through the portal vein with well opacities in the right atrium.*

**Discussion**

Portal hypertension is a serious complication of liver disease leading to the troublesome complication of bleeding esophageal varices. Portacaval anastomosis was the treatment of choice in the past with ammonia toxicity the untoward side effect of surgery. TIPS is a less invasive management which reduces such complications. The qualified interventional radiologist is able to correct the problems with a satisfactory result.

This procedure is a minimaly invasive technique to reduce the portal pressure by creating a connection between the portal and systemic circulation via percutaneous approach, in the majority of cases we perform via the transjugular vein. The shunt patency is maintained by placing an expandable metal stent. In 1969, Rosch created the connection between the portal vein and the hepatic vein via the jugular vein to create a functional shunt using a silicone tube and a silastic stent. But results were poor due to stent occlusion within a short period of time, until Gore via tips were approved by the Food and Drug Administration (FDA) which expanded polytera-fluoroethylene graft lining. These reduce occlusion by the prevention of bile and mucin penetration and growth of the tissue into endoprosthesis.

*Indications*

1. Uncontrolled acute varices or recurrent bleeding after medical treatment and sclerotherapy.
2. In case of liver hepatoma;
   i. Reduction of intrahepatic morbidity.
   ii. On waiting list for liver transplantation.
3. For palliative treatments to prolong life in case of inoperable and non-nourished vascular lesser degree neovascular or hepatic tumors.

*Contraindication*

1. Severe hepatic encephalopathy or liver failure.
2. Repeat hepatic failure.
3. Portal vein thrombosis.
4. Polycystic hepatic disease.

*Patient preparation*

1. Blood examination for coagulopathy. Platelets are routinely administered when platelet counts are less than 50,000 $mm^3$, fresh frozen plasma is used as well.
2. Prophylactic broad-spectrum antibiotics are given.
3. Anatomical structures of liver vascular apply. Both portal vein and hepatic vein are established. The patency of the portal vein is essential and doppler ultrasound should study portal flow end pressure.

MRI of the Liver should be performed to evaluate hepatic vein, portal vein and biliary tract.

*Technique*

1. Anesthesia by short acting sedation or general anesthesia.
2. Special tips commercial sets are available.
3. In the majority of case, right jugular vein approach by using ultrasound guidance is recommended.
4. A 5F catheter is wedged in a peripheral branch of the right or middle hepatic vein and carbon dioxide (CO2) gas to opacity portal vein.

5. Under biplane fluoroscopy, use the hepatic venogram images as a guide.

The colapinto needle is advanced through the right atrium, hepatic vein (right or middle branch) and directed anteroinferior direction after penetration of in an wall of the hepatic vein into the portal vein (right or middle branches). The catheter in the right hepatic vein lies supero-posterior to the portal vein. The needle is aimed anteromedially and advanced 3-4 cm in the liver caudally, after entrance into the portal vein, the guide wire and catheter are advanced into the portal vein. Then the portal vein is visualized. Precaution should be taken not to hit the portal vein at the extrahepatic portion, which can cause life-threatening hemorrhage. The portosystemic gradient pressure should be more than 12 mmHg, then the TIPS procedure will be effective. The porto-hepatic shunt should be a dilated shunt of 8-12 mm. After stent replacement is performed, the portosystemic shunt pressure should decrease and good flow demonstrated. The puncture site into the portal vein should be the intrahepatic portion proximal to the portal bifurcation by at least 1 cm.

*Complications*

1. Cardiac arrhythmia.
2. Injury to hepatic artery and/or bile duct.
3. Life-threatening hemorrhage due to capsular tear from portal venous puncture into extrahepatic portion.
4. Hepatic encephalopathy may develop case of child class, or portosystemic gradient reduction.
5. After TIPS procedure, deterioration of hemodynamic return may cause congestive heart failure to develop.

*Clinical results*

The success rate depends on an operation experience success rate of more than 90%. The portosystemic shunt gradient is less than 12 mmHg. The varices tend not to bleed. Improvement may occur within 1 month after the procedure. Stenosis may develop later. Follow up doppler ultrasound should be performed within 24 hours.

**Conclusion**

TIPS is an effective procedure to reduce portal pressure in cases of acute or recurrent variceal bleeding and uncontrolled medical treatment or sclerotic therapy. The success rate will be improved by operator experience. Complications of the procedure and hepatic encephalopathy may develop later dependent on liver status and the change in portosystemic circulation.

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