



# Transjugular Intrahepatic Portosystemic Shunt (TIPS) in a Split Liver Graft Transplant Recipient

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We report an unusual case of TIPS in a split liver graft recipient. A 65-year-old woman s/p right lobe split liver graft transplantation for chronic hepatitis C cirrhosis presented seven years after the transplantation with refractory ascites and melena requiring blood transfusions for a year. She had a prior history of endoscopic balloon dilatation and stenting of a posterior segmental ductal stricture 8 months post-transplantation. Her laboratory parameters were as follows -total bilirubin -1 mg/dl, AST-50U/L, ALT-48U/L, alkaline phosphatase-50U/L, INR-1.4, serum albumin-3.2 g/dl, serum creatinine-1.2 m/dl and a MELD score of 12. Upper GI endoscopy showed grade 2 gastroesophageal varices. Contrast-enhanced computed tomography of the abdomen revealed dilated posterior segmental biliary duct (►Fig. 1A) secondary to chronic ductal stricture with atrophy of the posterior liver segment and hypertrophy of the anterior segment. Posterior segmental portal vein branch caliber was small with near-vertical angulation of the anterior segmental portal vein (►Fig. 1A). There were features of portal hypertension with ascites, splenomegaly, and significantly dilated retroperitoneal and mesenteric venous collaterals (►Fig. 1B) and a dilated azygous venous system.

The case was discussed with the multidisciplinary team. The patient was given the option of re-transplantation and intervening bridging TIPS. Technical difficulties of the procedure were discussed including the small size of the graft liver, anteromedial rotation of the right anterior segmental portal vein (likely target in the TIPS procedure), and dilated posterior segmental biliary system. Percutaneous biliary decompression prior to TIPS was discussed to prevent accidental injury to the dilated duct during the procedure but was not considered due to the chronicity of

the stricture. TIPS was performed through the right jugular venous approach. The medial tributary of the right hepatic vein was cannulated (►Fig. 2A) with the subsequent puncture of the anterior segmental portal vein under ultrasound guidance and using the surface clip as a landmark (►Fig. 2B). Balloon dilatation of the tract was performed followed by placement of two stents 10 × 80mm (E-Luminex Bard stent) and 10 × 60mm Fluency stent graft (►Fig. 2C and 2D) cranially from the hepatic vein-inferior vena cava junction and caudally into the main portal vein (The stent-graft covered both the hepatic and portal vein entry end and uncovered stent extended distally into the main portal vein across the previous surgical portal vein anastomosis). The portal pressure decreased from 30 mm Hg prior to TIPS to 12mm of Hg post TIPS (Pre TIPS Portosystemic gradient was 34 and post TIPS 12). There was a gradual reduction in ascites over a period of one week, with no further episodes of melena during 3 months follow-up. Three-month follow-up Doppler (►Fig. 3A) showed a patent TIPS stent with good flow (PSV-more than 100 cm/sec).

Transjugular intrahepatic Portosystemic shunts (TIPS)<sup>1</sup> have been used as a bridge therapy for patients awaiting liver transplantation to control their symptomatic portal hypertension. Post-transplantation TIPS has been used to alleviate symptoms of recurrent portal hypertension, in the treatment of post-transplant sinusoidal obstruction,<sup>2</sup> in portal vein thrombosis, and in small size graft syndrome. Kim et al,<sup>3</sup> in their study of 14 patients with refractory ascites/ variceal bleeding who underwent TIPS following orthotopic liver transplantation, have shown that 50% of the patients had variceal bleeding control, and 57% had good

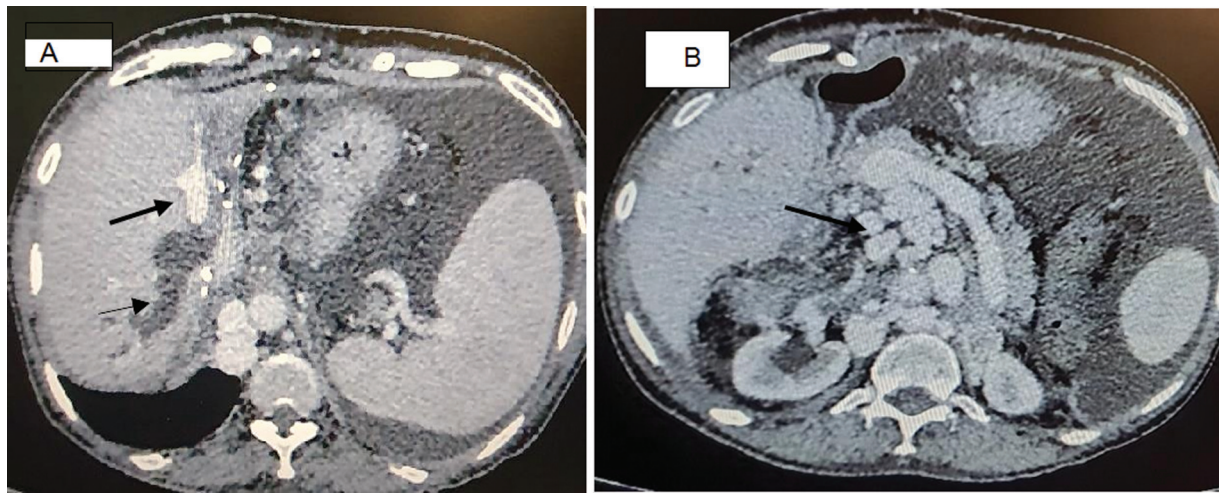
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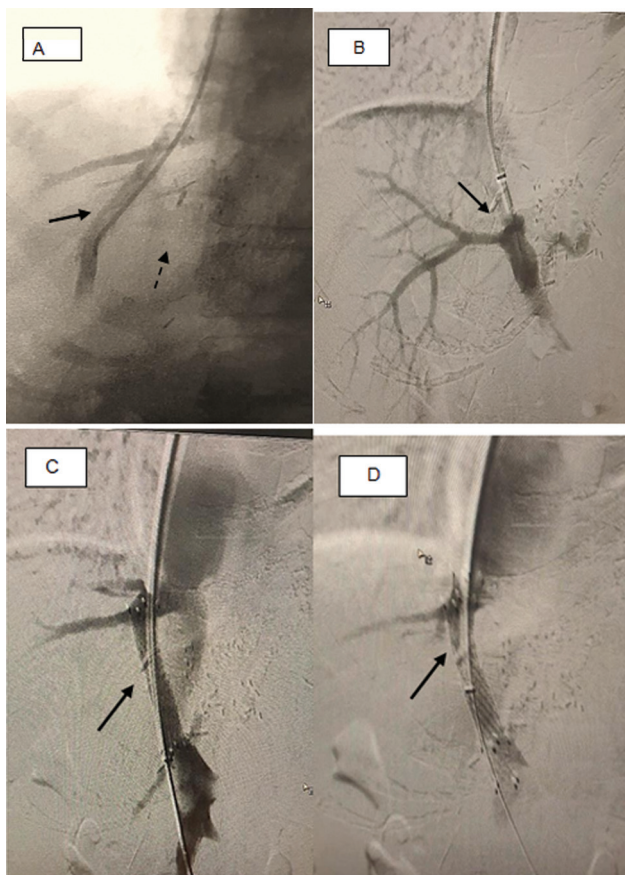
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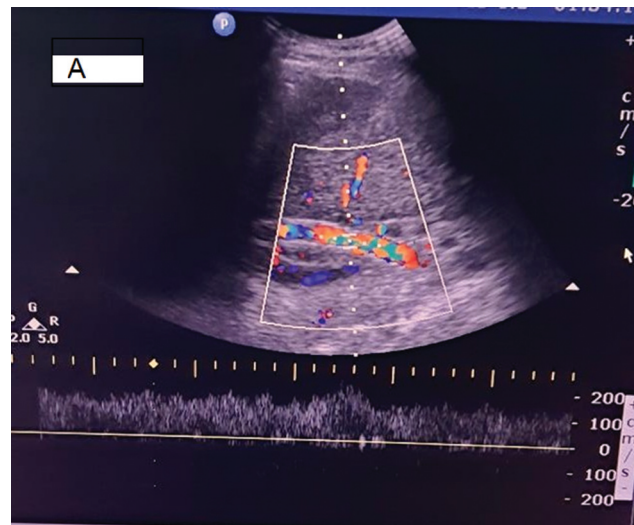
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**Fig. 1** 65-year old woman with right hepatic lobe split graft transplant presented with ascites and melena. (A) Contrast enhanced CT (Porto venous phase) showing dilated posterior segmental biliary duct (small black arrow) and vertical angulation of anterior segmental portal vein (black arrow) with (B) image showing dilated retroperitoneal and mesenteric collaterals (black arrow).



**Fig. 2** 65-year old woman with right hepatic lobe split graft transplant presented with ascites and melena. Fluoroscopic spots (A) showing cannulation of middle hepatic vein and surface clip used as landmark (dotted arrow) and (B) showing entry into portal vein close to clips with 65-year old woman with right hepatic lobe split graft transplant presented with ascites and melena. Fluoroscopic spots (C) and (D) showing placement of two stents.



**Fig. 3** 65-year old woman with right hepatic lobe split graft transplant presented with ascites and melena. Axial Doppler image showing good intrastent flow (PSV more than 100cm/sec).

ascitic control at one year follow up with one-year survival rate of 14%. They concluded only a marginal short-term benefit in the absence of re-transplantation. Eyob Feyssa et al,<sup>4</sup> in their study, showed TIPS for refractory ascites was effective in patients with MELD scores less than 15, and TIPS might extend their post-transplant survival. There is increasing evidence for post TIPS liver failure and resistant hepatic encephalopathy in transplant recipients, especially with a MELD score >15 in comparison with pre-transplant patients.<sup>4</sup> It has also been suggested that in chronic hepatitis C patients it should be reserved for those with a MELD score of less than 12.

Technically,<sup>5</sup> in whole graft liver transplant recipients, creating TIPS does not pose any major difficulty except in a few patients with piggyback anastomosis. In split graft recipients,<sup>5</sup> the small graft size allows little room for needle maneuvering. The hepatic/portal venous radical disorientation due to graft hypertrophy may lead to additional challenges. This is often more so in left-sided split grafts. In our case, due to the posterior segmental atrophy, there was near vertical angulation of the anterior segmental portal vein and it was technically challenging to access it from the right hepatic vein. We modified the needle by slightly increasing the angulation and it was assisted by medial rotation of the guiding cannula. Due to the small graft size, the cannula was pulled back along the hepatic vein and the parenchymal puncture was made near to the hepatic vein/IVC junction. Though the puncturing of the portal vein was done under ultrasound guidance, the surgical clip along the liver cut surface was used as a landmark in fluoroscopy. Other techniques<sup>5</sup> of unconventional TIPS in transplant groups have also been in the literature. These include placing a wire percutaneously into the portal vein, clips along the portal vein course, and the gunshot technique (REF).

In conclusion, TIPS for refractory ascites and bleeding in the split liver graft recipients is effective but technically

challenging. Technical modifications of the device and imaging guidance are useful in successfully performing the procedure.

#### Conflict of Interest

None declared.

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