Portal Vein Dilatation in The Liver Transplant Recipient

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Portal vein stenoses are quite rare in liver transplant recipients except when interposition grafts are used to facilitate the surgical anastomosis.¹ Often these lesions are discovered with non-invasive screening tests such as ultrasound but can also present with symptoms related to portal hypertension. Because stenoses can progress to complete occlusions that portend a much worse prognosis, we have aggressively sought and dilated stenoses. When encountered, this type of vascular complication is effectively alleviated with percutaneous angioplasty.²⁻⁶ Metallic stents have also been used effectively to treat recurrent and elastic stenoses.⁶⁻⁸

PROCEDURE

In children, portal venoplasty should be performed under general anesthesia. In adults, conscious sedation is usually sufficient. The liver is punctured with a 21 gauge needle (Accustick Introducer System, Boston Scientific, Natick, MA) using fluoroscopic or sonographic guidance. A subxiphoid approach is used for reduced size liver transplants and a lateral approach is used with orthotopic transplants. Ultrasound guidance is especially helpful in children and can limit passes through the liver parenchyma. When an appropriate portal vein branch is entered, the needle is exchanged for a 4-F coaxial dilator/6-F sheath combination included in the introducer system over either a 0.018" guidewire such as a 0.018" V18 control wire (Boston Scientific).

Portal venography (Fig. 1A) with portal vein pressure measurements are obtained. A 0.035" guidewire is used to traverse the stenotic segment. Occasionally, a hydrophilic guide wire may be used for particularly severe stenoses. After administering a bolus of heparin (50 U/kg) directly into the portal vein, a portal vein pressure measurement is obtained followed by dilatation of the stenotic segment (Fig. 1B). Post-venoplasty pres-

sure measurements and portal venography are performed (Fig. 1C). In recurrent stenoses (Fig. 1D) and in cases with persistent gradients of 5 mm Hg or greater, a self expanding stent such as a Wallstent (Boston Scientific) is deployed (Fig. 1E) and dilated if necessary with an appropriate sized balloon. In children we have used 8 mm × 20 mm stents and in adults, 10 × 40 mm stents.

Early in our experience, we embolized transhepatic tracts but have since found this unnecessary in well healed (> 1 month) transplants. Immediately after the procedure, the patient is systemically anticoagulated with heparin for 48-72 hours to maintain a partial thromboplastin time of 1.5 times control.

DISCUSSION

There are several ways to approach a portal vein lesion: directly transhepatic, transsplenic, and via a transjugular intrahepatic approach. The transsplenic approach is generally not performed due to the risk of bleeding complications, the transjugular approach may be tedious and only advantageous (in my opinion) if the risk of direct hepatic puncture is prohibitive. The direct transhepatic approach is the fastest and most straightforward means to access the portal vein. Mechanical advantage is superior to a transjugular approach due to the shorter, straighter path and portal vein access is often achieved in a single pass with sonographic guidance. In a patient with a well healed liver transplant, capsular bleeding is effectively non-existent due to the abundant scar surrounding the graft.

Portal vein angioplasty has been reported by numerous investigators and currently is the treatment of choice for delayed portal vein stenosis.³ In 2000, we reported the largest series of patients undergoing portal vein dilatation with the longest follow-up.⁸ This was also the only series documenting the patency of metallic

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Figure 1 Portal vein dilatation. (A) Transhepatic portal venogram shows stenosis of portal vein. (B) Fluoroscopic image shows balloon dilatation portal vein stenosis. (C) Transhepatic portal venogram after balloon dilatation shows resolution of stenosis.

stents deployed in growing veins. In 19 of 25 patients, we successfully treated stenoses and all patients with successful procedures have had patency maintained after interventions. Some have now had over 8 years of follow up. Intravascular stents were deployed in 12 patients. All stents have remained patent without further intervention. All unsuccessful procedures occurred in patients with chronic portal vein occlusions that could not be successfully crossed. When successful, portal vein angioplasty is expected to be curative.

REFERENCES

1. Millis JM, Seaman DS, Piper JB, et al. Portal vein thrombosis and stenosis in pediatric liver transplantation. *Transplantation* 1996;62:748-754
2. Raby N, Karani J, Thomas S, O'Grady J, Williams R. Stenosis of vascular anastomoses after hepatic transplantation: treatment with balloon angioplasty. *AJR Am J Roentgenol* 1991;157:167-171
3. Rollins NK, Sheffield EG, Andrews WS. Portal vein stenosis complicating liver transplantation in children: percutaneous transhepatic angioplasty. *Radiology* 1992;182:731-734
4. Zajko AB, Sheng R, Bron K, Reyes J, Nour B, Tzakis A. Percutaneous transluminal angioplasty of venous anastomotic stenoses complicating liver transplantation: intermediate-term results. *J Vasc Interv Radiol* 1994;5:121-126
5. Funaki B, Rosenblum JD, Leef JA, Hackworth CA, Szymiski GX, Alonso EM. Angioplasty treatment of portal vein stenosis in children with segmental liver transplants: mid-term results. *AJR Am J Roentgenol* 1997;169:551-554
6. Cherukuri R, Haskal ZJ, Naji A, Shaked A. Percutaneous thrombolysis and stent placement for the treatment of portal vein thrombosis after liver transplantation: long-term follow-up. *Transplantation* 1998;65:1124-1126
7. Mathias K, Bolder U, Lohlein D, Jager H. Percutaneous transhepatic angioplasty and stent implantation for prehepatic portal vein obstruction. *Cardiovasc Intervent Radiol* 1993;16:313-315
8. Funaki B, Rosenblum JD, Leef JA, et al. Percutaneous treatment of portal venous stenosis in children and adolescents with segmental hepatic transplants: long-term results. *Radiology* 2000;215:147-151