Cardiovasc Intervent Radiol (1993) 16:198–200

CardioVascular and Interventional Radiology

Portal Venous Branch Targeting with a Platinum-Tipped Wire to Facilitate Transjugular Intrahepatic Portosystemic Shunt (TIPS) Procedures

George P. Teitelbaum,* Richard J. Van Allan, Richard A. Reed, Susan Hanks, Michael D. Katz
Department of Radiology, LAC + USC Medical Center, 1200 N. State Street, Los Angeles, CA 90033, USA

Abstract. We describe a technique to aid in technically difficult transjugular intrahepatic portosystemic shunt (TIPS) procedures by sonographically guided transabdominal fine-needle portal vein puncture for placement of a 0.018-inch platinum-tipped target guidewire within an appropriate portal venous branch.

Key words: TIPS—Transjugular intrahepatic portosystemic shunt—Vein, portal

The transjugular intrahepatic portosystemic shunt (TIPS) procedure has been reported to be of value in the management of high surgical risk portal hypertension patients [1–3]. However, in occasional cases, where there is great difficulty in establishing needle access into the portal venous system, placement of a platinum-tipped 0.018-inch guidewire within the portal vein markedly facilitates this procedure.

* *Present address:* Interventional Neuroradiology, Department of Radiology, UCSF Medical Center, L352, 505 Parnassus Avenue, San Francisco, California 94143-0628, USA

Correspondence to: G.P. Teitelbaum, M.D.

Technique

A 9F hemostatic sheath (Cook, Inc., Bloomington, IN, USA) was maneuvered into the right hepatic vein via the right jugular approach. After failure of a reasonable number of attempts to advance a 16-gauge Colapinto needle from the tip of this right hepatic vein sheath into the right portal vein, right portal vein targeting was undertaken. Using color Doppler ultrasound guidance and an anterior abdominal approach, percutaneous freehand 22-gauge Chiba needle puncture of the portal vein near its bifurcation was performed and confirmed by contrast injection through this needle. (The intrahepatic portal venous branches were not well-defined by ultrasound making necessary an extrahepatic portal venous puncture.) Using digital roadmapping, a 0.018-inch Cope mandril guidewire (Cook) was then advanced through the needle and steered into the right portal vein. Selection of an

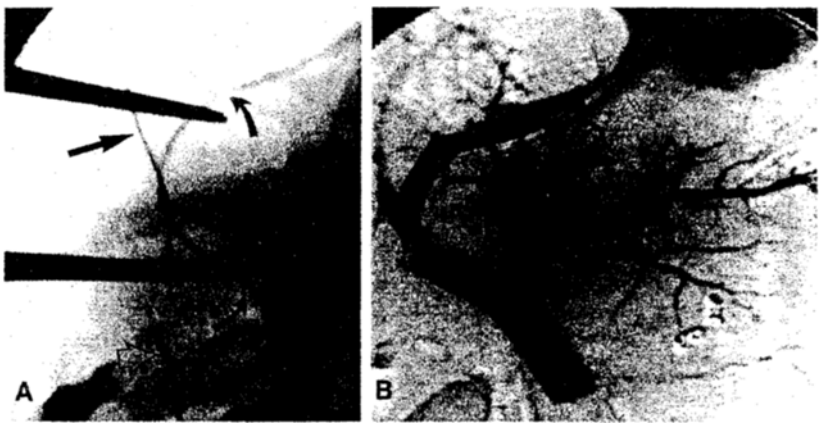

Fig. 1. Target-directed approach used in a TIPS procedure in a 38-year-old man with recurrent esophageal hemorrhage due to alcoholic cirrhosis. **A** A 0.018-inch Cope mandril wire (arrow), inserted via a 22-gauge needle (open arrow), was maneuvered into the right portal vein where it served as the target for a Colapinto needle directed transhepatically from the right hepatic vein. Note the Bentson wire extending from the right hepatic vein to the portal vein (curved arrows). **B** Portogram performed following creation of transhepatic portocaval shunt and embolization of esophageal varices.

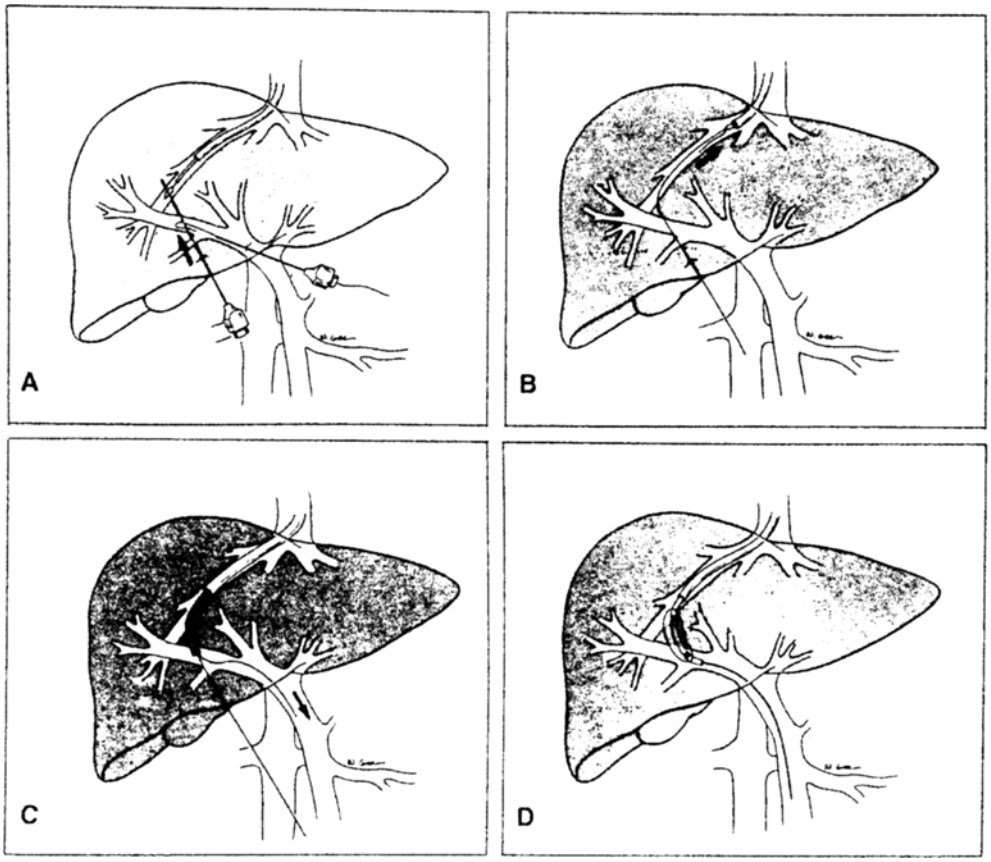

Fig. 2. Illustrations of wire pull-through technique used in a 57-year-old male patient with portal hypertension due to alcoholic cirrhosis. **A** The right portal vein is targeted with a 0.018-inch Cope mandril wire inserted through a 22-gauge Chiba needle used to puncture the portal vein near its confluence. The right hepatic vein is targeted with the loop of an Amplatz wire snare. A second 22-gauge needle is advanced (arrow), under fluoroscopic guidance, through the targeted portal vein and wire snare loop (which is then closed around this needle tip). A 0.016-inch exchange wire is passed through the captured needle which is then removed, leaving the 0.016-inch wire captured within the snare. **B** Following removal of target wire from the portal vein, the captured 0.016-inch exchange wire is pulled through the transjugular 9F sheath affording control over both ends of this guidewire. **C** A 0.038-inch internal diameter, 5F catheter is advanced through the transjugular sheath over the 0.016-inch wire until its tip is situated within the right portal vein. A second steerable 0.016-inch wire is advanced through the 5F catheter and is maneuvered (arrow) into the superior mesenteric vein. The jugulocutaneous wire is removed from the 5F catheter, and this catheter together with a 0.035-inch Sos wire are advanced into the superior mesenteric vein over the remaining 0.016-inch wire. The 5F catheter is then used for exchange to a 0.035-inch Amplatz extra-stiff wire. **D** Over this more substantial wire, a low-profile balloon angioplasty catheter is then inserted for dilatation of the intrahepatic shunt tract.

appropriate portal venous branch was made to allow the most direct course for transhepatic needle puncture (Fig. 1A). The tip of the Cope wire was left in a wide loop, indicating its position within a major right portal venous branch. The 16-gauge Colapinto needle was again advanced from the right hepatic vein, through liver parenchyma, to puncture the targeted portal vein. A 0.035-inch Bentson wire (Cook) was passed into the portal vein over which the needle was exchanged for a 5F catheter. The platinum-tipped wire was withdrawn. The TIPS procedure was then completed by exchanging the Bentson wire for an Amplatz extra-stiff wire (Cook) over which a balloon angioplasty catheter (Meditech, Watertown, MA, USA) was inserted for dilatation of the intrahepatic tract. A 10-mm diameter stainless steel Wallstent (Schneider, Minneapolis, MN, USA) was deployed within the tract (Fig. 1B). We have used this same target-directed technique in a patient requiring a left hepatic venous approach for transhepatic puncture of the portal venous system. In that case, we performed sonographically guided transabdominal freehand fine-needle puncture of the left portal vein to wire-target this vessel.

Rarely, hepatic anatomy may be so distorted by cirrhotic changes that even wire-targeting of the portal vein may not facilitate needle passage between hepatic and portal veins. In one of our cases, the right portal vein crossed anterior to the main right hepatic vein in too cephalad a location to permit needle passage between the 2 vessels. Following placement of a Cope mandril wire within a right portal venous branch from a main portal vein puncture site as described above, repeated transhepatic portal puncture attempts merely resulted in displacement of the guiding sheath from the right hepatic vein into the inferior vena cava. The needle within the 9F hepatic vein sheath was replaced with a 10-mm Amplatz intravascular retrieval snare device (Microvena, Vadnais Heights, MN, USA). The C-arm-mounted image intensifier was then rotated so as to align the Cope mandril wire tip (in the right portal vein) with the open loop of the Amplatz snare

within the right hepatic vein. The abdominal wall was aseptically cleansed and draped. Using local lidocaine anesthesia, a second 22-gauge Chiba needle was advanced, under fluoroscopic guidance, through the liver, the looped tip of the Cope mandril wire, and finally into the Amplatz snare which was closed around the Chiba needle tip (Fig. 2A). Contrast injection through the Chiba needle during its transhepatic insertion confirmed its passage through the right portal vein lumen. A 0.016-inch coronary exchange wire (ACS, Mountain View, CA, USA) was advanced through the Chiba needle which was then withdrawn, allowing the snare-captured 0.016-inch wire to be pulled out through the 9F jugular sheath, thus providing control over both ends of this wire (Fig. 2B). This afforded adequate support to advance a 5F (0.038-inch inner diameter) catheter through the intrahepatic tract between right hepatic and portal veins. Entry of the 5F catheter's tip into the right portal vein was demonstrated by injection of contrast around the 0.016-inch wire using a Touhy-Borst adaptor. A second steerable 0.016-inch platinum-tip wire was then advanced through the 5F catheter and directed into the superior mesenteric vein (Fig. 2C). The jugulocutaneous 0.016-inch wire was then removed, and a 0.035-inch Sos injectable wire (Schneider, Minneapolis, MN, USA) was passed over the remaining 0.016-inch wire, creating adequate wire support to advance the 5F catheter into the superior mesenteric vein. The TIPS procedure was then completed in a manner identical to that described above (Fig. 2D).

Discussion

The creation of percutaneous portosystemic shunts in pigs, initially reported by Rösch and colleagues [4], utilized targeting of the portal vein with a radiopaque metallic basket. However, in recent clinical reports of the TIPS procedure, investigators have relied solely on fluoroscopy to advance a needle from a hepatic vein into the portal venous system. Several techniques have recently been described for targeting the portal vein in difficult TIPS cases including placement of platinum microcoils in the periportal hepatic parenchyma [5] and percutaneous catheterization of a paraumbilical portosystemic collateral vein [6], both under sonographic guidance.

Patients undergoing TIPS procedures may have small, fibrous livers with marked distortion of hepatic vascular anatomy. An approach using only fluoroscopy in these distorted livers will frequently involve multiple transhepatic needle passes. Since it is reasonable to assume that the risk of hemorrhagic complications correlates with the number of passes made with a 16-gauge Colapinto needle, this risk may be reduced with a target-directed technique. Placement of a thin, radiopaque wire within the portal vein via a 22-gauge needle puncture is most likely safe, as proposed by Miller [7]. No patient in whom we have performed wire-targeting of the portal vein during a TIPS procedure has experienced hemorrhagic complications. Furthermore, the technique allows for optimum choice of a portal vein branch by contrast injection and manipulation of a steerable wire.

In 24 technically successful TIPS procedures (of 25 total attempts) thus far performed at our institution, only 3 have required portal vein wire-targeting. In all 3 cases, the Colapinto needle was initially directed with fluoroscopy only. However, multiple unsuccessful attempts at establishing needle access into the portal vein consumed hours of angiography laboratory time. Once an appropriate portal venous branch was wire-targeted, access into the portal venous system was achieved with relative ease in 2 of the 3 patients (with completion of the remainder of the procedure within 30 min). In the presence of greater anatomic difficulties in a third patient, portal vein wire-targeting was essential for a wire pull-through technique that ultimately resulted in a successful TIPS outcome.

Following a reasonable number of attempts at needle passage using fluoroscopy alone, a target-directed method of needle guidance during TIPS procedures may prove beneficial in occasional difficult cases.

References

1. LaBerge JM, Ring EJ, Lake JR, Ferrell LD, Doherty MM, Gordon RL, Roberts JP, Peltzer MY, Ascher NL (1992) Transjugular intrahepatic portosystemic shunts: Preliminary results in 25 patients. J Vasc Surg 16:258–267
2. Richter GM, Noeldge G, Roessle M, Roeren TH, Kauffmann GW, Palmaz JC (1991) Three-year results of use of transjugular intrahepatic portosystemic stent shunt (abstract). Radiology 181(P):99
3. LaBerge JM, Ring EJ, Gordon RL, Doherty MM (1992) Transjugular intrahepatic portosystemic shunts: Midterm results in 100 patients (abstract). Radiology 185(P):104
4. Rösch J, Hanafee WN, Snow H (1969) Transjugular portal venography and radiologic portacaval shunt: An experimental study. Radiology 92:1112–1114
5. Harman JT, Reed JD, Kopecky KK, Harris VJ, Haggerty MF, Strzembosz AS (1992) Localization of the portal vein for transjugular catheterization: Percutaneous placement of a metallic marker with real-time US guidance. JVIR 3:545–547
6. Wenz F, Nemcek AA, Tischler HA, Minor PL, Vogelzang RL (1992) US-guided paraumbilical vein puncture: An adjunct to transjugular intrahepatic portosystemic shunt (TIPS) placement. JVIR 3:549–551
7. Miller FJ (1992) Invited commentary. RadioGraphics 12: 623–624