A Combination Approach to Mesenteric Venous Thrombosis

Using percutaneous transhepatic thrombectomy and pharmacological thrombolysis to treat this highly morbid condition.

BY WEI ZHOU, MD; TAM T. HUYNH, MD; AND PETER H. LIN, MD

Mesenteric venous thrombosis (MVT) is an uncommon condition associated with significant mortality and morbidity, due in part to nonspecific presentations and frequent delays in diagnosis. The traditional management has been medical treatment with anticoagulation. Surgery is reserved for patients who have failed medical therapy or who present with signs of mesenteric ischemia. Endovascular intervention utilizing percutaneous mechanical thrombectomy (PMT) and thrombolysis provides an attractive alternative that is less invasive with minimal complications. We describe a patient with symptomatic MVT who was successfully treated with a percutaneous transhepatic approach. Several endovascular techniques were utilized to achieve the optimal result.

CASE STUDY

A 45-year-old woman presented with a 48-hour history of severe abdominal pain. Her medical history was only significant for her 17-year history of oral contraceptive usage. Initial laboratory evaluations, including arterial blood gas, complete blood cell counts, liver function tests, amylase, and lipase were unremarkable except for a mild elevated white blood cell count of 13,000. On physical examination, she was tender to palpation at the right upper quadrant and epigastric area. Abdominal ultrasound showed a normal-appearing gallbladder without wall thickening or pericholecystic fluid. Abdominal CT scan demonstrated thrombosis of the portal vein (PV) and superior mesenteric vein (SMV) without evidence of extrinsic compression (Figure 1). An evaluation for hypercoagulable states, including protein C and S, homocysteine, factor V Leiden, antithrombin, prothrombin mutation 20210, fibrinogen, lupus anticoagulant, and anticardiolipin antibody did not reveal any abnormality. Due to her acute symptoms and extensive thrombus, we decided to proceed with PMT and thrombolysis via a transhepatic approach.

Under ultrasound guidance, a tributary of PV was identified along with branches of bile duct and hepatic artery (Figures 2 and 3). The PV tributary was accessed using the standard Seldinger technique followed by advancing an angled Glidewire (Terumo Medical Corporation, Somerset, NJ) to the SMV. Once the access to the PV was secured with a 7-F guiding sheath, a 5-F tapered angled Glide catheter (Terumo) was tracked over the wire to the distal SMV. Initial angiography through the angled Glide catheter demonstrated occluded PV, proximal SMV, and splenic vein (Figure 4). Two mg of tPA (tissue plasminogen activator, Genentech, South San Francisco, CA) was infused into the occluded vessels followed by PMT using a 6-F AngioJet rheolytic catheter (Possis Medical, Inc., Minneapolis, MN) and subsequent balloon angioplasty with an 8-mm balloon. Upon completion of the procedure, antegrade venous flow was observed in

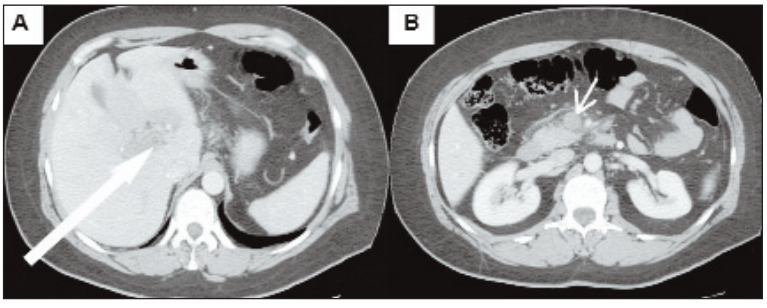

Figure 1. An abdominal CT scan revealed a thrombosed portal vein (long arrow) (A) and a thrombosed SMV (short arrow) (B).

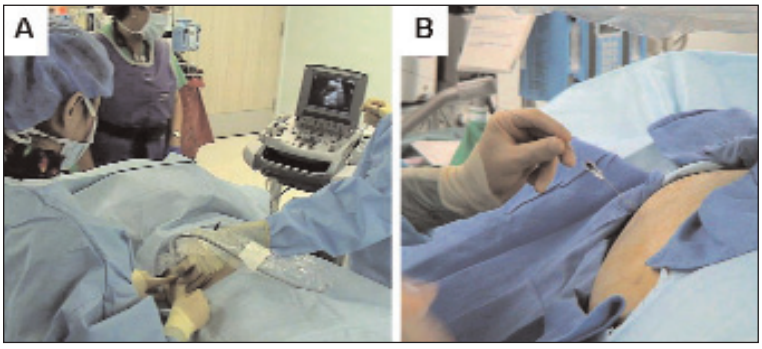

Figure 2. A transhepatic ultrasound was used to identify the portal vein (A), which was accessed using a .014-inch micropuncture entry needle (B).

the mesenteric system. A multihole infusion catheter was then placed in the SMV, and overnight tPA infusion at the rate of 0.5 mg/h was continued for treating residual thrombus within the lumen. The next day, the patient's symptoms were improved, and her abdominal pain had subsided. Nonetheless, due to angiographic evidence of sluggish flow and residual thrombus, we proceeded with another trial of AngioJet PMT followed by overnight thrombolysis with tPA at the infusion rate of 1 mg/h. The repeat venography was performed the next day, showing dramatically improved flow and patent PV and SMV (Figure 5). The sheath and the catheter were subsequently removed, and the catheter tract was embolized with coils (Terumo) and packed with Gelfoam (Pfizer, New York, NY) to achieve hemostasis. The patient was discharged home 3 days later on oral warfarin and remained symptom-free 1 year later. The oral contraceptive has since been discontinued.

DISCUSSION

MVT accounts for 5% to 15% of acute mesenteric ischemia[1] and is associated with multiple factors, including sluggish flow as in patients with portal hypertension or congestive heart failure (CHF), endothelium damage as in patients with visceral infection or trauma, and hypercoagulable state as in patients with malignancy or hematological disorders. Oral contraceptives are known to induce a hypercoagulable state and are associated with thrombotic phenomena in multiple sites including the mesenteric vein. As demonstrated in our patient, extensive laboratory evaluations of her hypercoagulable state were unremarkable, and a CT scan did not reveal any evidence of extrinsic compression. The only identifiable contributing factor was her prolonged history of oral contraceptive usage, which we postulated was the primary cause of MVT in our patient.

Acute MVT is traditionally treated with systemic anticoagulation using heparin and warfarin to prevent propagation of thrombus in a stable patient. Brunaud reviewed 26 patients with acute MVT over 12 years and compared the outcomes between surgical intervention and medical therapy.[2] They concluded that the morbidity, mortality, and survival rates were similar in both groups with a 2-year survival rate of 76.9%. A nonoperative approach avoids unnecessary resection of the small bowel that may be potentially reversible with anticoagulation alone. However, despite early anticoagulation therapy, transmural infarction can occur in up to 18% of patients with acute MVT. Surgery is warranted once any sign of clinical deterioration developed during the period of observation or on initial presentation. Even with prompt surgical intervention, the patients who presented with compromised bowel still have significant mortality rates up to 80%, and recurrent bowel infarction occurs in nearly 30%.[3]

Endovascular intervention offers an attractive therapeutic alternative that is minimally invasive and associated with relative low morbidity and mortality. There are several approaches reported in the literature including indirect intra-arterial infusion of a thrombolytic agent through the superior mesenteric artery,[4-6] transjugular portal vein access,[7-11] and direct transhepatic portal vein puncture.[12-16] Transarterial approach is the most indirect route and provides the least reliable doses of thrombolytic agents that reach the mesenteric venous system due to preferential flow to the collateral vessels.[7] Both transjugular and transhepatic approaches provide direct access to the portal vein, through which various endovascular techniques can be utilized. In addition, local infusion of thrombolytic agents in both transhepatic and transjugular approaches provides more predi-

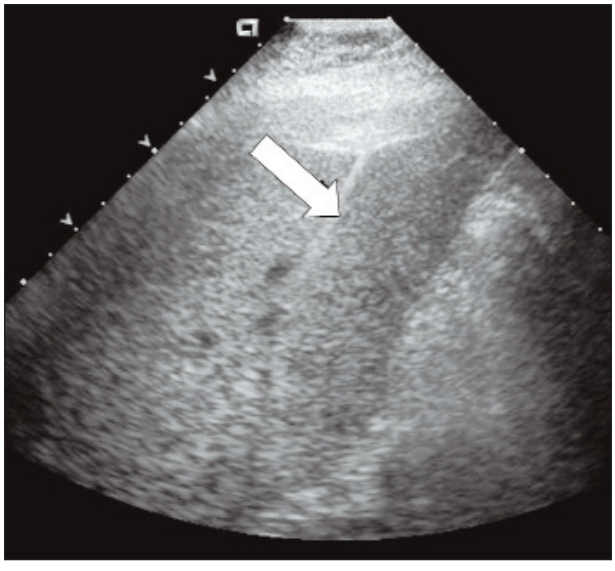

Figure 3. The PV (arrow) was seen under the ultrasound guidance.

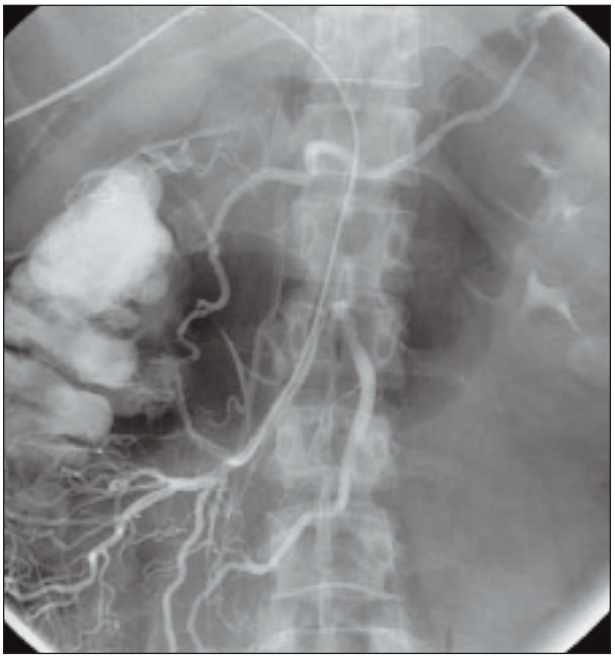

Figure 4. An initial transhepatic angiogram of the portal vein through an Angled Glide catheter demonstrated an occluded PV, splenic vein, and proximal SMV.

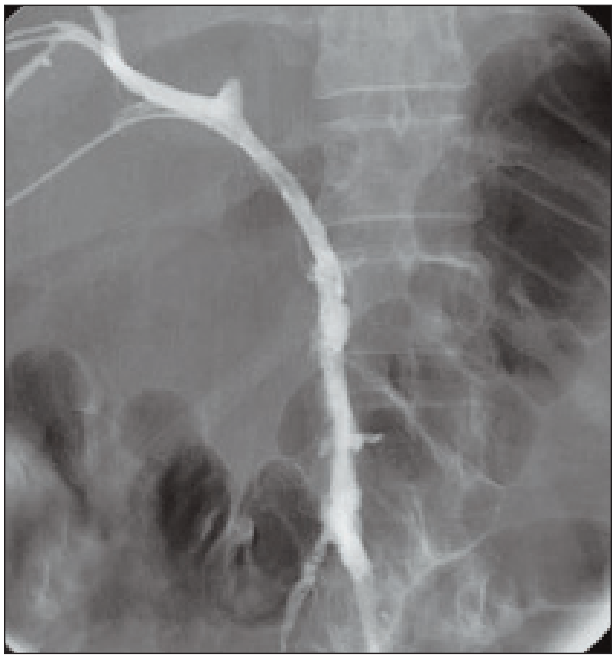

Figure 5. A repeat venography performed at 24 hours showed improvement of the blood flow in the SMV and PV.

cable and relatively rapid resolution of thrombus. Moreover, using a lower dose of thrombolytic agents with a direct approach tends to reduce the incidence of bleeding complications compared to systemic thrombolysis using the transarterial approach. Comparing the two direct approaches of transjugular and transhepatic, transjugular access is more technically challenging, particularly for patients with a thrombosed PV. Conversely, using ultrasound guidance for the transhepatic approach, PV tributaries can be easily visualized in experienced hands. As demonstrated in our patient, the PV tributary was undoubtedly identified along with branches of the hepatic artery and bile duct.

Multiple endovascular techniques, including AngioJet PMT and thrombolysis, balloon angioplasty, and stent placement, were used for our patient to achieve optimal clinical response. PMT has the advantage of rapidly removing thrombus and shortening the duration of thrombolytic infusions. Therefore, it reduces the potential for bleeding complications. We also used balloon angioplasty and pharmacological thrombolysis to achieve a satisfactory result. Admittedly, the potential drawback of PMT and angioplasty is intimal trauma, which may promote recurrent thrombosis. Bilbao et al observed two patients who experienced partial rethrombosis.[17] Our patient received heparin anticoagulation followed by long-term warfarin therapy to prevent recurrent thrombosis.

Due to the rarity of acute MVT, there is paucity of data describing long-term outcomes of endovascular interventions. Most exiting reports in the literature are of patients with posttransplant MVT.[9,13-18,19] Cherukuri successfully treated two patients using a transhepatic endovascular approach and reported a 100% patency rate at 2.5 years and 4.5 years after the procedures.[11] Lopera and his colleagues also successfully treated three patients with symptomatic acute MVT and achieved a good clinical outcome up to 36 months.[13] Recently, Kim et al reviewed their experience of percutaneous catheter-directed thrombectomy and thrombolysis for SMV thrombosis.[20] They, too, concluded that PMT/thrombolysis was associated with low incidences of morbidity and mortality over a mean follow-up of 42 months. Although there are increased clinical reports, the long-term data on PMT and thrombolysis are still lacking. Therefore, diligent long-term follow-up is warranted.

CONCLUSION

The transhepatic endovascular approach provides a safe and effective alternative to traditional therapy. It has the advantage of rapid thrombus resolution and potential prevention of MVT-associated bowel ischemia. Furthermore, a combined PMT and thrombolysis approach reduces the risk of bleeding by decreasing the dose and duration of thrombolytic infusion. Our case provides a valuable addition to this small literature collection and underscores the value of using multiple endovascular techniques to treat this potentially life-threatening condition. ■

(Continued on page 46)

(Continued from page 38)

Wei Zhou, MD, is Assistant Professor of Surgery, Division of Vascular Surgery & Endovascular Therapy, Michael E. DeBakey Department of Surgery, Baylor College of Medicine, and Michael E. DeBakey VA Medical Center, Houston, Texas. Dr. Zhou has disclosed that he holds no financial interest in any product or manufacturer mentioned herein. Dr. Zhou may be reached at (713) 794-7892; wzhou1@bcm.edu.

Tam T. Huynh, MD, is Associate Professor of Surgery, Division of Vascular Surgery & Endovascular Therapy, Michael E. DeBakey Department of Surgery, Baylor College of Medicine, and Michael E. DeBakey VA Medical Center, Houston, Texas. He has disclosed that he holds no financial interest in any product or manufacturer mentioned herein. Dr. Huynh may be reached at (713) 794-7892; thuynh@bcm.edu.

Peter H. Lin, MD, is Associate Professor of Surgery, Division of Vascular Surgery & Endovascular Therapy Michael E. DeBakey Department of Surgery, Baylor College of Medicine, and Michael E. DeBakey VA Medical Center, Houston, Texas. He has disclosed that he holds no financial interest in any product or manufacturer mentioned herein. Dr. Lin may be reached at (713) 794-7895; plin@bcm.edu.

1. Grendell JH, Ockner RK. Mesenteric venous thrombosis. Gastroenterology 1982;82:358-372.
2. Brunaud L, Antunes L, Collinet-Adler S, et al. Acute mesenteric venous thrombosis: case for nonoperative management. J Vasc Surg. 2001;34:673-679.
3. Khodadadi J, Rozencwajg J, Nacasch N, et al. Mesenteric vein thrombosis. The importance of a second-look operation. Arch Surg. 1980;115:315-317.
4. Tateishi A, Mitsui H, Oki T, et al. Extensive mesenteric vein and portal vein thrombosis successfully treated by thrombolysis and anticoagulation. J Gastroenterol Hepatol. 2001;16:1429-1433.
5. Robin P, Gruel Y, Lang M, et al. Complete thrombolysis of mesenteric vein occlusion with recombinant tissue-type plasminogen activator. Lancet. 1988;1:1391.
6. Antoch G, Taleb N, Hansen O, et al. Transarterial thrombolysis of portal and mesenteric vein thrombosis: a promising alternative to common therapy. Eur J Vasc Endovasc Surg. 2001;21:471-472.
7. Leebeek FW, Lameris JS, van Buuren HR, et al. Budd-Chiari syndrome, portal vein and mesenteric vein thrombosis in a patient homozygous for factor V Leiden mutation treated by TIPS and thrombolysis. Br J Haematol. 1998;102:929-931.
8. Ryu R, Lin TC, Kumpe D, et al. Percutaneous mesenteric venous thrombectomy and thrombolysis: successful treatment followed by liver transplantation. Liver Transpl Surg. 1998;4:222-225.
9. Sze DY, O'Sullivan GJ, Johnson DL, et al. Mesenteric and portal venous thrombosis treated by transjugular mechanical thrombolysis. Am J Roentgenol. 2000;175:732-734.
10. Uflacker R. Applications of percutaneous mechanical thrombectomy in transjugular intrahepatic portosystemic shunt and portal vein thrombosis. Tech Vasc Interv Radiol. 2003;6:59-69.
11. Cherukuri R, Haskal ZJ, Naji A, et al. Percutaneous thrombolysis and stent placement for the treatment of portal vein thrombosis after liver transplantation: long-term follow-up. Transplantation. 1998;65:1124-1126.
12. Yankes JR, Uglietta JP, Grant J, Braun SD. Percutaneous transhepatic recanalization and thrombolysis of the superior mesenteric vein. AJR Am J Roentgenol. 1988;151:289-290.
13. Lopera JE, Correa G, Brazzini A, et al. Percutaneous transhepatic treatment of symptomatic mesenteric venous thrombosis. J Vasc Surg. 2002;36:1058-1061.
14. Kercher KW, Sing RF, Watson KW, et al. Transhepatic thrombolysis in acute portal vein thrombosis after laparoscopic splenectomy. Surg Laparosc Endosc Percutan Tech. 2002;12:131-136.
15. Bhattacharjya T, Olliff SP, Bhattacharjya S, et al. Percutaneous portal vein thrombolysis and endovascular stent for management of posttransplant portal venous conduit thrombosis. Transplantation. 2000;69:2195-2198.
16. Bilbao JI, Arias M, Herrero JI, et al. Percutaneous transhepatic treatment of a posttransplant portal vein thrombosis and a preexisting spontaneous splenorenal shunt. Cardiovasc Intervent Radiol. 1995;18:323-326.
17. Bilbao JI, Vivas I, Elduayen B, et al. Limitations of percutaneous techniques in the treatment of portal vein thrombosis. Cardiovasc Intervent Radiol. 1999;22:417-422.
18. Durham JD, LaBerge JM, Altman S, et al. Portal vein thrombolysis and closure of competitive shunts following liver transplantation. J Vasc Interv Radiol. 1994;5:611-615; discussion 616-618.
19. Haskal ZJ, Naji A. Treatment of portal vein thrombosis after liver transplantation with percutaneous thrombolysis and stent placement. J Vasc Interv Radiol. 1993;4:789-792.
20. Kim HS, Patra A, Khan J, et al. Transhepatic catheter-directed thrombectomy and thrombolysis of acute superior mesenteric venous thrombosis. J Vasc Interv Radiol. 2005;16:1685-1691.