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Published in:
Polish journal of radiology / Polish Medical Society of Radiology

DOI:
10.12659/PJR.890990

Published: 2014-01-01

Citation for published version (APA):
Interventional Treatment of Mesenteric Venous Occlusion

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Summary

Background: Mesenteric venous thrombosis may be an incidental finding during imaging studies and asymptomatic patients are treated conservatively or with anticoagulant therapy only. Patients with symptomatic acute thrombosis causing bowel ischemia require urgent treatment, which frequently includes extensive surgery. Interventional treatment may be an alternative. Purpose: To present results of interventional treatment in patients with symptomatic occlusion of the mesenteric veins.

Material/Methods: Eight patients, four men and four women aged 24–74 years (mean 53 years) were treated due to symptomatic portomesenteric venous occlusion of thrombotic origin. Transhepatic (n=5), trans-splenic (n=2), and transjugular (n=4) accesses were used. Patients were treated with mechanical thrombus fragmentation (n=4), pharmacological thrombolysis (n=3) and stent placement (n=8). Additional transjugular intrahepatic portosystemic shunt (TIPS) was created to facilitate the outflow from the treated veins (n=4).

Results: The majority of the patients required combination of different treatment methods. Resolution of symptoms with initial clinical success was achieved in seven of the eight patients, and one patient died the day after the procedure due to sepsis. Two other patients had procedure-related complications; one of them required embolization. Two patients had documented long-term clinical success with patent stents and no symptoms at one year following intervention.

endovascular interventions. Six patients presented for treatment within four days from acute symptom onset. Two patients presented within one month of worsening symptoms, one of them had intractable ascites and the other had cholangitis. Symptoms included bowel ischemia secondary to compromised venous outflow (n=4), abdominal pain (n=5), ascites (n=3), gastrointestinal bleeding (n=2), and cholangitis secondary to portal biliopathy (n=1).

Occlusions, verified on non-invasive imaging computed tomography (CT) (n=6), magnetic resonance venography, (MRV) (n=3), were secondary to acute thrombosis of SMV (n=8), thrombosis of SMV and portal vein (n=5), partial thrombosis of the splenic vein (n=2) and were of chronic nature (n=4). Thrombosis could be also observed in some of the more peripheral SMV branches in a few patients.

Patients’ underlying conditions associated with portomesenteric thrombosis were secondary to intra-abdominal malignant tumor with vascular encasement (n=2), Klippel-Trenaunay Weber disease (n=1), cryptogenic cirrhosis with portal hypertension (n=1), hypercoagulability disorder (n=3) and portal hypertension with acute SMV thrombosis with unclear etiology (n=1).

All patients underwent endovascular recanalization and stenting procedures of the portomesenteric veins. Procedure-related data included mechanical thrombus fragmentation, catheter-directed thrombolysis, stent placement and TIPS. Four of the patients underwent endovascular thrombectomy and thrombolysis procedures (Table 1).

Paracentesis was performed in patients with a significant amount of ascites prior to the endovascular procedure. Transjugular access to the portal circulation was attempted initially using Rosh-Uchida transjugular liver access set (William Cook Inc, Bloomington, IN). When the portal vein could not be accessed with several attempts, a trans-hepatic access was achieved using NEFF access set (William Cook). In the patients with extensive portal vein and mesenteric thrombosis beyond the portal confluence, direct trans-splenic access to the splenic vein branch was obtained [12] under ultrasonographic guidance using a NEFF access set (Figure 1). In one patient with coagulopathy and portal hypertension, a 5 F Cobra catheter (Cordis, Miami Lakes, FL) was positioned by transfemoral route, with the tip in the splenic artery, as a precaution for possible splenic hemorrhage, before a direct splenic access was attempted.

**Table 1. Patients and treatment.**

<table>
<thead>
<tr>
<th>Patient</th>
<th>Sex</th>
<th>Age, years</th>
<th>Portal vein</th>
<th>SMV</th>
<th>Splenic</th>
<th>Ascites</th>
<th>Occlusion</th>
<th>Symptoms at presentation</th>
<th>Access</th>
<th>Initial treatment</th>
<th>Stenting</th>
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</table>

SMV – superior mesenteric vein; TIPS – transjugular intrahepatic portosystemic shunt.
Mechanical thrombectomy procedures included suction of the thrombus using a 6–8 F guiding catheter (Cordis), power pulse thrombolysis (Angio-Jet, MedRad, Warrendale, PA) with heparinized saline and/or tissue plasminogen activator (TPA), and the over-the-wire Trerotola device (Arrow, Reading, PA) in patients with acute thrombus. Angio-Jet and Trerotola devices were chosen based on the availability of the product in the angiography suite. The patients with acute thrombus poorly responsive to initial treatment received continuous TPA infusion (0.02–0.04 mg/kg/hr) directly into the thrombosed mesenteric vessel through a 4–5 F infusion catheter (Unifuse, Angiodynamics, Latham, NY). The effect of the infusion was evaluated every 24 hours, up to 48 hours. In patients with chronic thrombosis, recanalization with angioplasty, and stenting were performed and significant competing collaterals were embolized to improve the flow (Figure 2).

TIPS with stent-graft (Viatorr, Gore, Newark, DE) 8–10 mm in diameter was created in patients with extensive thrombus burden to provide better outflow and also in patients with underlying portal hypertension and evidence of chronic portal vein occlusion (Figure 3). Mesenteric vessels with persistent stenosis or thrombosis were stented with either self-expanding (Wallstent, Boston Scientific, Natick, MA) 8–12 mm in diameter, or balloon expandable stents (Express LD Vascular Stent, Boston Scientific Corporation, Natick,
MA) (Palmaz Genesis stent, Cordis, Bridgewater NJ) sized 1–2 mm greater than the vessel diameter (Figures 4 and 5).

At the end of the procedures, direct trans-hepatic access tract was embolized with gelatin sponge pledgets and trans-splenic access tracts with a combination of platinum coils and gelatin sponge pledgets. Transjugular access was closed by manual compression.

**Results**

The majority of the patients showed documented short-term clinical success with complete resolution of initial symptoms in seven patients. Three of the patients had patent stents and three had occluded stents at the end of the observation period. One patient died the day after the procedure secondary to septic shock; in that patient the short-term clinical success could not be evaluated. Two patients showed long-term clinical success with patent stents and no symptoms at one year after the intervention. Patient number two had cholangitis related to portal biliopathy, which disappeared after decompression of portal biliary collaterals following portal and SMV stent placement. Patient number five returned for another recanalization and stenting after 14 months following the initial procedure. Two patients developed stent thrombosis within six months, but remained symptom-free. Patient number seven did not have follow-up imaging but remained symptom-free six months after the procedure (Table 2).

Two of the patients had a procedure-related complication; both of them underwent thrombectomy procedures. Patient number one had splenic hemorrhage from the transsplenic access tract after 48 hours of ongoing thrombolysis, successfully treated with selective peripheral splenic arterial embolization. Patient number six had mesenteric vein perforation during the procedure, but without clinical consequences (Table 2).

Four of the patients were discharged on anticoagulant medications. Two of the patients with patent stents were on anticoagulation medications (Table 2).

**Discussion**

Bowel ischemia is secondary to mesenteric venous thrombosis in 5–15% cases [1], but in the majority of patients it is caused by compromised arterial circulation. Bowel ischemia progressing to infarction has been shown to have a significant mortality rate, of 13–50% [2].

A symptomatic porto-mesenteric thrombosis may be secondary to different medical conditions. Surgery is often
difficult or impossible and endovascular treatment may be the only durable option for a symptomatic patient. Two of our patients with malignancy-induced mesenteric thrombosis responded promptly to the treatment and showed long-term clinical success without procedure-related complications. Short-term success with palliation of symptoms related to malignant mesenteric thrombosis has been reported previously [4,5,9].

Three of our patients with hypercoagulability disorder were admitted with severe acute symptoms and profound mesenteric thrombus burden. Those patients underwent initially extensive thrombectomy attempts. Two of them developed procedure-related complications. One of those complications, i.e., splenic access tract hemorrhage, occurred after 48 hours of TPA infusion and was successfully treated with distal splenic artery branch embolization. There is limited evidence of the safety of trans-splenic access for intervention, but we showed its usefulness in cases of extensive thrombosis limiting the possibility of the trans-jugular and trans-hepatic access.

The other complication, mesenteric vein perforation, was most likely due to the concurrent intra-abdominal sepsis in the patient with known pre-procedural septic shock. Despite initial technical success of the procedure, that patient died the day after the intervention. Initial technical success of the procedure, but we showed its usefulness in cases of extensive thrombosis limiting the possibility of the trans-jugular and trans-hepatic access.

In conclusion, our study has shown that endovascular treatment (including stenting) of patients with acute symptoms secondary to porto-mesenteric venous occlusion has good short-term clinical success rate. The majority of the patients remain later asymptomatic regardless of stent patency.

### Declaration of conflicting interests

The authors declare that there are no conflicts of interest.
References: