Use of a Mechanical Thrombectomy Device to Recanalize a Subacutely Occluded Aortohepatic Bypass After Orthotopic Liver Transplantation

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Purpose: To report the use of a rotational thrombectomy device for recanalization of a thrombosed hepatic artery bypass graft in an orthotopic liver transplant (OLT).

Case Report: Six months after a second OLT in a 52-year-old man, an iliac conduit used for an aortohepatic bypass became occluded, interrupting arterial supply to the liver transplant. The 8-F Straub Rotarex system was used to successfully remove clot from the bypass graft, avoiding embolization to the hepatic arteries. The recanalized conduit has remained patent for 1 year with the patient on an anticoagulation regimen.

Conclusions: The Rotarex thrombectomy system may be considered an alternative to other percutaneous interventions for the treatment of occluded bypass conduits supplying a liver transplant.

Key words: liver transplantation, aortohepatic bypass graft, complication, thrombosis, mechanical thrombectomy

Arterial graft perfusion is absolutely necessary to guarantee liver graft function in humans, since the biliary endothelium is supplied by the hepatic artery.1 The most common arterial complication in orthotopic liver transplantation (OLT) is hepatic artery thrombosis (HAT), which occurs in 3% to 9% of adult transplant recipients.2 Whereas native livers usually can tolerate the interruption of hepatic artery flow because of collateral blood supply, HAT occlusion is often a life-threatening event after OLT because of the inadequate supply of donor organs. Consecutive complications include hepatic necrosis, liver failure, late biloma, or hepatic abscess formation. Some years ago, surgical re-vascularization and re-transplantation were considered the mainstay of therapy for HAT.3 Nowadays, endovascular therapy plays an important role in its treatment,4 reducing significantly the need for redo OLT in cases of arterial graft dysfunction. Stange et al.2 reported that about 46% of the patients with HAT needed a redo OLT because of progressive allograft dysfunction, whereas 54% could be treated by other methods, such as surgical thrombectomy, lysis, or angioplasty. In particular, the endovascular approach is helpful when there is an inadequate supply of donor organs. Furthermore, patients with multiple transplants are at high risk for HAT.5

In recent years, percutaneous mechanical thrombectomy devices have proven to be ex-
cellent tools for achieving complete clot removal without vessel wall damage. We report a novel approach to hepatic allograft revascularization in a subacutely occluded iliac arterial graft between the aorta and the hepatic artery.

**CASE REPORT**

A 52-year-old man underwent OLT for end-stage liver disease secondary to Laennec cirrhosis (Child A). Three weeks after liver transplantation, a redo OLT was required when the celiac trunk and hepatic artery thrombosed. During that procedure, a new arterial pathway was created by using a donor iliac artery as a vascular conduit between the infrarenal aorta and the allograft hepatic artery. Six months later, the patient complained of colicky epigastric pain, nausea, and fever. A color Doppler sonogram revealed occlusion of the aortohepatic shunt. On contrast-enhanced computed tomography (CT), no intrahepatic arteries could be shown in the arterial phase, but 5 cm underneath the right renal artery, a vessel stump was visualized, suggesting proximal occlusion of the shunt. The portal vein showed no signs of thrombosis on the CT; however, periporal edema was visible.

At angiography, a 5-F Cobra catheter (William Cook Europe, Bjaeverskov, Denmark) was placed in a stable position within the proximal vascular conduit (Fig. 1A) after several attempts with different catheters. A 0.035-inch Terumo J guidewire (Terumo Corp., Leuven, Belgium) was advanced through the conduit into the hepatic artery. Selective angiography revealed a thrombosed aortohepatic bypass, mainly in its proximal part (Fig. 1B). Because of the high risk of hepatic artery embolism, lysis and plain balloon angioplasty were rejected in favor of an 8-F Straub-Rotarex mechanical thrombectomy device (Straub Medical AG, Wangs, Switzerland). After insertion of an 8-F sheath, the Terumo guidewire was exchanged by a 0.018-inch wire (Pointer; PBM Medicals, Denmark). The Rotarex catheter was then inserted with its tip into the proximal part of the thrombosed shunt. Heparin (5000 units) was given intravenously. The device was activated at 40,000 rotations per minute and advanced gently through the occlusion. After 3 passes of 1-minute each, a neolumen was created, and flow was restored (Fig. 1C). Sixty milliliters of blood had been collected by the system. The distal anastomosis of the aortohepatic bypass was dilated using a 5 × 60-mm Fox balloon (Abbott Vascular, Beringen, Switzerland). The control angiogram (Fig. 1D) demonstrated a patent bypass and normal perfusion of the hepatic arteries, without any signs of distal embolization. Color Doppler sonography on the next day and magnetic resonance angiography 5 days later confirmed successful arterial revascularization of the liver transplant. The patient was prescribed phenprocoumon and aspirin (100 mg/d) to prevent thrombosis of the conduit in the future. Nine months after the recanalization procedure, the patient's clinical condition was still excellent, with no abdominal symptoms. Color Doppler examination every 2 months up to 1 year have demonstrated continued normal flow through the aortohepatic bypass.

**DISCUSSION**

Diagnostic radiology has always been essential in the identification of vascular complications after liver transplantation. Specifically, color Doppler sonography is routinely performed for surveillance, with contrast-enhanced CT angiography used to evaluate suspicious results. Furthermore, interventional techniques, such as balloon angioplasty and local fibrinolysis, have become good alternative treatment options to surgical intervention for hepatic artery thrombosis in liver transplants. However, in our patient, early HAT demanded a redo OLT to avoid liver necrosis, so a donor iliac artery was used as a conduit to revascularize the transplant from the aorta.

After the conduit occluded, we considered several less invasive percutaneous methods to avoid a high-risk surgical procedure. We decided not to use intra-arterial thrombolysis because of the risk of bleeding, so we elected to use the 8-F Rotarex system (Fig. 2A) based on experience in the peripheral arteries. The rotating helix of the catheter creates a vacuum that aspirates thrombotic material (Fig.
Figure 1 • (A) Selective angiography of the aortohepatic artery bypass (arrow) demonstrates thrombotic occlusion of the conduit vessel, with multiple clots (B, arrows). (C) Angiography of the aortohepatic conduit after removal of the thrombotic material with the Straub Rotarex system. Note the patent conduit vessel and the intrahepatic arterial branches, with no evidence of thrombotic material. (D) The wall of the conduit is smooth, and normal intrahepatic perfusion has been restored.

2B), unlike the passive evacuation of fragments featured in other devices. Mechanical detachment and fragmentation of the thrombotic material (even organized thrombus with calcifications) and removal of the debris under negative pressure prevents peripheral embolization, which is a particular advantage of the Rotarex system over traditional thrombectomy techniques. The device is safely advanced over a guidewire to avoid vessel dissection. Other advantages include easy handling, quick preparation of the equipment, and a short procedural time. However, care is necessary in small vessels or heavily calcified thrombus to avoid wall trauma or dissection. Since the catheter uses the aspirated blood as a “cooling system,” continuous twisting of the catheter with gentle and careful movement of the tip is mandatory to transport the blood through the housing. After successful recanalization with the Rotarex in our case, we performed balloon dilation to
smooth the wall of the conduit and ensure good flow.

In conclusion, mechanical thrombectomy using the Rotarex system safely and successfully re-established arterial blood supply to a liver transplant. This technique should be considered as an alternative to other known and traditionally used revascularization methods when confronted with a thrombosed hepatic artery bypass.

REFERENCES