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Successful Surgical Removal of an Infected Transjugular Intrahepatic Portosystemic Shunt

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Background	Transjugular intrahepatic portosystemic shunting (TIPS) is a widely used strategy in the management of portal hypertension, with chronic endovascular infections ("endotipsitis") becoming an increasingly recognized, difficult-to-treat complication. While the most common therapy for endotipsitis is long-term intravenous antimicrobials, we present a case of successful surgical removal of a thrombosed TIPS in a patient with persistent bacteremia and fungemia.
Summary	A 63-year-old man presented to the hospital with persistent fevers and chills. He had undergone pancreaticoduodenectomy for locally advanced pancreatic adenocarcinoma several months before presentation and developed high-grade stenoses of the superior mesenteric and splenic veins, for which he underwent elective intervention with venoplasty and placement of endovascular stents. A TIPS was placed to enable access to present and future interventions within the portal venous system. After that, the patient experienced repeated episodes of bacteremia and fungemia refractory to medical management and was transferred to our institution, where he underwent successful surgical removal of the infected TIPS. His fungemia and bacteremia subsequently resolved.
Conclusion	Endotipsitis is a dangerous complication of TIPS and is challenging to treat, with long-term antimicrobial therapy yielding mixed success at best. We present a case of successful surgical removal of an infected TIPS in a patient with prior pancreaticoduodenectomy. This case highlights the importance of avoiding TIPS in patients with biliary-enteric anastomoses and the need for further exploration of surgical management for endotipsitis.
Key Words	hepatobiliary; complications; candidemia; endotipsitis; transjugular intrahepatic portosystemic shunting (TIPS)

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Case Description

Transjugular intrahepatic portosystemic shunting (TIPS) has become a widely used strategy in managing portal hypertension. Given the vulnerability of the liver disease population, recognition of infectious complications in TIPS is of significant importance. While infections in the immediate post-procedural time frame are not uncommon,[1,2] chronic endovascular TIPS infection is a rare but dangerous long-term complication. Initially recognized and termed "endotipsitis" by Sanyal et al., such infections may be suspected in patients with persistent bacteremia and a definite thrombus or vegetation within the stent or persistent bacteremia with an apparently normal TIPS but no other source of infection.[3] With an estimated incidence of 1%,[4] endotipsitis can present a diagnostic challenge, given the lack of a consensus definition. While definitive diagnosis requires biopsy and culture of the pseudo-epithelium of the TIPS, this is not a practical methodology in clinical practice.

Endovascular TIPS infections are also difficult to treat, with the most common strategy being prolonged broad-spectrum antimicrobial therapy, given the technically complex nature of retrieval.[5] However, without source control, the success rate of antimicrobial therapy is estimated to be only 56%.[5] We report a case of successful surgical removal of a thrombosed TIPS in a patient with persistent polymicrobial bloodstream infection.

A 63-year-old male presented to his local emergency department with a fever and was found to have a polymicrobial bloodstream infection, including *Candida glabrata* and vancomycin-resistant *Enterococcus faecalis* (VRE). His relevant medical history was notable for locally advanced pancreatic adenocarcinoma. He had undergone neoadjuvant chemo- and chemoradiation therapy, followed by pancreaticoduodenectomy (Whipple resection) at our institution approximately four months prior to the current presentation. Final pathology revealed a complete pathologic response (T0N0, 0/25 lymph nodes-positive). His initial postoperative course was uncomplicated, and he was discharged home on postoperative day 6.

One month before presentation, he was found to have high-grade stenoses of the superior mesenteric and splenic veins on routine surveillance cross-sectional imaging. Therefore, an elective intervention was arranged. An area of short-segment occlusion of the SMV was venosplastied and stented. The stenosis at the confluence with the splenic vein was venoplastied with an endovascular stent placement. The two stents were thus positioned in a "Y" configuration. A transjugular intrahepatic portosystemic shunt was placed to enable access to present and future portal venous system interventions. Approximately 48 hours later, he presented in septic shock with polymicrobial bacteremia. Four weeks later, he again presented in septic shock with blood cultures growing VRE, *Enterobacter* and *Candida glabrata*. He had been appropriately treated with multiple courses of broad-spectrum antimicrobial agents without success. Extensive evaluation to identify the source of the patient's persistent bloodstream infections, including transthoracic and transesophageal echocardiogram, was unrevealing. Repeat computed tomography scan of the abdomen and pelvis demonstrated a non-occlusive thrombus of the left and right portal vein as well as occlusion of the TIPS catheter. The diagnosis of endotipsitis was thus made following consultation with our institution. Attempted endovascular retrieval of the TIPS was unsuccessful, and the patient was transferred for definitive management.

Upon arrival at our center, it was decided following multidisciplinary discussion that removing the TIPS was necessary for source control. Given the previous failure of endovascular management, a surgical approach was thought to be most favorable, although high-risk. The patient was severely deconditioned given the nearly seven weeks of fungemia and bacteremia. The patient and his family agreed, and he underwent surgical TIPS removal via a trans-hepatic venous approach. Access to the porta hepatis was avoided given his post-Whipple status. A primary, extended right subcostal incision was made, and multiple adhesions were divided. The liver was mobilized the main right hepatic vein was exposed for approximately 2 cm.

The TIPS stent was palpable at the interface of the hepatic vein as it entered the parenchyma. The hepatic vein was encircled to permit isolated clamping while maintaining caval and left liver hepatic venous flow. A transverse venotomy was made anteriorly in the right hepatic vein, just distal to the end of the TIPS. The catheter was retrieved in its entirety and submitted for cultures. Hepatic venous flow was minimized by placing a 10 Fogarty catheter into the proximal right hepatic vein. The right hepatic vein venotomy was closed transversely with running 5-0 Prolene. Ultrasonography of the hepatic veins following stent removal confirmed venous flow in all hepatic veins. Hemostasis was secured throughout the operative field, the abdomen was irrigated, and the incision was closed.

The patient was transferred to the ICU postoperatively and was extubated on postoperative day 1. Intraoperative cultures from the TIPS were positive for *Candida glabrata* and his blood cultures subsequently cleared. His postoperative course was complicated by the progression of his known portal vein thrombosis resulting in several episodes of upper gastrointestinal bleeding in therapeutic anticoagulation for pre-existing pulmonary embolus, which resolved without intervention. He additionally developed ascites secondary to portal hypertension that required medical management. He was discharged to a skilled nursing facility in stable condition on postoperative day 59.

Discussion

Endovascular TIPS infection or "endotipsitis" is an uncommon but morbid complication. Reported cases are limited, but a review conducted by Navaratnam et al. estimated a 31% overall mortality rate.[5] The most commonly identified organisms are *Enterococcal* species, *Staphylococcus aureus*, and *Escherichia coli*. Approximately seven cases of fungal endotipsitis have also been reported,[6] with identification of *Candida glabrata* being associated with a mortality of 67%.[5] In our patient, identifying *Candida glabrata* in blood cultures was a poor prognostic indicator.

Management of endotipsitis, as in many endovascular infections, is particularly challenging. To date, the most common strategies for management have been long-term antimicrobial therapy, which is often unsuccessful in preventing recurrence, or orthotopic liver transplant.[5] Given our patient's oncologic history, he was certainly not a transplant candidate. As in this case, endovascular manipulation is technically challenging and, even if successful, often does not prevent a recurrence.[7] A literature review revealed no reported cases of attempted surgical removal of TIPS to indicate endotipsitis; however, cases of surgical salvage for failed TIPS have proven challenging, with high mortality.[8] In the present case, the decision to proceed with surgical TIPS removal was made after extensive discussion with the vascular surgery, infectious diseases, and interventional radiology services. The presence of a hepaticojejunostomy was a deciding factor.

TIPS placement in patients with biliary-enteric anastomoses, such as those with a hepaticojejunostomy following Whipple resection, is particularly high-risk beca ıse of enteric microbial colonization of the biliary tree and resultant vegetative infection of the catheter. In a similar case reported by Gupta et al., a patient who had undergone Whipple resection with hepaticojejunostomy presented with polymicrobial bacteremia, which persisted despite endovascular TIPS removal.[9] TIPS placement should be avoided in this patient population due to the high risk of endotipsitis. Vascular access to the portomesenteric circulation for the treatment of stenosis has been described using percutaneous transsplenic, transhepatic, or direct portal vein access, typically via a secondary branch. These techniques introduce unique risks, including peri-operative bleeding and closure of access tracts. As a result, portomesenteric access in oncologic and post-liver transplant patients often requires the involvement of interventional radiologists with significant experience in these specific procedures to minimize procedural risk.[10–13]

Conclusion

We report a case of successful surgical removal of an infected TIPS in a patient with a hepaticojejunostomy from prior Whipple resection and persistent polymicrobial bloodstream infection that had not responded to appropriate medical therapy. To our knowledge, this is the first reported case of successful surgical TIPS removal for endotipsitis, suggesting that this may be a feasible option in centers with access to experienced hepatobiliary, vascular, and transplant surgery services when medical management has failed.

Lessons Learned

Endovascular infections of transjugular intrahepatic portosystemic shunts are a rare but morbid complication. Patients with biliary-enteric anastomoses (e.g., hepaticojejunostomy) are at particular risk, and medical management is unsuccessful. Surgical removal may be feasible in centers with access to experienced subspecialty surgical services.

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