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BRIEF REPORT

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Portal vein angioplasty using a transjugular, intrahepatic approach for treatment of extrahepatic portal vein stenosis after liver transplantation

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Abstract Symptomatic portal vein stenosis is an uncommon complication after liver transplantation. Portal vein angioplasty has been successfully established for treatment of portal vein stenosis using mesenteric or percutaneous, transhepatic approaches. We herein report on a patient who suffered from variceal bleeding due to portal hypertension 3 months after liver transplantation. After successful endoscopic sclerotherapy, an extrahepatic portal vein stenosis was diagnosed, and portal vein angioplasty was considered as primary therapeutic option. Instead of mesenteric or percutaneous, transhepatic approaches, we adopted a transjugular, intrahepatic access to introduce a 14-mm balloon catheter into the portal vein. Using this technique, angioplasty was successfully performed. After intervention, no further episodes of variceal bleeding occurred. We favour the transjugular, intrahepatic technique for portal vein angioplasty because it does not require general anesthesia, in contrast to the mesenteric approach, and it reduces the risk of intra-abdominal bleeding, compared to the percutaneous, transhepatic approach.

Keywords Portal vein stenosis · Angioplasty · Liver transplantation

Abbreviations *TIPSS* Transjugular intrahepatic portosystemic stent-shunt

Introduction

Symptomatic portal vein stenosis is an uncommon vascular complication after orthotopic liver transplantation (OLT) affecting the postoperative course in approximately 1–2% of transplant recipients [8, 11, 14]. The recommended management is surgical intervention such as resection and reconstruction of the anastomosis [16]. In recent years, portal vein angioplasty has been established as a successful alternative to surgical treatment using a percutaneous, transhepatic approach [3, 10, 13, 14] or a mesenteric approach via a mesenteric vein using a mini-laparotomy [2].

We herein report on a patient who underwent OLT for liver cirrhosis secondary to chronic hepatitis C virus infection and who suffered from postoperative extrahepatic portal vein stenosis detected 3 months after liver transplantation. The patient became symptomatic with esophageal variceal bleeding due to severe portal hypertension. Portal vein stenosis was successfully treated with portal vein angioplasty which was performed using a transjugular, intrahepatic transparenchymal approach.

Case report

A 56-year-old patient underwent liver transplantation for liver cirrhosis secondary to chronic hepatitis C virus infection (Child C). His medical history revealed a Billroth II-operation due to chronic gastric ulcer disease 16 years before. OLT was performed using standard techniques including a veno-venous bypass. Biliary reconstruction was accomplished as end-to-side choledochoduodenostomy. A supraceliacal iliac artery interposition to the aorta was performed for arterial reconstruction. Cold ischemic time of the graft was 17 h, the duration of surgery 10 h.

Reperfusion of the liver graft was judged as excellent, and bile production started intraoperatively. Reperfusion injury, measured by initial peak of liver enzymes, was low, with AST 282 U/l and ALT 224 U/l. Due to diffuse arterial bleeding, reoperation was necessary at the first and second postoperative day. Subsequently, the patient developed acute renal insufficiency, requiring hemodialysis. At POD 20 a tracheostomy had to be performed because of persistent respiratory insufficiency. At POD 23 a leakage of the bile duct anastomosis led to further reoperation with reconstruction of the biliodigestive anastomosis. The bile leakage persisted and was treated conservatively by external drainage hereafter. Within the following 3 weeks, renal and respiratory insufficiency fully recovered, and weaning from the respirator was successfully performed.

Three months after OLT, acute esophageal variceal bleeding occurred, necessitating the transfusion of 11 units of red blood cells. Esophago-gastro-duodenoscopy revealed esophageal varicosis caused by portal hypertension. Variceal bleeding was successfully managed by endoscopic sclerotherapy. Doppler ultrasonography revealed an extrahepatic stenosis of the portal vein, which was confirmed by late arteriography (Figure 1). Because of the complicated postoperative course of the patient with multiple reoperations, we considered portal vein angioplasty as the primary therapeutic measure. The number of thrombocytes at this time was 76/nl, thromboplastin time was 84%, and hemoglobine amounted to 11.5 g/dl.

Using a standard Seldinger technique, a 10-French sheath (Cook, Bjaeverskov, Denmark) was placed into the inferior vena cava after ultrasonographic-guided puncture of the right internal jugular vein. Initial and postinterventional pressure in the inferior vena cava were measured at this location. A modified 9-French Ross needle (Cook, Bjaeverskov, Denmark) was introduced into the right hepatic vein, and a transparenchymal puncture of the right portal vein was performed. A 14-mm diameter balloon catheter (Meditech, Boston Scientific, Ratingen, Germany) was then introduced into the portal vein and passed across the stenosis. After successful dilatation of the stenosis, the pressure of the portal vein decreased from 35 to 25 cm H_2O, and the caval pressure increased from 5 to 10 cm H_2O after intervention. A stent implantation was not considered necessary because of sufficient blood flow (Figure 2).

After portal vein angioplasty, no further episodes of variceal bleeding occurred, and Doppler ultrasonographic controls displayed normal blood flow of the portal vein. The patient was discharged 3 weeks after angioplasty. Despite a hepatitis C virus reinfection, the patient is in good clinical condition 6 months after transplantation, without any clinical or Doppler ultrasonographic evidence of portal vein stenosis or portal hypertension.

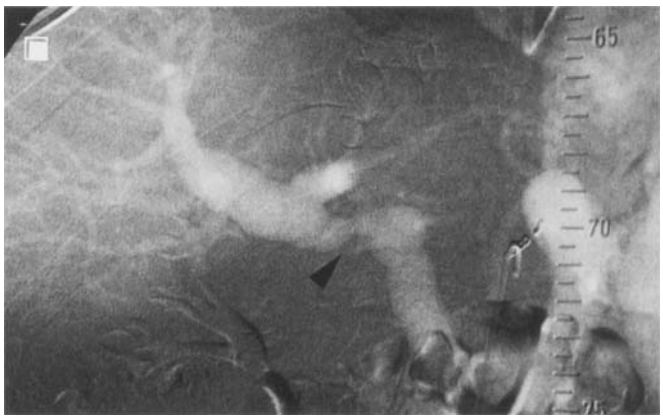

Fig. 1 Extrahepatic portal vein stenosis demonstrated by late arteriography 3 months after OLT

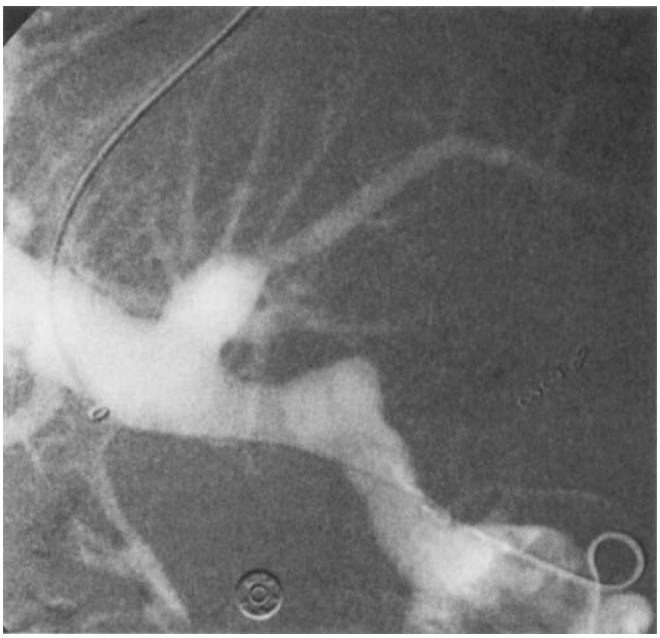

Fig. 2 Portal vein after successful angioplasty via a transjugular, intrahepatic parenchymal access

Discussion

The postoperative course after orthotopic liver transplantation (OLT) displays vascular complications of the portal vein such as thrombosis or stenosis in approximately 1–2% of transplant recipients [8, 11, 14]. The majority of cases are observed in patients requiring intraoperative reconstruction of the portal vein or who had a preoperative portal vein thrombosis [8]. Other predisposing conditions are decreased portal blood flow due to previous splenectomy or spontaneous collateral formation, severe allograft edema, and hypercoagulation. Vessel size discrepancy between donor and recipient might cause kinking or relative stenosis of the portal vein [11].

Despite Doppler ultrasonograpy, the diagnosis of portal vein complications can be difficult because of the variety of clinical symptoms. The most frequent presentation is portal hypertension with concomitant esophageal varices, ascites, splenomegaly, and variceal bleeding. Portal vein stenosis or thrombosis may also result in fulminant hepatic allograft failure. In case of spontaneous portal decompression through formation of venous collaterals, recipients may be completely asymptomatic, or with a nonspecific decrease in liver function tests as the only clinical sign [8, 11, 14].

The recommended surgical management of early thrombosis was thrombectomy or resection and reconstruction of the anastomosis [8]. In case of symptomatic portal vein stenosis, portal vein angioplasty has been suggested as an alternative to surgical treatment in some patients [2, 3, 10, 13, 14]. Using a percutaneous, transhepatic approach, the portal vein was punctured via an intercostal transhepatic route, and hereby a balloon catheter was introduced passing across the stenosis [3, 10, 13, 14]. Azoulay *et al.* report on a mesenteric approach introducing a balloon catheter into the portal vein after cannulation of a mesenteric vein. Therefore, the terminal loop of ileum was exposed through a McBurney incision [2]. These techniques have successfully been performed, and portal vein stenosis substantially improved thereafter [2, 3, 10, 13, 14].

In our patient who suffered from esophageal variceal bleeding due to portal hypertension, an extrahepatic stenosis of the portal vein was diagnosed 3 months following OLT. Portal vein angioplasty was considered as a primary therapeutic step. Instead of the mesenteric approach necessitating general anesthesia and laparatomy, we decided to adopt a transjugular, intrahepatic approach to introduce a balloon catheter into the portal vein. The percutaneous, transhepatic approach was not considered because of the potential risk of intraabdominal bleeding which might be associated to this technique when puncturing through the liver capsule [3]. Thus, portal vein angioplasty using a 14-mm balloon catheter was successfully performed after transparenchymal puncture of the portal vein from the right hepatic vein. Pressure of the portal vein decreased from 35 to 25 cm H_2O, and the caval pressure increased from 5 to 10 cm H_2O after intervention. No complications related to this technique occurred. There was no further episode of eophageal variceal bleeding, and Doppler ultrasonographic controls showed normal blood flow of the portal vein.

The transjugular, intrahepatic approach has already been described as a treatment for portal hypertension or refractory ascites in cirrhotic patients [15], as well as for patients who had undergone OLT [1, 9, 12]. Transparenchymal puncture of the portal vein via a hepatic vein creates an intrahepatic portosystemic shunt and results in decompression of the portal system. If necessary, a stent has to be implanted to achieve shunt patency (transjugular intrahepatic portosystemic stent-shunt, TIPSS). Hereby, the risk of variceal bleeding due to portal hypertension might be reduced, and refractory ascites or related complications such as hepatorenal syndrome and hepatic hydrothorax may improve [6, 15]. General anesthesia is not required, as in contrast to the mesenteric approach, as a mini-laparotomy for exposition of a mesenteric vein is used [2]. In addition, the risk of intraabdominal hemorrhage might be reduced because the percutaneous route through the liver capsule is avoided. Undoubtedly, the access route after percutaneous treatment can be sealed with coils, histoacryl, or fibrin glue to shorten the route for potential complications, but especially liver transplant recipients might experience a compromised coagulation status due to postoperative liver graft dysfunction, or might suffer from postoperative thrombocytopenia, thus, harbouring an increased risk for severe hemorrhage [11]. In at least 21 patients after OLT, the placement of TIPS for treatment of portal hypertension in a transplanted liver was feasible and required no special technical consideration when compared to placement in native livers [2, 9, 12].

Concerning the incidence of hemorrhage by comparing the different modes of access to the portal vein, only few comparative data are available in the literature. Helton *et al.* and Jabbour *et al.* found an incidence of hemorrhage after transparenchymal, intrahepatic puncture of 2.5% [4, 5]. In a recently published analysis on the safety of percutaneous liver biopsy in liver transplant recipients, the incidence of hemorrhage amounted to 1.4% [7]. As reported in large studies on the TIPSS procedure [5, 6, 15] it should be stressed, however, that intra-abdominal hemorrhage due to accidental perforation of the liver capsule after transparenchymal puncture was self-limiting in most patients, and surgical intervention was rarely required. In contrast to these findings, hemorrhage after percutaneous liver graft biopsy was not self-limiting in a total of 53% of liver transplant recipients, and surgical intervention was necessary [7].

After portal vein angioplasty, the main goal is to guarantee long term patency of the portal vein. If angioplasty is not satisfactory and portal hypertension might persist, one should primarily consider the insertion of an endoluminal prothesis [3]. In our patient, portal vein blood flow was excellent after angioplasty, and therefore no stent was placed. Nevertheless, repeated sessions of angioplasty, with or without stent implantation, might safely be performed using this approach [15].

In conclusion, portal vein angioplasty represents an alternative to reconstructive surgery in the treatment of symptomatic portal vein stenosis after OLT. With regard to the route used for portal vein angioplasty, the potential complications due to percutaneous liver punction or general anesthesia and mini-laparotomy in case of transhepatic or mesenteric approach might be avoided using a transjugular, intrahepatic transparenchymal access to the portal vein.

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