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Temporary Right Portocaval Shunt During Piggyback Liver Transplantation

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Abstract

Background During piggyback liver transplantation (LT), a temporary end-to-side portocaval anastomosis (PCA) facilitates native total hepatectomy while maintaining hemodynamic stability. Some argue that PCA, performed on the main portal trunk (PT), might shorten the main portal vein and could cause technical difficulties during LT. We describe a temporary PCA performed on the right portal vein (R-PCA).

Methods The technique entails complete dissection of the main portal trunk up its right and left branches. After having ligated the left portal vein, the right is anastomosed end-to-side to the anterior face of the inferior vena cava. Taken down of R-PCA, before graft-recipient portal vein anastomosis, is achieved by stapling or suturing.

Results An R-PCA has been performed in 14 over 15 planned procedures at our unit. In one case, because of intraoperative difficulties the PCA was performed on the PT.

Conclusions A temporary R-PCA represents a feasible alternative method of portal decompression during LT. Its use can be implemented into the technical armamentarium of transplant surgeons.

Introduction

During liver transplantation (LT), the preservation of the retrohepatic inferior vena cava (piggyback technique) has been associated with improved hemodynamical stability and avoidance of using an extracorporeal veno-venous bypass. However, with piggyback LT the optimal management of the portal vein during recipient hepatectomy remains debated. Some authors preferred, during the recipient hepatectomy, a systematic and early portal ligation division with a fashioning of a temporary end-to-side portocaval anastomosis (PCA) [1, 2]. This technique avoids bowel congestion and facilitates the hepatectomy of a "totally devascularized" liver while maintaining hemodynamic stability [1]. Other authors perform piggyback recipient hepatectomy under an undivided portal vein and/or with a short portal clamping time, giving the fact that cirrhotic patients have often spontaneous portocaval shunts [3]. One of the technical arguments against an end-to-side temporary PCA is the fact that this kind of technique might reduce the portal vein length. At our center, portal vein decompression during LT is systematically performed according to different techniques. Our technique of choice is based on a passive shunt via a catheter between the inferior mesenteric vein and the saphenous vein [4]. Alternatively, we have recently performed a PCA on the

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right portal vein (R-PCA). In this technical report, we describe this technique and evaluate its results.

Patients and methods

At our unit, portal decompression during LT is tailored according to local anatomy and patient conditions as previously described [4]. Briefly, portal decompression is used in the absence of hemodynamically efficient spontaneous shunt and PCA is preferred over a passive mesentericosaphenous shunt in the presence of (1) small segment 1; (2) difficult access to the IMV; and (3) transjugular intrahepatic portosystemic shunt.

Hepatic pedicle division

The abdominal cavity is entered through transverse incision with midline extension. Dissection of the hepatic pedicle starts on its right side with suture ligation of the cystic duct and artery. The pars flaccida of the epiploon is sectioned, and the dissection proceeds from left to the right. The left, the middle and the right branches of the proper hepatic artery are sequentially suture-divided followed by the common bile duct which is sectioned above the cystic duct insertion. The arterial and biliary structures are then retracted downward by the first assistant, and the anterior aspect of the main portal trunk (PT) with its right and left portal branches is dissected. Bipolar coagulation is usually used to divide the Glissonian sheet behind and laterally to the PT inferiorly up to the first duodenum. With the liver retracted cephalad, the left portal vein is dissected; care should be taken to isolate the left portal vein above the branches directed toward segment 1 (Fig. 1, Video). The left portal vein is divided first and then the branches for segment 1. At that point, it becomes easier to dissect the right portal vein up to its entrance into the liver parenchyma. This provide at least 1.5 cm of vessel length for fashioning a sound PCA anastomosis. The main portal trunk course is marked with ink up to the right portal vein to keep a correct orientation during the fashioning of the PCA. The right portal branch is clamped into the liver and the PT is clamped at its origin (Video).

Fashioning of a temporary portocaval anastomosis on the right portal vein

Upon clamping the portal vein, the anterior surface of the IVC is dissected from bottom to the top over 4 centimeters to make a safe partial clamping. Usually one to two short hepatic veins draining segment 1 must be suture-ligated and divided to have enough working space. Then the anterior surface of the IVC is clamped partially using a Satinsky clamp, and a longitudinal 3-cm-long incision is made. The transitory R-PCA is fashioned using two 5/0 polipropilene running sutures. A first stich is placed between the anterior surface of the PT, at the half of its circumference, and the superior edge of the longitudinal incision on the IVC. A second stich approximates the posterior surface of the PT to the inferior edge of the IVC incision. To achieve good exposure, two stay sutures are placed at the right side of the PT and IVC edges (Fig. 2). Upon fashioning, the PCA caval clamping is released first to eliminate air and sutures are then tightened leaving a small growth factor (Fig. 3). Hepatectomy then follows standard rules. Before performing the portal anastomosis, the R-PCA is taken down by applying an endoscopic vascular stapler on the right portal vein (Video).

Results

The technique described has been used in 15 patients undergoing LT at our unit over the last two years. Median age of patients was 54 years (range 31–69), median MELD score was 26 (range 7–40) and median BMI was 25 (range 22–33). Indications for surgery were fulminant hepatitis ($n = 3$), cirrhosis ($n = 6$) and hepatocellular carcinoma ($n = 6$). Preoperatively the median platelet count was 101 (66–123). Two patients had TIPSS, three a patent umbilical vein and three a portosystemic shunt via the left gastric vein. Median cold ischemia time was 350 min (190–612), and extended criteria donors were present in 53% of cases. Intraoperative transfusion was needed in eight patients, and postoperative mortality was nihil. In one case, a planned PCA on the right portal branch was instead made on the PT because of an intraoperative injury of a venous branch directed to segment 1.

Discussion

Temporary portocaval anastomosis represents an easy and safe way of managing the portal vein during recipient hepatectomy during piggyback liver transplantation. PCA seems to be associated with improved hemodynamic stability, decreased blood loss, better postoperative hepatic and renal function over conventional techniques [1, 2, 4, 5]. From a technical point of view, the fashioning of a temporary PCA facilitates the recipient hepatectomy in the presence of a devascularized liver and avoids bowel edema associated with portal clamping. This can be particularly useful at the beginning of the learning curve of transplant surgeons and greatly improves the safety profile of the procedure. The technique presented in this report represents a technical variation of the conventional PCA which

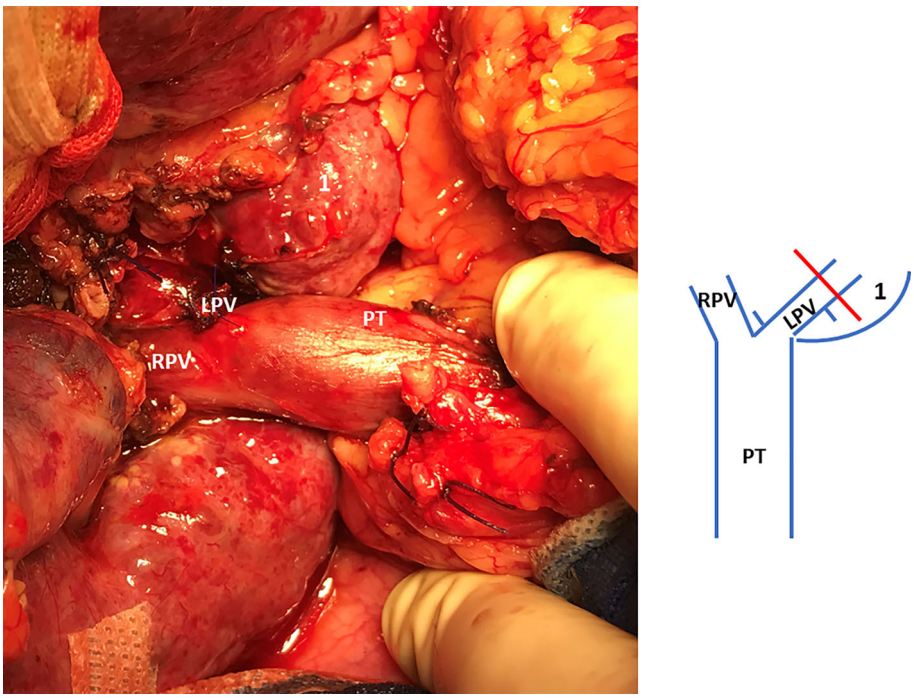

Fig. 1 Intraoperative view of the temporary R-PCA fashioning. The left portal vein (LPV) has been divided and the right portal vein (RPV) isolated. In cartouche, the red line indicates the safe point of transection of the left portal vein to avoid injuries to the portal branches of segment 1. PT (portal trunk); 1 = segment 1

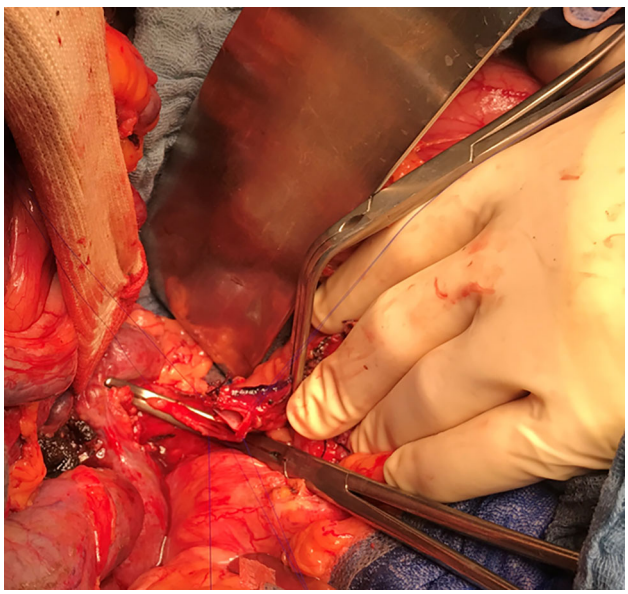

Fig. 2 Intraoperative view of the temporary R-PCA anastomosis fashioning. The anterior surface of the inferior vena cava and the portal trunk has been clamped. Stay sutures expose the right side of the anastomosis

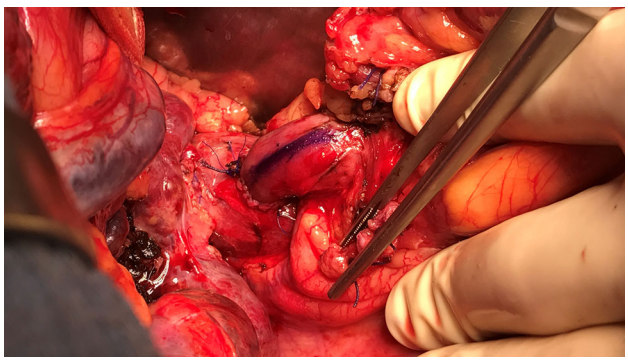

Fig. 3 Final aspect after unclamping of the temporary R-PCA

could avoid excessive shortening of the portal vein. From an anatomical point of view, in our opinion this technique presents several advantages. First the right portal branch enters the liver following the same axis of the portal trunk which makes easier the fashioning of the PCA anastomosis. Second the right portal branch is closer to the IVC which further facilitates the procedure. Third its caliber is at least 1 cm less than that of the PVT which avoids large opening and avoids extensive dissection on of the anterior surface of IVC while maintaining an adequate flow. The principal drawbacks of this technique are given by (1) the necessity of the dissection of the two portal branches, which can increase the risk of venous injuries; (2) the impossibility of performing R-PCA in the presence of a trifurcated portal vein, of a right portal vein thrombus and of extreme right lobe atrophy which shortens the right portal vein. We believe that this technique can be used in patients requiring a PCA during LT whenever possible.

Conclusions

A temporary R-PCA represents a safe alternative method of portal decompression during recipient hepatectomy in piggyback liver transplantation. Its use can be implemented into the technical armamentarium of transplant surgeons.

Compliance with ethical standards

Conflict of interest The authors declare that they have no competing interests.

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