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LETTER TO THE EDITOR

Conversion to termino-terminal cavo-cavostomy as a rescue technique for infrahepatic obstruction after piggyback liver transplantation

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Orthotopic liver transplantation (OLT) is a well standardized therapeutic alternative in the management of irreversible hepatic diseases. The standard operative technique with the 'en bloc' hepatectomy along with the native retro hepatic vena cava (RHVC) originally described by Starzl [1,2] has been modified over the years to minimize risks and operative time and to introduce more flexible techniques. Particularly, the caval implant underwent gradual evolution through the introduction of several variants with the aim of developing a more flexible technique. The common feature among these techniques is the preservation of the recipient RHVC by its complete dissection during hepatectomy [3]. This approach allows anastomosis of the donor's caval vein by three different methods of which the classic 'piggyback' (PB), described in the original series by Tzakis [4], has been adopted by many transplant surgeons because of several advantages when compared with the others [5–7]. However, one of the drawbacks of this technique is the potential for caval return occlusion by compression of the native infrahepatic caval vein with subsequent haemodynamic instability and high risk of RHVC thrombosis [8].

We retrospectively reviewed our experience in management of acute infrahepatic caval obstruction after classic PB OLT procedure performed in 89 adult cases out of 90 OLT, between 3/2004 and 7/2007.

Two patients out of 89 PB procedures (2.4%) experienced in the postoperative course a haemodynamically significant obstruction of the preserved native retrohepatic caval vein as a result of its compression by the hepatic graft implanted in a piggyback fashion. Both cases presented with an associated ongoing intra-abdominal bleeding requiring urgent re-laparotomy. In one case, the patient's stable condition allowed performing a computerized tomography scan with vascular reconstruction (angio-CT) before the operation (Fig. 1).

In both cases, active bleeding was localized at the site of the inflamed pericaval tissue and retrohepatic native caval vein; this was also caused by the heavy compression exerted by the graft. Because of the impossibility in obtaining a satisfactory caval haemostasis and the significant compression of the vessel, it was decided to restore subhepatic venous outflow by using the graft infrahepatic caval vein. After complete dissection and isolation of the native infrahepatic caval vein, from the suprarenal tract to the native hepatic veins cuff, the caval segment was cut off by vascular stapler. The cul-de-sac of the donor infrahepatic caval vein was prepared by minimal dissection and end-to-end cavo-cavostomy between the native suprarenal caval vein and the donor infrahepatic caval vein was carried out, using running 3/0 Prolene® suture for the back wall and single-stitches 3/0 Prolene® suture for the front wall (Fig. 2).

Figure 1 Acute stenosis of the recipient vena cava as a result of its compression by the graft (line) and perihepatic haematomas caused by active bleeding (arrow) from native vena cava and retrohepatic surfaces.

In both cases, haemostasis was easily achieved once the native RHVC was resected and caval flow was restored without signs of compression by the graft. The patency of the cavostomy and absence of turbulence were confirmed by Doppler ultrasound. The patients had an uneventful postoperative course and they are not experiencing caval

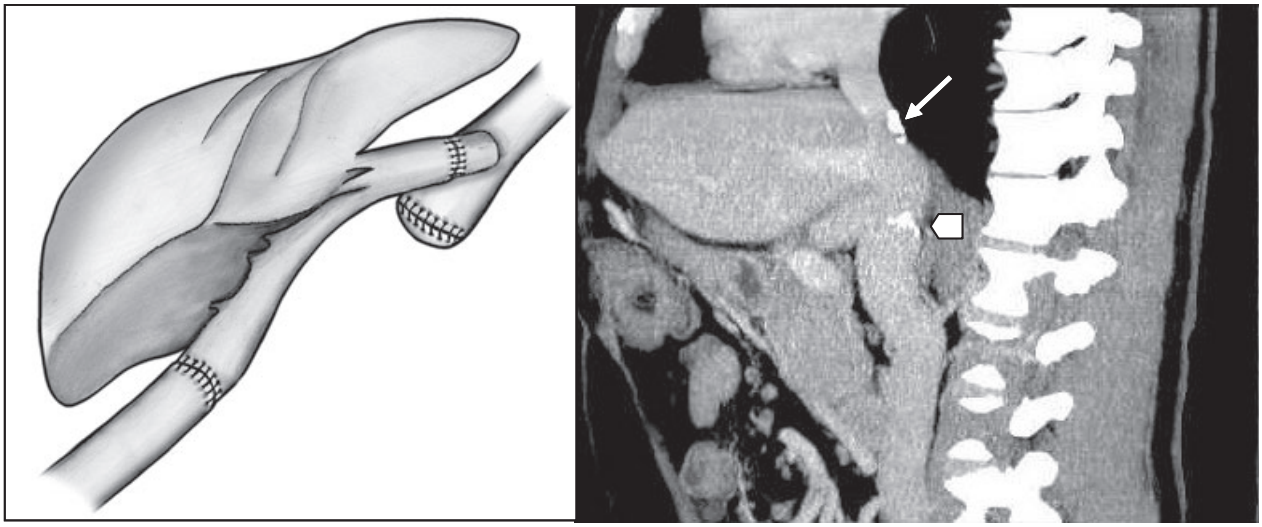

Figure 2 Termino-terminal donor–recipient rescue cavo-cavostomy. Drawing and CT scan. Retrohepatic native vena cava stapled below hepatic cuff (arrow); end-to-end anastomosis between suprarenal native vena cava and graft caval vein (arrowhead).

complications at a median follow up of 14 months post-transplantation.

In spite of there being a contention over the advantages and specific complications related to the use of piggyback technique, large series confirmed the piggyback technique to be safe and efficient with a low rate of complications, especially when the hepatic cuff patch formed by the three suprahepatic veins is used for venous reconstruction [9]. Specific caval complications of PB OLT are poorly reported in literature. A large series [10] allowed the identification of two types of complications: haemorrhage and occlusion of the caval venous flow with subsequent caval thrombosis or Budd-Chiari syndrome.

The causes of caval obstruction are predominantly technical in nature such as excessive length and kinking of the RHVC and mechanical obstruction because of donor–recipient size mismatch. In rare cases, poor graft function can result in swelling of the liver allograft with subsequent obstruction and thrombosis of the vena cava. Anatomical variations with severe narrowing of the infrahepatic vena cava are seldom advocated [11].

These complications are rare, but severe and early to appear. It has been estimated that they concern 2–4% of the patients and the mortality at 3 months is estimated up to 16.8%. Even if limited to a single-centre experience, we reported the same incidence of the literature (2.4%) with early occurrence (POD 1° and 5°) and no mortality.

In both cases, the signs and symptoms of presentation included acute renal failure, haemodynamic instability and lower limbs oedema.

Concerning the post-OLT haemorrhage, it is well known that several anatomical conditions such as inferior caval vein encircled by hypertrophic segment I, as present in our two patients, seem to be directly involved in the occurrence of this complication [5].

Because of the rarity of the set of recipient caval vein compression associated with massive caval and pericaval bleeding, no standardized technique was applicable.

Percutaneous dilatation and Gianturco stent placement have been successfully described by some authors [12,13], although there is still a concern about anastomotic rupture, especially during the early postoperative period. Massive bleeding was experienced in our patients, thus no endovascular approach was possible.

Several surgical treatments, some of which are extremely invasive, have been described in few case reports: Mazzaferro *et al.* [14] described the successful use of a reno-splenic shunt to overcome an early caval occlusive thrombosis; Eid *et al.* [15] shunted a caval obstruction with a prosthetic cavo-atrial shunt and Boggi *et al.* [16] relieved an acute caval occlusion placing in appropriate position two surgical gloves filled with sterile saline, progressively deflated until resolution of the occlusion. Re-transplantation is not usually required.

In our limited experience, we performed a resection of the native retrohepatic caval vein to achieve good haemostasis of the retrohepatic region and thus restore a satisfactory caval flow by conversion to an end-to-end cavostomy between suprarenal native caval vein and the use, as new conduit, of the retrohepatic graft caval vein, previously stapled to perform a piggyback transplantation. This approach allowed us not to use a vascular exclusion of the graft, preventing a possible primary nonfunction; it resulted in a feasible, useful, safe and stable procedure. We

believe that such a technique might be kept in mind as a rescue technique in case of surgical approach to infrahepatic caval obstruction following PB liver transplantation.

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