LETTER TO THE EDITOR

Excellent outcome using an alternative technique for arterial reconstruction in living-related liver transplant: sphenoid anastomosis

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Thrombosis of the hepatic artery (HAT) after living-related liver transplantation (LRLT) is a significant cause of graft loss. Microsurgical methods can decrease the incidence of HAT between 0% and 2% [1]. We use alternative technique, which does not require an operating microscope.

From February 2002 to October 2005, 35 adult LRLTs and four pediatric LRLTs were performed for end-stage liver disease. Twenty recipients were male and 15 female, mean age 51 years (range: 18–74). The four pediatric patients, all younger than 6 months and below 10 kg of weight, underwent combined living donor liver/small bowel transplant for short gut syndrome and Total Parenteral Nutrition induced end-stage liver disease. The size of each pediatric hepatic artery was between 2 and 2.5 mm. The recipient operation has been described in detail elsewhere [2,3].

The arterial anastomosis is performed with the aid of 4× surgical loupes. The arteries are rinsed with heparin. Longitudinal arteriotomies in the recipient and donor vessels are performed. The arteriotomy in the donor artery is performed in the posterior wall, with the length of incision approximately equal to the diameter of the artery. A mirror arteriotomy is performed in the anterior wall of the recipient artery (Fig. 1). The cross-section of each vessel resembles a wedge, hence the term *sphenoid*. The anastomosis is performed with running 7/0 Prolene. The first stitch is placed from the apex of the graft arteriotomy to the middle of the posterior wall of the recipient artery (Fig. 1). The back wall is sutured first from the 'inside' with perfect visualization of the intima. The suture is run in both directions beginning with a 'parachute' technique until the corners of the arteriotomy on each side are reached. No corner stitches must be placed as the two ends of the running posterior wall suture can be placed on slight tension and open the field for the suturing of the anterior wall (Fig. 2). Then, a second 7/0 Prolene is placed from the apex of the recipient arteriotomy to the mid portion of the anterior wall of the artery of the graft. The suture is run in both directions to join the suture run on the opposite wall. Arterial flow is re-established before the sutures are tied to allow further expansion at the anastomosis site and avoid a 'purse-string' effect.

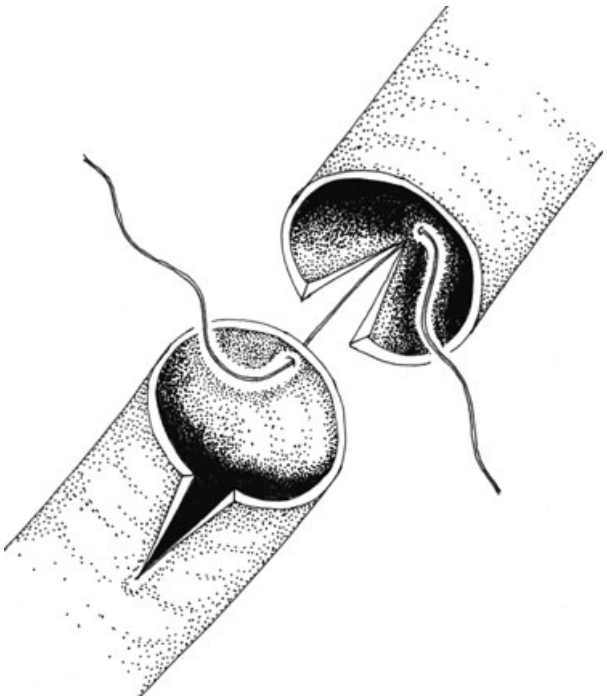

Figure 1 Schematic presentation of how the anastomosis is started. The suture is placed between the apex of the graft vessel's arteriotomy and the hepatic artery of the graft.

Thirty-five donors underwent right liver and four left lateral hepatectomy. In the adult recipients, the arterial anastomosis was constructed 14 times with the Right Hepatic artery of the recipient; 14 times with the Proper Hepatic artery; three times each with a Replaced Hepatic artery and a patch of the Gastroduodenal-Common Hepatic artery and in one re-transplant with an arterial conduit from the aorta. In four cases, an interposition venous or arterial conduit was used. In the pediatric recipients, the anastomsosis was invariably performed using the Left Hepatic artery of the graft and the Proper

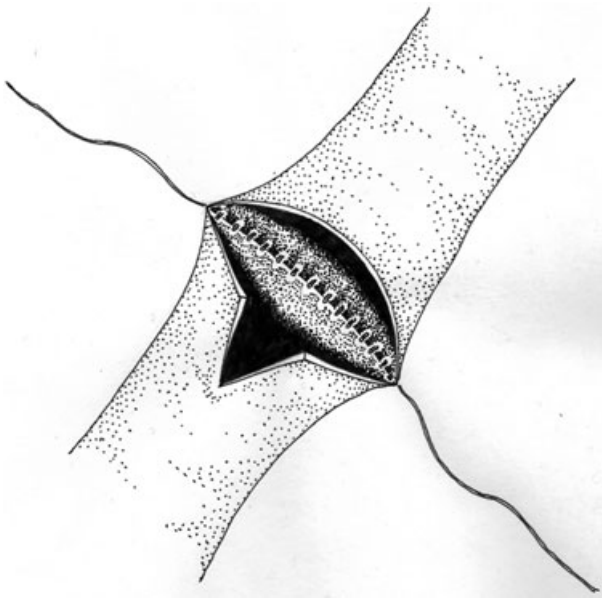

Figure 2 A completed posterior wall of the anastomosis and an arteriotomy in the recipient vessel.

Hepatic of the child; no conduit was used. The size of the anastomosis' diameter using the sphenoid technique was increased by approximately 25–50%. Continuous heparin infusion was used in the first five postoperative days anytime the INR tested lower than 1.5. Platelets were transfused only when lower than 20 K/μl; the hemoglobin and hematocrit were kept <10 g/dl and <30%, respectively. Serial Doppler Ultrasound was performed daily for 5 days after the transplant. HAT did not occur in any of the patients from this series.

HAT is the most feared and severe complication in LRLT associated with a mortality rate >50% [4]; its incidence varies between 1.6% and 22% [1]. Risk factors for HAT include the technical performance of the anastomosis [1,2,5,6]. The literature in cadaver liver transplantation suggests that using a gastro-duodenal artery branch-patch improves the outcome [5,7], however, the use of a patch in LRLT is not always possible because of the limitations in vessel length.

Several factors make the sphenoid technique appealing in LRLT. The method is always feasible and the anastomosis does not depend on the topography of the recipient vessel. The artery does not need to be rotated to complete the posterior wall. This is an important advantage if the vessels are short and require excessive torsion to complete the union, a factor, which is typically associated with a very high risk of intimal damage. The increased surface at the anastomosis prevents the so-called 'purse string' effect, a constant risk factor of running sutures. The abrupt change in caliber is avoided, hence the resulting decrease in turbulence of the blood flow. The above-described advantages make the technique very useful not only in adults but also in pediatric LRLT, where the vessels are much smaller. Most surgeons still may prefer to use the bifurcation of the recipient's artery as anastomotic site; the sphenoid method helps to make a smooth transition in the vessel diameter.

Two anastomotic techniques other than end-to-end have been described in LRLT. Di Benedetto et al. [8] have proposed a branch-patch including the recipient cystic artery. Loupe magnification and a temporary catheter in the gastroduodenal artery were used to help perform a running end-to-end anastomosis [8]. Marcos et al. [9] proposed an *ex situ* reconstruction consisting of a 'Y' hepatic arterial extension graft in donor livers that had two arteries, or a reversed graft of the recipient Left, Right, and Proper hepatic arteries that included a union between two branch-patches.

The principle of increasing the total area of a vessel end was first described by Harashina and Irigaray who used the so-called 'fish mouth' incision consisting of two longitudinal contralateral (180° apart) arteriotomies in the same vessel to effect expansion of the lumen in cases of marked size discrepancy [10]. The sphenoid anastomosis described here can be regarded as a simplified 'fish mouth' technique that in our experience successfully deals with minor to moderate discrepancies in the vessel size common in living donor liver transplantation and provided a very smooth transition of the vessel caliber. In conclusion, we recommend the sphenoid anastomosis in anatomical reconstructions including vessel size discrepancy and small arteries to minimize the manipulation of the artery and improve the patency rate.

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