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Combined whole pancreas and liver retrieval: comparison between Y-iliac graft and splenomesenteric anastomosis

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Abstract. With the recent increase in the number of liver and pancreas transplants being performed in Europe, many groups have found it necessary to develop techniques for the combined harvesting of whole pancreaticoduodenal and liver grafts. To date we have carried out a total of 35 multiorgan procurements including liver, heart, pancreas, and kidneys. In ten cases we reconstructed the arterial supply of the pancreas with an end-to-end anastomosis between the proximal splenic artery and the distal end of the superior mesenteric artery (SMA), and in eight patients we used a donor Y-iliac graft. Patients were monitored postoperatively by determination of BUN, serum creatinine, blood glucose, serum and urinary amylase levels, and Doppler assessment of the graft was carried out at regular intervals. Mean ischemia/preservation time in both groups was 6 h. All simultaneous kidney and pancreas transplants functioned well initially with none of the patients requiring dialysis. All patients were insulin-free immediately after surgery. One patient in the splenomesenteric group developed venous thrombosis of the graft, requiring removal of the gland, but has subsequently been successfully retransplanted. All remaining patients have been insulin-free for 1–14 months. One patient in the Y-iliac group also developed venous thrombosis of the graft, but all remaining patients in this group have been insulin-free for 1–12 months after transplantation. Both groups were comparable in terms of serum creatinine (1.4 ± 1.0 vs 1.5 ± 0.9 mg%), blood glucose (105 ± 15 vs 104 ± 12 mg%), serum amylase (400 ± 106 vs 410 ± 100 IU/l), and urinary amylase ($130{,}000 \pm 54{,}000$ vs $100{,}000 \pm 42.000$ IU/l). Therefore, we now prefer to use this simpler technique of splenomesenteric revascularization as a first choice for reconstruction of pancreatic grafts.

Key words: Multiorgan donor – Pancreas procurement, and liver – Procurement of pancreas and liver – Liver procurement, and pancreas

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Over the last few years, pancreas transplantation has experienced a significant improvement in terms of graft and patient survival [5]. However, since there has also been a corresponding increase in the number of liver transplants, the possibility of both liver and pancreas being harvested from a single cadaver donor has increased. Many institutions have, therefore, found it necessary to develop techniques for the simultaneous, combined procurement of liver and whole pancreas grafts [3, 6]. Combined liver and pancreas procurement has been uncommon in the past because transplant surgeons have preferred to include the entire coeliac axis for either the liver or pancreatic allograft, usually compromising on the pancreas.

We have developed a technique for vascular reconstruction of the pancreas without the use of a Y-iliac graft. The arterial supply to the pancreas is reconstructed by performing an end-to-end anastomosis between the proximal end of the splenic artery and the distal end of the superior mesenteric artery (SMA). In this report, we compare our results using this technique with those obtained using standard Y-iliac reconstruction.

Materials and methods

To date we have performed a total of 35 multiorgan procurements including liver, heart, pancreas, and kidneys. In ten cases we reconstructed the arterial supply of the pancreas with an end-to-end anastomosis between the proximal splenic artery and the distal end of the SMA, and in eight patients we used a Y-iliac graft from the donor. The characteristics of the patients in these two groups are listed in Table 1. Standard patient monitoring after simultaneous renal/pancreas transplantation included BUN, serum creatinine, blood glucose, and serum and urinary amylase determinations. On the 3rd postoperative day and every week thereafter, we routinely assessed blood flow through the graft by duplex Doppler scanning of both kidney and pancreas.

Operative technique

After obtaining control of the great vessels, the anatomy of the hepatic blood supply is identified. Unlike Sollinger et al. [4], we have not found the presence of an aberrant right hepatic artery to be a

contraindication to combined harvesting. If the hepatic artery arises from the SMA. it is divided close to its origin from the SMA and the defect is oversewn. The liver surgeons anastomose the hepatic artery to the splenic artery close to its origin from the coeliac. The entire pancreas with the portal and mesenteric vessels are then mobilized and the common bile duct is ligated close to the gland. The liver and pancreas are flushed with UW solution via the aorta (2000–3000 ml) and the mesenteric vein (500–1000 ml).

The portal vein is divided 2 cm proximal to the pancreatic margin. The splenic and hepatic arteries are divided close to their origins; the heart is removed and then the liver with the coeliac artery and a Carrel patch. The kidneys and ureters, together with pancreas, spleen, and duodenum are removed to a side table and ex vivo separation of kidneys and pancreas is performed. The donor iliac bifurcation is removed at the time of organ retrieval. The pancreas is placed in ice-cold Ringer's lactate and perfused with UW solution.

In ten patients the arterial supply was reconstructed by end-to-end anastomosis between the proximal splenic artery and distal SMA (Fig. 1). End-to-side anastomosis is performed between the SMA with its aortic patch and the right iliac artery of the recipient. The portal vein is anastomosed to the right iliac vein and urinary diversion is carried out by duodenocystostomy. In eight cases the arterial supply was reconstructed with a donor Y-iliac graft, anastomosing the internal iliac artery to the splenic artery, the external iliac to the SMA, and the graft common iliac to the recipient right iliac. The venous anastomosis and urinary diversion are carried out as before.

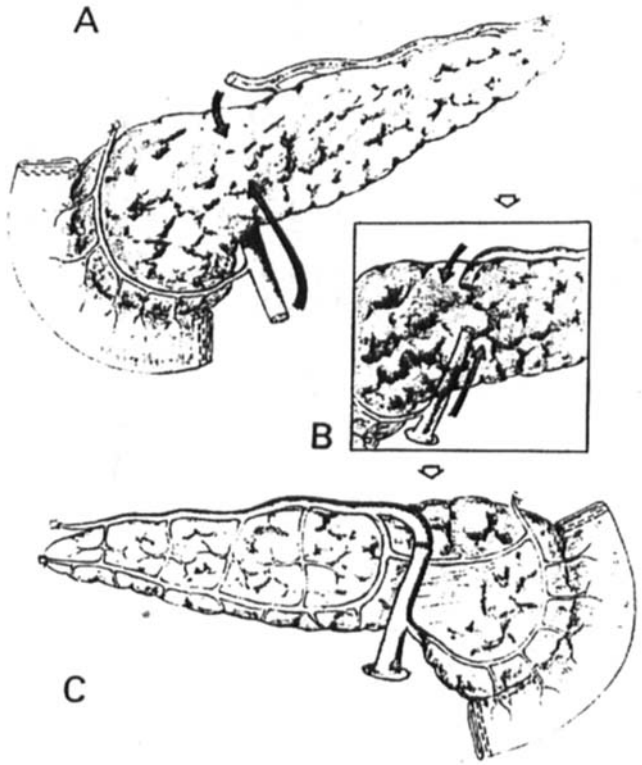

Fig. 1 A–C. Technique for splenomesenteric anastomosis. The proximal branches of the jejunal arteries have been ligated and divided and all fatty tissue surrounding the splenic and superior mesenteric arteries has been removed to facilitate performance of the anastomosis without tension. **A** The distal end of the SMA is then rotated towards the splenic artery behind the pancreas. **B** The proximal end of the splenic artery and the distal end of the SMA are approximated and anstomosed with 5/0 prolene. **C** The anastomosis is completed

Results

Mean ischemia/preservation time was 6 h in both groups. All simultaneous pancreas and kidney transplants functioned well initially with none of the patients requiring dialysis. All of the patients were insulin-free immediately after surgery. One patient in the splenomesenteric group developed venous thrombosis of the graft, requiring removal of the gland. This patient was subsequently successfully retransplanted. All remaining patients are insulin-free 1–14 months after transplantation.

There were no deaths in the Y-iliac graft group. One patient, however, developed venous graft thrombosis. The remaining seven patients are insulin-free. In this group of patients the graft is functioning 1–12 months after transplantation.

Discussion

With the increasing number of liver and pancreas transplants being performed in Europe, it has become necessary to develop a technique that allows for simultaneous liver and pancreas procurement. In Barcelona combined liver/pancreas harvesting is performed as a routine procedure; however, the preservation of the blood supply is a matter of controversy. Two principal techniques are available to vascularize the pancreatic graft. In the first, the coeliac axis and the SMA origins are removed, together with the pancreas, on a common aortic patch, leaving the common hepatic artery to supply the liver graft. However, many people believe that the hepatic blood supply should be left undisturbed [2] and that the coeliac axis and its aortic patch should remain with the liver graft. In this case the splenic artery is transected before its junction with the hepatic artery, making it necessary to reconstruct the arterial supply using one of the following techniques. The standard method, as used in eight of our patients, involves the use of the donor common iliac artery with its bifurcating internal and external iliac arteries. However, there are some circumstances in which this is not suitable, such as in the presence of atherosclerosis in the donor or if damage occurs to the vessel at the time of procurement. Another

Table 1. *Patient characteristics in the two transplant groups*

	Y-graft	Splenomesenteric group
Male	5	5
Female	2	5
Mean age at operation	35 ±7	38 ±6
Mean duration of dialysis (years)	3.3 ±3	1.5 ±1
Mean duration of diabetes (years)	23 ±7	19 ±4

technique involves end-to-side anastomosis of the splenic artery into the SMA with its aortic patch. A third method is to perform end-to-side anastomosis between the coeliac artery and the proximal end of the SMA [1].

We have recently developed the much simpler technique of arterial reconstruction with end-to-end anastomosis between the proximal end of the splenic artery and the distal end of the SMA. This technique, which provides a much better size match, can be performed in almost all cases as long as care is taken to remove all excess fatty tissue from the arteries in order to facilitate performance of the anastomosis.

Our study has shown that the results with this technique are comparable in terms of amylase level, glucose control, and renal function with those obtained using the standard Y-graft. Therefore, we now prefer to use the technique of splenomesenteric reconstruction as a first choice for arterial reconstruction of pancreatic grafts.

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