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Reconstruction of a Pancreatic Allograft With Variant Arterial Anatomy for Transplantation

Dylan Adamson, MD,[1] Matthew L. Holzner, MD,[1] Vikram Wadhera, MD,[1] and Ron Shapiro, MD[1]

Abstract. Donor pancreas utilization rates remain low and aberrant donor anatomy can lead to organ discard by transplant centers. We report on a case of successful pancreas transplantation using a graft with variant arterial anatomy demonstrating that arterial reconstruction is a viable option if aberrant anatomy is encountered at the donor operation. Efforts must be made to use all pancreas grafts that are felt to be of appropriate quality.

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Despite the consistent, albeit slight, increase in deceased donor organ donation, the number of pancreas transplants has steadily declined in the United States over the past 13 years.[1] Donor pancreas utilization rates remain low, and pancreas grafts have the highest discard rate among abdominal organs for transplantation.[2] Given the risks of technical failure associated with pancreas transplantation, aberrant donor anatomy can lead to organ discard by transplant centers. Up to 3% of all deceased donors consented for pancreas procurement are not recovered due to anatomical reasons, whereas nearly 30% of pancreata recovered with the intent to transplant are subsequently discarded for anatomic abnormalities.[3,4] We report on a case of a successful pancreas transplantation using a graft with variant arterial anatomy (four arteries), including an accessory splenic artery and a dorsal pancreatic artery (DPA), requiring vascular reconstruction.

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[1] *Recanati/Miller Transplantation Institute, Icahn School of Medicine at Mount Sinai, New York, NY.*

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ORCIDs: Matthew L. Holzner: http://orcid.org/0000-0002-4935-9968. Ron Shapiro: https://orcid.org/0000-0003-1213-2142. Dylan Adamson: https://orcid.org/0000-0001-6648-1247.

Correspondence: Dylan Adamson, MD, Recanati/Miller Transplantation Institute, 1 Gustave L. Levy Place, New York, NY 10029. (dylan.adamson@mountsini.org).

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Case

The recipient was a 38-year-old male with history of type 1 diabetes mellitus, diagnosed at age 13 years, and hypertension. Baseline insulin regimen consisted of 23 units of long-acting nightly and 12 units of short-acting with meals. His hemoglobin A_{1c} (HbA_{1c}) was 8.8% before transplantation, and he was on hemodialysis three times weekly for 3 years through an upper extremity arteriovenous fistula.

The donor was a 23-year-old brain-dead donor who suffered a traumatic head injury secondary to a motor vehicle collision. The Kidney Donor Profile Index was 20%, and the BMI was 25, ABO compatible (O to O), terminal creatinine of 1.06 mg/dL, amylase of 88 U/L, lipase of 86 U/L, 5.7% HbA_{1c}, no significant history of alcohol or drug use. No intra-abdominal injury was noted on preoperative cross-sectional imaging, and the pancreas was poorly visualized on ultrasound. At the time of procurement, it was noted that the pancreas had two distinct splenic arteries of equivalent size off of the celiac artery as well as a DPA originating from the superior mesenteric artery (SMA), in addition to the inferior pancreaticoduodenal artery coming off the SMA. Due to the variant arterial anatomy, the procuring center declined, and our institution accepted.

The recipient had a PRA of 0%, and the CDC crossmatch was B cell–positive before heat and negative after, with T cell–negative before and after heat.

Given the size of all involved arteries, it was judged clinically that all would require reconstruction and reimplantation; no angiogram was performed given the findings at the time of recovery. On the back bench, both of the splenic arteries were incised logitudinally and syndactylized using running 7-0 prolene to create a common opening (Figure 1). The common opening was anastomosed to the internal iliac artery of the Y graft from same donor end-to-end fashion with 6-0 prolene. The donor SMA was anastomosed to the external iliac artery of the graft end-to end using 6-0 prolene. The remaining DPA was anastomosed end-to-side to the donor common iliac with interrupted 7-0 prolene. The reconstruction was tested with heparinized saline and appeared

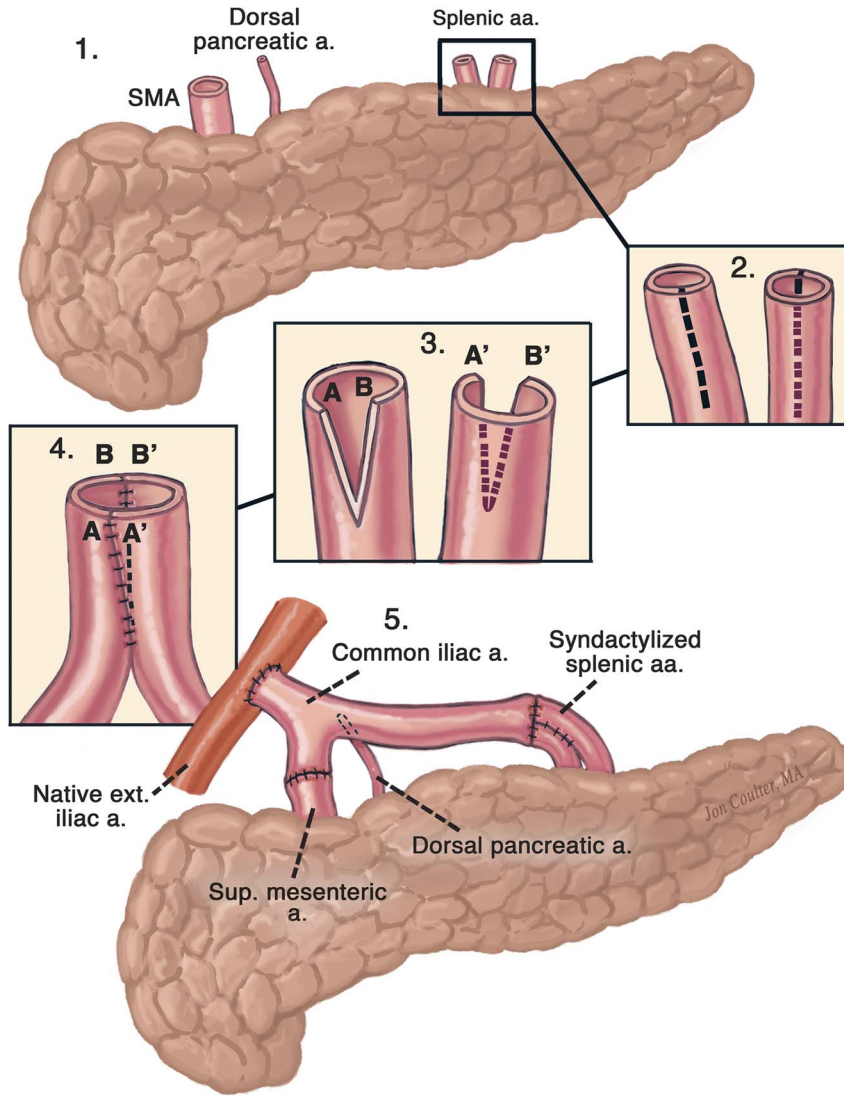

FIGURE 1. Variant arterial anatomy at time of procurement (1.1) including accessory splenic artery; reconstruction of accessory splenic artery (1.2-1.4); final reconstruction at time of implantation (1.5).

to be patent. A portal vein extension was created using the donor iliac vein, to achieve comparable length of the vein and artery. We do not routinely perform a portal vein extension for all cases, but the donor portal vein was short and given the arterial reconstruction and length, it was felt to be clinically appropriate in that setting. The recipient vessels were without any evidence of atherosclerosis, and the pancreas was implanted in the right iliac fossa to the external iliac artery and external iliac vein with an uneventful reperfusion. This was all done through a midline incision in an intraperitoneal position after mobilizing the right colon. Exocrine secretions were drained into the jejunum via a duodenojejunostomy approximately 40 cm from the ligament of Treitz. Warm ischemia time was 35 minutes, and the cold ischemia time was 9 hours 42 minutes.

The left kidney had a second artery, supplying the upper pole, which was maintained on a common patch with the main renal artery. The renal allograft was transplanted to the left iliac fossa uneventfully.

We do not routinely place postoperative patients on anticoagulation beyond pharmacologic deep venous thrombosis prophylaxis, and it was not felt to be warranted in this instance. Ultrasound performed immediately after the transplant demonstrated good arterial and venous flow in both grafts. Low-dose subcutaneous heparin and 81-mg aspirin were initiated on postoperative day one. The hospital course was uncomplicated, and the patient was discharged on postoperative day 12. Induction immunosuppression was with thymoglobulin 6 mg/kg, IVIG 2 g/kg, mycophenolate mofetil, tacrolimus, and steroids. The patient was discharged on mycophenolate mofetil, tacrolimus, and oral prednisone. He is now 1 year posttransplant and continues to have normal kidney and pancreas function, with a most recent HbA_{1c} of 5.5%, and a serum creatinine of 1.09 mg/dL. No additional imaging has been performed to assure that all arteries remained patent, because it has not been felt to be clinically warranted.

DISCUSSION

This case demonstrates that arterial reconstruction is a reasonable option if variant arterial anatomy is encountered at the donor operation. The DPA, if present, is usually a branch

off of the splenic artery, but may arise from anywhere along the celiac axis and may supply a large portion of the head, body, or tail of the pancreas.[5-7] It will usually join the inferior pancreaticoduodenal artery in forming the inferior pancreatic arcade or transverse pancreatic artery. The importance of this vascular anomaly for transplant was well described by Baranski et al.[6] Witte et al[7] described an instance where the inferior pancreaticoduodenal artery was absent and the transverse pancreatic artery was supplied solely by the DPA. Although the organ they described was a cadaveric dissection, reimplantation of the DPA would have been essential if the graft was to be used for transplant. Given the high discard rate for pancreas for a variety of factors, we as a community must make every effort to use all grafts that are felt to be of appropriate quality. Based on this case report, back bench surgical reconstruction of variant pancreatic arterial anatomy should be considered a viable option. Dye instillation may assist in clinical decision making whether or not to reconstruct or reimplant variant anatomy if concern remains.

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