Robotic Pancreas Transplantation

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KEYWORDS

• Robotic transplant • Pancreas transplantation • Diabetes • Obesity
• Surgical-site infection

KEY POINTS

- Obesity is considered a relative contraindication to pancreas transplantation.
- The minimally invasive approach reduces wound-related complications and surgical-site infections.
- This approach offers an extended indication for pancreas transplantation to obese type 2 diabetic patients with suppressed C-peptide.

BACKGROUND AND INDICATIONS

Along with the increasing incidence of type 1 diabetes,[1] the prevalence of obesity in this population is escalating.[2] Outcomes after pancreas transplantation in select type 1 diabetic patients are excellent,[3] but can be burdened by significant complications that are more commonly observed in obese recipients.[4] Consequently, obesity is considered a relative contraindication to pancreas transplantation, because of an overall increase in surgical and wound-related complications, which increase risk of graft loss.[5–8] Moreover, the indication for pancreas transplantation has been extended to include selected, nonobese type 2 diabetic patients or obese diabetic patients with suppressed C-peptide. Among recipients of simultaneous pancreas-kidney transplants (SPK), the proportion of type 2 diabetic patients increased 4-fold from 1994 to 2010.[9]

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As always, the dilemma persists in optimizing utility while ensuring equity access to organ transplantation. Lynch and colleagues[6] observed that although obese kidney transplantation recipients experienced surgical site infections and related graft and patient loss, those who did not present wound complications maintained comparable patient and graft outcomes as those with normal body mass index (BMI). Fridell and colleagues[10] found that the 1-year patient and graft survival was comparable between obese and nonobese pancreas recipients. More recently, Laurence and colleagues[4] reported that obese pancreas recipients with well-controlled cardiovascular risk have comparable survival outcomes but still have a significantly higher risk of wound-related complications and early rejection as compared with nonobese pancreas recipients. Therefore, organ transplantation in well-selected obese patients seems to be a worthy and reasonable pursuit; however, in this patient population, strategies that effectively reduce wound-related complications require further development to mitigate these increased risks. Minimally invasive approaches can reduce wound-related complications. With the availability of robotic assistance, more technically demanding procedures can be safely performed in a minimally invasive manner.

At the University of Illinois at Chicago, the authors performed the initial series of robotic-assisted pancreas transplantation in patients with type 1 and 2 diabetes, and they hypothesize that this novel approach could extend the acceptable BMI range.

SURGICAL TECHNIQUE

During the donor procurement, particular attention must be given to ligate all the small vascular tributaries to the pancreas in order to prevent bleeding at the time of reperfusion. Warm dissection of the entire organ should be favored for this purpose.

The benching of the transplant graft is performed as follows: the spleen is removed first; the root of the mesentery stump is oversewn with 4.0 Prolene; the proximal duodenal stump is oversewn with 4.0 Prolene. Then, the stump of the superior mesenteric artery and splenic artery are reconstructed with a “Y” iliac artery graft from the same donor. In order to minimize post-reperfusion bleeding, the organ is flushed with a solution of 1 L of University of Wisconsin Solution and methylene blue to address any visible leaking points.

Positioning of the patient and trocars placements are as illustrated in **Fig. 1**. In the case of SPK, the robotic cart has to be redocked after the pancreas transplant is completed, and symmetric contralateral ports for the robotic arms must be placed to the other side. Usually the pancreas goes to the left iliac fossa, whereas kidney goes to the right iliac fossa.

The patient is placed in a seated position with Yellofins stirrup devices and then tilted into steep Trendelenburg position. For insertion of the organs and hand assistance, a 7-cm supraumbilical midline incision is performed, and a GelPort is used. The rest of the trocars placement is as described in **Fig. 1**.

The authors have chosen to place the pancreas graft into the left iliac fossa with the head facing caudal for dorsal alignment of the portal vein with the left external iliac vein, and ventral alignment of the arterial Y-graft with the external iliac artery.

After mobilizing the descending colon, the left external iliac vessels are mobilized under appropriate hemostasis and lymphostasis. Bulldog vascular clamps are applied robotically during the anastomosis time. The implantation starts by performing the portal to iliac vein anastomosis in an end-to-side fashion with 5-0 expanded polytetrafluoroethylene suture. The arterial anastomosis between the Y-graft and the common iliac artery is performed in the same manner (**Fig. 2**).