Pancreatic Transplantation: What Radiologists Need to Know

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INTRODUCTION

Pancreatic transplantation was introduced more than 40 years ago and it is currently the treatment of choice for type I diabetic patients. It is often performed in conjunction with renal transplantation to protect the transplanted kidney from recurrent diabetic nephropathy. Multiple efforts have been made in order to improve pancreatic graft survival, so it is imperative for radiologists to familiarize themselves with the surgical technique, normal graft imaging and postoperative complications.

Since pancreatic transplantation poses a great imaging challenge due to the surgical technique, a multimodality imaging approach is often encouraged, ultrasound with Doppler being the first line modality.

It is important to highlight that pancreatic transplants receive the highest amount of immunosuppression in comparison to other solid organ transplants. As a result, they are more susceptible to the complications of immunosuppressive therapy. We will present a pictorial review of the expected normal findings and most common post-transplantation complications.

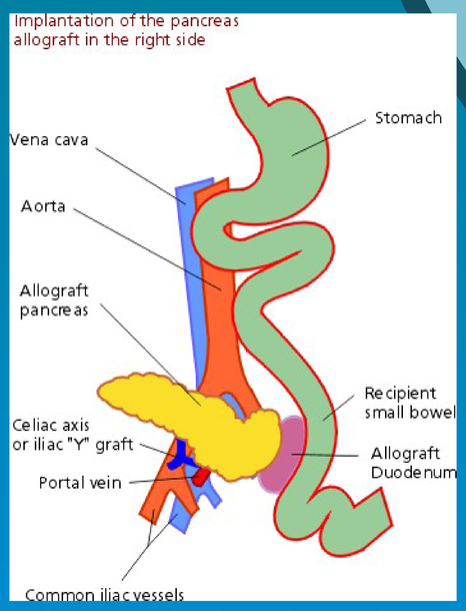
SURGICAL TECHNIQUE - ANATOMY

The two important surgical aspects of pancreatic transplants is the exocrine and venous drainage.

Throughout the initial decades of pancreatic transplantation, exocrine drainage into the bladder was popular however given the multiple complications the majority of transplant centers now perform enteric drainage of exocrine secretions. This enteric drainage is either directly into a loop of jejunum in a side-to-side manner or into a Roux limb of jejunum. The venous drainage of the graft is either to the systemic circulation (via an iliac vein or the inferior vena cava) or to the portal circulation.

The location of the graft will depend on the venous drainage of choice, mid-abdominal if portal approach or pelvic (most commonly the right side) if systemic venous drainage is preferred. At our institution, the pelvic approach is preferred.

When the graft is placed in the pelvis, the donor portal vein is anastomosed to the external iliac vein, the common iliac vein, or the inferior vena cava. In this pelvic position, the graft is oriented with the duodenum in either the superior or inferior direction.



Pancreatic transplant with enteric drainage technique

CASE 1

Normal Pancreas on US

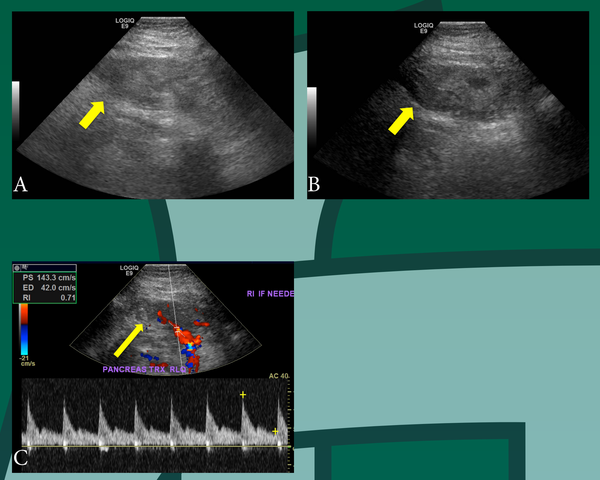
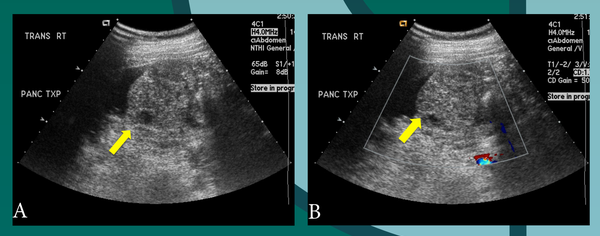


Image a and b - US images demonstrate a well defined, homogeneously hypoechoic structure in the right lower quadrant reflecting the pancreatic transplant. This graft was performed with enteric exocrine and systemic vascular drainage.
Image c - Duplex US image demonstrates normal vascularity with an adequate low-resistance arterial waveform and resistive index.

CASE 2

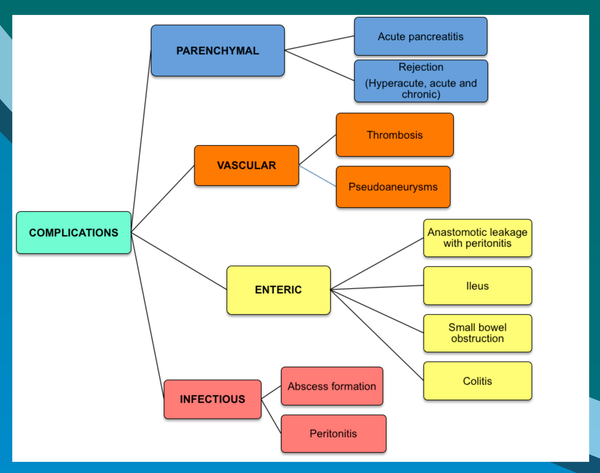
Failed/chronic rejection of pancreatic transplant by ultrasound



Images a and b - longitudinal US images exhibit a non-enlarged echogenic right lower quadrant transplant with absent vascularity throughout. These images were obtained 7 months after transplantation and considered to be in chronic rejection.

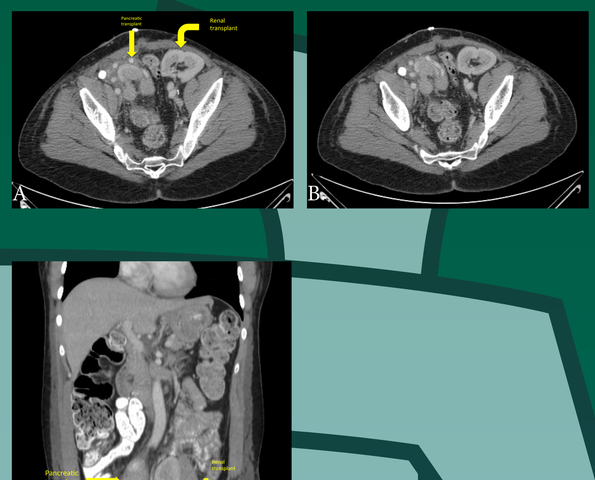
COMPLICATIONS

US is routinely performed in the initial evaluation of a failing graft. Complications can be categorized as below:



CASE 3

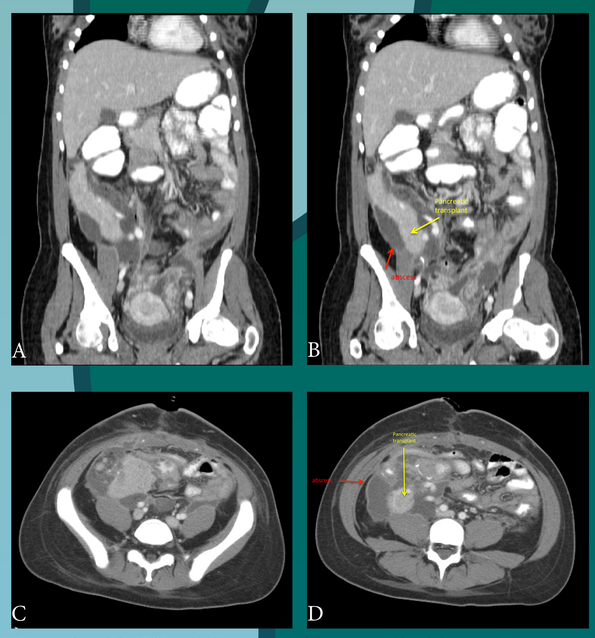
Normal pancreas on CT



Images a, b and c - CECT axial and coronal images through the pelvis demonstrate a normal right lower quadrant transplant as well as a left lower transplanted kidney. This graft was performed with enteric exocrine and systemic vascular drainage.

CASE 4

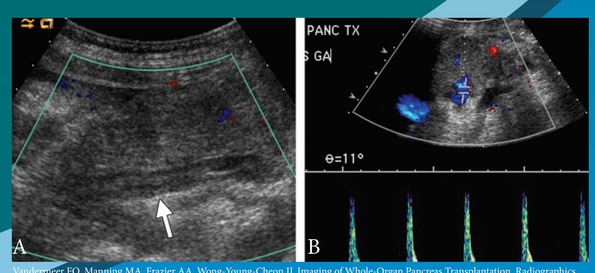
Peripancreatic abscess formation



Images a through d – CECT axial and coronal images demonstrate a viable right lower quadrant pancreatic transplant with a large surrounding rim-enhancing fluid collection concerning for abscess. This images were obtained 1 months after transplantation.

CASE 5

Splenic vein thrombosis



Vandermeer FQ, Manning MA, Frazier AA, Wong-Young-Cheon JJ. Imaging of Whole-Organ Pancreas Transplantation. Radiographics. 2012; 32:411–435

Splenic venous thrombosis (requiring explantation of the allograft on postoperativeday 3) in a 35-year-old man after SPK transplantation. (a) Color Doppler US image shows striated echogenic material distending the splenic vein (arrow), with no blood flow identified in the vessel or the allograft. (b) Duplex Doppler image demonstrates a high-resistance waveform with reversal of diastolic flow in the graft artery.

CASE 6

Chronic transplant rejection and necrosis

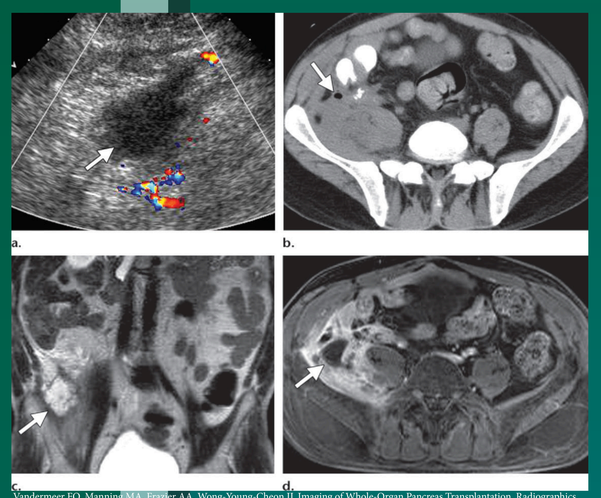


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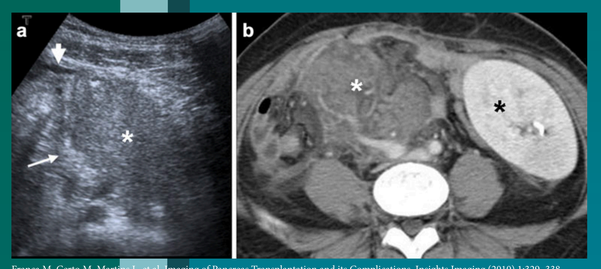
Figure 14. Chronic transplant rejection and necrosis in a 42-year-old man who had undergone PTA 8 years earlier. (a) Color Doppler US image over an area of tenderness in the right iliac fossa shows a nonvascular ill-defined fluid collection (arrow) with no identifiable pancreatic tissue. (b) Unenhanced CT image shows loss of definition of tissue planes, with fluid and gas (arrow) in the same area. (c) Coronal T2-weighted HASTE MR image shows a high-signal-intensity fluid collection (arrow) in the right lower quadrant and edema of the subjacent musculature. (d) Axial contrast-enhanced fat-suppressed T1-weighted MR image shows the rim-enhancing fluid collection (arrow) and inflammation of the iliac and psoas muscles. At surgery, there was a purulent phlegmon and no recognizable pancreatic tissue.

CASE 7

Graft pancreatitis



Franca M, Certo M, Martins L, et al. Imaging of Pancreas Transplantation and its Complications. Insights Imaging (2010) 1:329–338.

A 36-year-old woman after SPK transplantation presenting graft pancreatitis. a Ultrasound shows enlarged pancreatic graft (asterisk) with adjacent hyperechoic fatty tissue (thin arrow) and a small amount of free intraperitoneal fluid (large arrow). b Axial contrast-enhanced helical CT shows an enlarged pancreatic graft with heterogeneous contrast enhancement (white asterisk), peri-pancreatic fat stranding and free peritoneal fluid. Normal renal graft is located on the left (black asterisk)

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