Ultrasound – Pancreas Transplant Protocol

PURPOSE:
To evaluate the parenchyma and vasculature associated with a pancreas transplant for structural or vascular pathology.

SCOPE:
Applies to all US studies performed in Imaging Services / Radiology for evaluation of patients with prior pancreas transplant.

ORDERABLE:
- US Doppler Pancreas Transplant

CHARGEABLES:
- US Abdomen Limited
- US Duplex scan of arterial inflow and venous outflow of abdominal organs, complete study

INDICATIONS:
- Presence of a pancreas transplant and
    - Signs (fever, weight loss, loss of appetite) or symptoms (pain) associated with pancreatic disease or transplant rejection
    - Abnormal lab values (increased lactate, lipase)
    - Abnormal findings on other imaging studies
    - Follow up of prior abnormal findings

CONTRAINDICATIONS:
- None.

EQUIPMENT:
- Linear array transducer with frequency of 5-18 MHz. If unable to visualize, curved transducer with a frequency range of 1-9 MHz allows for appropriate penetration and resolution depending on patient's body habitus.

PATIENT PREPARATION:
- Ideally patients should be NPO for 4-6 hours prior to study, allowing for reduction in obscuring bowel gas. However, in the emergent situation (eg. Immediate post-op; time-sensitive evaluation of acute pathology), imaging may proceed without fasting.

EXAMINATION:

GENERAL GUIDELINES:

A complete examination includes evaluation of:
- Pancreatic transplant vasculature
- Pancreatic transplant parenchyma
- Adjacent anatomical structures, including for free fluid and walled of collections

EXAM INITIATION:
- Review any prior imaging, making note of abnormalities requiring specific evaluation.

- Introduce yourself to the patient
- Verify patient identity using patient name and DOB
- Explain test
- Obtain patient history including symptoms. Enter location of transplant (eg. LLQ; RLQ) and store data page
- Place the patient in a supine position. Right lateral decubitus (RLD), and/or left lateral decubitus (LLD) positions may assist with displacing obscuring bowel gas away from the pancreas transplant.

TECHNIQUE CONSIDERATIONS:

- The pancreas transplant is generally located in the right lower quadrant, iliac fossa, of the abdomen in a vertical orientation. It is usually accompanied by a renal transplant, placed in the contralateral lower quadrant.
- Pancreas:
    - Pancreatic allograft should be evaluated for diffuse and/or focal abnormalities, pancreatic duct dilatation with diameter measurement (if visualized)
- Using color Doppler, survey as much of the transplant splenic vein as possible.
- Venous anastomosis may either be to the main portal vein, iliac vein, or IVC.
- The pancreas is transplanted with a portion of the donor duodenum (duodenal cuff). The duodenum may be anastomosed to small bowel (enteric drainage; more common) or the bladder (less common).
- Peripancreatic Tissues:
    - Assess for peripancreatic adenopathy or fluid.
    - A walled-off collection (pseudocyst) is a common complication seen in pancreatic transplants. It is usually, but not always, located close to the transplant.
    - If seen (i.e. fluid filled), document the duodenal segment and its anastomosis with the bowel.
- Even if not specifically requested, the kidney transplant should be briefly evaluated, if present, and a representative longitudinal image should be taken to evaluate for hydronephrosis.

DOCUMENTATION:

Anatomy	Grey Scale	Color Doppler	Waveform	PSV	RI	eSAT
Anatomic components (still images and cine loops)						
Longitudinal pancreas: head	x	x				
Longitudinal pancreas: body	x	x				
Longitudinal pancreas: tail	x	x				
Transverse pancreas: head	x	x				
Transverse pancreas: body	x	x				
Transverse pancreas: tail	x	x				
Duodenal segment (if visible; often fluid-filled)	x					
Enteric anastomosis (for enteric drainage) Bladder anastomosis (if present, though less common)	x					
Vascular components						
TX Pancreas splenic artery (pancreatic tail): distal	x	x	x	x	x	x
TX Pancreas splenic artery (pancreatic body): proximal	x	x	x	x	x	x
TX Pancreatic Y-graft : splenic artery anastomosis	x	x	x	x	x	x
TX Pancreas SMA (pancreatic head)	x	x	x	x	x	x
TX Pancreatic Y- graft : SMA anastomosis	x	x	x	x	x	x
TX Pancreatic Y-graft artery: mid (before bifurcation)	x	x	x	x	x	x
TX Pancreatic Y-graft artery: anastomosis at iliac artery	x	x	x	x	x	x
Iliac artery: proximal to anastomosis	x	x	x	x	x	x
Iliac artery: at anastomosis	x	x	x	x	x	x
Iliac artery: distal to anastomosis	x	x	x	x	x	x
TX splenic vein: entire length (multiple images if needed)	x	x	x			
TX venous outflow (MPV or IVC)	x	x	x			
Peripancreatic Tissues						
Still images of representative peripancreatic tissues	x	x				
Cine loops of peripancreatic tissues	x					
Ascites check (4 quadrants)	x					
Renal Transplant (if present)						
*Longitudinal renal transplant: middle	x	x				
*Include one image with length measurement and one without						
PSV = peak systolic velocity EDV =end diastolic velocity						

RI = resistive index
SAT = systolic acceleration time
TX = transplant

PROCESSING:

- Review examination images and data
- Export all images to PACS
- Confirm data in Imorgon
- Document relevant history, if the patient was altered or received pain medication prior to the examination, and any study limitations

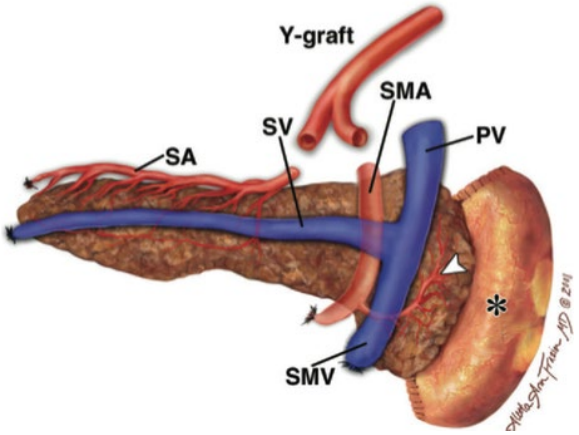
REFERENCES:

- ACR-AIUM Practice Guideline (Revised 2007)
- Pozniak MA and Tublin, ME (2008). Ultrasound Evaluation of the Transplanted Liver, Kidney, and Pancreas. In *Diagnostic Ultrasound* (pp. 301-338). CRC Press, 2nd ed.
- Heller MT, Bhargava P. Imaging in Pancreatic Transplants. Indian Journal of Radiology and Imaging 2014; 24(4):339-349.
- Tolat PP, Foley WD, Johnson C, Hohenwalter MD, Quiroz FA. Pancreas Transplant Imaging: How I Do It. Radiol 2015; 275:14-27.
- Vandermeer FQ, Manning MA, Frazier AA, Wong-You-Cheong, JJ. Imaging of Whole-Organ Pancreas Transplants. RadioGraphics 2012; 32:411-435.
- Chandra J, Phillips RR, Boardman P et al. Pancreas transplants. Clinical Radiology 2009; 64:714-723.

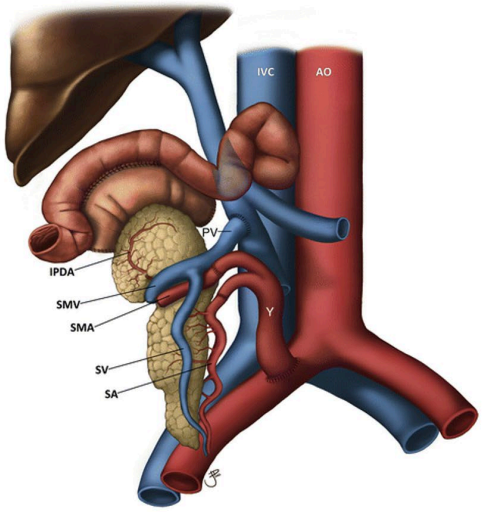
REVISION HISTORY:

STATUS	NAME & TITLE	DATE	BRIEF SUMMARY
Submission	David Fetzer, MD, Director; Matthew Carrigan, RDMS, RVT, RMSKS	6/30/25	Submitted
Approval	David Fetzer, MD, Director	8/30/25	Approved
Review			
Revisions			

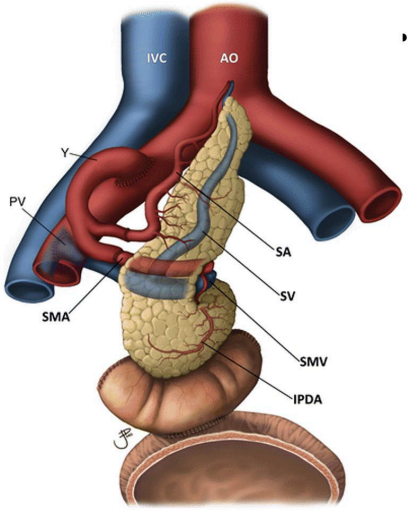
APPENDIX:



Donor transplant with oversewn splenic vein (SV) and SMV, and oversewn distal splenic artery (SA) and SMA, with Y-graft to proximal SA and SMA. Also not oversewn duodenal C loop (*)

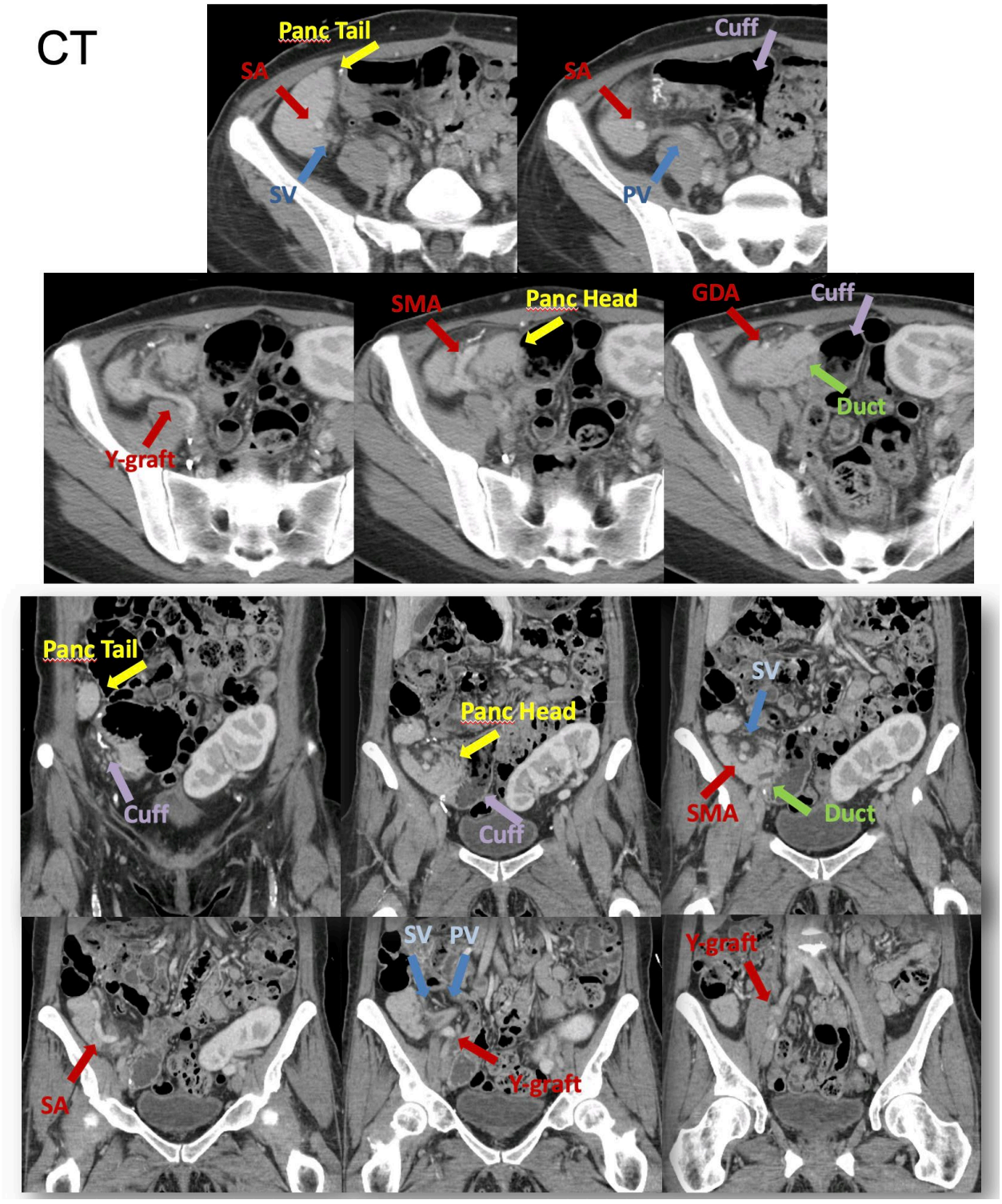


- Arterial
  - Y-graft anastomosed to recipient common/external iliac artery
- Portal vein
  - Endocrine drainage
    - Systemic drainage:
      - End-to-side with EIA
      - End-to-side with IVC
    - Portal drainage:
      - SMV
- Donor duodenal cuff oversewn ("C-loop")
  - Ductal anatomy preserved
- Exocrine drainage (left)
  - Side-to-side anastomosis with recipient small bowel
    - Distal ileum
    - Proximal jejunum

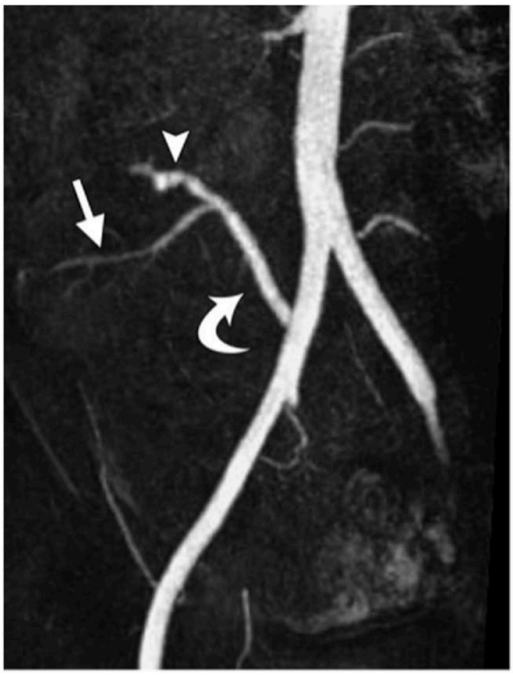


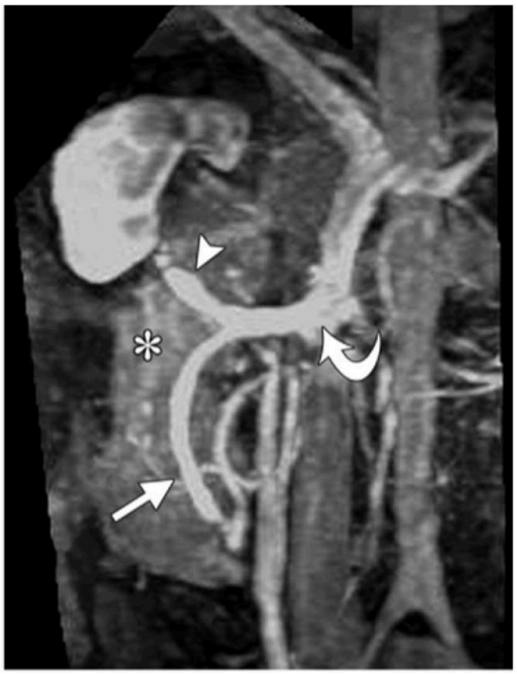
- Exocrine bladder drainage
  - Historical (<10% new transplants)
  - Side-to-side duodenocystostomy anastomosis
  - High degree of complication:
    - Metabolic acidosis
    - Stone formation
    - Hematuria
    - Recurrent UTI
    - Urethritis and stricture
    - Reflux pancreatitis
    - Leak

CT


Panc Tail
SA
SV
SA
Cuff
PV
Y-graft
SMA
Panc Head
GDA
Cuff
Duct
Panc Tail
Cuff
Panc Head
Cuff
SV
SMA
Duct
SA
SV
PV
Y-graft
Y-graft

MRI

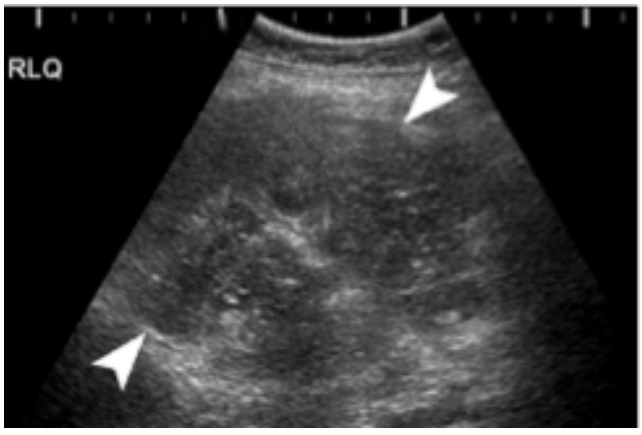


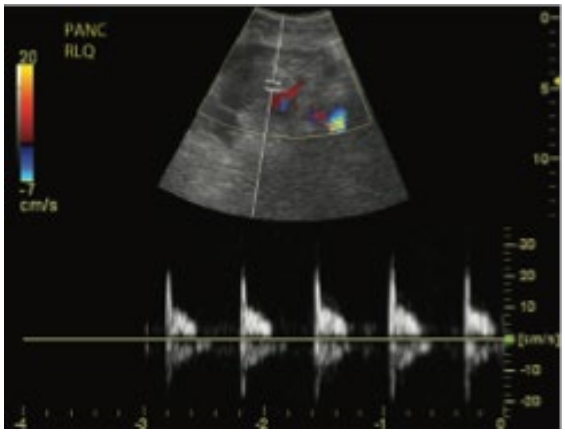


Artery **Vein (portal drainage)**

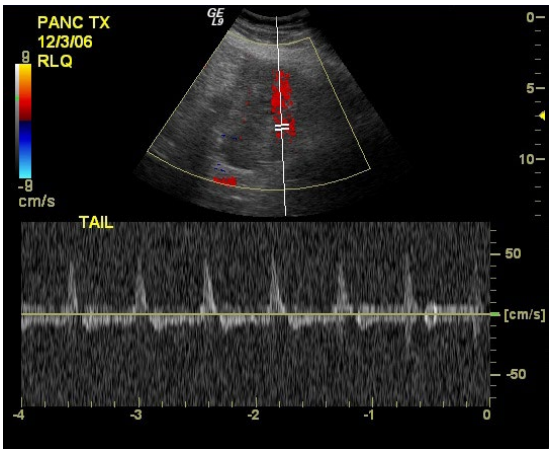
COMPLICATIONS

- **Rejection**
- **Pancreatitis (incidence up to 35%)**
- **Vascular**
  - Arterial stenosis
  - Venous stenosis; thrombosis (MUCH MORE COMMON)
  - Pseudoaneurysm; hemorrhage
- **Post-operative collections**
  - Hematoma, seroma, abscess, pseudocyst
- **Duodenal cuff dehiscence**

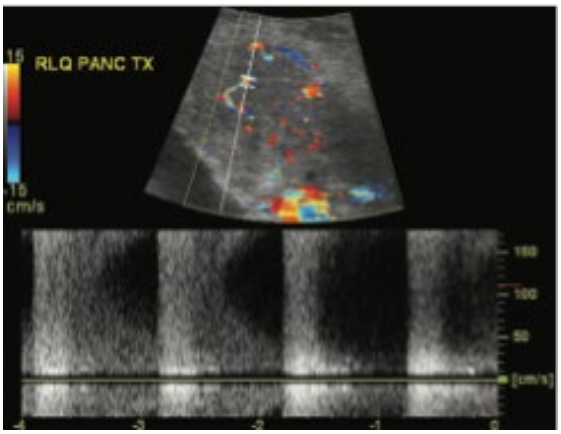




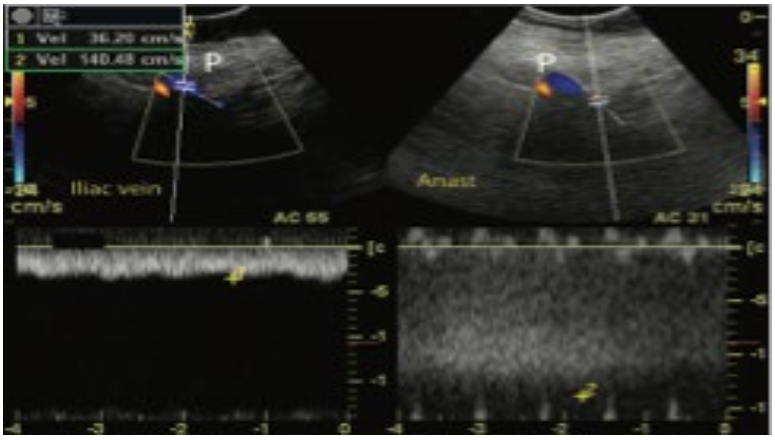
Acute Rejection



Splenic Vein Thrombosis
(no venous waveform identified)



AV Fistula



Venous Stenosis