RENAL TRANSPLANT

The type of donor kidney is helpful. A kidney from a living donor will have an end to end or end to side anastomosis as the renal artery from the donor will be used. A kidney from a cadaver will have part of the donor aorta for the renal artery so the main renal artery will be larger than normal. The arterial anastomosis for an end-to-side anastomosis is to the external iliac artery. The end-to-end anastomosis is to the internal iliac artery. The ureter is connected directly to the bladder.

The renal sinus is normally hyperechoic, and the medullary pyramids are distinguished by their more echolucent appearance than the renal cortex. Small amount of fluid collection around the graft is common, mostly representing a hematoma, which generally resolves spontaneously.

The characteristics of intrarenal color Doppler ultrasound, used as a window to both intrarenal and main renal vessels play an important role in the diagnosis and differential diagnosis of vascular complications of renal transplants.

The anatomy of the intrarenal arteries in order from large to small diameter, are segmental, interlobar, and arcuate arteries.

Connecting to the iliac artery, the transplant renal artery divides close to the hilum into 4 or 5 segmental arteries that supply each segment of the kidney. The segmental arteries divide into 2 or 3 interlobar arteries that run toward the cortex and divide into arcuate arteries at the corticomedullary junction. The arcuate artery that runs circumferentially along the Corticomedullary junction divides into several interlobular (cortical radial) arteries that ascend the cortex.
Intrarenal veins start with the arcuate veins and then the interlobar veins. The lobar veins join to form superior and inferior venous trunks that drain into the main renal vein.
The main transplant renal vein connects to the iliac vein.

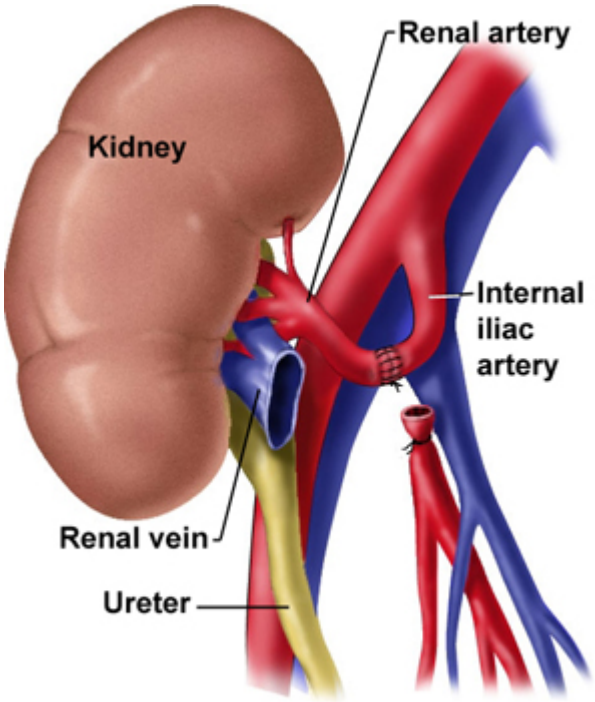
Renal vein thrombosis or occlusion- caused by fluid collection, surgical difficulty, coagulation disorders, hypovolemia or propagation of clot from the iliac vein.

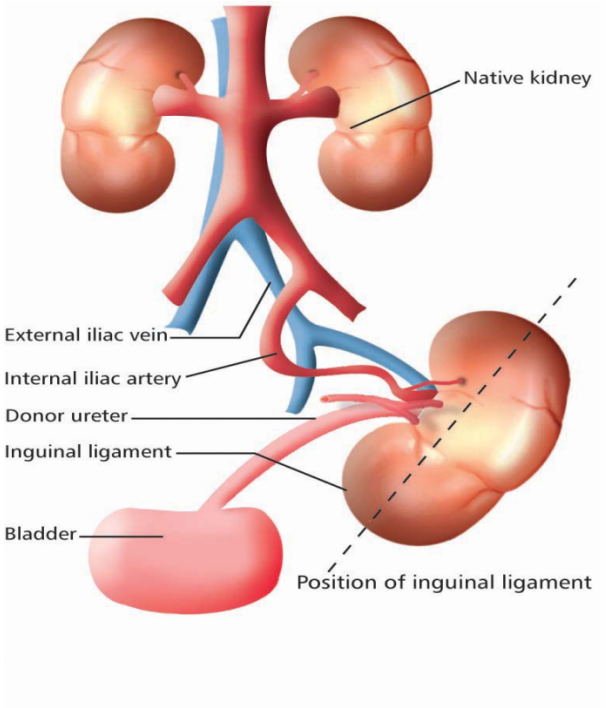
AV fistula – can occur as a result of biopsy of transplanted kidney

Intrarenal artery occlusion – more common than in the main renal artery. It may not cause renal failure if the area of infarction is small. However, diffuse or large areas of ischemia in the renal parenchyma from multiple intrarenal artery occlusions may cause transplant dysfunction. The main clinical signs are renal failure and pain over the graft.

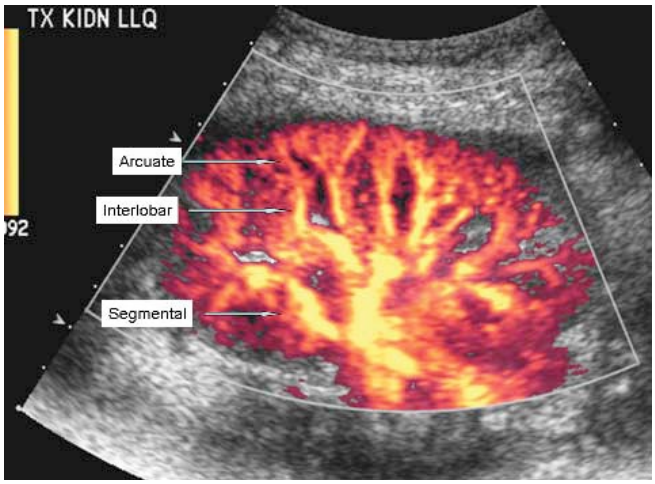
Intrarenal venous occlusion - Reversal of diastolic flow of the paired artery is present.
Venous stasis in the transplanted kidney may be caused by a collection compressing the iliac vein. Elevated RI and increased venous flow in intrarenal veins may indicate venous obstruction, which puts the patient at risk for renal vein thrombosis.

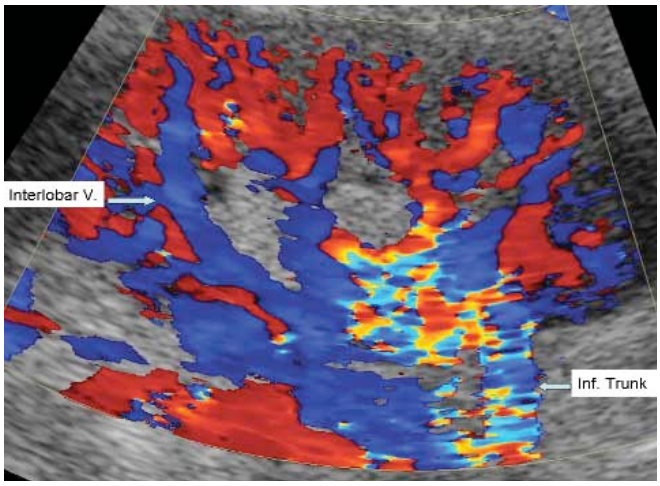
Intrarenal pseudoaneurysm – common complication of kidney biopsy. Usually small and of no clinical importance as they spontaneously resolve.

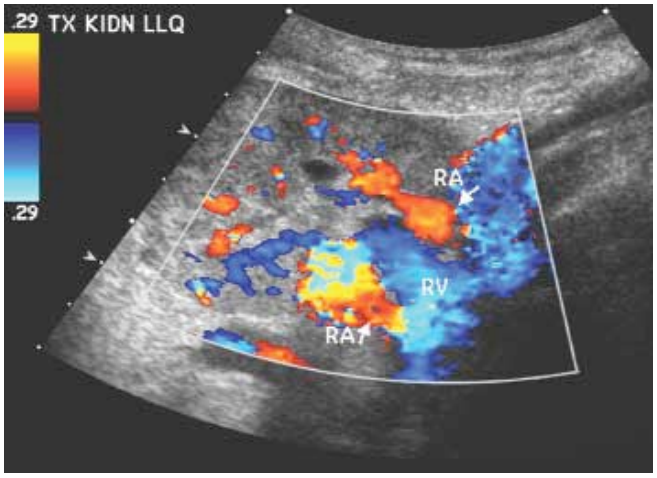


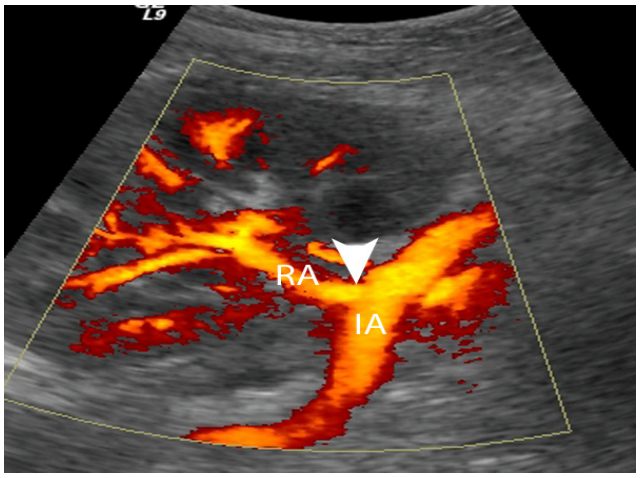


A, Anatomy of the intrarenal vessels. From large to small: segmental, interlobar, arcuate, and interlobular (not indicated). **B**, Anatomy of the intrarenal vein system. **C**, Multiple transplant renal arteries (RA). **D**, Renal artery anastomosis to iliac artery (arrow).

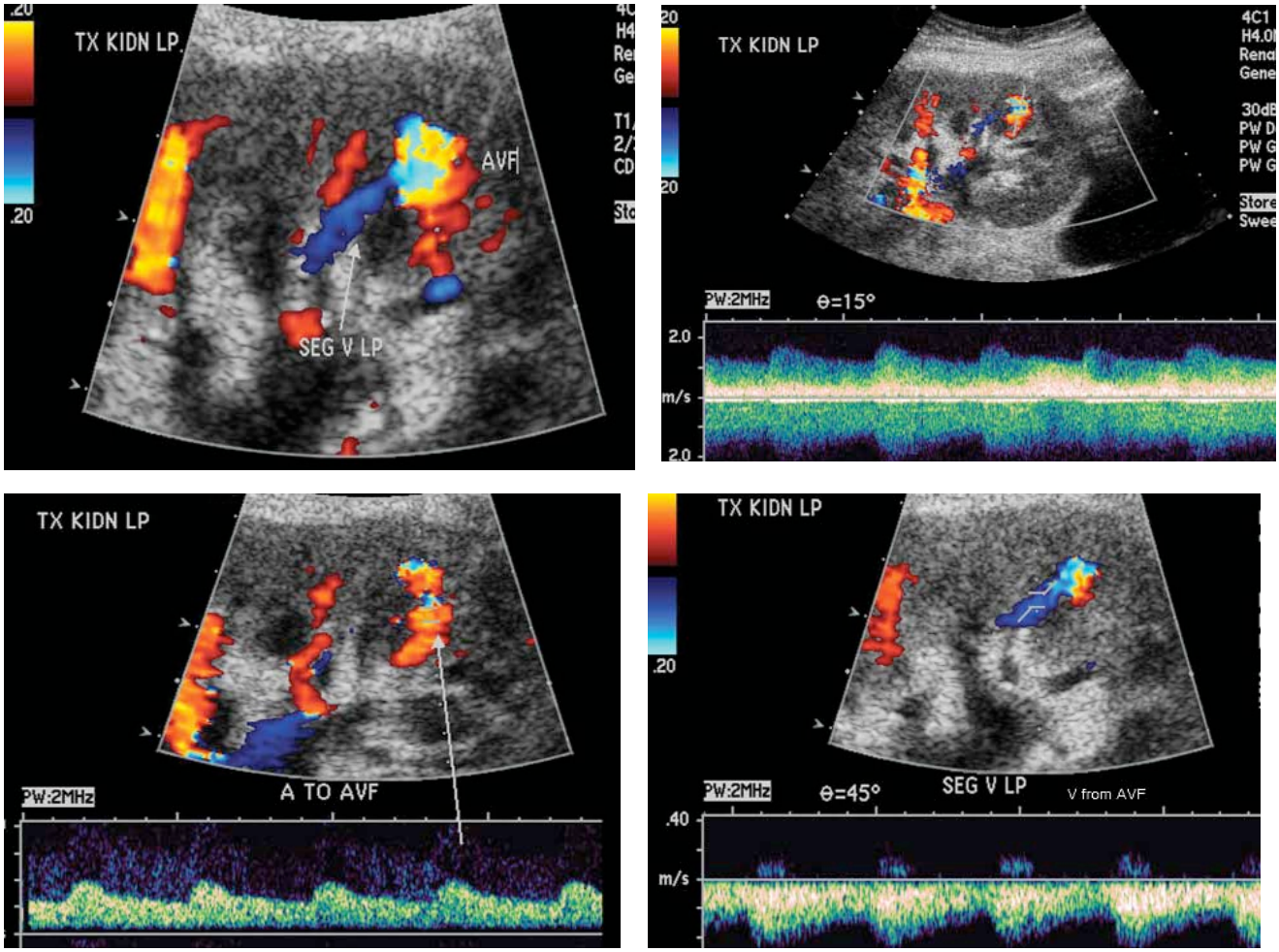




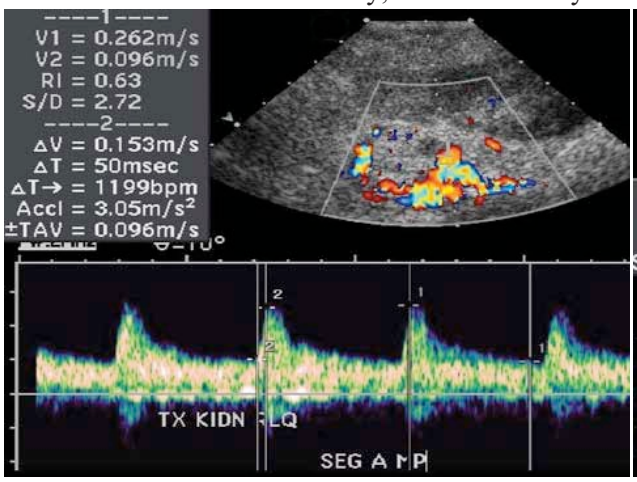


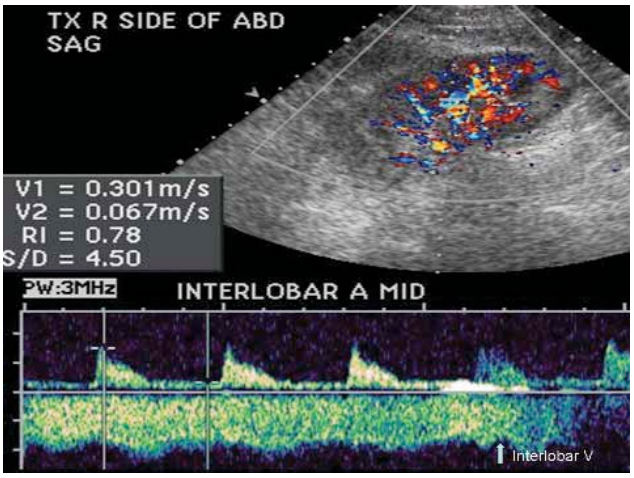


With a narrowed color Doppler box on a magnified image, a small intrarenal AVF is shown after biopsy of the lower pole of a transplanted kidney. **A**, Color flow imaging showing a small AVF between an interlobar artery and vein at the biopsy site. **B**, Doppler spectrum confirming an AVF with mixed arteriovenous flow. **C**, Low-resistance flow in the feeding artery of the AVF. **D**, Arterialized draining venous flow of the AVF.



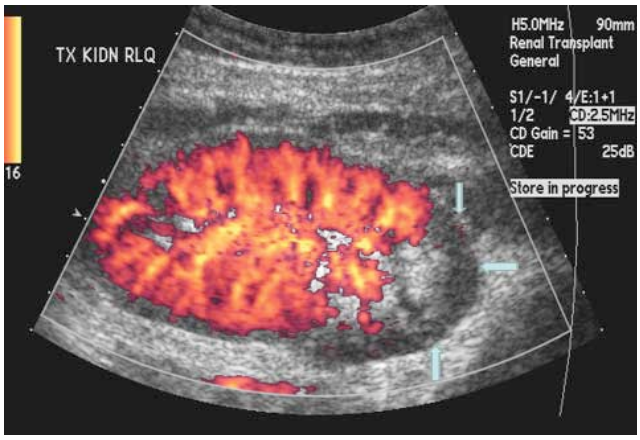
Intrarenal flow in arcuate artery, interlobar artery and vein

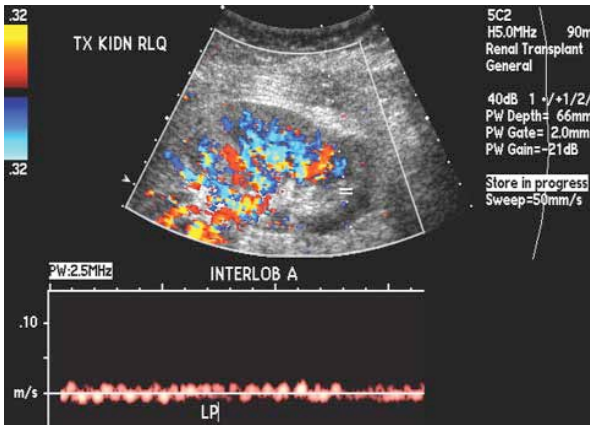




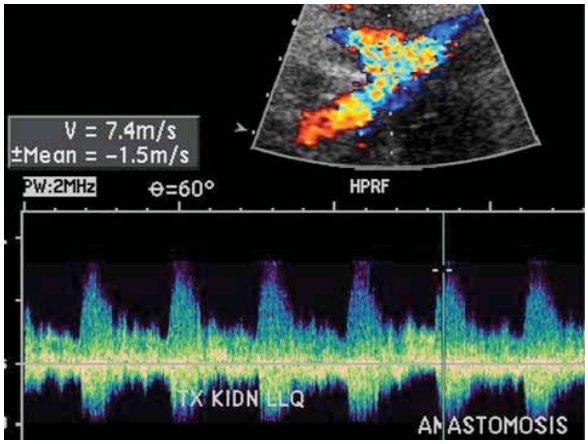
Normal RI .63, AT 50 msec in intrarenal artery

Normal intrarenal venous flow below baseline

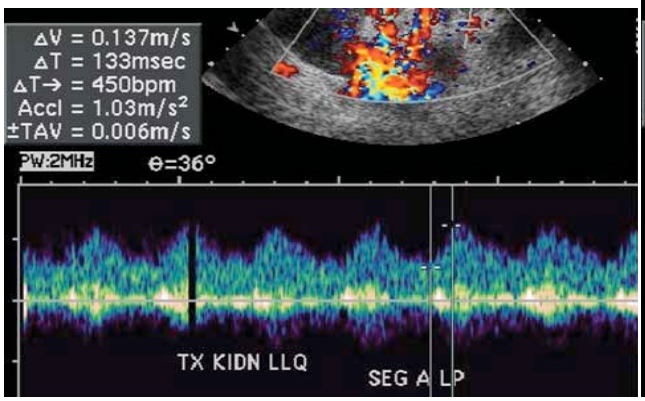


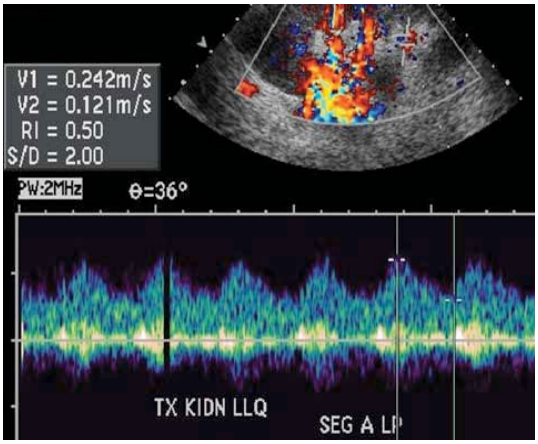


Small wedge shaped area w/color defect lower pole. No flow suggests infrarenal art infarction



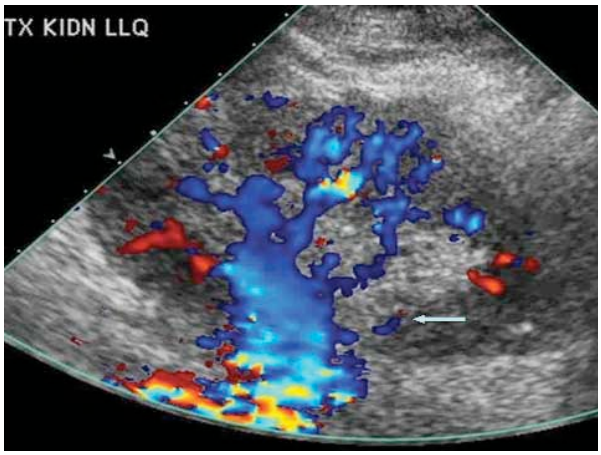
Increased PSV of 740cm/s & renal/iliac ratio of 4.7- Transplant renal artery stenosis

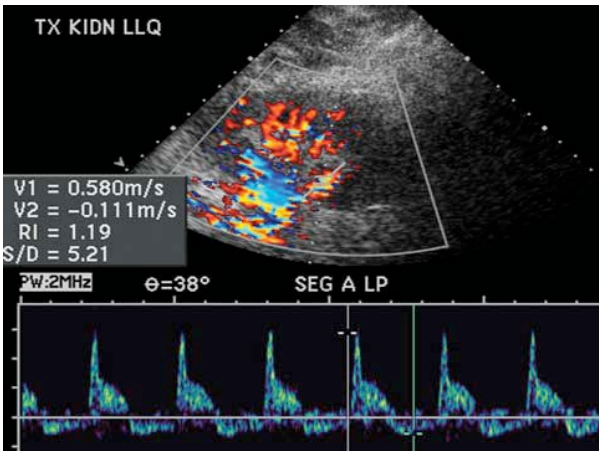


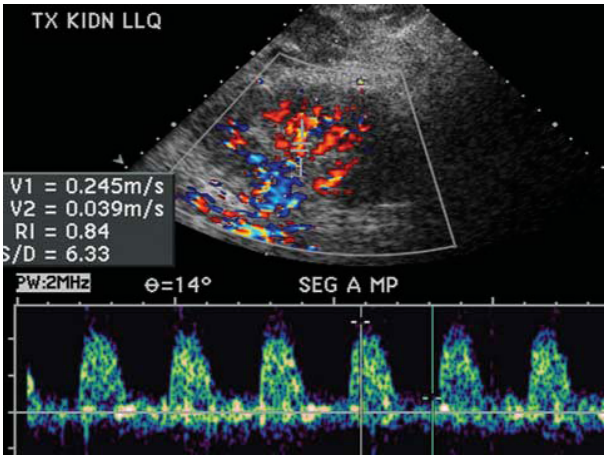


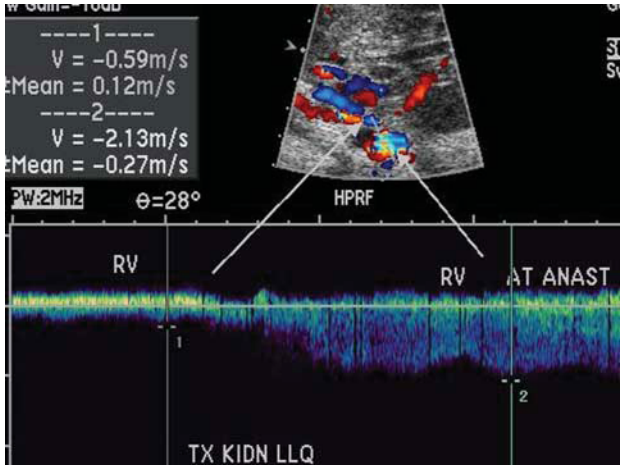
Tardus parvus signal distally

Routine CDUS performed to rule out acute vascular rejection. **A**, No color filling in the segmental vein at the lower pole of the transplanted kidney (arrow). **B**, Reversal of diastolic flow in the segmental artery of the lower pole. **C**, Monophasic flow of the segmental artery of the middle pole where the segmental vein was patent. **D**, Increased velocity (>2 m/s) and velocity gradient between the transplant renal vein and the venous anastomosis showing transplant renal vein stenosis at the venous anastomosis.









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