MARY WASHINGTON HEALTHCARE IMAGING SERVICES

RENAL TRANPLANT ULTRASOUND CRITERIA

Normal findings:

1) Hyperechoic renal sinus with the medullary pyramids more echolucent in appearance compared to the renal cortex.
2) Small amount of fluid collection around the graft is common, mostly representing a hematoma, which generally resolves spontaneously.
3) Patent iliac artery, arterial anastomosis, and transplant renal arteries.
4) Patent iliac vein, venous anastomosis and transplant renal vein.
5) Patent intrarenal veins with lower velocities and minimal respiratory phasicity.
6) Patent intrarenal arteries with resistive index = <.7 to .8.
7) Acceleration time = < 70 ms

Rejection can be classified as acute rejection (AR), accelerated acute rejection (AAR) and chronic rejection (CR). **Note:** Patients with milder but clinically significant rejection episodes can have normal sonographic and Doppler findings

Acute Rejection

1) Increased cortical echogenicity
2) Increased prominence of the medullary pyramids
3) Loss of definition of corticomedullary junction
4) Decreased echogenicity of the renal sinus
5) Edema within the renal sinus fat, which may obliterate the sinus echo complex
6) Cortical hypoechoic regions (resulting from edema, hemorrhage, ischemia or necrosis)
7) Perigraft fluid due to necrosis and hemorrhage.
8) R.I. >.8 with reduced or absent diastolic flow or reversed flow in early diastole in intrarenal arteries is seen in severe rejection or acute tubular necrosis. (Reversal of flow during entire diastole is associated with TRVT (transplant renal vein thrombosis)

Accelerated Acute Rejection

1) The sonographic features are identical to those seen in AR but occur within first week.

Chronic rejection

1) Small kidney transplant with thinned echogenic cortex, RI is normal to slightly elevated.

Renal vein thrombosis or occlusion

1) Enlarged kidney
2) Absent venous color flow with a thrombus filled main renal vein
3) Reversal of arterial flow throughout diastole in intrarenal artery.

Renal artery thrombosis- rare condition. Result of anastomosis problems.

Renal artery stenosis - stenosis usually within one cm of anastomosis due to neointimal hyperplasia at this site.

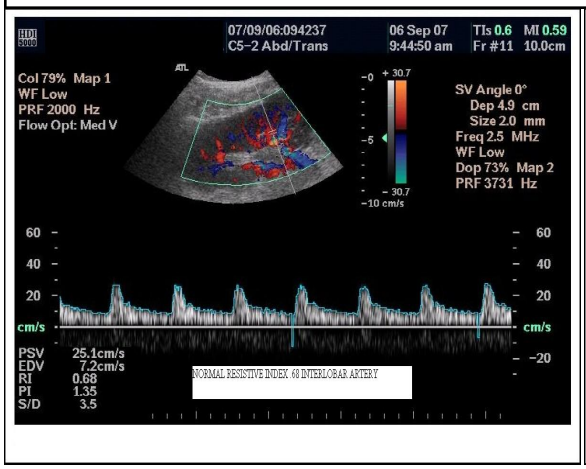
1) Increased PSV renal artery >250 cm/sec with turbulent flow
2) PSV velocity ratio >3.5 renal artery / iliac artery suggest.
3) Presence of parvus-tardus waveform and >70ms suggest >70% RAS.

AV fistula

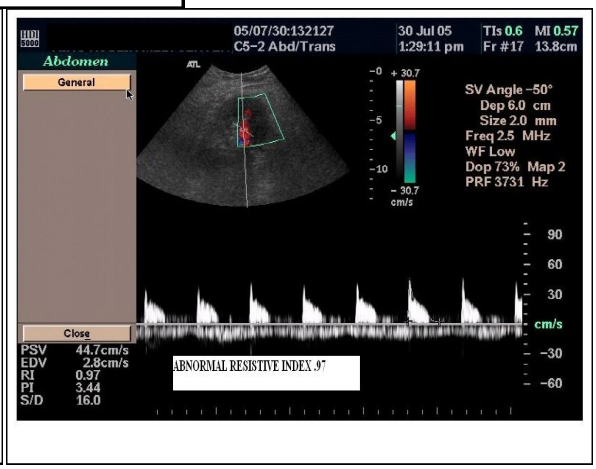
1. High amplitude, low resistance arterial flow.
2. Focal area of significantly increased velocity of the effected vein with "arterialized flow" and a lack of respiratory phasicity

Intrarenal artery occlusion – more common than in the main renal artery.
Intrarenal venous occlusion - reversal of diastolic flow of the paired artery will be present

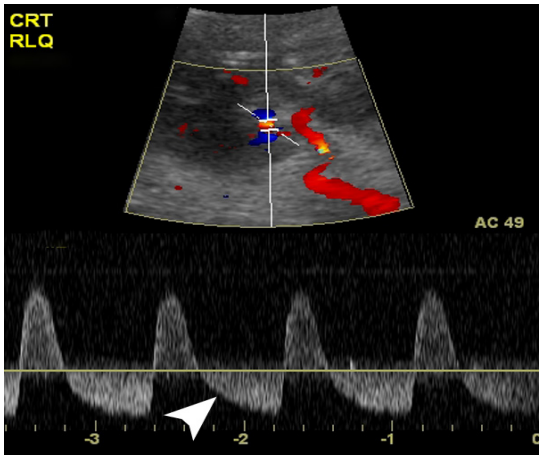
Enlarged edematous kidney consistent with acute allograft rejection



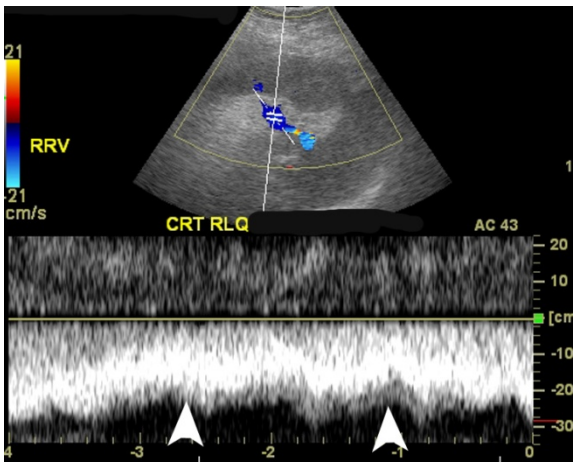
Normal resistive index .68



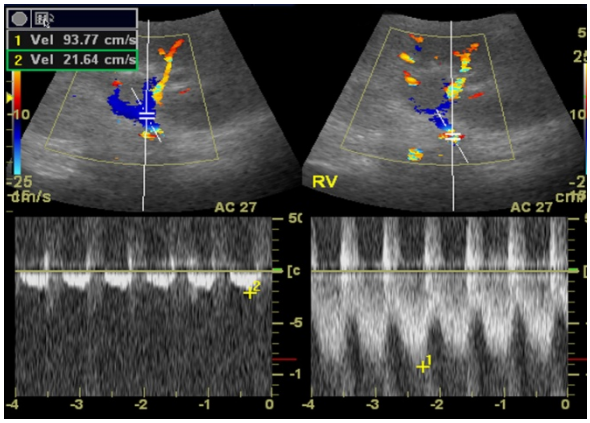
Abnormal resistive index .97



Reversed diastolic flow in renal artery suggestive of renal vein thrombosis.
It can also be seen with severe rejection, severe pyelonephritis, drug toxicity & extrinsic compression.



Normal renal vein flow with minimal phasicity.



Focal velocity increase at the anastomosis with a 4.3-fold velocity gradient.

Reference:

1) Intrarenal Color Duplex Ultrasonography; A Window to Vascular Complications. Jing Gao, M.D. et al. Jultrasoundmed.org
2) Ultrasound Evaluation of the Renal Transplant. Matthew T. Heller, MD
3) Al-Khulaifat S. Evaluation of a Transplanted Kidney by Doppler Ultrasound. Saudi J Kidney Dis Transpl 2008;19:730-6
4) American Institute of Ultrasound in Medicine 2001 Vascular Ultrasound Update Vascular Complications of Transplants: Liver, Pancreas and Renal