RENAL TRANSPLANT ULTRASOUND EXAMINATION

POLICY: Renal transplant ultrasound will be performed with an order from a physician or other qualified clinical practitioner. The examination will be supervised and interpreted by a radiologist or other licensed practitioner who is qualified by reason of training to understand the normal anatomy and pathophysiology of renal transplants and the urinary tract, and integration of ultrasound with other imaging techniques to optimize the probability of detecting disease.

PURPOSE: To assess the anatomy of the urinary bladder, transplant kidney with associated blood vessels and document normal and abnormal structures therein.

INDICATIONS: Ultrasound of a transplant kidney is indicated for patients with signs, symptoms, and/or laboratory evidence of transplant failure or other disease. This examination can also be performed as a screening for those with a transplant kidney, even without signs, symptoms, or laboratory evidence of disease.

PATIENT PREPARATION: No special preparation is required for renal transplant ultrasound.

PROCEDURE: Each organ should be imaged in its entirety (e.g. long and transverse views) before imaging the next organ. The order of organ imaging will be (minimal number of images in parenthesis):
- Bladder (6 images)
- Transplant kidney - grayscale (6 images, 1 cine clip)
- Transplant kidney – color and spectral Doppler (10 images)

URINARY BLADDER:
- Whenever possible, the ultrasound examination should begin with the urinary bladder full.
- The urinary bladder should be examined to image its entire luminal surface, bladder outlet, wall thickness, and expected positions of the distal ureters.
- With the urinary bladder full, minimal stored images should include:
  - one right parasagittal view of the bladder labeled long bladder rt.
  - one midline sagittal view of the bladder labeled long bladder ml.
  - one left parasagittal view of the bladder labeled long bladder lt.
  - one transverse view through the bladder base labeled trans bladder base.
  - one transverse view through the middle third of the bladder labeled trans bladder mid.
  - one transverse view through the upper third of the bladder labeled trans bladder sup.
In obtaining a pre-void bladder volume and post-void residual, these additional images are required (the volume calculation package on the ultrasound system should be used if available):

- one pre-void midline sagittal view with the maximal and orthogonal luminal diameters measured with electronic calipers and labeled as *long bladder pre-void*.
- one pre-void transverse view through the largest transverse diameter of the urinary bladder with the maximal transverse luminal diameter measured with electronic calipers and labeled *trans bladder pre-void*.
- one post-void midline sagittal view with the maximal and orthogonal luminal diameters measured with electronic calipers and labeled as *long bladder post-void*.
- one post-void transverse view through the largest transverse diameter of the urinary bladder with the maximal transverse luminal diameter measured with electronic calipers and labeled *trans bladder post-void*.

Note: patients should be asked to void as completely as possible, requesting them to repeat voiding (double void) if retained urine is demonstrated after voiding.

**TRANSPLANT KIDNEY:**

- Examination of the transplant should be performed to visualize the entire capsule through the longest axis and perpendicular to the long axis. Observations should include the renal size, contour, intrinsic echogenicity of the kidney, condition of the collecting structures and perinephric space.
- The transplant should be surveyed completely in longitudinal and transverse planes, from lateral to medial and superior to inferior respectively.
- Examination of the native kidneys is not necessary.
- Minimal stored grayscale images of the transplant should include:
  - two longitudinal views of the maximal renal length of the transplant kidney, measured with electronic calipers and labeled *long transplant kidney*;
  - additional longitudinal views of the transplant kidney may be necessary if the entire renal parenchyma was not well visualized in the above required images, appropriately labeled *long transplant kidney sup, mid or inf*;
  - one view of the upper one third of the transplant kidney imaged perpendicular to its long axis, and labeled *trans transplant kidney sup*.
  - one view of the middle one third of the transplant kidney imaged perpendicular to its long axis, and labeled *trans transplant kidney mid*.
  - one view of the middle one third of the transplant kidney imaged perpendicular to its long axis, with the maximal anteroposterior and transverse diameters of each kidney measured with electronic calipers, and labeled *trans transplant kidney mid*.
  - one view of the lower one third of the transplant kidney imaged perpendicular to its long axis, and labeled *trans transplant kidney inf*. 
• one transverse cine clip of the transplant kidney from superior to inferior labeled trans transplant kidney sup-inf.
• sufficient images of the transplant kidney to allow assessment of the relative echogenicity of the renal cortex, medulla (pyramids), and sinus, appropriately labeled long or trans, transplant kidney.

• Minimal stored color and spectral Doppler images of the transplant should include:
  • one longitudinal view of the transplant kidney with color or power Doppler, optimized to demonstrate perfusion of blood throughout the entire kidney, and labeled long transplant kidney;
  • one view in the upper, middle and lower thirds of the transplant kidney, in the plane which best optimizes the image, demonstrating a spectral Doppler waveform with calculated resistive index of an interlobar artery, labeled long or trans transplant kidney sup, mid or inf;
  • one longitudinal view of the main renal vein with color Doppler demonstrating patency and excluding stenosis, labeled long transplant kidney vein;
  • one longitudinal view of the main renal vein with an angle-corrected spectral Doppler waveform demonstrating patency and excluding stenosis, labeled long transplant kidney vein;
  • one longitudinal view of the main renal artery with color Doppler demonstrating patency and excluding stenosis, labeled long transplant kidney artery;
  • one longitudinal view of the main renal artery with an angle-corrected spectral Doppler waveform of the highest attainable velocity, demonstrating patency and excluding stenosis, labeled long transplant kidney artery;
  • one longitudinal color Doppler image with an angle-corrected spectral waveform of the external iliac artery proximal to the transplant renal artery origin, labeled long external iliac artery.

PATHOLOGIC CONDITIONS:
Pathologic conditions encountered during a renal transplant ultrasound examination include, but are not limited to, fluid collections (e.g. hematomas, uromas, lymphoceles), chronic rejection (e.g. cortical thinning, mild hydronephrosis, prominent sinus fat, renal calculi, decreased perfusion, increased resistive indices), infection (e.g. pyelonephritis with or without abscess) and vascular abnormalities (e.g. renal artery/vein stenosis or thrombosis). Additional static and Doppler images of pathologic findings are necessary for complete characterization of the abnormality and comparison to earlier examinations.