

# **RENAL TRANSPLANT US PROTOCOL**

## **PURPOSE:**

- To evaluate the renal transplant for any parenchymal or vascular abnormalities/complications.

## **INDICATION:**

- Performance of a screening ultrasound to establish a baseline following transplantation as per hospital surveillance protocol.
- Follow-up of abnormal findings on prior transplant ultrasound.
- Evaluation for pain, fever, sepsis, or abnormal laboratory/clinical values (e.g. elevated creatinine, low or decreased urine output).
- Evaluation for vascular patency.
- Assessment of hematuria or known or suspected hydronephrosis, hydroureter or bladder abnormality.
- Evaluation for possible fluid collection or assessment of drainage catheter output.
- Evaluation of the transplant in the setting of hypertension or bruit.
- Evaluation for iatrogenic injury or complications following biopsy of a transplanted kidney.
- Evaluation for malignancy, either recurrent or post-transplant lymphoproliferative disorder.

## **EQUIPMENT:**

- 3-5 MHz curve probe

## **PATIENT PREPARATION & ASSESSMENT:**

- The patient should be NPO after midnight or 6-8 hours prior to exam.
- Introduce yourself to the patient.
- Verify patient identity via two patient identifiers (name and date of birth) per hospital policy.
- Explain the exam, its purpose and how long it will take.
- Answer any questions the patient may have regarding the exam.
- Obtain patient history including symptoms, signs, risk factors and other relevant history.

## **GENERAL GUIDELINES:**

- Optimize equipment gain and display settings with respect to depth, dynamic range and focal zones while imaging vessels.
- Add color Doppler to supplement grayscale images with proper color scale to demonstrate areas of high flow and color aliasing.
- Use power Doppler to validate low flow states or occlusions.
- Set spectral Doppler gains to allow a spectral window and optimized to reduce artifacts.
- Cursor sample size will be small and positioned parallel to the vessel wall and/or direction of blood flow.
- A spectral Doppler angle of 45-60 degrees or less will be used to measure velocities. Note exceptions to these angles on the technologist worksheet.
- Send the measurements screenshot page if your machine is capable.

- For focal lesions (masses, cysts, nodules, lymph nodes, fibroids) obtain split-screen images of the lesion without calibers, with calibers and with Color Doppler.
- Any deviations from the standard protocol and any limitations to the examination should be documented on the technologist worksheet for future reference and for repeatability in follow-up studies.

## **DOCUMENTATION:**

### Renal Transplant (grayscale)

- Document longitudinal images of the following (scanning lateral to medial):
  - Lateral (cortex only)
  - Lateral (cortex & sinus)
  - Mid without and with maximal length measurement (normal 9-13 cm) and one with color Doppler flow
  - Medial (cortex & sinus)
  - Medial (cortex only)
- Document transverse images of the following (scanning superior to inferior):
  - Superior (cortex only)
  - Superior (cortex & sinus)
  - Mid without and with maximal AP and TR measurements
  - Inferior (cortex & sinus)
  - Inferior (cortex only)
- Note any hydronephrosis, cyst, mass, stone or perinephric fluid collections. If there are multiple cysts, measure the largest of the simple cysts and any complex cysts. If there are multiple stones, measure the largest one.
- If hydronephrosis is present, assess urinary bladder for bilateral renal jets (up to 5 minutes) and assess for post void change in severity of hydronephrosis.

### Renal Transplant (color and spectral Doppler)

- Document transverse and longitudinal color Doppler images in the proximal, mid and distal aspects of the main renal artery.
- Document longitudinal spectral Doppler waveforms in the proximal, mid and distal aspects of the main renal artery with measurement of PSV, resistive indices and acceleration times in all three arterial segments.
- Document longitudinal spectral Doppler waveforms and resistive indices of the upper pole, interpolar and lower pole segmental arteries. Use a 0-degree Doppler angle (only for segmental arteries).
- Document transverse and longitudinal color Doppler and longitudinal spectral Doppler images of the renal vein.
- Findings suggestive of renal artery stenosis: main renal artery PSV >180-200 cm/secs, renal:aorta PSV ratio >3.5, acceleration time >70 msec (i.e. tardus parvus waveform) and difference in resistive indices between right and left of greater than 0.05-0.07.
- Normal resistive index 0.5-0.7, borderline 0.7-0.8, elevated >0.8, low <0.5.

### Iliac Artery and Vein

- Document longitudinal spectral Doppler waveforms in the iliac artery and vein on the side of the transplant.
- Measure PSV in the artery.

### Bladder

- Obtain longitudinal and transverse grayscale and color Doppler images throughout the bladder.
- Obtain grayscale image measuring bladder wall at its thickest point.
  - Normal wall thickness is <3 mm when distended or <5 mm when nondistended.
- Note any stone, mass or diverticulum.

- For non-stone pathology (mass-like debris, masses, nodules) obtain color and spectral Doppler images of the pathology. Debris will not have blood flow. Masses will have blood flow.

## **REFERENCES:**

- Al-Katib, S., Shetty, M., Jafri, S. M., & Jafri, S. Z. (2017). Radiologic assessment of Native Renal Vasculature: A Multimodality Review. *RadioGraphics*, 37(1), 136-156. doi:10.1148/rg.2017160060.
- Granata, A., Fiorini, F., Andrulli, S., Logias, F., Gallieni, M., Romano, G., . . . Fiore, C. (2009). Doppler ultrasound and renal artery stenosis: An overview. *Journal of Ultrasound*, 12(4), 133-143. doi:10.1016/j.jus.2009.09.006.
- Robinson, K. A., Kriegshauser, J. S., Dahiya, N., Young, S. W., Czaplicki, C. D., & Patel, M. D. (2016). Detection of transplant renal artery stenosis: Determining normal velocities at the renal artery anastomosis. *Abdominal Radiology*, 42(1), 254-259. doi:10.1007/s00261-016-0876-7
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