Renal/Urinary Bladder Ultrasound Protocol

I. Patient Preparation

a. Drink 16oz of water 2 hours prior to exam, do NOT void 1 hour prior to exam.

II. Equipment

a. Performed with real-time scanner using a sector or curved linear transducer with frequencies ranging from 3.5 MHz to 5.0 MHz, higher frequencies often necessary for children and infants. On occasion, large patients may require a lower frequency of 1 or 2.5 MHz.
b. Matrix x-plane and volumetric gray scale and/or power/color 3D evaluation can be employed.
c. High frequency linear transducer with frequency of 12 Mhz should be used to assess the anterior urinary bladder wall. On occasion, in a thin patient may be used to evaluate the perinephric region.
d. Transvaginal curved transducer should be used to evaluate the distal ureter in an adult female with hydronephrosis to evaluate for distal calculus.

III. Procedure Protocol

a. For any masses seen in any organ, use Power Doppler to assess for blood flow. All lesions should be demonstrated in gray scale with and without measurements, with imaging directed to evaluate the borders, echogenicity, size, mobility, through transmission, compressibility, vascularity as needed. Additional maneuvers such as compression should be employed if necessary (i.e., urinary bladder diverticulum color flow jet with compression).
b. If any area cannot be visualized due to bowel gas or surgical removal, etc., please note on image "region of" or "fossa"
    i. Pancreas
        1. Image the pancreas in Sagittal (Longitudinal) and Transverse planes, taking images at the head, neck/uncinate process, body and tail or as much as can be seen.
        2. If the CBD can be seen at the head of the pancreas, take an AP measurement.
        3. Assess the peri-pancreatic region for any adenopathy, inflammation, pseudocyst or fluid. Image any abnormality.
    ii. Aorta
        1. Image the aorta in Sagittal and Transverse planes taking images at the proximal (posterior to the left lobe of the liver), mid (just distal to the SMA) and distal (just proximal to the umbilicus).
        2. Measure the aorta at all three levels when imaging in the Sagittal plane.
        3. Image the common iliac arteries just below the bifurcation in the transverse plane with AP measurements.
        4. Document any aortic dilatation in the Sagittal plane (length and height) and in the Transverse plane (width measurement). Color Doppler or Power Doppler should be used to evaluate flow in the AAA. Angle corrected spectral analysis should also be used to evaluate the AAA.
    iii. Kidneys
        1. Image both kidneys in the Sagittal (Longitudinal) and Transverse planes, include the liver/right kidney and spleen/left kidney interfaces.
        2. In the Transverse plane, the kidneys should be scanned sequentially from the upper (superior) to the lower (inferior) poles with images labeled appropriately.

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3. Measure the kidney length (maximum elongated kidney at hilum) on the longitudinal image at the center, then obtain a longitudinal color doppler image. **Measurements in AP and transverse plane are no longer required, but a color Doppler transverse mid pole image is still required.
4. Assess the kidneys for any masses or cysts. Assess the peri-renal areas for any abnormalities, such as perinephric fluid, mass, adenopathy.
5. If clinically suspected pyelonephritis, power Doppler evaluation on the longitudinal image of each kidney (or 3D color flow map) to document symmetric vascularity throughout the entire kidney.
6. In adults, asymmetric length of the kidneys greater than or equal to 1.5 cm is considered significant. In children, greater than or equal to 1 cm asymmetric length is significant.
7. If the ureter is dilated, it should be followed to evaluate for the cause and level of obstruction.

iv. Adrenal Glands

1. Normal adrenal glands are typically not visualized in adults, although should be evaluated in every patient with documentation of adrenal masses or thickened adrenal glands if identified (usually located superior to the right kidney, anterior to the upper pole left kidney).
2. In infants and neonates, image and measure in Sagittal and Transverse planes
3. Assess for masses, hemorrhage, calcification, or other abnormality.

v. Urinary Bladder

1. Image the bladder in the Sagittal (Longitudinal) and Transverse planes, obtaining a volume measurement pre and post void.
2. Assess the anterior urinary bladder wall using a high frequency linear transducer.
3. Document bilateral ureteral jets using Color or Power Doppler. **Allow at least 3-5 minutes of time if jets not readily visible.
4. Survey the urinary bladder and the bladder wall for any focal lesions, diverticula, or masses. Assess for internal debris, urachal remant, or other pathology.
5. In an adult female patient with hydronephrosis, transvaginally imaging should be obtained to evaluate for the presence of a distal ureteral calculus.
6. Urinary bladder wall thickness greater than 3 mm is considered abnormally thickened for a distended urinary bladder, with greater than 5 mm abnormally thickened for a underdistended or collapsed urinary bladder. Please note that the anterior urinary bladder wall can be measured for thickness with use of a linear probe; however, the posterior urinary bladder wall should be measured for thickness when using a sector probe due to anterior wall reverberation artifact.
7. As a rule of thumb, the urinary bladder should empty to approximately 10% of the pre-micturition volume. If the initial post-void volume is greater than 100 mL encourage the patient to try again because a large residual volume may be artifactual following a very full bladder.

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