

Kidney and Bladder USG

Weon Jang (weon0315@gmail.com)

Jeonbuk National University Hospital, Korea

Renal ultrasonography (US) is one of the safe and easily applicable imaging techniques that can provide real-time images at the bedside. This examination is safe as it does not involve the use of contrast agents or radiation exposure. Recently, contrast-enhanced ultrasonography (CEUS) has been introduced, which can be helpful for lesion characterization.

Renal US is typically conducted with adult patients in the supine position. The kidneys are examined using longitudinal and transverse scan planes with a 3–6 MHz curved transducer placed on the flanks. Pediatric patients are usually examined using a higher-frequency transducer.

The kidney is bean-shaped in the longitudinal scan plane, with a size of about 10–12 cm. Cortical thickness is typically measured at about 10 mm. It is divided into parenchyma and renal sinus. On B-mode imaging, the echogenicity of the renal cortex is slightly lower than that of the liver, while the renal medulla shows slightly lower echogenicity compared to the renal cortex. The renal sinus exhibits relatively higher echogenicity due to abundant fat. Normal differentiation between the renal cortex and medulla is clear, while corticomedullary differentiation becomes obscured when renal function is abnormal, such as in acute kidney injury.

If the patient has chronic kidney disease, the echogenicity of the renal cortex increases, while the size of the kidney decreases with cortical thinning. Renal cysts are frequently observed as round-shaped anechoic lesions. Complex cysts exhibit intracystic septation, and if there is hemorrhage, the internal echogenicity could become heterogeneous. Solid renal masses could be malignant, such as renal cell carcinoma (RCC). RCCs are usually isoechoic and located peripherally; however, they could also be found in the central portion, and contrast-enhanced ultrasound (CEUS) could be helpful in identifying the lesion. Renal angiomyolipoma typically shows higher echogenicity than RCC, which could be a key differentiation point.

Renal US is also useful for evaluating the urinary collecting system. The renal pelvis and calyces exhibit dilation in cases of hydronephrosis, which can be caused by urinary obstruction, such as urolithiasis. Although other imaging modalities such as CT or MRI could be helpful for evaluating extrarenal structures, ultrasound has advantages as a primary imaging modality, particularly for patients such as pregnant women and children.

Ultrasonography of the bladder can be easily performed, especially when the bladder is filled with urine. It can provide variable information such as detecting intravesical masses, assessing wall thickening, and identifying perivesical hyperemia.

With proficiency in ultrasonography examinations, radiologists can provide valuable clues in diagnosing patients' diseases.