Urogenital ultrasound

Introduction

- **Diagnostic and therapeutic technique** that permits initial screening for numerous urological diseases.
- **Requires abdominal transducers**: sectorial or convex between 2.5-5 MHz (abdominal), 7-14 MHz for soft tissue (scrotal), and 5-7.5 MHz (transrectal).

Renal ultrasound

- **The patient should be properly positioned**, lying down on his side. The transducer is placed subcostally and the patient is instructed to take a deep breath and hold it in order to properly visualize the upper portion of the kidney.
  - **Renal morphology**: the longitudinal section has a diameter of approx. 11-18 mm. The renal cortex has a weak echogenic response with the medulla, which is seen as a hyperechogenic band in the interior of the parenchyma. Normally, neither the calyces nor the pelvis are visualized.
- **The main pathological changes** that can be diagnosed via ultrasound are:
  - **Obstructive pathologies** in the calyces, pelvis, and ureter can be seen, depending on the degree and level of obstruction. In mild ectasia, the calyces are seen as anechoic tubular structures continuous with the pelvis, with the kidney size remaining normal. In moderate ectasia, the parenchyma is smaller in size, but >1 cm. In severe ectasia, renal atrophy can be seen (parenchymal thickness <1 cm).
  - **Lithiasis**: usually detected when the stones are >3 mm; they appear as hyperechogenic images with posterior acoustic shadowing.
  - **Renal masses**:
    - **Solid masses**: diagnostic accuracy is limited if the mass measures <2 cm or is of central origin. The most common lesion is the **angiomyolipoma**, which is a rounded, solid, and intensely hyperechogenic formation. Other solid masses have an iso- or hypoechogenic nodule that distinguishes them from an **angiomyolipoma**.
    - **Cystic masses**: **simple renal cysts** appear as an anechoic image with posterior enhancement and with thin walls and rounded morphology. **Complex cysts** exhibit internal echoes, septa, thickened walls, or calcifications; it is important to rule out any probable malignant origin.
- **Allows concomitant performance of directed percutaneous nephrostomies**.

Bladder-prostate ultrasound

- **Performed** with the patient in supine decubitus position and with the bladder distended, with the 2.5-5 Mhz sectorial transducer at the suprapubic level. Allows for assessment of:
  - **Dependent wall lesions** such as **bladder tumors**, characterized as endoluminal isoechogenic masses lacking mobility. Unlike tumors, if the mass is a clot, it will move within the bladder when the patient is put in lateral decubitus position.
  - **Bladder diverticulum**: an anechoic area (usually posterolateral) that is connected to the bladder through the neck of the diverticulum. Usually secondary to an obstructive pathology and may present with interior clots, tumors, or lithiasis.
  - **Bladder stones**.
  - **Prostatic volume**: since there is an equivalence between prostate weight (1.05 g/cm³) and its volume, prostate size can be calculated with an ellipsoid formula (0.52 x max. anteroposterior diameter x max. transverse diameter x max. cephalocaudal diameter).
There is a relationship between prostatic weight and anteroposterior diameter.

<table>
<thead>
<tr>
<th>Prostate Grade</th>
<th>Estimated weight</th>
<th>AP diameter*</th>
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</thead>
<tbody>
<tr>
<td>Grade I</td>
<td>&lt;30 g</td>
<td>&lt;3.5 cm</td>
</tr>
<tr>
<td>Grade II</td>
<td>30-50 g</td>
<td>3.5-4.5 cm</td>
</tr>
<tr>
<td>Grade III</td>
<td>50-80 g</td>
<td>4.5-5.5 cm</td>
</tr>
<tr>
<td>Grade IV</td>
<td>&gt;80 g</td>
<td>&gt;5.5 cm</td>
</tr>
</tbody>
</table>

*Anteroposterior diameter.

- **Measurement of postvoid residual urine**: after spontaneous voiding or uroflowmetry with the aid of the ellipsoid formula.

- **Transabdominal bladder ultrasound** can help guide a suprapubic puncture, if necessary.

### Transrectal prostatic ultrasound

- **The patient is placed** in lateral decubitus position and the anus and anal canal are lubricated. A 5-7.5 MHz radial or lineal transducer is introduced slowly into the anal canal. This procedure allows assessment of:

  - **Prostate size**: if there is doubt about the volumes obtained transabdominally.
  - **Study of male infertility**: if unilateral or bilateral agenesis of the vas deferens or obstruction of the ejaculatory ducts is suspected.
  - **Prostatic abscesses**.
  - Not useful in diagnosing prostate cancer since there is no specific ultrasound image of tumors. Moreover, it has a low sensitivity and a tendency to understage in extension studies. For this reason, a DRE and MRI are preferred.

- **Transrectal prostatic ultrasound techniques permit concomitant performance of a prostatic biopsy** for the diagnosis of prostate cancer.

### Scrotal ultrasound

- **Primary imaging technique for the study of scrotal pathology** using a high frequency (7-14 MHz) lineal transducer. **Color Doppler** techniques are especially useful.

  - **Testicular morphology**: elliptical, 4-5 cm in diameter, with a diffuse and homogeneous granular pattern. On the posterior side, the tunica albuginea converges in an incomplete hyperechogenic septum (**mediastinum testis**). The epididymis surrounds the testicle posterolaterally. The body and tail of the epididymis are not always visible.

- **The primary changes diagnosed with scrotal ultrasound**:

  - **Testicular torsion**: assesses the presence/absence of blood flow via Doppler techniques.
  - **Testicular trauma**: can assess albugineal rupture and the presence of intratesticular hematocoles or hematomas.
  - Aids in the differential diagnosis of benign scrotal tumors (hydroceles, umbilical cord cysts, epididymal cysts) and malignant tumors (intratesticular lesions with areas of low density).
  - **Varicocele**: seen as **pampiniform** plexus veins with a caliber >2 mm that increase in size after the **Valsalva** maneuver. **Color Doppler** confirms the presence of venous reflux.
  - **Inflammatory processes**: seen as an increase in size and vascularization of the epididymis with lower echogenicity. If associated with orchitis, one testicle will appear increased in size, hypervascularized, and heterogeneous.