Standard operating procedures for ultrasound examinations

Genital organs: Prostate and Testis

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Review

Practical recommendations for performing ultrasound scanning in the urological and andrological fields

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The Minimum Training Recommendations for the Practice of Medical Ultrasound were published under the EUROPEAN FEDERATION OF SOCIETIES FOR ULTRASOUND IN MEDICINE AND BIOLOGY European Journal of Ultrasound 2006;27,1:79-105.

The EFSUMB Guidelines and Recommendations on the Clinical Practice of Contrast Enhanced Ultrasound (CEUS): Update 2011 on non-hepatic applications

Authors

Ultrasound of the Prostate

PROSTATIC ULTRASOUND SCANNING
WITH THE SUPRAPUBIC OR TRANSRECTAL
TECHNIQUE

suprapubic

transrectal
SUPRAPUBIC Scanning

DEVICES AND TRANSDUCERS USED

Convex transducer with a frequency of 3.5 MHz, or multifrequency 5-2 MHz. Probes depend on the patient’s constitution and how deeply the gland is located.

PREPARATION FOR INVESTIGATION AND PATIENT POSITION

1. Fasting is not necessary
2. The bladder must be replete with at least 300 cc
3. The investigation is normally performed with the patient in supine position
DEVICES AND TRANSDUCERS USED

Real time endocavitary transducer (transrectal) with a frequency of ≥ 6 MHz (or anyway high)

• A linear monoplanar probe: for prostate sections along the longitudinal plane.
• A convex-linear or bi-convex biplanar probe: associates transverse and longitudinal scanning, through two orthogonal convex probes.
• A variable frequency probe (end-fire): allows transverse, longitudinal and oblique scanning

PREPARATION FOR INVESTIGATION AND PATIENT POSITION

1. Fasting is not necessary
2. The patient must undergo at least one enema two hours before the test
3. The bladder must be replete
4. The investigation is normally performed with the patient in left decubitus or if this is impossible, in lateral right decubitus or in semilithotomotic position
1. **Hypoechogenic** pars adenomatosa, as compared to pars peripherica of the prostate

2. Identification of the medial lobe, and its size and relationships with the bladder floor

3. Presence of calcifications (diameter ≥ 3 mm), that appear **hyperechogenic** with a posterior shadow (possibly showing signs of previous inflammation).

4. Presence of focal hyperechogenic areas with no posterior shadow (diameter ≥ 3 mm) (possibly showing signs of previous inflammation).

5. Presence of abscesses and/or **hypo/anechogenic** areas (diameter ≥ 3 mm), that appear prevalently with a fluid anechogenic or dyshomogenous component, possibly showing inflammation processes in an active phase. Anechogenic/echogenic areas of inflamed abscesses

6. In a picture of cervico-ureteral obstruction due to prostatic hypertrophy causing severe detrusor impairment, any presence of bladder stones of the ejaculatory ducts.

7. Dilation/cysts of the ejaculatory ducts.

8. Perviousness and funnelling of the cervical or anastomotic region in surgical scars
Definitions - echogenicity

Homogeneous-Uniform

Heterogeneous-Mixed
Hypoechogenic pars adenomatosa inner gland

Normoechogenic external gland

calcifications

hyperechogenic with a posterior shadow

Liver: benchmark for echogenicity

cysts

anechogenic area
Prostate orientation

Longitudinal view

Transverse view

Coronal view (3D)
Normal prostate

Homogeneous triangular gland

Prostate size: 3-4 cm long (C-C); 2-3 cm A-P; 4 cm L-L
Volume 15-20 cc - 0.52 * (LxWxAP)
INDICATIONS

1. To assess the size and volume of the gland for medical/surgical workup, regardless of the type of treatment or underlying disease
2. To assess patients with lower urinary tract symptoms
3. Prostatic biopsy guidance
4. Suspected prostatitis and/or prostatic abscess
5. To examine congenital anomalies
6. In infertility of the couple (morphological study of the seminal tracts)
7. Study of the bladder neck
8. Postoperative controls (post disobstructive surgery or radical prostatectomy)
9. Post-treatment controls for prostatic tumors (radiotherapy, HIFU, cryotherapy)
Prostatic hypertrophy

- adenoma
- hypertrophy of the detrusor
- middle lobe
- expansion of the periprostatic venous plexus
- calcifications

Chronic prostatitis
Abscess

Distinct margins with a highly hypo/anechogenic content

Post TURP

anechogenic area
Suspected tumor areas

Areas generally heterogeneously hypoechoic
ESSENTIAL PARAMETERS THAT MUST BE SPECIFIED IN THE FINAL REPORT

1. Presence or absence of the prostate.
2. Orthotopic or heterotopic site.
4. Size/volume of the gland (latero-lateral, antero-posterior and cranio-caudal, to be multiplied by 0.52, according to the ellipsoid formula, if the device does not make an automatic calculation).
5. Size/volume of the transition zone/adenoma.
6. Presence or absence of the third lobe (if present, volume and/or measurements of protrusion into the bladder)
7. Presence and size of calcifications (diameter ≥ 3 mm)
8. Presence and size of abscesses/cysts (diameter ≥ 3 mm)
9. Presence and size of intra-prostatic cysts or bladder neck cysts (diameter ≥ 3 mm)
10. Echostructure of the peripheral portion
11. Integrity of prostatic capsule.
12. Presence of the ureters and any dilation or anomalous outlet.
13. Any pain elicited during the investigation
PROSTATIC BIOPSY GUIDANCE

In cases of suspected tumor areas, describe:

– site
– size
– morphology
– ultrasound appearance
– margins
– relations of lesion with the capsule, bladder neck, seminal vesicles in cases of basal nodules with an extracapsular extension
– If several nodules are present, each must be detailed
THE ROLE OF ECHOCOLORDOPPLER

Color Doppler, power Doppler and CEUS are generally used to identify neovascularization foci, possibly expressing abscesses (vascularization absent in the center) or tumors.
Images to be included
(not all are always indispensable, depending on the clinical picture)

1. One image of the prostate in transverse scan (indicating the diameters of both the entire gland and adenoma)
2. One image of the prostate in longitudinal scan (indicating the diameters of both the entire gland and adenoma)
3. One image of the prostate in transverse scan showing the bladder
4. One image of the prostate in longitudinal scan showing the bladder
5. One image of the seminal vesicles in transverse scan
6. One or more images of any anomalies
7. Any images of the juxtavesical ureter in longitudinal scan
Ultrasound of the Testes

Thank you, my friends, for a few photos:
Michele Bertolotto (Trieste-IT)
Massimo Valentino (Tolmezzo-IT)
Ultrasound of the scrotum

DEVICES AND TRANSDUCERS USED

real time scanner, preferably with a linear transducer
the frequency may range from 8 to 15 MHz or more
the transducer length may range between 4 and 8 cm
The doppler frequencies must be as high as possible to optimize the resolution and show the blood flow. Modern devices offer a frequency range of 5 to 10 MHz.

PREPARATION FOR INVESTIGATION AND PATIENT POSITION

1. The investigation must be performed in a darkened room
2. Initially, the patient should lie supine with a scrotal support to facilitate exposure
3. After examining the content of the scrotal sac in clinostatic position, the investigation should be continued with the patient in orthostatic position, making a careful evaluation of the venous flow of the spermatic cords
ESSENTIAL PARAMETERS IN THE STUDY OF THE SCROTUM

1. The scrotal wall
2. The testis (volume and echostructure)
3. The epididymis (volume and echostructure)
4. Vascularization
5. The pampiniform plexus
Scanning terminology
Scrotal orientation

Longitudinal (sagittal view)

- Epididymis
  1. Head (caput)
  2. Body (corpus)
  3. Tail (cauda)

Transverse view
- Medial and lateral

Ultrasound of the scrotum: Tillmann Loch
Normal adult Testis

Smooth homogeneous ovoid gland

Testis size: 4-5 cm long; 2.5 cm A-P; 3 cm wide
Volume 20-30 cc  -  0.71 * (LxWxAP)
Normal examination views and measurements

Longitudinal view
Scan medial to lateral

Transverse view
Scan superior to inferior

Prostate size

- Length (sup-inf) 4-5 cm
- A-P (ant-post) 2.5 cm
- Wide (med-lat) 3.0 cm
- Volume 20-30 cc = 0.71 * (L x W x AP)

M. Bertolotto
Always compare the two testes
Normal adult Epididymis

Usually more echogenic than the testes

Head: 10-12 mm

Body: 2-5 mm

Tail: 2-5 mm

Spermatic cord
Normal examination testicular vasculature

Color doppler

Power doppler
INDICATIONS

1. To evaluate the acute scrotum: testicular trauma, ischemia, suspected torsion and infectious or inflammatory diseases
2. To assess palpable masses in the inguinal or scrotal site
3. To assess any asymmetry and increased volume of the scrotum
4. To assess a possible scrotal hernia
5. For diagnosis and staging of varicocele
6. To evaluate male infertility
7. In follow-up of previous lesions shown at ultrasound
8. To assess cryptorchidism
9. To search for an occult primitive tumor in a patient with germinal tumor metastases
10. In the follow-up of patients with a primitive testicular tumor, lymphoma or leukemia
11. In follow-up after testicular surgery
12. In diagnostic workup for anomalies observed at other imaging studies like CT, MRI or PET
13. To assess sexual conditions
Painful scrotal enlargement
Epididymitis/ orchitis

Testicular abscess
Painful scrotal enlargement
Testicular torsion

Whirlpool Sign (Vijayaraghavan 2006)
Non-Painful scrotal enlargement

- hydrocele
- septate hydrocele
- epididymal cyst
- spermatocele
- scrotal hernia

Contains sperm

M. Bertolotto
Non-Painful scrotal enlargement
testicular tumor

hypoechoic or isoechoic mass
with increased flow within the tumor
Color doppler imaging, helpful to identify and document

Varicocele

microlithiasis

testicular rupture
**Example of Final Report**

**Scrotal Echocolor Doppler**

*Toshiba Aplio; Examination performed with linear probe 11.5 MHz*

**History:** Previous right orchiectomy for embryonal testicular K. Known left varicocele.

**Didymi:** left didymis in situ with normal echostructure and volume, markedly hypotrophic approx 3.5 cc (ellipsoid formula calc. 0.52 x 3 diameters)

**Epididymi:** normal echostructure and size; small cyst of head of left epididymis. Small scrotolite present.

**Vascularization of didymis-epididymis:** within normal limits

**Left pampiniform plexus:** severe peritesticular ectasia with vessel diameter exceeding 4mm.

**ColorDoppler investigation of pampiniform plexus in orthostatic position.**

**Left pampiniform plexus:** basal reflux little modified by functional manoeuvres.

**Diagnostic conclusion:** left Varicocele, grade V according to Sarteschi classification.
Images to be included (not all are always indispensable)

1. One image of each testis and epididymis in transverse scan
2. One image of each testis and epididymis in longitudinal scan
3. One image of both testes and epididymis for direct comparison
4. One or more images of the pampiniform plexus at rest and under Valsalva.
5. Color doppler evaluation of both testes
6. One or more images of any palpable anomalies