Scrotum
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SCROTUM

1) **Other Names:**
   - Scrotum→ None
   - Testicles→ Testes (Curry Tempkin, p. 236, 2/3/2)
   - Ductus deferens→ spermatic cord (Tempkin, p. 279, "Anatomy"), vas deferens (Hagen-Ansert, p. 531, 2/1/1)
   - Epididymis→ ductus epididymis (Curry-Tempkin, p. 237, 2/1/1)

2) **Definition/Location:**

Scrotum

- The **scrotum** is a sac of cutaneous tissue that supports the testicles, the paired organs of reproduction (Curry-Tempkin, p. 236, 2/3/1), (Curry-Tempkin, p. 237, Fig. 15-1).
- It is continuous with the abdomen and suspended from the base of the male pelvis between the perineum and the penis (Curry-Tempkin, p.236, 2/4/1).
- The scrotum has two-compartments that divide the **median raphe**, a fibrous septum (Tempkin, p.279, "Anatomy"), (Curry Tempkin, p. 238, Fig. 15-2, 15-11), (Hagen-Ansert, p. 534, Fig. 19-10).
- It contains the **testicles**, **epididymis**, and proximal portion of the **ductus deferens** (Curry-Tempkin, p. 236, 2/4/3), (Curry-Tempkin, p. 237, Fig. 15-1).

Testicles

- The **testicles** (testes) are male gonads and are classified as both endocrine and exocrine glands; they produce sperm, which are transported through a network of ducts (exocrine function) that store and transport the sperm (Curry-Tempkin, p.236, 2/3/2) (Curry-Tempkin, p. 238, Fig. 15-2).
- The testicles appear round in transverse and oval in longitudinal (per Mrs. Campbell) (Curry-Tempkin, p. 243, Fig. 15-6, 15-7).
- They are symmetric, oval-shaped glands residing in the scrotum (Hagen-Ansert, p.530, 2/1/1).
- The testes superior pole lies more anterior (Tempkin, p. 280, "Anatomy").
- Each testis is divided into more than 250 to 400 conical lobules containing the **seminiferous tubules** (Hagen-Ansert, p. 530, 2/1/3) (Curry Tempkin, p. 239, Fig 15-3).
- At the upper pole of the testis, the **appendix testis** is attached. It is located between the testis and epididymis (Hagen-Ansert, p.531, 2/3/1).
- They are completely covered by a dense, fibrous tissue termed the **tunica albuginea**. The posterior aspect of the tunica albuginea reflects into the testis to form a vertical septum known as the **mediastinum testis**. The

mediastinum supports the vessels and ducts coursing within the testis (Hagen-Ansert, p. 531, 1/1/1).

- The **tunica vaginalis** lines the inner walls of the scrotum, covering each testis and epididymis. It consists of two layers: parietal and visceral (Hagen-Ansert, p.531, 1/1/7).
- Functions as an endocrine gland by synthesizing and secreting testosterone, the male hormone, and by producing spermatozoa which drain into the epididymis (Tempkin, p. 280, "Physiology").

Epididymis

- The **epididymis** is bilateral and divided anatomically into three parts: the head (globus major), body (corpus), and tail (globus minor). The head lies superior to the testis. The body and tail are posteroinferior to the testis (Tempkin, p.280, "Anatomy"), (Curry-Tempkin, p. 239, Fig. 15-3).
- It is a tubular structure beginning superiorly and then coursing posterolateral to the testis (Hagen-Ansert, p.530, 2/2/1).
- It drains into the ductus deferens at the base of the testis. The ductus deferens courses superiorly and exits the scrotum through the inguinal canal. Once inside the abdominal cavity, each ductus deferens courses along the lateral aspect of the urinary bladder and turns medially and posteriorly to connect with the **seminal vesicles** (Curry-Tempkin, p. 236, 2/5/1).
- The vas deferens is a continuation of the ductus epididymis. It is thicker and less convoluted. It dilates at the terminal portion near the seminal vesicles called the ampulla of deferens. The vas deferens joins the duct of the seminal vesicles to form the ejaculatory duct, which in turn, empties into the urethra (Hagen-Ansert, p. 531, 2/1/1).
- The seminal vesicles are paired glands that lie posterior to the urinary bladder just superior to the prostate. Each seminal vesicle angles medially toward the apex of the bladder and lies medial to the ureters (Curry-Tempkin, p. 236, 2/6/1), (Curry-Tempkin, p.241, Fig. 15-5A).

3) Ultrasound Appearance:

- The testes appear as smooth, medium gray structures with a fine echo texture (Hagen-Ansert, p. 530, 2/1/6), (Curry-Tempkin, p. 243, Fig. 15-6, 15-7).
- Testicular parenchyma is similar to that of the normal thyroid gland (Tempkin, p.280, "Sonographic Appearance").
- The epididymis is midgray or medium-level echoes that are equal to or slightly more echogenic than the normal testes. The head is easier to visualize that the body or tail (Tempkin, p.280, "Sonographic Appearance"), (Hagen-Ansert, p. 531, Fig. 19-2).
- The normal epididymis appears as isoechoic or hypoechoic compared with the testis, although the echo texture is coarser (Hagen-Ansert, p. 530, 2/2/13).
- The mediastinum testis is highly reflective or very echogenic. Longitudinally, it appears as a line extending craniocaudally or parallel to the epididymis. Transversely, it appears as an ovoid structure in a 3 or 9 o'clock position

(Tempkin, p. 280, “Sonographic Appearance”), (Curry-Tempkin, p.243, Fig. 15-6, 15-7), (Hagen-Ansert, p. 532, Fig. 19-4).

- The appendix testis and appendix epididymis are hyperechoic protuberances superior to the testis and epididymis (Tempkin, p. 280, “Sonographic Appearance”), (Hagen-Ansert, p. 531, Fig. 19-3).
- The spermatic cord appears as multiple hypoechoic linear structures in the longitudinal plane and circular hypoechoic structures in the transverse plane (Tempkin, p. 280, “Sonographic Appearance”).

4) Normal Size Range(s):

- In adults, the testis measures approximately 3 to 5 cm in length, 2 to 4 cm in width, and approximately 3 cm in height (Hagen-Ansert, p.530, 2/2/2).
- The epididymis is a 3.8 to 7cm tubular structure (Hagen-Ansert, p.530, 2/3/1), (Curry-Tempkin, p.246, “Normal Measurements”).
- The head is the largest part of the epididymis, measuring 6 to 15 mm in width (Hagen-Ansert, p.530, 2/3/3).
- The body and tail are approximately 2-5 mm in diameter. With increasing age, the epididymis decreases in size (Tempkin, p.280 “Anatomy”).
- Scrotal wall thickness measures approximately 2-8 mm (Tempkin, p.280, 1/5/1).
- The ductus (vas) deferens measures 45 cm (Curry-Tempkin, p.246, “Normal Measurements”).
- Prior to the age of 12, the testicular volume is less than 5 ml. After the male reaches maturity, the average testicular volume is approximately 25 ml, with the testicle weighing between 10 and 15 g (Curry-Tempkin, p.237, 1/2/3).

5) Pertinent Lab Data: (Curry-Tempkin, p.212, “Laboratory Values”)

- Hematocrit: Indicates the percentage of red blood cells per volume of blood.
  - Male: (Normal) 40%-54%
  - Female: (Normal) 37%-47%
  - Abnormally low hematocrit points to internal bleeding
- Infection would show elevation of the white blood count (per Mrs. Campbell).

6) Common Pathologies:

- **Infection**
  - **Epididymitis**- enlarged, heterogeneous texture, hypoechoic, may contain hyperechoic areas, and high blood flow in the epididymis (Hagen-Ansert, p.539, Table 19-4), (Hagen-Ansert, p.540, Fig. 19-15).
  - **Focal orchitis**- hypoechoic area within testis, high blood flow in the testis (Hagen-Ansert, p.539, Table 19-4), (Hagen-Ansert, p. 541, Fig. 19-16).
  - **Diffuse orchitis**- enlarged, hypoechoic testis, low echogenicity of whole testis (Hagen-Ansert, p.539, Table 19-4), (Hagen-Ansert, p. 541, Fig. 19-16).

- **Trauma**
  - **Rupture**- irregular contour, focal alteration in echogenicity (Hagen-Ansert, p.539, Table 19-4).
  - **Hematoma**- heterogeneous area, becomes hyperechoic as the blood clot ages, avascular (Hagen-Ansert, p.539, Table 19-4), (Hagen-Ansert, p. 540, Fig. 19-14).
  - **Torsion**- grayscale image of testis normal when duration < 4 hours, testis enlarged and hypoechoic 4-12 hours, testis heterogeneous after 24 hours, absence of testicular flow (Hagen-Ansert, p.539, Table 19-4), (Hagen-Ansert, p.543, Fig. 19-18).
- **Fluid Collections**
  - **Hydrocele**- may be anechoic, but often contains low-level echoes, surrounds anterolateral aspect of testis (Hagen-Ansert, p.539, Table 19-4), (Hagen-Ansert, p. 540, Fig. , 19-15A), (Hagen-Ansert, p.547, 19-25).
  - **Spermatocele**- located in head of epididymis, may contain internal echoes and/or septations, smooth walls, posterior acoustic enhancement (Hagen-Ansert, p.539, Table 19-4). Differential diagnosis would be an epididymal cyst.
  - **Epididymal cyst**- may be located anywhere in epididymis, usually small and anechoic; ultrasound cannot differentiate between spermatocele and epididymal cyst; posterior acoustic enhancement may also be present (Hagen-Ansert, p.539, Table 19-4), (Hagen-Ansert, p.544, Fig. 19-20).
  - **Varicocele**- tortuous, dilated veins, increased size with Valsalva maneuver or patient standing, dilated veins fill with color on Valsalva maneuver, spectral Doppler confirms venous flow (Hagen-Ansert, p.539, Table 19-4), (Hagen-Ansert, p.545-546, Fig. 19-21, 19-22).
  - **Hematocele**- contains low-level echoes, may contain septations and loculations (Hagen-Ansert, p.539, Table 19-4), (Hagen-Ansert, p.548, Fig. 19-27)
- **Tumor**
  - **Seminoma**- solid malignant mass, hypoechoic lesion, smooth, well-defined borders (Hagen-Ansert, p.549, Table 19-6), (Hagen-Ansert, p.550, Fig. 19-33).

7) Patient Prep:

- Ultrasound examination of the scrotum is performed with the patient in the supine position. The penis is positioned on the abdomen and covered with a towel. The patient is asked to place his legs close together to provide support for the scrotum. Alternatively, a rolled towel placed between the thighs can support the scrotum. It is often unnecessary to place a towel for support if the legs are positioned close together. This may be more comfortable for the patient in pain (Hagen-Ansert, p. 533, 1/1/1) (Tempkin, p. 283, "Patient Prep").
- Don't touch male penis.
- Don't let significant other in room.

8) **Transducer (Probe) Frequency:** (Curry-Tempkin, p. 284, "Transducer")
   - 5 MHz, high resolution, real-time, linear.
   - 7.5 MHz, 10 MHz.
   - Conventional Doppler with color flow imaging.
   - Gel stand-off pad- used for better visualization of anterior lesions.

9) Protocol:
   - In transverse, images are taken that show the superior, mid, and inferior portion of each testis. The width of the testis is measured in the mid transverse view. A transverse view of the head of the epididymis is included. Superior to the epididymal head, an image is obtained to demonstrate the area of the spermatic cord (Hagen-Ansert, p. 534, 1/2/2).
   - In the sagittal plane, images are taken to show the medial, mid, and lateral portions. A long axis measurement of testicular length is obtained in the midsagittal image. An image is obtained of the epididymal head superior to the testicle. At least one image is taken to show both testes at the same time so the interpreting physician can compare size and echogenicity (Hagen-Ansert, p. 534, 1/2/6).
   - Additional images may be taken to demonstrate abnormal areas (Hagen-Ansert, p. 534, 1/2/8).

10) Image Reference:
   - Curry-Tempkin, p. 237, Fig. 15-1
   - Curry-Tempkin, p. 238, Fig. 15-2
   - Curry-Tempkin, p. 245, Fig. 15-11
   - Hagen-Ansert, p. 534, Fig. 19-10
   - Curry-Tempkin, p. 238, Fig. 15-2
   - Curry-Tempkin, p. 243, Fig. 15-6, 15-7
   - Curry-Tempkin, p. 239, Fig. 15-3
   - Curry-Tempkin, p.241, Fig. 15-5A
   - Hagen-Ansert, p. 531, Fig. 19-2
   - Hagen-Ansert, p. 532, Fig. 19-4
   - Hagen-Ansert, p. 531, Fig. 19-3
   - Hagen-Ansert, p.540, Fig. 19-15
   - Hagen-Ansert, p. 541, Fig. 19-16
   - Hagen-Ansert, p. 540, Fig. 19-14
   - Hagen-Ansert, p.543, Fig. 19-18
   - Hagen-Ansert, p. 540, Fig. 19-15A
   - Hagen-Ansert, p.547, Fig. 19-25
   - Hagen-Ansert, p.544, Fig. 19-20
   - Hagen-Ansert, p.545-546, Fig. 19-21, 19-22
   - Hagen-Ansert, p.548, Fig. 19-27
   - Hagen-Ansert, p.550, Fig. 19-33
   - Tempkin, p. 283, "Patient Prep"

11) References:

- Curry, R.A. and Tempkin, B.B. (2004). Sonography: Introduction to normal structures and function (2nd ed.). St. Louis, MO: Saunders.
- Hagan-Ansert, S.L. (2006). Textbook of diagnostic ultrasonography (6th ed.) (Vol.1). St. Louis, MO: Mosby.
- Tempkin, B.B. (1999). Ultrasound scanning: Principles and protocols (2nd ed.). Philadelphia, PA: Saunders.