Male Reproductive System
Lecture Objectives

• Describe the peritoneal foldings on the pelvic viscera in the male.
• Describe the male genital organs.
• Describe the relationship, blood supply, innervation, and lymph drainage of all the above.
Male Reproductive System

- **External genitalia:**
  - penis, scrotum (testis, epididymis, ductus deference), & spermatic cord

- **Internal genitalia:**
  - seminal vesicles, ductus deference, ejaculatory duct, prostate & bulbourethral glands
Penis

• Parts: Root & Body

• Root
  – Bulb of the penis
    • Attached in the midline to urogenital diaphragm
    • Traversed by urethra
    • Covered by the bulbospongiosus m.
  – Right & left crura of the penis
    • Attached to the pubic arch
    • Covered by the ischiocavernosus m.
Penis

- **Body**
  - Corpus spongiosum – ventrally
    - Continuation of the bulb
    - Contains the urethra
    - Ends with glans penis
      - Corona & neck of glans
      - External urethral meatus
  - Corpora cavernosa – dorsally
    - Continuation of the penile crora
    - Covered distally by the glans
  - Prepuce (foreskin): fold of skin covers the glans
    - Frenulum
• **Fascia**
  - Superficial fascia
    • Continuous with that of the scrotum (dartos fascia)
  - Deep fascia (Buck’s fascia): a tubular sheath of fascia
    • Covers the erectile columns

• **Ligaments**
  - Suspensory ligament of penis
    • From pubic symphysis to deep fascia
    • At junction between root & body
  - Fundiform ligament of penis
    • From linea alba to the superficial fascia
Penis

- **Blood supply:** branches of the internal pudendal a.
  - Deep aa. of the penis – corpora cavernosa
  - Artery of the bulb – corpus spongiosum
  - Dorsal artery of the penis

- **Lymphatics:**
  - Skin – superficial inguinal nodes
  - Deep structures – internal iliac nodes

- **Nerve supply:**
  - Dorsal nerve of the penis – pudendal n.
  - Parasympathetic – inferior hypogastric plexus
Penis: Blood & Nerve Supply

Diagram showing blood and nerve supply to the penis, including the following structures:

- Common iliac artery
- Internal iliac artery
- External iliac artery
- Femoral artery
- External pudendal artery
- Dorsal artery of penis
- Deep artery of penis
- Artery of bulb
- Perineal artery
- Posterior scrotal artery
- Lumbar splanchnic nerves
- Superior hypogastric plexus
- Sacral splanchnic nerve
- Vesical plexus
- Sympathetic trunk
- Lumbosacral trunk
- Left hypogastric nerve
- Pelvic splanchnic nerves
- Inferior hypogastric plexus
- Prostatic plexus
- Inferior anal nerve
- Pudendal nerve
- Cavernous nerves
- Perineal nerve
- Posterior scrotal nerves

Key:
- Yellow: Sympathetic nerves
- Light blue: Parasympathetic nerves
- Green: Mixed sympathetic and parasympathetic nerves
- Orange: Somatic nerves

Left lateral view
Scrotum

- Out pouching of the lower anterior abdominal wall
- Layers
  - Skin
  - Superficial fascia
    - Dartos m. (replace the fatty layer)
    - Colles’ fascia (continuation of Scarpa’s fascia)
      - Septum of scrotum
  - External spermatic fascia (ext. oblique m.)
  - Cremasteric fascia (int. oblique m.)
  - Internal spermatic fascia (fascia transversalis)
  - Tunica vaginalis (peritoneum)
    - Ease the movement of testes
Scrotum

• Blood Supply:
  – Anterior scrotal - external pudendal - femoral a.
  – Posterior scrotal - scrotal branches of internal pudendal aa.

• Lymphatics:
  – Superficial inguinal nodes

• Nerve supply:
  – Anterior scrotal – ilioinguinal n. & genital branch of the genitofemoral n.
  – Posterior scrotal – branches of the perineal n. & posterior cutaneous nerves of the thigh
Spermatic Cord: Coverings

- External spermatic fascia
  - Ext. oblique aponeurosis
- Cremasteric fascia
  - Int. oblique m.
- Internal spermatic fascia
  - Transversalis fascia
Spermatic Cord: Content

- The vas deferens
- The testicular artery - aorta
- Testicular vein (pampiniform plexus) – to IVC & left renal v.
- Testicular lymph vessels
  - Follow the artery
- Autonomic nerves
  - Sympathetic – follow the artery
- Remnants of processus vaginalis – peritoneum
- Genital branch of the genitofemoral nerve
  - Cremaster m.
Testes

- Paired oval glands measuring 2 in. by 1 in.
  - Left usually at a lower level
- Surrounded by dense white capsule called tunica albuginea
  - Septa form 200 - 300 compartments called lobules
  - Mediastinum - posteriorly
- Each is filled with 2 or 3 seminiferous tubules where sperm are formed
Pathway of Sperm Flow through the Ducts of the Testis

- Seminiferous tubules
- Straight tubules
- Rete testis
- Efferent ducts
- Ductus epididymis
- Ductus (vas) deferens
Temperature Regulation of Testes

• Sperm survival requires 3 degrees lower temperature than core body temperature
• Mechanisms of regulating temperature
  – Dartos muscle causes wrinkling of scrotal wall
  – Cremaster muscle in spermatic cord
    • Elevates testes on exposure to cold & during arousal
    • Warmth reverses the process
  – Countercurrent heat exchange
    • Pampiniform plexus & the branches of the testicular aa.
Descent of Testes

- Develop near kidney on posterior abdominal wall
- Descends into scrotum by passing through inguinal canal
  - during 7th month of fetal development
- Drag with it the blood, nerve & lymphatic supply
Epididymis

- Comma-shaped organ, 1.5in long along posterior border of each testis
- Ductus epididymis - 20 feet tube if uncoiled
- Head
  - Receive multiple efferent ducts
- Body
- Tail
  - Continues as ductus deferens on the medial side of epididymis
- Sinus of the epididymis
  - Laterally between epididymis & testis
Epididymis

- Site of sperm maturation
  - motility increases over 2 week period
- Storage for 1-2 months
- Absorbs excess fluid
- Add nutrient substances
- Propels sperm onward
**Testes & Epididymis**

- **Blood Supply:**
  - Testicular a. – aorta
  - Left testicular v. – left renal v.
  - Right testicular v. – IVC
- **Lymphatics:**
  - Lumbar lymph nodes
- **Nerve supply:**
  - Testicular plexus
  - Parasympathetic – vagus
  - Sympathetic – T7
Ductus (Vas) Deferens

• Pathway of 18 inch muscular tube
  – ascends along medial side of epididymis
  – passes up through spermatic cord and inguinal ligament
  – reaches posterior surface of urinary bladder
  – empties into prostatic urethra with seminal vesicle

• Lined with pseudostratified columnar epithelium & covered with heavy coating of muscle
  – convey sperm along through peristaltic contractions
  – stored sperm remain viable for several months

• Blood supply:
  – Branches from the vesicle arteries
  – Veins drain into the testicular or prostatic veins
Ductus (Vas) Deferens

- Traverse deep inguinal ring
- Cross inferior epigastric artery laterally
- Run on the pelvic floor backward and inferiorly
- Cross the ureters medially
- End with the ampulla medial to seminal vesicle & posterior to urinary bladder
**Seminal Vesicles**

- Pair of pouch-like organs found posterior to the base of bladder
- Anterior to rectum
  - Rectovesical pouch
- Alkaline, viscous fluid
  - neutralizes acidity of vagina & male urethra
  - fructose for ATP production
  - prostaglandins stimulate sperm motility & viability
  - clotting proteins for coagulation of semen
- Blood supply:
  - Inferior vesicle & middle rectal vessels
- Lymphatics: internal iliac nodes
Ejaculatory Ducts

- Formed from duct of seminal vesicle & ampulla of vas deferens
- About 1 inch long
- Adds fluid to prostatic urethra just before ejaculation
- Pierces prostate posteriorly and drain beside the utricle
Prostate Gland

- Conical shape gland
  - Base – above
  - Apex – below
- Surrounds the prostatic urethra
  - Urethral crest
    - Prostatic utricle – analog of uterus & vagina
    - Prostatic sinus
- Covered by fibrous capsule
- Fascial sheath covers the capsule
- Ligaments – connected to the fascial sheath
  - Anteriorly – puboprostatic ligament
  - Posterioly – rectovesical septum (fascia of Denonvilliers)
Prostate Gland: Relations

- Superiorly – urinary bladder neck
- Inferiorly – urogenital diaphragm
- Laterally levator ani muscles
- Anteriorly – pubic symphysis
  - Retropubic space (cave of Retzius)
    - Extraperitoneal fat
- Posteriorly – rectal ampulla
Prostate Gland

• Lobes
  – Anterior (isthmus) – anterior to urethra
    • Musculofibrous - No glands
  – Posterior – posterior to urethra
  – Median (middle) – between urethra & ejaculatory duct
  – Right & left lateral – sides of urethra

• Zones
  – Central zone – drain directly into urethra
  – Transitional zone – drains into the sinus
  – Peripheral zone – drains into the sinus
Prostate Gland

• Blood supply:
  – Branches from the inferior vesicle & middle rectal aa.
  – Prostatic venous plexus – between capsule and fascial sheath
    • Drains into internal iliac v.
• Lymphatics: internal iliac nodes
• Nerve supply: Inferior hypogastric plexus
Bulbourethral or Cowper’s Gland

- Paired, pea-sized gland within the UG diaphragm
- Ducts pierce the perineal membrane
  - Opens into spongy urethra
- Secretes alkaline mucous that neutralizes acids and lubricates
Semen

• Mixture of sperm & seminal fluid
  – glandular secretions and fluid of seminiferous tubules
  – slightly alkaline, milky appearance, sticky
  – contains nutrients, clotting proteins & antibiotic seminal plasmin

• Typical ejaculate is 2.5 to 5 ml in volume

• Normal sperm count is 50 to 150 million/ml
  – actions of many are needed for one to enter

• Coagulates within 5 minutes -- reliquesfies in 15 due to enzymes produced by the prostate gland

• Semen analysis----bad news if show lack of forward motility, low count or abnormal shapes
Erection & Ejaculation

• Erection
  – sexual stimulation dilates the arteries supplying the penis
  – blood enters the penis compressing the veins so that the blood is trapped.
  – parasympathetic reflex causes erection

• Ejaculation
  – muscle contractions close sphincter at base of bladder and move fluids through ductus deferens, seminal vesicles, & ejaculatory ducts
  – ischiocavernousus & bulbospongiosus complete the job