



# Male Reproductive System

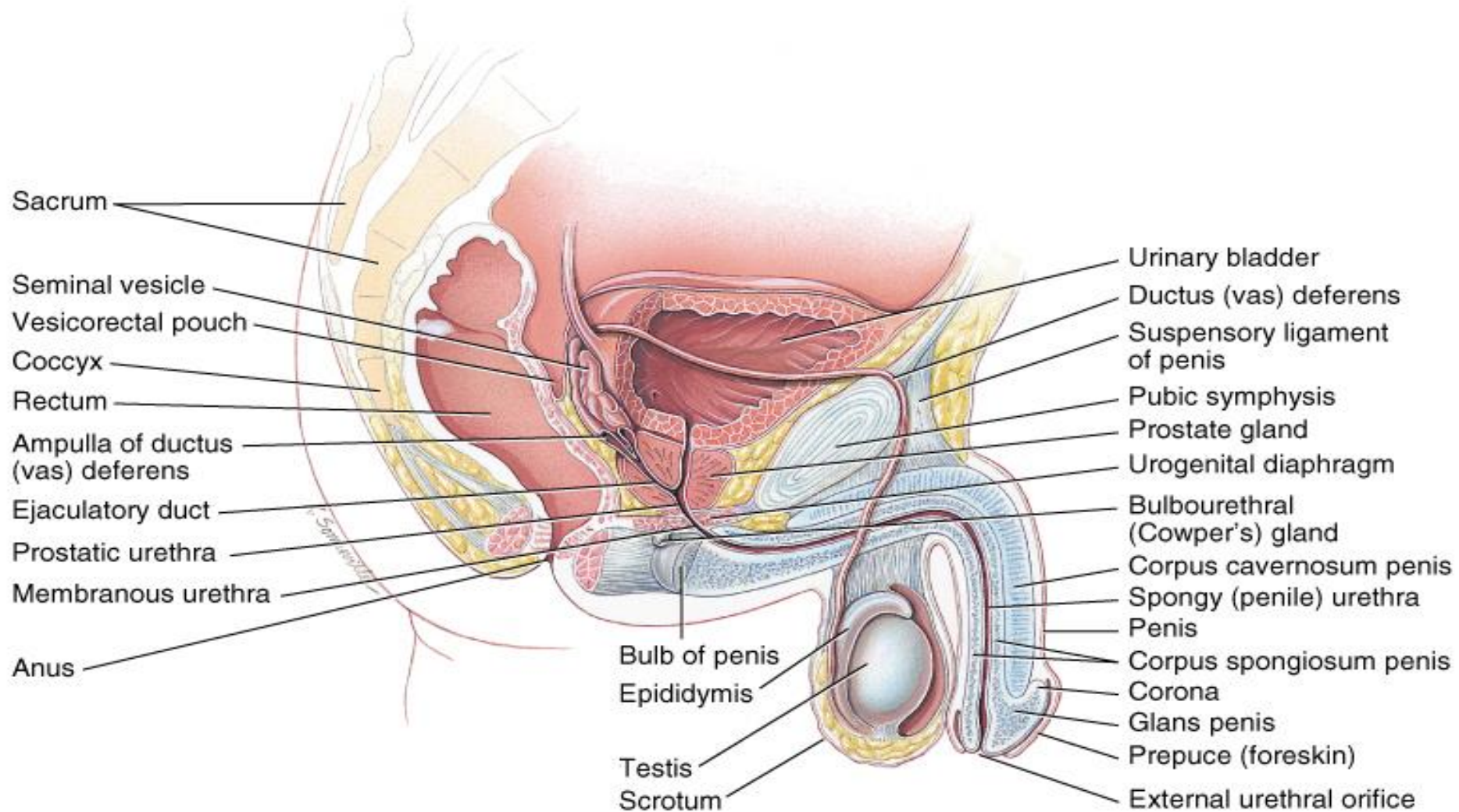
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# Learning Objectives

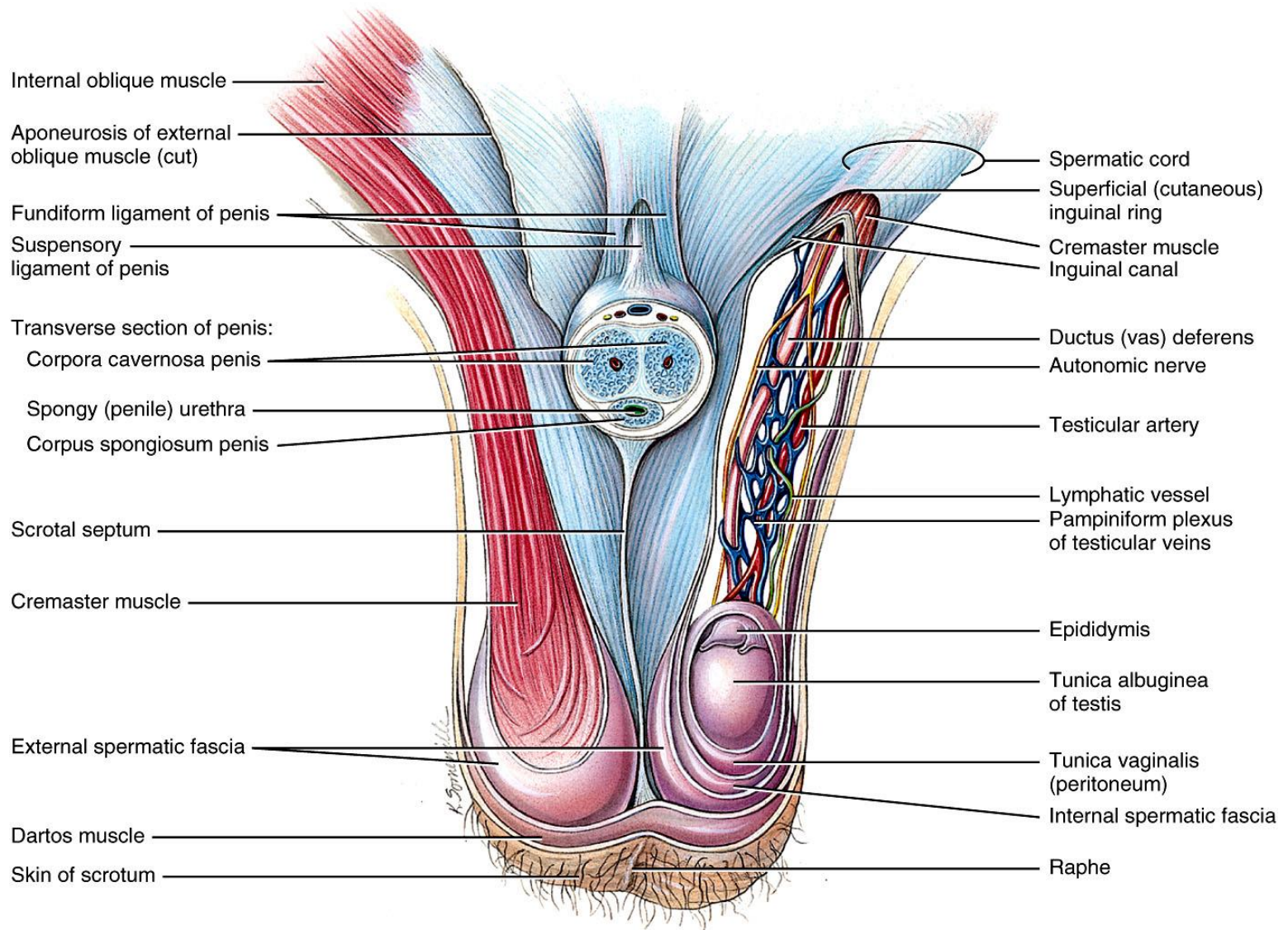
1. Describe the General Anatomy of the Male Reproductive System
2. Identify the structures that are related to the prostate.

# General Anatomy of the Male Reproductive System



(a) Sagittal section

# The Scrotum



Anterior view of scrotum and testes and transverse section of penis



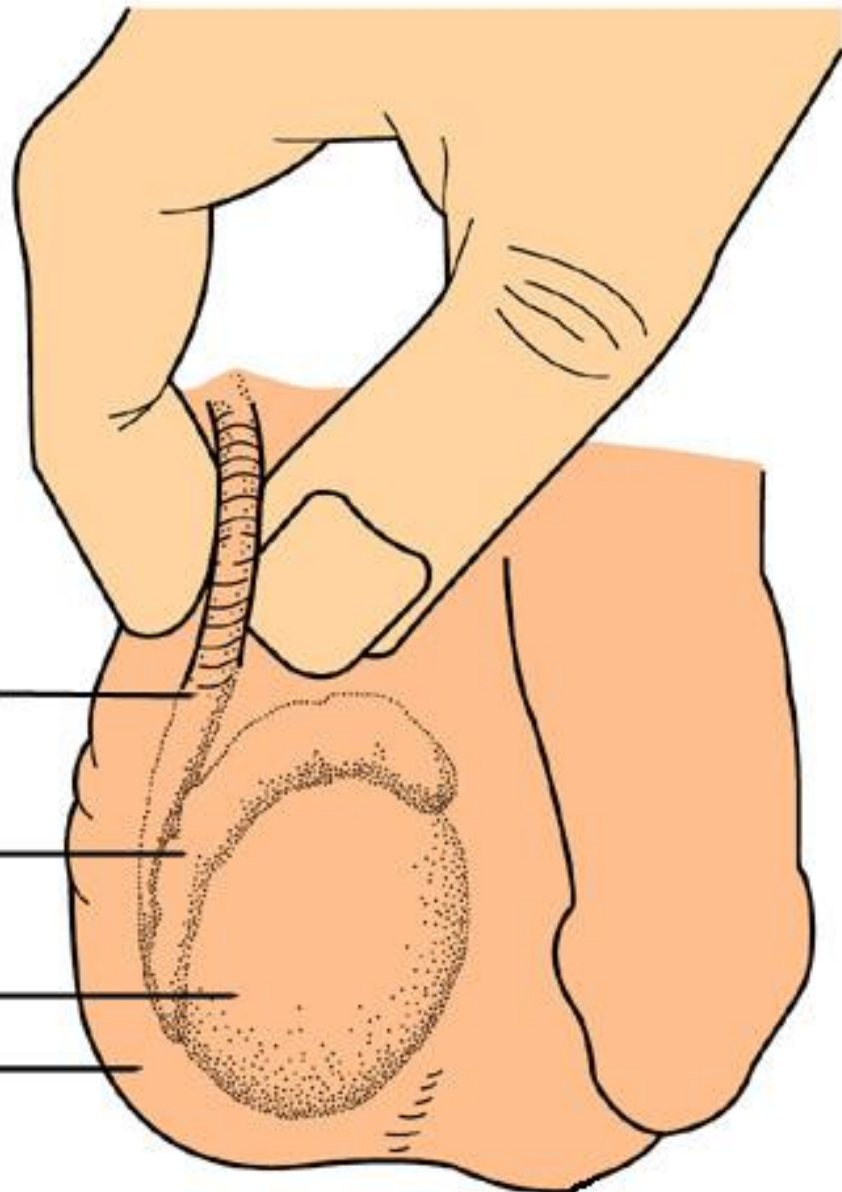
# The Scrotal Structures

Spermatic cord

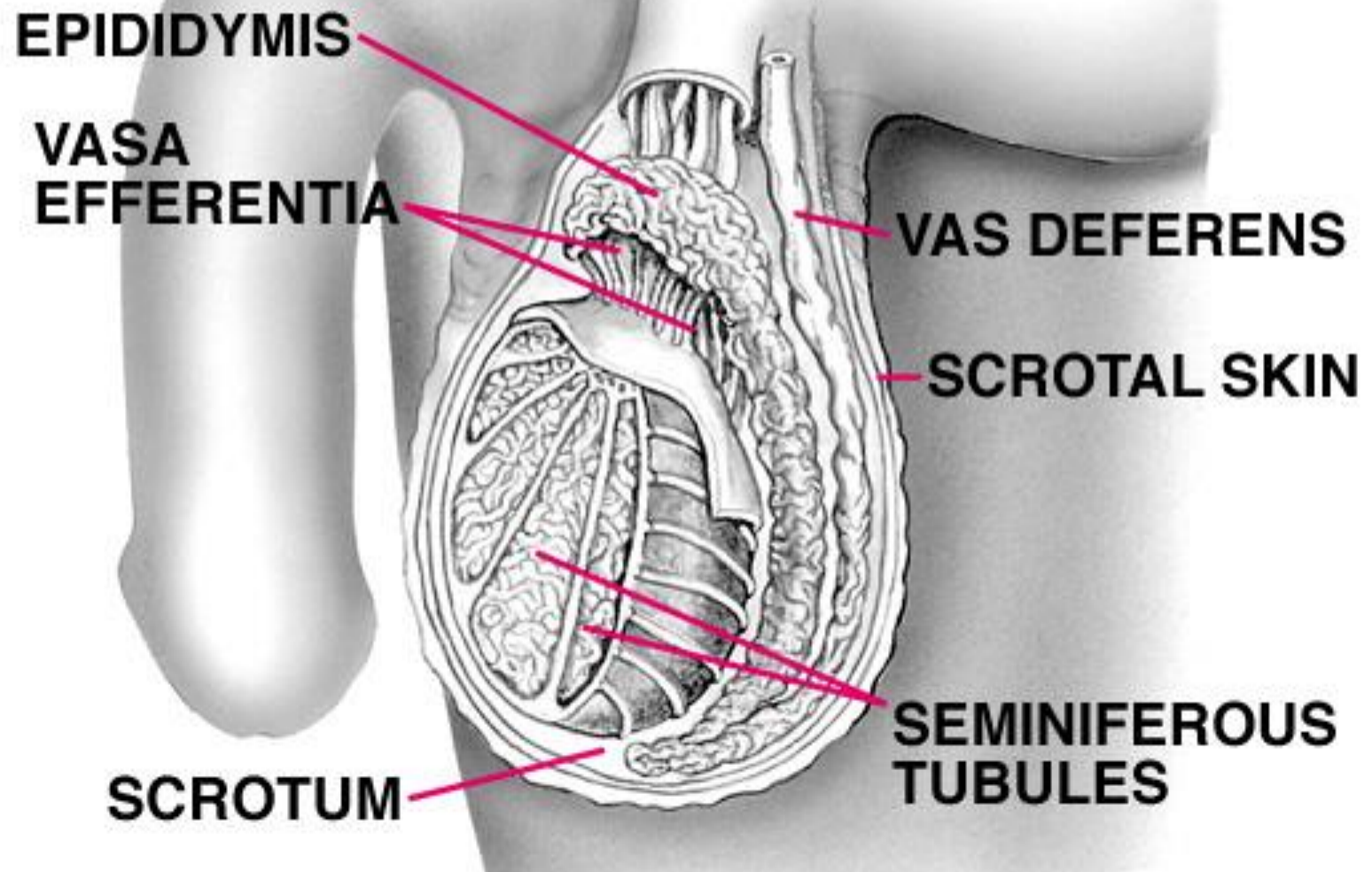
Epididymis

Testis

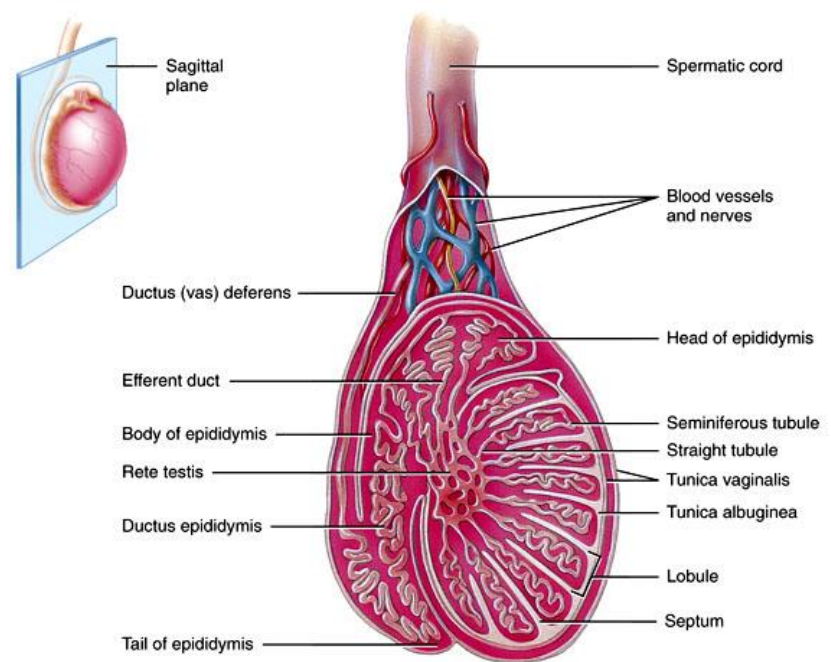
Scrotum



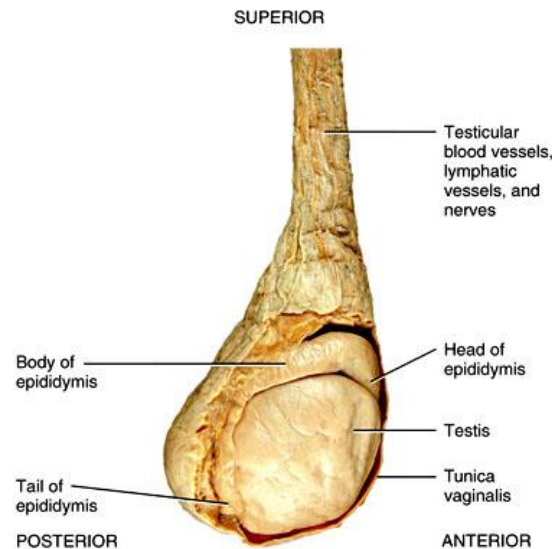
# Testes



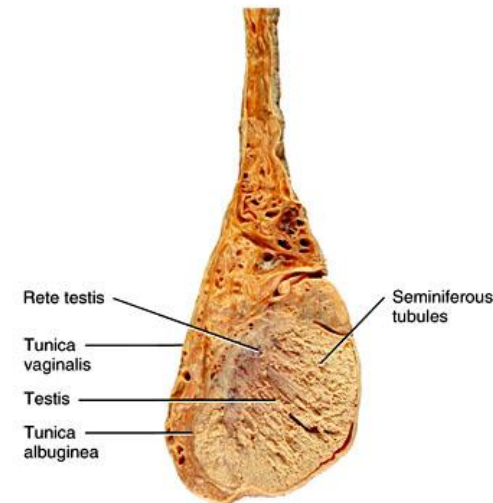
# Internal and external anatomy of a testis



(a) Sagittal section of a testis showing seminiferous tubules



(b) Lateral view of testis and associated structures



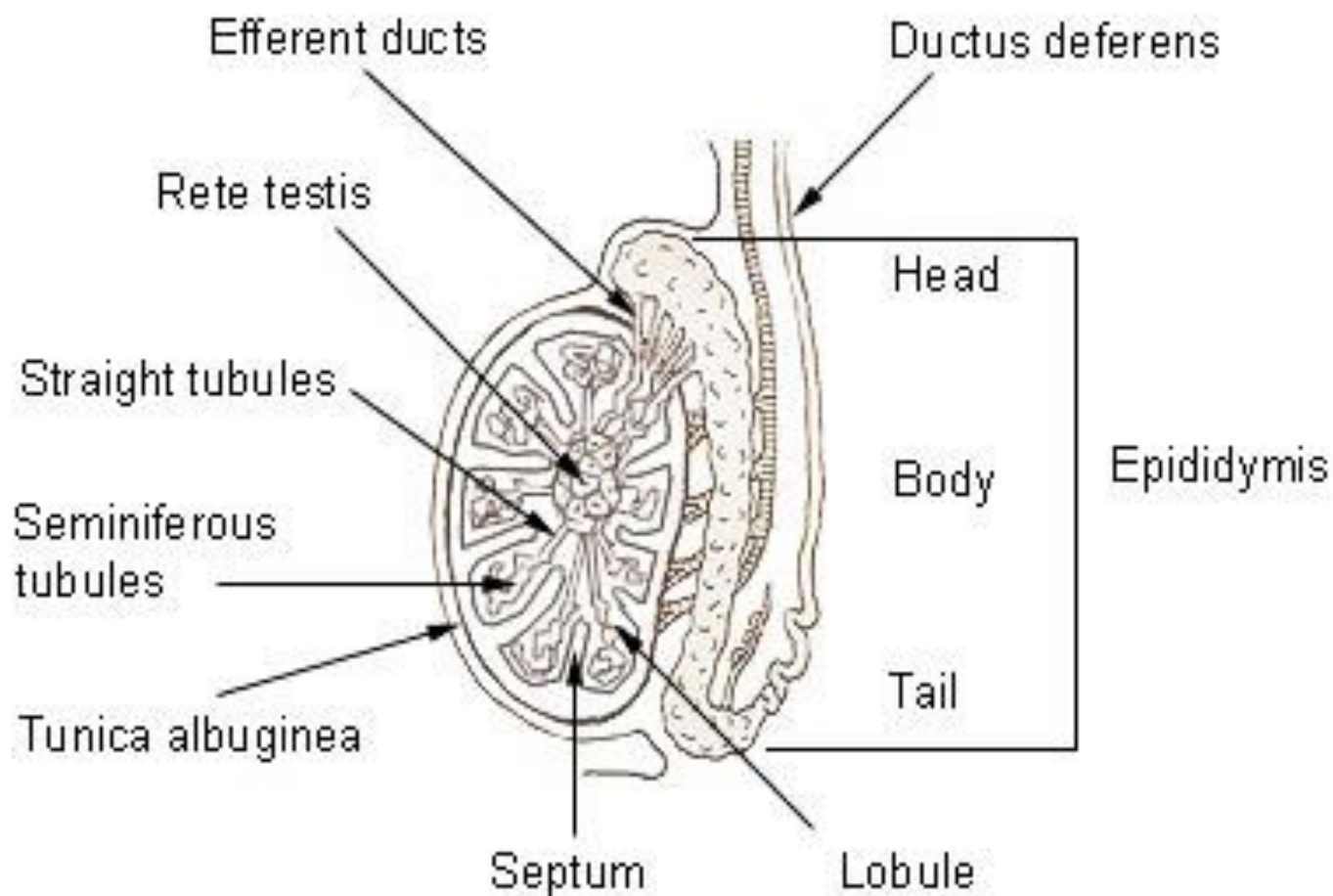
(c) Sagittal section

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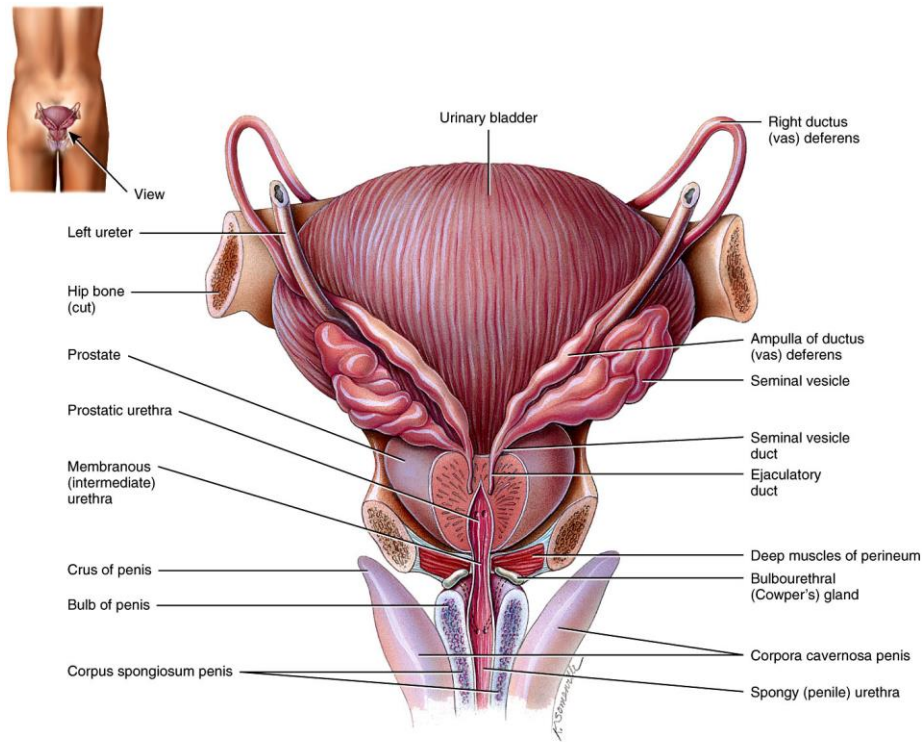
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## **Sagittal section of a testis and Epididymis**



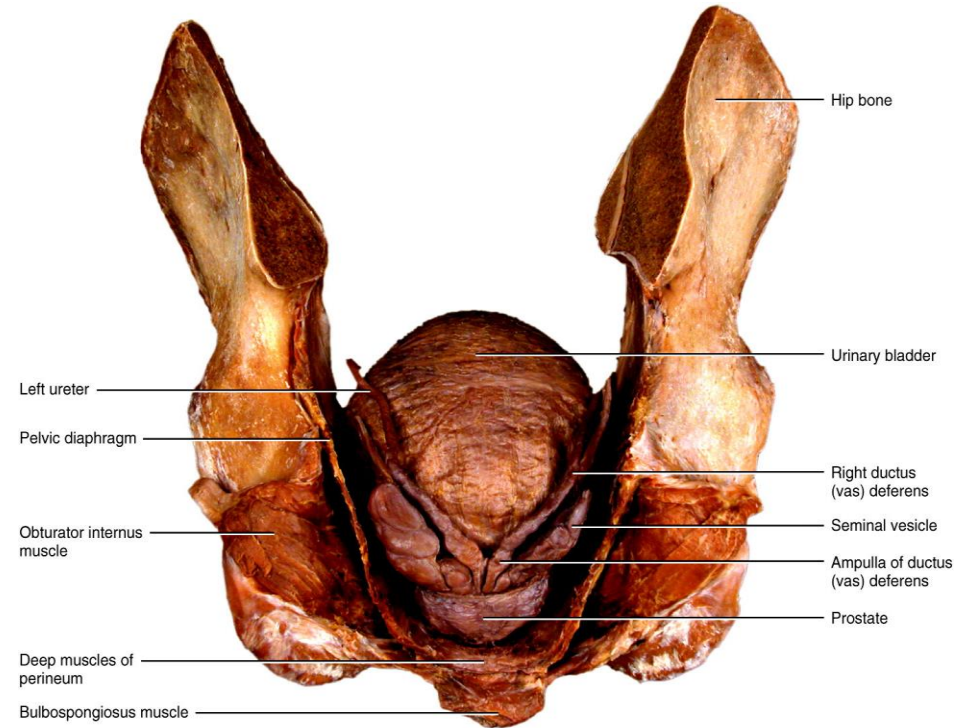


# Accessory reproductive organs in males



(a) Posterior view of male accessory organs of reproduction

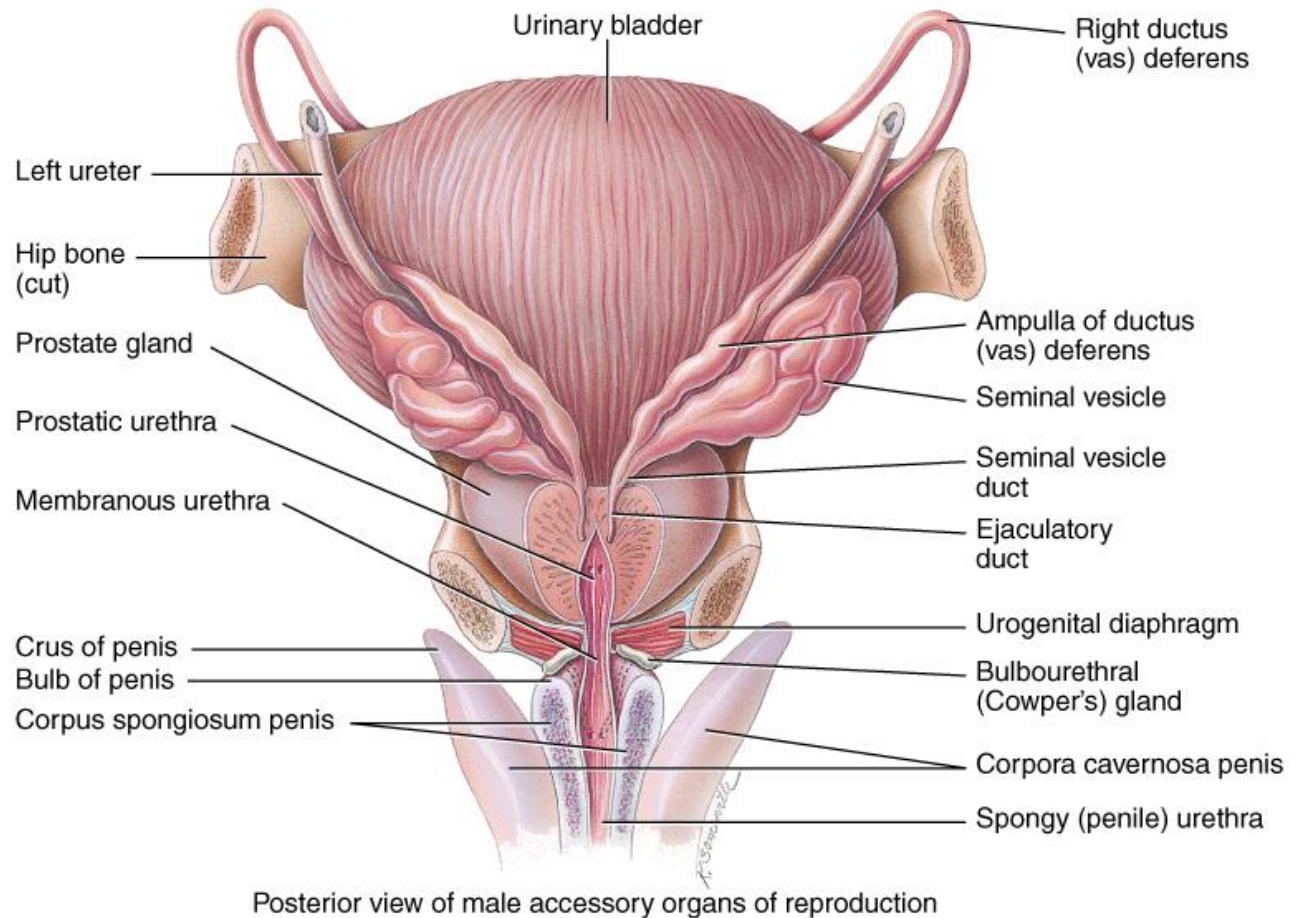
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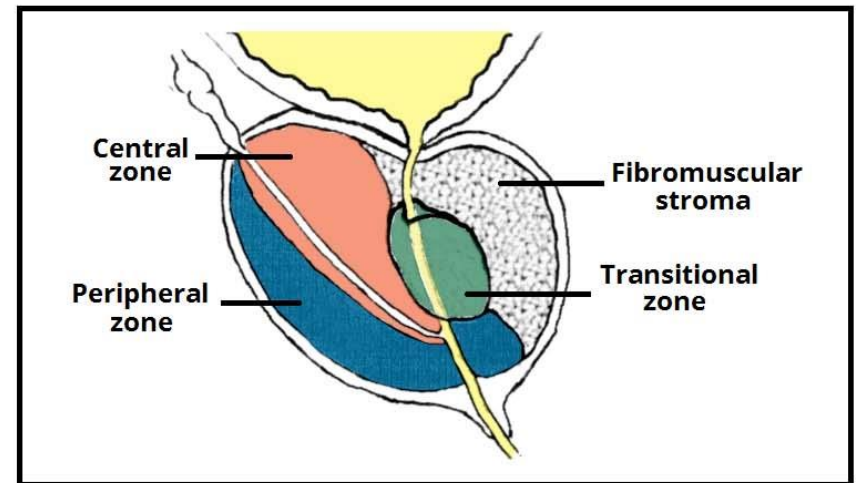
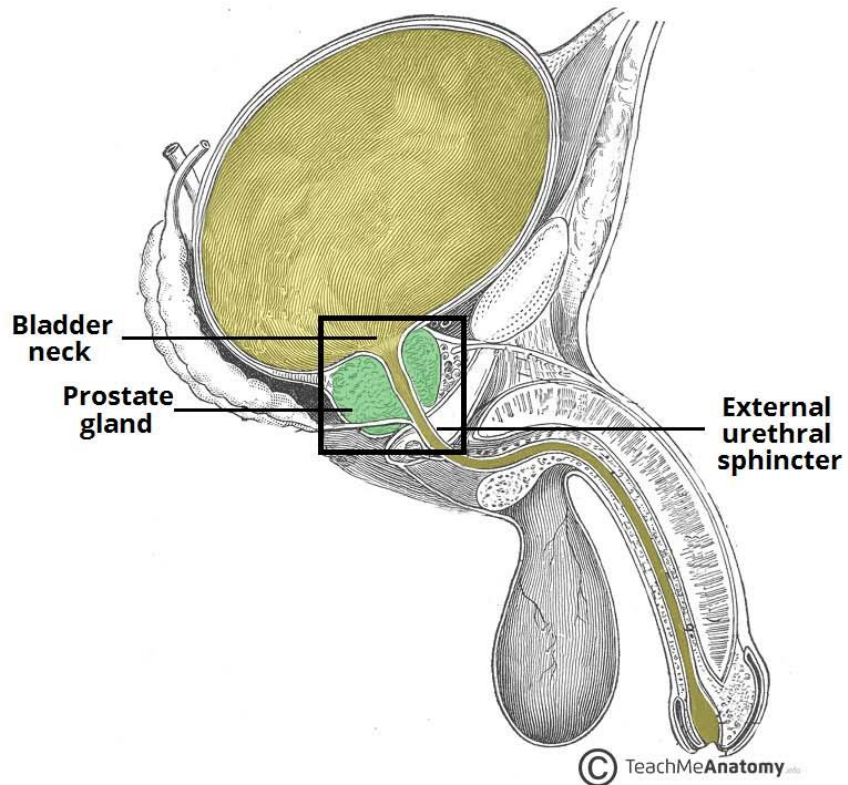
(b) Posterior view of male accessory organs of reproduction

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# Organs involved in the Production of Semen

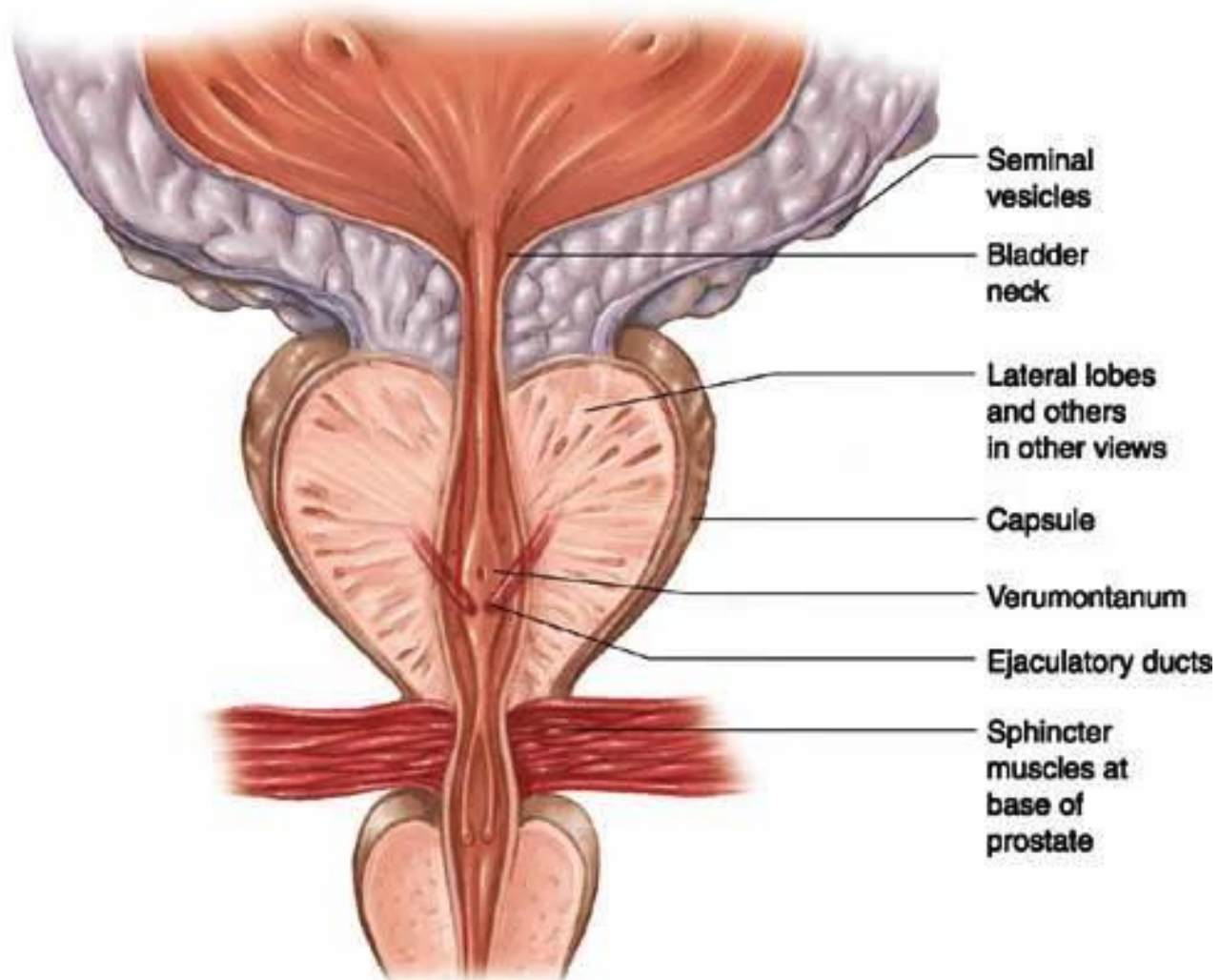


# The Prostate



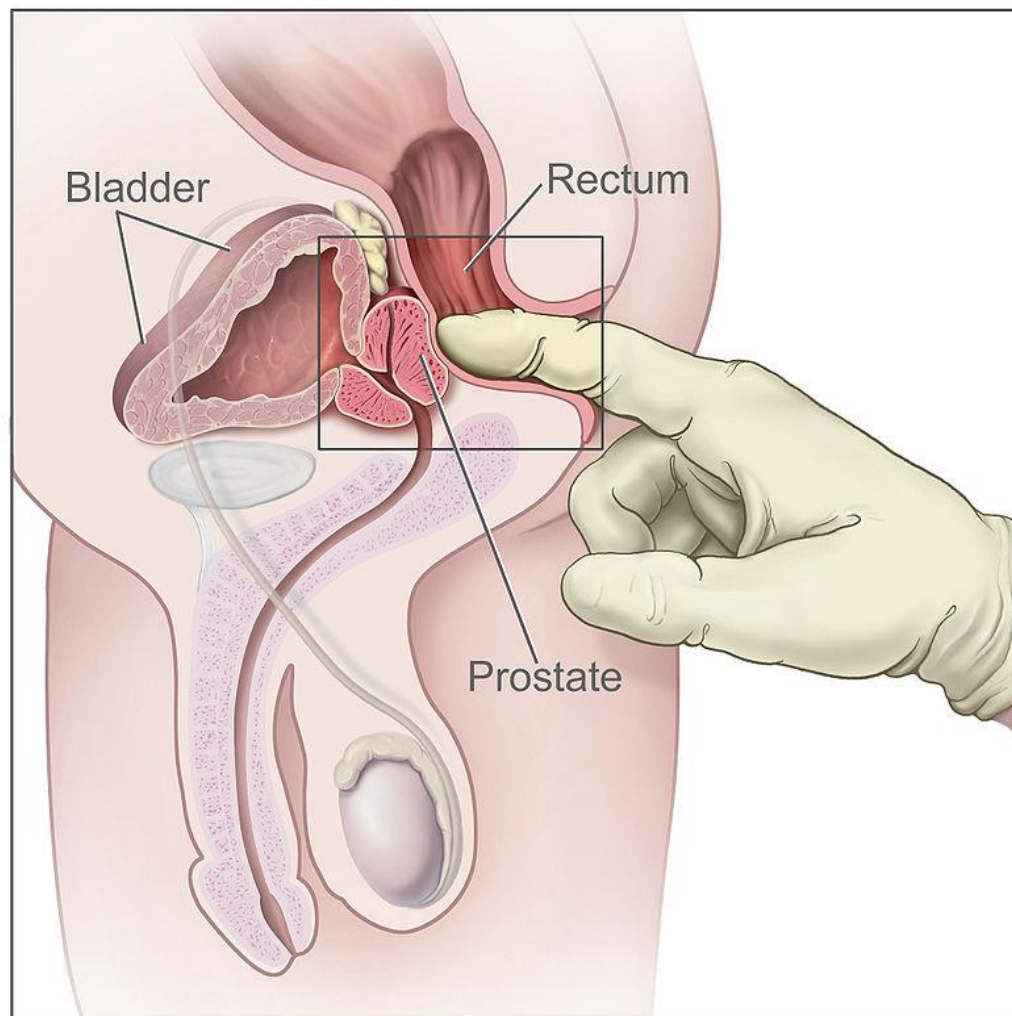
# The Prostate - Relation

**Front View**



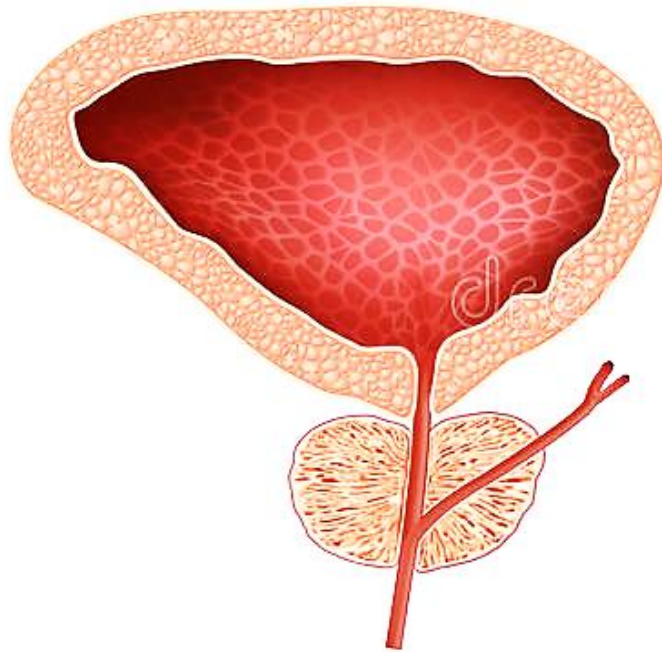


# The Prostate – Examination

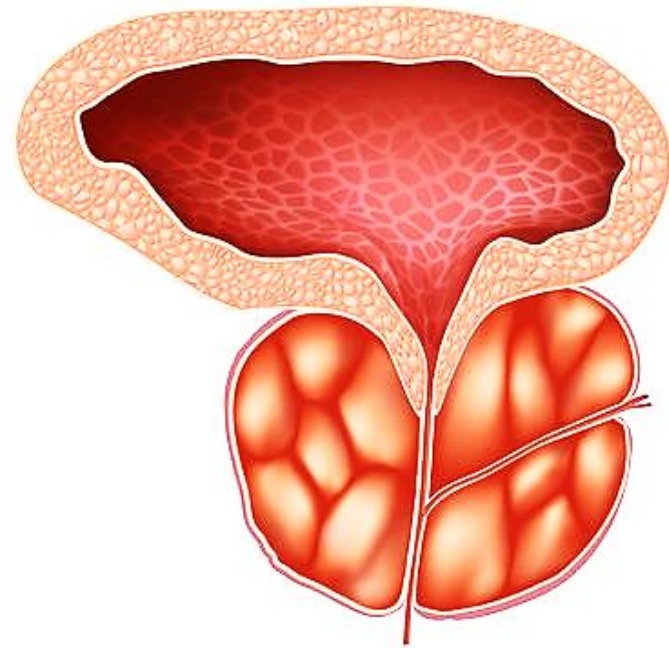


# The Prostate – Case Presentation

## Benign Prostatic Hyperplasia



Normal prostate



Enlarged prostate



# Male reproductive system

- Gonads – testes
  - Produces sperm and secretes hormones
- System of ducts – transport and stores sperm, assists in their maturation, and conveys them to the exterior
  - Epididymis, ductus deferens, ejaculatory ducts, and urethra
- Accessory sex glands – adds secretions to semen
  - Seminal vesicles, prostate, and bulbourethral glands
- Supporting structures
  - Scrotum supports testes and penis delivers sperm into female reproductive tract



# Scrotum

- Supporting structure for testes
- Raphe – external median ridge
- Scrotal septum – internally divides scrotum into two sacs, each with a single testis
  - Made up of subcutaneous layer and dartos muscle
- Associated with each testis is the cremaster muscle
- Normal sperm production requires a temperature 2-3°C below core body temperature
  - Cremaster and dartos muscle contracts or relaxes

# Testes or testicles

- Paired oval glands in the scrotum
- Develops near kidney and descends through inguinal canals near 7<sup>th</sup> month of fetal development
- Tunica vaginalis partially covers testes
- Tunica albuginea – internal to tunica vaginalis
  - Extends inward forming septa that divide testis into lobules
- Each of 200-300 lobules contains 1-3 seminiferous tubules
  - Sperm produced here through spermatogenesis

# Seminiferous tubule cells

- Spermatogenic cells – sperm-forming cells
  - Spermatagonia (stem cell) develop from primordial germ cells that arise in yolk sac and enter testes in 5<sup>th</sup> week of development
  - Primary spermatocytes → secondary spermatocytes → spermatids → sperm cells → lumen
- Sertoli cells or sustentacular cells– support cells
  - Tight junction form blood-testis barrier – prevents immune response against sperm cell surface antigens
  - Nourish spermatocytes, spermatids and sperm, phagocytize excess spermatid cytoplasm, control movements of spermatogenic cells, release sperm into lumen, produce fluid for sperm transport, secrete inhibin, regulate effects of testosterone and follicle-stimulating hormone (FSH)
- Leydig (interstitial) cells found in spaces between seminiferous tubules
  - Secrete testosterone

# Reproductive system ducts in males

- Ducts of testis
  - Pressure generated by fluid produced by Sertoli cells push sperm along seminiferous tubules into straight tubules, rete testis, efferent ducts in epididymis and then ductus epididymis
- Epididymis
  - Consists of tightly coiled ductus epididymis
  - Stereocilia are microvilli that reabsorb degenerated sperm
  - Site of sperm maturation – acquire motility and ability to fertilize
  - Can store sperm for several months
  - Continues as ductus (vas) deferens
- Ductus (vas) deferens
  - Conveys sperm during sexual arousal through peristaltic contractions
  - Can also store sperm several months



# Male reproductive system ducts

- Spermatic cord
  - Ascends out of scrotum
  - Consists of ductus deferens as it ascends through scrotum, testicular artery, veins that drain testes and carry testosterone, autonomic nerves, lymphatic vessels, and cremaster muscle
  - Spermatic cord and ilioinguinal nerve pass through inguinal canal
- Ejaculatory ducts
  - Formed by union of duct from seminal vesicle and ampulla of ductus deferens
  - Terminate in prostatic urethra
  - Eject sperm and seminal vesicle secretions just before release of semen into urethra
- Urethra
  - Shared terminal duct of reproductive and urinary systems
  - Subdivided into prostatic urethra, membranous urethra, and spongy (penile) urethra
  - Ends at external urethral orifice

# Accessory sex glands – secrete most of liquid portion of semen

- Seminal vesicles - About 60% of semen volume
  - Secrete alkaline, viscous fluid containing fructose, prostaglandins, and clotting proteins (different from blood)
- Prostate - About 25% of semen volume
  - Secretes milky, slightly acidic fluid containing citric acid, several proteolytic enzymes, acid phosphatase, seminalplasmin (antibiotic)
- Bulbourethral glands
  - Secrete alkaline fluid that protects passing sperm by neutralizing acids from urine in urethra
  - Mucus lubricates end of penis and lining of urethra

# Semen and Penis

- Semen
  - Mixture of sperm and seminal fluid
  - Typical volume 2.5-5 mL with 50-150 million sperm/mL
  - Slightly alkaline pH of 7.2-7.7 due to seminal vesicle secretions
  - Provides transport medium, nutrients, and protection
  - Coagulates after ejaculation due to clotting proteins
- Penis
  - Contains urethra
  - Passageway for ejaculation of semen and excretion of urine
  - Body of penis – 3 cylindrical masses of tissue with erectile tissue
  - Glans penis – terminal opening is external urethral orifice
    - Prepuce or foreskin covers glans in uncircumcised men
  - Root of penis is attached portion
  - Erection – parasympathetic fibers release and cause local production of nitric oxide (NO) causing smooth muscle in arterioles to relax and dilate allowing large amounts of blood to enter penis

# Testes

- Each testis is an oval structure about 5 cm long and 3 cm in diameter
- Covered by: tunica albuginea
- Located in the scrotum
- There are about 250 lobules in each testis. Each contains 1 to 4 -seminiferous tubules that converge to form a single straight tubule, which leads into the rete testis.
- Short efferent ducts exit the testes.
- Interstitial cells (cells of Leydig), which produce male sex hormones, are located between the seminiferous tubules within a lobule.

# scrotum

- consists of skin and subcutaneous tissue
- A vertical septum, of subcutaneous tissue in the center divides it into two parts, each containing one testis.
- Smooth muscle fibers, called the **dartos muscle**, in the subcutaneous tissue contract to give the scrotum its wrinkled appearance. When these fibers are relaxed, the scrotum is smooth.
- the **cremaster muscle**, consists of skeletal muscle fibers and controls the position of the scrotum and testes. When it is cold or a man is sexually aroused, this muscle contracts to pull the testes closer to the body for warmth.

# Epididymis

- a long tube (about 6 meters) located along the superior and posterior margins of the testes.
- Sperm that leave the testes are immature and incapable of fertilizing ova. They complete their maturation process and become fertile as they move through the epididymis. Mature sperm are stored in the lower portion, or tail, of the epididymis



# spermatic cord

- contains the proximal ductus deferens, testicular artery and veins, lymph vessels, testicular nerve, cremaster muscle and a connective tissue covering.

# Duct System

- Sperm cells pass through a series of ducts to reach the outside of the body. After they leave the testes, the sperm passes through the epididymis, ductus deferens, ejaculatory duct, and urethra.

# Ductus Deferens [vas deferens]

- a fibromuscular tube that is continuous with the epididymis.
- enters the abdominopelvic cavity through the inguinal canal and passes along the lateral pelvic wall, behind bladder & toward the prostate gland. Just before it reaches the prostate gland, each ductus deferens enlarges to form an ampulla.
- Sperm are stored in the proximal portion of the ductus deferens, near the epididymis

# Ejaculatory Duct

- Each ductus deferens, at the [ampulla](#), joins the duct from the adjacent seminal vesicle (one of the accessory glands) to form a short ejaculatory duct.
- Each ejaculatory duct passes through the prostate gland and empties into the urethra.

# Urethra

- extends from the urinary bladder to the external urethral orifice at the tip of the penis.
- It is a passageway for sperm and fluids from the reproductive system and urine from the urinary system.
- divided into three regions: The prostatic urethra, the membranous urethra & the penile urethra (also called spongy urethra or cavernous urethra)

# accessory glands

- are the seminal vesicles, prostate gland, and the bulbourethral glands. These glands secrete fluids that enter the urethra.





# Seminal Vesicles

- glands posterior to the urinary bladder.
- Each has a short duct that joins with the ductus deferens at the ampulla to form an ejaculatory duct, which then empties into the urethra.
- The fluid is viscous and contains fructose, prostaglandins and proteins.

# Prostate

- a firm, dense structure about the size of a walnut that is located just inferior to the urinary bladder.
- encircles the urethra as it leaves the urinary bladder.
- Numerous short ducts from the prostate gland empty into the prostatic urethra. The secretions of the prostate are thin, milky colored, and alkaline. They function to enhance the motility of the sperm.

# Bulbourethral Glands (Cowper's)

- small, about the size of a pea, and located near the base of the penis. A short duct from each enters the proximal end of the penile urethra.
- In response to sexual stimulation, the bulbourethral glands secrete an alkaline mucus-like fluid

# penis

- is a cylindrical pendant organ located anterior to the scrotum and functions to transfer sperm to the vagina.
- consists of three columns of erectile tissue that are wrapped in connective tissue and covered with skin. The two dorsal columns are the **corpora cavernosa**. The single, midline ventral column surrounds the urethra and is called **the corpus spongiosum**.

# penis

- 3 parts: a root, body (shaft), and glans penis.
- The root of the penis attaches it to the pubic arch
- the body is the visible, pendant portion.
- The corpus spongiosum expands at the distal end to form the glans penis.
- The urethra, which extends throughout the length of the corpus spongiosum, opens through the external urethral orifice at the tip of the glans penis. A loose fold of skin, called the prepuce, or foreskin, covers the glans penis.