MEDICAL EDUCATION RESOURCE

Male External Genital Organ

? Introduction

- The **male external genital organs** include:
    1. **Penis**
    2. **Scrotum**
    3. **Testes** (partly external)
    4. **Spermatic cords**
- These structures lie in the **perineal region**, anterior to the pubic symphysis.
- Functionally associated with **urination** and **sexual intercourse**.

? Dissection Notes

- Identify the **penis**, **scrotum**, and **spermatic cord** emerging from the **superficial inguinal ring**.
- Reflect the skin to observe:
    - **Superficial fascia of penis (Dartos fascia)**

- **Deep fascia (Buck’s fascia)** enclosing erectile tissues and vessels.

- Expose the **three erectile bodies** and trace the **urethra** running within the corpus spongiosum.

? Penis

Structure

- Composed of **root**, **body**, and **glans penis**.
- Consists of **three erectile masses** enclosed in a fascial sheath:
  1. **One corpus spongiosum** (contains urethra).
  2. **Two corpora cavernosa** (main erectile tissues).

? Root of Penis

- **Fixed part**, attached to the **perineal membrane**.
- Formed by:
  - **Bulb of penis** (posterior enlargement of corpus spongiosum).
  - **Two crura of penis** (posterior ends of corpora cavernosa).

Muscles covering root:

- **Bulbospongiosus** ? covers bulb; aids in ejaculation and emptying urethra.
- **Ischiocavernosus** ? covers each crus; compresses veins to maintain erection.

Relations:

- Lies between **perineal membrane** (superiorly) and **superficial perineal fascia** (inferiorly).
- Traversed by **urethra** within corpus spongiosum.

? Body of Penis

- The **free pendulous portion** extending from the root to the glans.
- Enclosed by **deep fascia (Buck's fascia)**, which binds the erectile tissues together.

Components:

1. **Two corpora cavernosa** — dorsal position, surrounded by tough **tunica albuginea**.
2. **One corpus spongiosum** — ventral position, enclosing the **spongy urethra**.

Blood supply:

- From **deep arteries of penis** (branches of internal pudendal artery).
- **Dorsal arteries** run on each side of deep dorsal vein.

Venous drainage:

- **Superficial dorsal vein** ? external pudendal vein.
- **Deep dorsal vein** ? prostatic venous plexus.

Nerve supply:

- **Sensory:** Dorsal nerve of penis (from pudendal).
- **Parasympathetic (S2–S4):** Erection via pelvic splanchnic nerves.
- **Sympathetic (L1–L2):** Ejaculation and detumescence.

? Histology of the Body of Penis

- Each corpus (cavernosum or spongiosum) contains **trabeculae of smooth muscle and connective tissue**, enclosing **blood-filled cavernous spaces**.
- **Tunica albuginea** is thick around corpora cavernosa, thin around corpus spongiosum.
- The **central lumen of corpus spongiosum** is the **urethra**, lined by **stratified columnar epithelium**, becoming **stratified squamous near meatus**.
- **Endothelial-lined vascular spaces** fill with blood during erection, leading to rigidity.

? Glans Penis

- Expanded distal end of corpus spongiosum covering the tips of corpora cavernosa.
- Contains **external urethral meatus** at its summit.

- Margin projects as the **corona glandis**, separated by the **neck** from the body.
- **Prepuce (foreskin):** Fold of skin covering glans; attached by **frenulum preputii**.

?? Clinical Anatomy

1. Phimosis:

- Prepuce too tight ? cannot retract over glans.
- May cause **pain, infection**, and **urinary obstruction**.

2. Paraphimosis:

- Retracted tight foreskin constricts glans ? **venous congestion and pain**.

3. Hypospadias:

- Urethral opening on **ventral surface** of penis (due to incomplete urethral fold fusion).

4. Epispadias:

- Urethral opening on **dorsal surface**, often with **bladder exstrophy**.

5. Priapism:

- Prolonged painful erection due to venous drainage failure.

6. Circumcision:

- Surgical removal of prepuce; prevents infection and carcinoma.

7. Carcinoma Penis:

- Common in **uncircumcised males**; spreads via **inguinal lymph nodes**.

8. Erectile Dysfunction:

- Failure of parasympathetic-mediated vasodilation in penile arteries.

? Scrotum

- The **scrotum** is a **cutaneous pouch** that contains the **testes**, **epididymides**, and **lower parts of spermatic cords**.
- It is divided into **right and left compartments** by a **median septum**, visible externally as the **raphe**.

Layers of the Scrotum

From superficial to deep:

1. **Skin** – thin, pigmented, rich in sweat and sebaceous glands.
2. **Superficial fascia (Dartos fascia)** – contains **smooth muscle fibres** (dartos muscle) but **no fat**.
    - Responsible for **wrinkling of scrotal skin** and **thermoregulation**.
3. **External spermatic fascia** – from **external oblique aponeurosis**.
4. **Cremasteric fascia and muscle** – from **internal oblique**; raises the testis.

5. **Internal spermatic fascia** – from **fascia transversalis**.
6. **Tunica vaginalis** – serous sac around testis (parietal and visceral layers).

Nerve Supply

- **Anterior one-third:** L1 (ilioinguinal + genital branch of genitofemoral).
- **Posterior two-thirds:** S3 (pudendal and perineal branches of posterior cutaneous nerve of thigh).

Blood Supply

- **Arteries:** External pudendal, internal pudendal, and cremasteric arteries.
- **Veins:** Follow arteries and drain into external pudendal veins.

Lymphatics

- Drain into **superficial inguinal lymph nodes**.

?? Clinical Anatomy of Scrotum

- **Scrotal oedema:** Due to dependent position and loose areolar tissue.
- **Sebaceous cysts:** Common due to rich sebaceous glands.
- **Difficult anaesthesia:** Supplied by distant dermatomes (L1 and S3).
- **Hydrocele:** Fluid accumulation in **tunica vaginalis**; may be:

    - **Vaginal, Infantile, Congenital, or Encysted.**

- **Procedure of tapping hydrocele:** Needle passes through
  skin ? dartos ? external spermatic fascia ? cremasteric fascia ? internal spermatic fascia ? parietal tunica vaginalis

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- **Other scrotal conditions:** Tumour, epididymitis, varicocele, spermatocele.

? Testis

- **Male gonad** homologous with the **ovary**.
- Suspended in the **scrotum** by the **spermatic cord**.
- **Left testis** lies slightly **lower** than the right.

Shape and Size

- Oval, slightly compressed laterally.
- **3.75 cm long**, **2.5 cm broad**, **1.8 cm thick**.
- **Weight:** 10–15 g.

Coverings

1. **Tunica vaginalis** – parietal and visceral layers (from processus vaginalis).

2. **Tunica albuginea** – dense white fibrous capsule forming **mediastinum testis**.
3. **Tunica vasculosa** – innermost vascular coat.

? Internal Structure

- Testis divided by septa into **200–300 lobules**.
- Each lobule contains **2–3 seminiferous tubules** (each ~60 cm long if uncoiled).
- Tubules unite to form **straight tubules ? rete testis ? efferent ductules ? epididymis**

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? Arterial Supply

- **Testicular artery** — branch of abdominal aorta at L2 level.
- Accompanied by **pampiniform plexus of veins**, which form the **testicular vein**:
  - **Right** ? drains into **inferior vena cava**.
  - **Left** ? drains into **left renal vein**

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Lymphatics:

- Drain to **preaortic and para-aortic lymph nodes (L2 level)**.

Nerve Supply:

- **Sympathetic fibres** from **T10** via renal and aortic plexuses.

? Histology of Seminiferous Tubule

- Lined by **4–8 layers** of cells:
    - **Spermatogenic cells** – spermatogonia ? primary ? secondary spermatocytes ? spermatids ? spermatozoa.
    - **Sertoli (sustentacular) cells** – tall, columnar; support, nourish, and regulate developing germ cells.
- **Leydig (interstitial) cells** between tubules ? secrete **testosterone** under control of **ICSH (LH)**.
- **Spermatogenesis** regulated by **FSH**

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?? Clinical Anatomy of Testis

- **Monorchism/Anorchism:** Absence of one or both testes.
- **Cryptorchidism (Undescended Testis):**

    - May lie in lumbar, inguinal, or upper scrotal region.
    - Prone to **malignancy**, **infertility**, and **torsion**.
- **Ectopic Testis:** Deviates from normal descent; may lie in thigh, perineum, or near penis.
- **Varicocele:** Dilated veins of pampiniform plexus (more common on **left**).
- **Torsion of testis:** Twisting of spermatic cord ? acute ischemia.
- **Orchitis:** Inflammation, often post-mumps infection.

? Epididymis

Structure

- Highly **coiled tubular organ**, acts as a **reservoir and site of maturation for spermatozoa**.
- **Parts:**
    - **Head (Caput):** Formed by coiled **efferent ductules**, connected to upper pole of testis.
    - **Body (Corpus):** Middle portion, formed by a **single coiled duct** (duct of epididymis).
    - **Tail (Cauda):** Lower end, continuous with **ductus deferens**.

Vessels and Nerves

- **Arterial supply:** From a **branch of testicular artery**, which anastomoses with the **artery to ductus deferens**.
- **Venous and lymphatic drainage:** Similar to that of the testis.
- **Nerve supply:** Sympathetic fibres from **testicular plexus (T11–L1)**.

Clinical Anatomy

- **Epididymitis / Epididymo-orchitis:** Inflammation due to **tuberculosis, filariasis, gonococcal or pyogenic infections**.
- May present with **painful scrotal swelling**, tenderness, and fever.
- Chronic infection can lead to **fibrosis and infertility**.

Histology

- **Lining:** Pseudostratified **columnar epithelium with stereocilia**.
- **Supporting tissue:** Rich in connective tissue and smooth muscle to aid sperm movement.

? Development of Male Reproductive System

- **Testis** develops from **three sources**:
  - **Spermatogenic cells:** From endoderm of dorsocaudal yolk sac.
  - **Sertoli cells:** From coelomic epithelium.

    - **Leydig cells:** From mesoderm.

- **Descent of Testis:**
    - Develops near mesonephros (T10–T12 level).
    - Begins to descend in **2nd month** of intrauterine life.
    - **3rd month:** Reaches iliac fossa.
    - **4th–6th month:** Lies at deep inguinal ring.
    - **7th month:** Passes through inguinal canal.
    - **8th month:** Reaches superficial inguinal ring.
    - **9th month:** Descends into scrotum.
    - Process guided by **gubernaculum** (fibrous band connecting testis to scrotum).
    - **Processus vaginalis** precedes the testis and later forms **tunica vaginalis**.

Factors aiding descent:

- Hormones (testosterone, maternal gonadotropins)
- Differential growth of body wall
- Action of **gubernaculum**
- Intra-abdominal pressure and temperature changes

Clinical note:

- Failure of descent ? **cryptorchidism** (undescended testis).
- Abnormal route ? **ectopic testis** (e.g., thigh, perineum).

? Ducts Derived from Mesonephric System

- **Mesonephric (Wolffian) duct** forms:
  - Epididymis
  - Ductus deferens
  - Seminal vesicle
  - Ejaculatory duct
  - Trigone of urinary bladder
- **Paramesonephric (Müllerian) duct** ? vestigial **appendix testis**.
- **Mesonephric tubules** ? rete testis, paradidymis, and aberrant ductules.

? External Genitalia Development

- **3rd week:** Mesenchymal cells from primitive streak surround cloacal membrane ? **cloacal folds**.
- **6th week:** Cloacal folds divide into:

    - **Urethral folds (anterior)**
    - **Anal folds (posterior)**
- **Genital swellings** appear lateral to urethral folds.
- Fusion and elongation form **genital tubercle**, giving rise to **penis** in males.

? Molecular Regulation

- **SRY gene** (Sex-determining Region of Y chromosome):
    - Encodes **Testis Determining Factor (TDF)** ? initiates testicular differentiation.
- **SOX9** gene: Works with SRY; activates **Müllerian Inhibiting Substance (MIS)** gene.
- **FGF9 (Fibroblast Growth Factor 9):** Induces mesonephric tubules to form testicular cords.
- **SF1 (Steroidogenic Factor 1):** Promotes differentiation of **Leydig and Sertoli cells**, enhances **AMH** secretion, and stimulates **testosterone synthesis**.
- **Testosterone** ? differentiates **mesonephric duct derivatives** (epididymis, ductus deferens, seminal vesicles).
- **Dihydrotestosterone (via 5?-reductase)** ? forms **male external genitalia**.

Facts to Remember

- The **epididymis** acts as a **reservoir and site of maturation of spermatozoa**; sperm gain motility here.
- It consists of **head, body, and tail**, continuous below with the **ductus deferens**.
- **Sertoli cells** provide support and nutrition to developing sperm cells and secrete **inhibin**.
- **Leydig cells** secrete **testosterone**, the main male sex hormone.
- The **testicular artery** arises directly from the **abdominal aorta** at **L2 level**.
- **Venous drainage** forms the **pampiniform plexus**, which regulates testicular temperature.
- **Lymph from the testis** drains to **preaortic and para-aortic lymph nodes**, not inguinal nodes.
- **Gubernaculum** guides the descent of the testis from abdomen to scrotum.
- The **processus vaginalis** forms the **tunica vaginalis**; if it remains patent, may cause **congenital hydrocele**.
- **Cryptorchidism** (undescended testis) increases risk of **infertility and malignancy**.
- **Mesonephric (Wolffian) duct** gives rise to epididymis, ductus deferens, seminal vesicle, and ejaculatory duct.
- **Paramesonephric (Müllerian) duct** regresses under the influence of **Müllerian Inhibiting Substance (MIS)** secreted by Sertoli cells.

- **SRY gene** on the Y chromosome triggers testicular differentiation via **Testis Determining Factor (TDF)**.
- **Dihydrotestosterone (DHT)** derived from testosterone is responsible for development of **male external genitalia**.
- **Hypospadias** and **epispadias** result from defects in urethral fold fusion and genital tubercle formation.
- **Varicocele** is more common on the **left** due to perpendicular drainage of left testicular vein into the left renal vein.
- **Epididymo-orchitis** can follow mumps or urinary tract infection, leading to infertility.
- **Temperature regulation** is vital; testes are maintained 2–3°C below body temperature for normal spermatogenesis.
- **Cremasteric reflex** serves to protect testis by elevating it during cold or threat.

?? Clinicoanatomical Problems

1. A 20-year-old male presents with painless swelling in the scrotum that transilluminates.
? **Diagnosis:** Hydrocele due to accumulation of fluid in tunica vaginalis.
? **Anatomical reason:** Patent processus vaginalis or imbalance between secretion and absorption of fluid.

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2. A 25-year-old man presents with a “bag of worms” feel in the scrotum, more prominent on standing.
? **Diagnosis:** Varicocele (dilated pampiniform plexus).
? **Cause:** Left testicular vein drains into left renal vein at right angle ? venous stasis.

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3. A 30-year-old patient complains of acute pain and swelling in scrotum with fever.
? **Diagnosis:** Epididymo-orchitis.
? **Cause:** Bacterial infection via vas deferens from urinary tract.
? **Complication:** Fibrosis and sterility.

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4. A 7-year-old boy has an empty scrotum on one side.
? **Diagnosis:** Cryptorchidism (undescended testis).
? **Complication:** Infertility and risk of malignant change.

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5. A 12-year-old boy has testis located in the upper thigh.
? **Diagnosis:** Ectopic testis.
? **Cause:** Abnormal migration of gubernaculum during descent.

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6. A neonate presents with bilateral inguinal swellings that reduce on lying down.
? **Diagnosis:** Congenital inguinal hernia with patent processus vaginalis.

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7. A patient has defective spermatogenesis despite normal hormone levels.
? **Diagnosis:** Sertoli cell dysfunction ? defective spermatogenic support.

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8. A young male has ambiguous genitalia with male gonads and female external genitalia.
? **Diagnosis:** 5?-reductase deficiency.
? **Cause:** Inadequate conversion of testosterone to dihydrotestosterone (DHT).

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9. A 40-year-old man reports dull dragging pain in the scrotum.
? **Diagnosis:** Varicocele causing venous congestion of pampiniform plexus.

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10. A patient complains of infertility with low sperm motility but normal count.
? **Diagnosis:** Epididymal dysfunction ? impaired sperm maturation.

? More Clinicoanatomical Problems

11. A 3-month-old infant presents with a cystic swelling in the spermatic cord above the testis. The swelling transilluminates and is separate from the testis.
? **Diagnosis:** Encysted hydrocele of the cord.
? **Anatomical basis:** Partial persistence of **processus vaginalis** between the internal ring and the upper pole of the testis.

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12. A 22-year-old patient presents with severe pain after sudden twisting of the scrotum during sports.
? **Diagnosis: Torsion of testis.**
? **Anatomical explanation:** Twisting of **spermatic cord** cuts off **testicular artery** and venous drainage ? ischemic necrosis.
? **Note:** More common when **gubernaculum** or **scrotal ligaments** are underdeveloped (bell-clapper deformity).

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13. A 30-year-old man has pain radiating to the groin during urination. Palpation reveals a thickened epididymis.
? **Diagnosis: Tuberculous epididymitis.**
? **Mechanism:** Retrograde spread of infection from prostate or seminal vesicle via **vas deferens**.

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14. A 5-year-old boy's mother notices that one scrotal half enlarges whenever he cries or coughs.
? **Diagnosis: Congenital inguinal hernia.**
? **Cause:** Persistent **processus vaginalis** allows abdominal contents to enter the tunica vaginalis.

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15. A 32-year-old man with mumps develops painful scrotal swelling a week after parotid symptoms.
? **Diagnosis: Mumps orchitis.**
? **Complication: Atrophy of seminiferous tubules** ? possible **infertility** due to destruction of germinal epithelium.

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16. A 25-year-old male has small, firm testes and azoospermia but normal secondary sexual characteristics.

? **Diagnosis: Sertoli-cell-only syndrome (Del Castillo syndrome).**
? **Explanation:** Germinal epithelium absent; only Sertoli cells remain ? infertility with normal testosterone levels.

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17. During inguinal hernia repair, the surgeon accidentally ligates the testicular artery.
? **Outcome:** Testis may **undergo ischemic necrosis**, unless collateral supply from **artery to vas deferens** and **cremasteric artery** maintains perfusion.

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18. A newborn has ambiguous genitalia with partial fusion of the urethral folds and small phallus.
? **Diagnosis: Hypospadias** (glandular or penile type).
? **Cause:** Failure of **urethral folds** to fuse completely in the midline.

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19. A teenage boy complains of a dull, aching scrotal pain that worsens on standing and improves when lying down.
? **Diagnosis: Varicocele.**
? **Anatomical reason:** Vertical drainage of **left testicular vein** into **left renal vein** under pressure ? venous reflux and dilation of pampiniform plexus.

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20. A patient presents with painless, hard swelling in the testis that does not transilluminate.
? **Diagnosis: Testicular tumour.**
? **Clinical importance:** Lymphatic spread is to **para-aortic nodes** at the **L2 level**, not inguinal nodes.

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21. A 7-year-old boy develops an infection in the scrotal skin. Later, the inguinal nodes are enlarged.
? **Explanation:** Scrotal skin drains into **superficial inguinal lymph nodes**, whereas testicular infection would enlarge **para-aortic nodes**.

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22. A 2-year-old child has a swelling that changes in size and position during the day.
? **Diagnosis: Communicating hydrocele.**
? **Cause:** Incomplete obliteration of processus vaginalis communicating with the peritoneal cavity.

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23. An elderly man presents with testicular atrophy after long-term anabolic steroid use.
? **Explanation: Negative feedback inhibition** of pituitary gonadotropins ? decreased **FSH and LH** ? suppressed **Leydig and Sertoli activity**.

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24. A man presents with infertility but normal sperm count; motility is markedly reduced.
? **Diagnosis: Epididymal blockage or ciliary defect.**
? **Reason:** Failure of maturation in **epididymal duct** or defective **stereocilia-mediated absorption** of testicular fluid.

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25. A 45-year-old diabetic patient develops a rapidly spreading necrosis of the scrotum with foul odour and crepitus.
? **Diagnosis: Fournier's gangrene.**
? **Anatomical note:** Involves superficial fascia (Dartos and Colles'), spreading rapidly through **continuous fascial planes**.

? Frequently Asked Questions — Epididymis & Male Reproductive System

1. What are the coverings of the testis?
? From inside outward:

1. **Tunica vasculosa**
2. **Tunica albuginea**
3. **Tunica vaginalis (visceral and parietal layers)**
4. **Internal spermatic fascia**
5. **Cremasteric fascia**
6. **External spermatic fascia**

7. **Dartos fascia and skin**

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2. What are the parts of the epididymis?
? **Head, body, and tail.**

- Head ? receives **efferent ductules**.
- Body ? long coiled **duct of epididymis**.
- Tail ? continuous with **ductus deferens**.

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3. What is the function of the epididymis?
? Maturation, concentration, and storage of spermatozoa; absorption of testicular fluid.

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4. What is the blood supply of the testis?
? **Testicular artery** (from abdominal aorta).
? Accompanied by **pampiniform plexus of veins** forming **testicular vein**.

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5. Why is the left testis lower than the right?
? Because the **left spermatic cord is longer**.

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6. Why is temperature lower in the scrotum than in the body cavity?
? For **spermatogenesis**; maintained by **pampiniform plexus** and **dartos muscle thermoregulation**.

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7. What is the lymphatic drainage of the testis and scrotum?
? **Testis:** Preaortic and para-aortic nodes (L2).
? **Scrotum:** Superficial inguinal nodes.

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8. What is the difference between hydrocele and varicocele?
? **Hydrocele:** Fluid in tunica vaginalis.
? **Varicocele:** Dilated veins of pampiniform plexus.

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9. What are the causes of undescended testis (cryptorchidism)?

? Defective gubernaculum, hormonal deficiency, or obstruction in inguinal canal.

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10. What is the function of Sertoli cells?

? Nourish and protect developing sperm; secrete **inhibin** and **androgen-binding protein (ABP)**.

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11. What is the function of Leydig cells?

? Secrete **testosterone** under **LH (ICSH)** control.

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12. What is the homologous organ of testis in females?

? **Ovary.**

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13. What is the processus vaginalis?

? Peritoneal diverticulum descending with testis; forms **tunica vaginalis** when closed.

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14. What is the difference between cryptorchidism and ectopic testis?

? **Cryptorchidism:** Testis arrested in normal path of descent.

? **Ectopic testis:** Testis deviates to an abnormal position (perineum, thigh, etc.).

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15. What are the derivatives of the mesonephric (Wolffian) duct?

? Epididymis, ductus deferens, seminal vesicle, and ejaculatory duct.

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16. What are the derivatives of the paramesonephric (Müllerian) duct in males?

? **Appendix testis** and **prostatic utricle.**

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17. What guides the descent of the testis?

? **Gubernaculum testis**, a fibrous cord connecting testis to scrotal wall.

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18. What hormones influence testicular descent?

? **Testosterone**, **maternal gonadotropins**, and **Müllerian inhibiting substance (MIS).**

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19. What is the role of the SRY gene?

? Triggers testicular differentiation via **Testis Determining Factor (TDF)**.

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20. What happens if the SRY gene is absent?

? Gonads develop as **ovaries** (female differentiation).

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21. What is hypospadias?

? Urethral opening on the **ventral surface** of penis due to failure of urethral fold fusion.

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22. What is epispadias?

? Urethral opening on the **dorsal surface** of penis, usually associated with **bladder exstrophy** .

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23. What is the difference between spermatic cord and vas deferens?

? **Spermatic cord** contains **vas deferens**, vessels, nerves, and fascial coverings; **vas deferens** is just one of its components.

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24. Why is testicular tumour dangerous?

? Lymph spreads **retroperitoneally** to para-aortic nodes near **L2**, often unnoticed until late.

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25. What is the function of Dihydrotestosterone (DHT)?

? Responsible for development of **male external genitalia** (penis, scrotum, prostate).

? Multiple Choice Questions — Epididymis and Male Reproductive System

1. The epididymis is derived from:

a. Paramesonephric duct

b. Mesonephric tubules and duct

c. Cloacal folds

d. Mesonephric duct ?

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2. The testicular artery arises from:

a. External iliac artery

b. Internal iliac artery

c. Abdominal aorta ?

d. Inferior epigastric artery

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3. Lymph from the testis drains into:

a. Superficial inguinal nodes

b. Deep inguinal nodes

c. Para-aortic (lumbar) nodes ?

d. External iliac nodes

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4. The left testicular vein drains into:

a. Inferior vena cava

b. Left renal vein ?

c. Common iliac vein

d. Internal iliac vein

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5. The function of the epididymis is:

a. Secretion of testosterone

b. Storage and maturation of spermatozoa ?

c. Production of seminal fluid

d. Spermatogenesis

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6. Which of the following structures prevents the descent of the testis in ectopic testis?

a. Tunica vaginalis

b. Gubernaculum abnormality ?

c. Processus vaginalis

d. Dartos muscle

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7. The processus vaginalis of peritoneum gives rise to:

a. Tunica albuginea

b. Tunica vaginalis ?

c. Dartos fascia

d. Cremasteric fascia

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8. Which of the following cells secrete testosterone?

a. Sertoli cells

b. Leydig cells ?

c. Germ cells

d. Spermatogonia

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9. Which hormone is responsible for the development of male external genitalia?

a. Testosterone

b. Dihydrotestosterone (DHT) ?

c. Estrogen

d. Müllerian inhibiting substance

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10. The epididymis continues below as:

a. Ejaculatory duct

b. Ductus deferens ?

c. Rete testis

d. Seminal vesicle

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11. The failure of closure of processus vaginalis results in:

a. Varicocele

b. Epididymitis

c. Congenital hydrocele or hernia ?

d. Torsion of testis

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12. Which of the following does *not* pass through the spermatic cord?

a. Vas deferens

b. Testicular artery

c. Ilioinguinal nerve ?

d. Pampiniform plexus

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13. The cremasteric muscle is derived from:

a. External oblique

b. Internal oblique ?

c. Transversus abdominis

d. Rectus abdominis

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14. Which of the following represents the female homologue of the testis?

a. Clitoris

b. Labia majora

c. Ovary ?

d. Vestibule

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15. In descent of testis, the structure that guides its movement is:

a. Gubernaculum ?

b. Dartos fascia

c. Processus vaginalis

d. Pampiniform plexus

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16. Which of the following is derived from the paramesonephric duct in the male?

a. Epididymis

b. Ductus deferens

c. Appendix testis ?

d. Ejaculatory duct

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17. Which of the following structures is *not* derived from the mesonephric duct?

a. Epididymis

b. Ductus deferens

c. Prostatic utricle ?

d. Ejaculatory duct

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18. The scrotal raphe represents:

a. Site of gubernaculum attachment

b. Line of fusion of labioscrotal swellings ?

c. Line of descent of testis

d. Fusion of urethral folds

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19. In hypospadias, the external urethral opening is present:

a. At the tip of glans

b. On ventral surface of penis ?

c. On dorsal surface of penis

d. On perineum

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20. In epispadias, the urethral opening is present:

a. On ventral surface of penis

b. On dorsal surface of penis ?

c. In perineum

d. On scrotum

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21. The main venous structure involved in varicocele is:

a. Cremasteric vein

b. Deep dorsal vein

c. Pampiniform plexus ?

d. External pudendal vein

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22. The gene responsible for testis differentiation is:

a. SRY gene on Y chromosome ?

b. SOX9 gene

c. SF1 gene

d. DAX1 gene

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23. Which of the following regulates the secretion of testosterone?

a. Luteinizing hormone (ICSH) ?

b. Follicle-stimulating hormone

c. ACTH

d. Thyroxine

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24. The first structure formed during testicular descent is:

a. Processus vaginalis ?

b. Tunica albuginea

c. Epididymis

d. Dartos fascia

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25. Failure of descent of testis into scrotum is known as:

a. Cryptorchidism ?

b. Ectopic testis

c. Hydrocele

d. Varicocele

? Key MCQ Focus Areas

- Developmental derivatives (Wolffian vs Müllerian)
- Descent and coverings of testis
- Hormonal and genetic control (SRY, DHT, MIS)
- Clinical correlations (cryptorchidism, hydrocele, varicocele, hypospadias)
- Microscopic and vascular anatomy

? Viva Voce — Epididymis & Male Reproductive System

1. What are the coverings of the testis?

? Tunica vasculosa, tunica albuginea, tunica vaginalis, internal spermatic fascia, cremasteric fascia, external spermatic fascia, dartos fascia, and skin.

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2. What is the function of the epididymis?

? Storage, maturation, and transport of spermatozoa; absorption of testicular fluid.

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3. Which part of the epididymis continues as the vas deferens?

? The **tail (cauda)**.

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4. What is the function of Sertoli cells?

? Support and nourish developing sperm; form the **blood–testis barrier**; secrete **inhibin** and **androgen-binding protein (ABP)**.

5. What is the function of Leydig cells?

? Secrete **testosterone** under the influence of **luteinizing hormone (ICSH)**.

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6. What is the blood supply of the testis?

? **Testicular artery** (from the abdominal aorta) and veins forming the **pampiniform plexus**.

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7. What is the lymphatic drainage of the testis?

? To **preaortic and para-aortic lymph nodes** at the level of **L2**.

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8. What is the lymphatic drainage of the scrotum?

? To **superficial inguinal lymph nodes**.

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9. What is the nerve supply of the scrotum?

? **Anterior:** Ilioinguinal and genital branch of genitofemoral nerve.

? **Posterior:** Pudendal and posterior cutaneous nerve of thigh.

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10. Why is the testis located in the scrotum?

? To maintain a temperature **2–3°C below body temperature**, which is optimal for spermatogenesis.

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11. What is the significance of the pampiniform plexus?

? Acts as a **countercurrent heat exchanger**, cooling arterial blood to maintain testicular temperature.

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12. What is cryptorchidism?

? Failure of one or both testes to descend into the scrotum.

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13. What is ectopic testis?

? Testis deviated to an abnormal site outside its usual path of descent (thigh, perineum, etc.).

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14. What is the gubernaculum testis?

? A fibrous cord guiding descent of the testis from posterior abdominal wall to scrotum.

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15. What is the processus vaginalis?

? A peritoneal diverticulum that precedes the testis during descent and later forms **tunica vaginalis**.

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16. What is the homologous structure of the testis in females?

? **Ovary**.

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17. What is the homologous structure of the scrotum in females?

? **Labia majora**.

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18. What is the homologous structure of the penis in females?

? **Clitoris**.

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19. What are the derivatives of the mesonephric (Wolffian) duct in males?

? Epididymis, ductus deferens, seminal vesicle, and ejaculatory duct.

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20. What are the derivatives of the paramesonephric (Müllerian) duct in males?

? Appendix testis and prostatic utricle (vestigial remnants).

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21. What hormone causes regression of the Müllerian duct in males?

? **Müllerian Inhibiting Substance (MIS)** from **Sertoli cells**.

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22. What is the gene responsible for testis formation?

? **SRY gene** on the Y chromosome, producing **Testis Determining Factor (TDF)**.

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23. What is the function of Dihydrotestosterone (DHT)?

? Development of **male external genitalia** (penis, scrotum, prostate).

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24. What is hypospadias?

? Urethral opening on the **ventral surface of the penis** due to failure of urethral fold fusion.

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25. What is epispadias?

? Urethral opening on the **dorsal surface**, often associated with **bladder exstrophy**.

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26. Why is varicocele more common on the left side?

? Left testicular vein drains into **left renal vein** at right angle, causing higher venous pressure.

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27. What is torsion of the testis?

? Twisting of the spermatic cord ? obstruction of blood flow ? ischemia and necrosis.

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28. What is hydrocele?

? Accumulation of serous fluid in the **tunica vaginalis** around the testis.

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29. What is the difference between infantile and congenital hydrocele?

? **Infantile:** Processus vaginalis closed at internal ring but patent distally.

? **Congenital:** Processus vaginalis communicates with peritoneal cavity.

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30. What is the effect of failure of testicular descent on fertility?

? High intra-abdominal temperature damages germinal epithelium ? **infertility** and increased risk of **malignancy**.