PIPADOR REVISION

# MRCOG Part 1 Revision Notes

## *Development of the Urethra*

EMBRYOLOGY • LECTURE 58

VISUAL EXAMINATION REVISION NOTES

*2026 Edition*

MRCOG Part 1 Revision Notes

# Lecture 58: Development of the Urethra

*Embryology • Visual revision edition*

COLOUR CODE USED THROUGHOUT THESE NOTES

| PELVIC SINUS | PHALLIC SINUS / FOLDS | GLANS TIP | GLANDS | HORMONES / CLINICAL |
|---|---|---|---|---|

**LEARNING OBJECTIVES — tick off as you go**

- ☐ Describe the origin of the female urethra and the three parts of the male urethra.
- ☐ Explain penile urethra formation and the role of DHT.
- ☐ Know the urethral glands and their homologues.
- ☐ Recognise hypospadias, epispadias, posterior urethral valves and urethral diverticulum.
- ☐ Apply to UTI, stress incontinence, DSD (CAH, 5α-reductase deficiency) and urethral trauma.

## 1 Origins

**IN ONE LINE:** *Female urethra = the pelvic urogenital sinus (all of it). Male urethra = pelvic sinus + phallic sinus + a glans tip.*

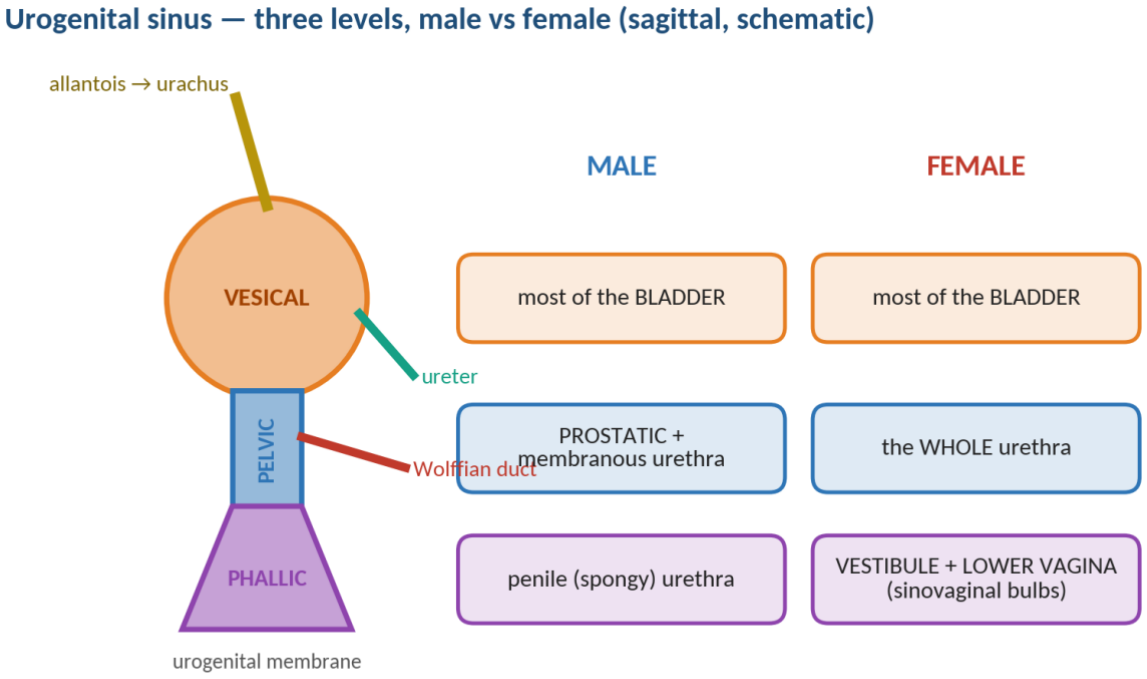



*Figure 1. The urogenital sinus (from Lecture 56).*

- **Female**: ~3–4 cm, opens into the vestibule between clitoris and vagina; lining **endoderm**, smooth muscle **splanchnic mesoderm**, striated external sphincter from mesoderm of the urogenital diaphragm.

## 2 The Male Urethra

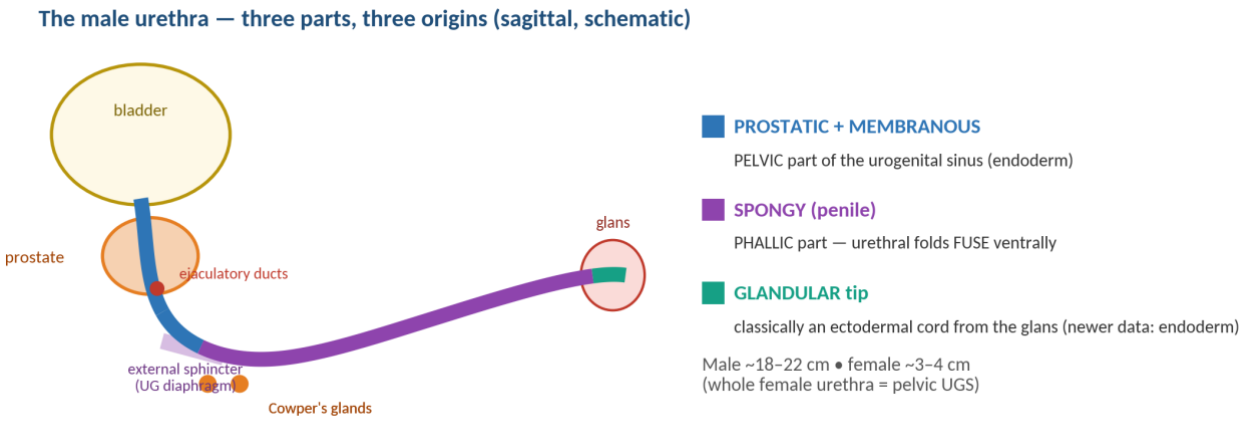



*Figure 2. Three parts, three origins.*

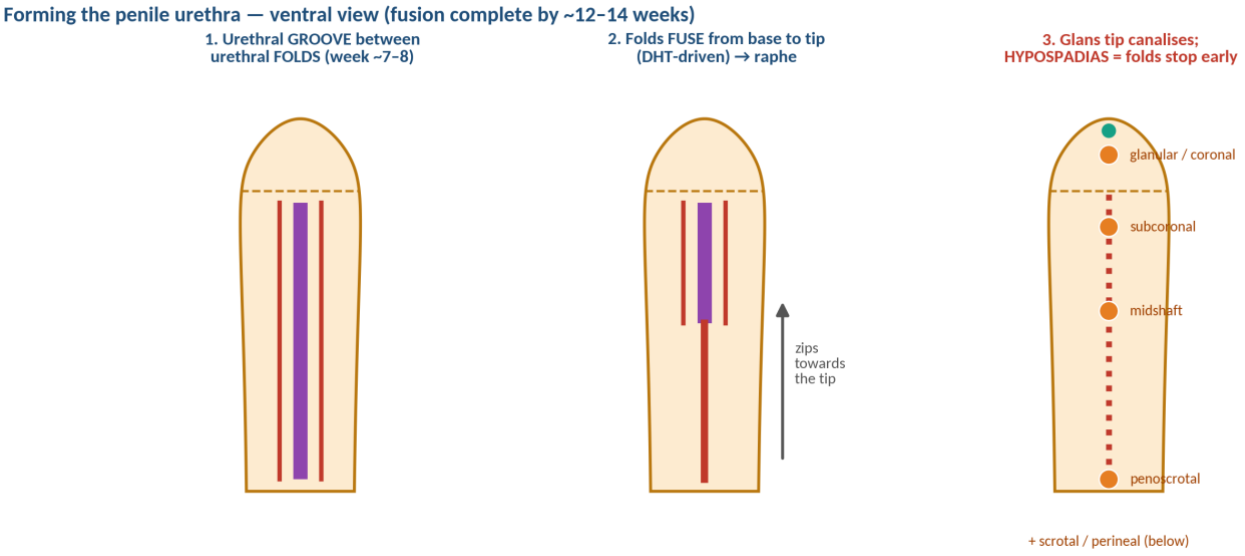



*Figure 3. Urethral folds fuse from base to tip.*

**EXAM HOOK**

**DHT** (testosterone → **5α-reductase**) drives urethral-fold fusion — complete by **~12–14 weeks**. Failure → **hypospadias**.

## 3 Glands and Homologues

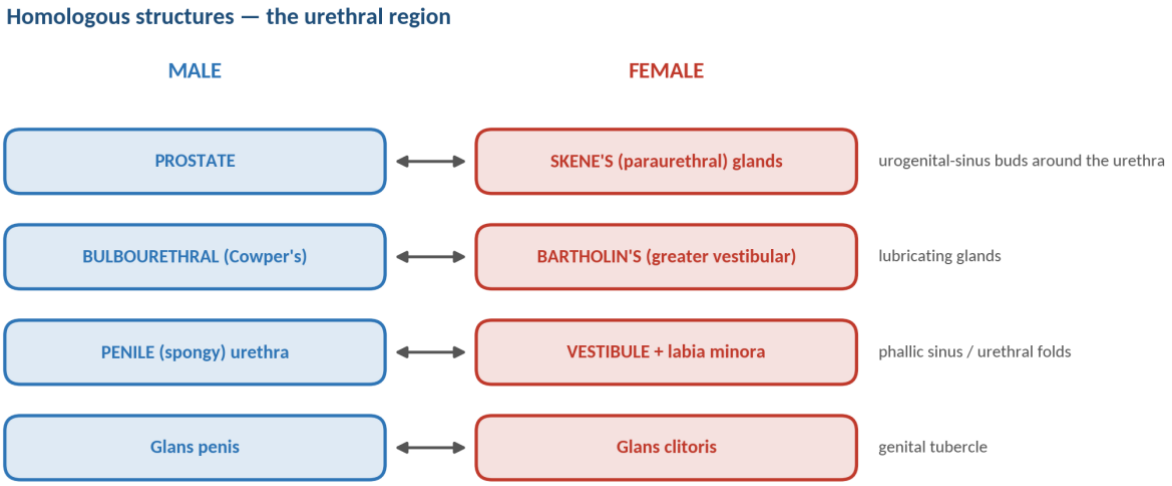



*Figure 4. Male–female homologues.*

- **Skene's glands** bud from the **urogenital sinus** around the urethra — the female **prostate** homologue (not Wolffian). **Bartholin's** = bulbourethral (Cowper's) homologue.

> **MNEMONIC / MEMORY HOOK**
>
> **'Prostate–Paraurethral, Cowper–Bartholin'** — pair P with P (paraurethral = Skene's), C with B.

## 4 Congenital Anomalies

| Anomaly | Key points |
|---|---|
| **Hypospadias** | Folds fail to fuse → meatus on the ventral penis; ~1 in 200–300 boys. Distal (glanular/coronal/subcoronal) most common; proximal (penoscrotal, scrotal, perineal) often with chordee. Risk: prematurity/FGR, IVF, family history, possibly endocrine disruptors. Repair ~6–18 months — no circumcision first (foreskin used for repair). Proximal hypospadias or with undescended testis → DSD work-up |
| **Epispadias** | Meatus on the dorsal penis (female: bifid clitoris, meatus above); rare (~1 in 100 000+); part of the exstrophy–epispadias complex |
| **Posterior urethral valves** | Commonest cause of bladder outflow obstruction in newborn boys — megacystis, keyhole sign, bilateral hydroureteronephrosis, oligohydramnios → pulmonary hypoplasia, renal dysplasia |
| **Urethral atresia** | Complete failure of canalisation — severe early outflow obstruction |
| **Urethral diverticulum** | Mainly women — infected periurethral (Skene's) gland; dysuria, dribbling, dyspareunia, recurrent UTI, tender anterior vaginal mass |
| **Chordee** | Ventral bend from fibrous tissue along the urethral plate |

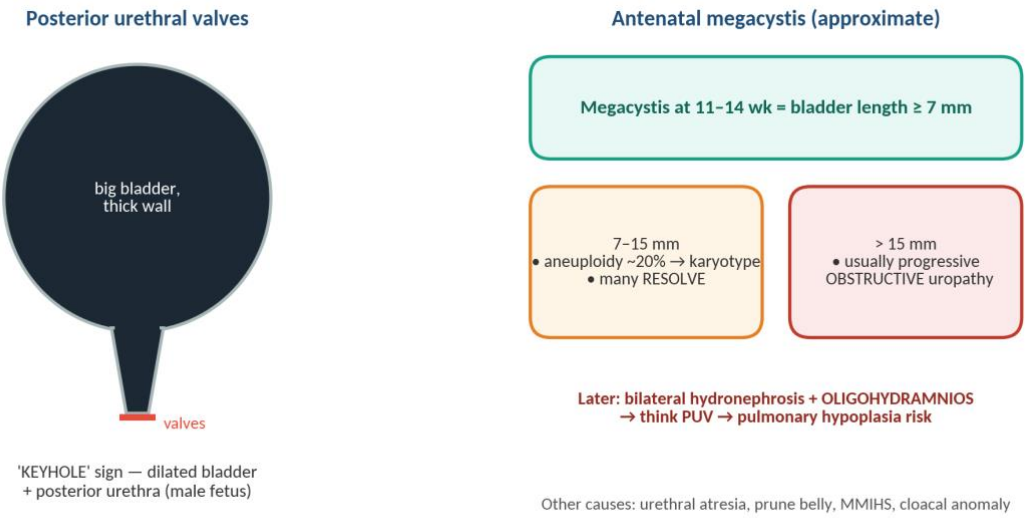



*Figure 5. Megacystis and posterior urethral valves (from Lecture 56).*

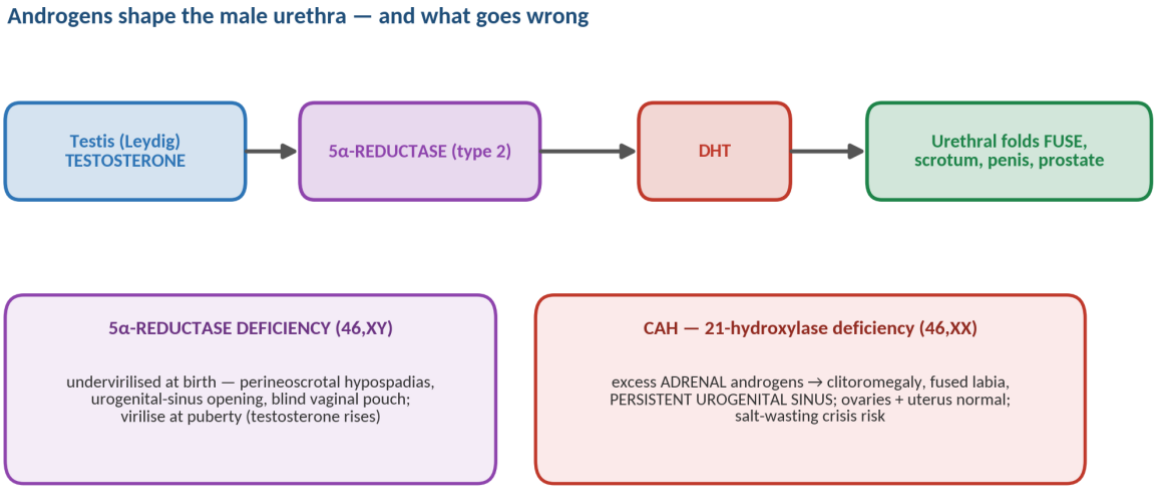



*Figure 6. Androgens and the urethra — DSD links.*

## 5 Clinical Correlates

### UTI IN WOMEN

- **Short urethra** near the vulva and anus
- Pregnancy: progesterone-related dilatation + pressure → more **asymptomatic bacteriuria** and pyelonephritis — screen at booking

### STRESS INCONTINENCE (NICE NG123)

- Childbirth damage to urethral support and sphincter
- **Supervised pelvic floor training ≥ 3 months** first
- Surgery: colposuspension, autologous fascial sling, bulking agents; mid-urethral **mesh** tapes now used only under strict conditions in the UK

### ANTENATAL OBSTRUCTION

- Male fetus + megacystis + keyhole + oligohydramnios → **PUV**
- Karyotype if other anomalies; vesico-amniotic shunt in selected cases

### TRAUMA + STRICTURE

- Female: obstetric or surgical injury
- Male: pelvic fracture → **membranous** urethra; straddle injury → **bulbar** urethra; iatrogenic

★ PEARL

**Hypospadias = ventral, epispadias = dorsal** (and epispadias goes with bladder exstrophy).

**Severe hypospadias with impalpable testes** may be a virilised 46,XX baby with **CAH** — don't just book a repair; investigate urgently.

## 6 MRCOG Exam Pearls — Last-Minute Page

**Numbers to know**

| | | | |
|---|---|---|---|
| **3–4 cm**<br>Female urethra | **18–22 cm**<br>Male urethra | **12–14 wk**<br>Fold fusion complete | **~1 in 250**<br>Hypospadias |
| **6–18 mo**<br>Hypospadias repair | **1:100 000+**<br>Epispadias | **3**<br>Parts of male urethra | **≥ 3 mo**<br>Pelvic floor training first |

**HIGH-YIELD CHECKLIST**

- ☐ Female urethra = pelvic urogenital sinus; ~3–4 cm.
- ☐ Male: prostatic + membranous (pelvic sinus), spongy (phallic sinus), glans tip.
- ☐ Urethral folds fuse base → tip under DHT, by ~12–14 weeks.
- ☐ Hypospadias ventral, epispadias dorsal (exstrophy).
- ☐ Proximal hypospadias ± undescended testes → DSD work-up; no circumcision before repair.
- ☐ Prostate ↔ Skene's; Cowper's ↔ Bartholin's.
- ☐ PUV: commonest newborn male outflow obstruction; keyhole sign.
- ☐ 5α-reductase deficiency: undervirilised 46,XY; CAH: virilised 46,XX with UG sinus.
- ☐ Urethral diverticulum: dysuria, dribbling, dyspareunia.
- ☐ SUI: pelvic floor first; mesh restricted.

**Self-assessment** — cover the right-hand column

| Question | Answer |
|---|---|
| **Origin of the whole female urethra?** | Pelvic part of the urogenital sinus |
| **Origin of the male spongy urethra?** | Phallic sinus — fusion of the urethral folds |
| **Hormone needed for urethral-fold fusion?** | DHT (via 5α-reductase) |
| **Where is the meatus in hypospadias?** | Ventral (underside) of the penis |
| **Anomaly associated with epispadias?** | Bladder exstrophy |
| **Female homologue of the prostate?** | Skene's (paraurethral) glands |
| **Female homologue of Cowper's glands?** | Bartholin's glands |
| **Antenatal features of PUV?** | Megacystis, keyhole sign, hydronephrosis, oligohydramnios |
| **Effect of CAH on a 46,XX fetus?** | Virilisation, clitoromegaly, persistent urogenital sinus |
| **Classic triad of urethral diverticulum?** | Dysuria, dribbling, dyspareunia |

## 7 References


- Sadler TW. Langman's Medical Embryology. 14th ed. 2019.
- NICE NG123. Urinary incontinence and pelvic organ prolapse in women. 2019.
- Society for Endocrinology UK guidance on initial evaluation of an infant with suspected DSD. 2021.