

Emryology tables

1 - Development of the **urinary system**

Adult Anatomical Part	Corresponding Embryological Origin
Excretory units of the kidney (Nephrons: Bowman's capsule, PCT, Loop of Henle, DCT)	Metanephric cap (caudal part of intermediate mesoderm),.
Collecting system of the kidney (Ureter, renal pelvis, calyces, and collecting tubules)	Ureteric bud (a diverticulum from the lower mesonephric duct).
Major part of the urinary bladder	Vesico-urethral canal (endodermal part of the primitive urogenital sinus),.
Trigone of the urinary bladder	Absorbed lower parts of the mesonephric ducts (mesodermal).
Coats of the urinary bladder (Muscular and serous layers)	Splanchnic mesoderm.
Median umbilical ligament	Urachus (a fibrous cord derived from the constricted allantois).
Male Prostatic Urethra (Supracollicular part)	Vesico-urethral part of the urogenital sinus (except the dorsal wall),.
Male Prostatic Urethra (Infracollicular part)	Pelvic part of the urogenital sinus,.
Male Membranous Urethra	Pelvic part of the urogenital sinus,.
Male Penile (Spongy) Urethra	Phallic part of the urogenital sinus (except the terminal part),.
Male Terminal Urethra (within the glans penis/navicular fossa)	Ectodermal ingrowths (canalized glandular plate),.
Female Urethra	Vesico-urethral canal (except the dorsal wall),.
Dorsal wall of Female Urethra (and supracollicular male prostatic urethra)	Absorbed lower parts of the mesonephric ducts (mesodermal),,.
Lower 2/5 of the Vagina and Vestibule	Pelvic and phallic parts of the urogenital sinus.
Vas deferens, Seminal vesicle, and Ejaculatory duct	Mesonephric (Wolffian) ducts.
Efferent ductules of the testis	Mesonephric tubules.

Key Developmental Insights

- **Germ Layer Origins:** The male and female urethra are predominantly **endodermal** in origin, with specific exceptions being the **mesodermal** dorsal walls (from absorbed mesonephric ducts) and the **ectodermal** terminal part of the male penile urethra,.
 - **The Metanephros:** The permanent kidney (metanephros) begins development in the **sacral region** and must undergo a significant **ascent** into the abdomen, accompanied by a **90-degree medial rotation** of the hilum,,.
 - **The Cloaca:** This endodermal dilatation is partitioned by the **urorectal septum** into a ventral **primitive urogenital sinus** and a dorsal **anorectal canal**,. The urogenital sinus further differentiates into the vesico-urethral canal, the pelvic part, and the phallic part to form the various segments of the bladder and urethra,,.
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2 – development of the **genital system**

Adult Part	Corresponding Embryological Part
Gonads (General: Testis/Ovary)	Proliferating coelomic epithelium, adjacent mesenchyme, and primordial germ cells.
Sertoli cells	Coelomic epithelium (mesodermal).
Leydig cells	Subjacent mesenchyme.
Spermatogonia / Primary Oocytes	Primordial germ cells (endodermal) from the yolk sac.
Seminiferous tubules	Primary sex cords (from coelomic epithelium).
Ovarian follicles	Secondary (cortical) sex cords (from coelomic epithelium).
Uterine (Fallopian) tube	Cranial and middle parts of the paramesonephric (Mullerian) ducts .
Uterus	Caudal vertical parts (uterovaginal canal) of fused paramesonephric ducts.
Upper 3/5 of the Vagina	Lower part of the uterovaginal canal (mesodermal).
Lower 2/5 of the Vagina	Vaginal plate derived from the Mullerian tubercle (endodermal).
Vaginal vestibule	Definitive urogenital sinus (endodermal).
Male Genital Ducts (Vas deferens, etc.)	Mesonephric (Wolffian) ducts .
Appendix of the testis	Cranial end of the paramesonephric duct.
Prostatic utricle	Caudal fused parts of the paramesonephric ducts.
Penis / Clitoris (Corpora cavernosa)	Genital tubercle (phallus).
Penis (Corpus spongiosum)	Genital (urethral) folds .
Penile Urethra (Penile part)	Urethral plate (endodermal).
Scrotum	Fused genital (labio-scrotal) swellings .
Labia majora	Separate genital swellings .
Labia minora	Separate genital (urethral) folds .
Gubernaculum (Testis/Ovary)	Caudal part of the genital mesentery .
Ligament of the ovary	Middle part of the ovarian gubernaculum.
Round ligament of the uterus	Middle part of the ovarian gubernaculum.
Broad ligaments of the uterus	Transverse folds of peritoneum .

Key Developmental Notes

- **Indifferent Stage:** Up to the **6th or 7th week**, the gonads and external genitalia cannot be differentiated by sex.
- **Hormonal Control:** In males, **Mullerian Inhibitory Factor (M.I.F)** from Sertoli cells causes paramesonephric ducts to regress, while **testosterone** from Leydig cells promotes mesonephric duct development and male external genitalia.
- **Female Default:** In the absence of M.I.F and testosterone, paramesonephric ducts develop into female structures while mesonephric ducts regress.
- **Germ Layer Origin:** All genital ducts are **mesodermal** in origin. The lower vagina and vestibule are **endodermal**.