

The urinary bladder and the urethra

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Urinary Bladder

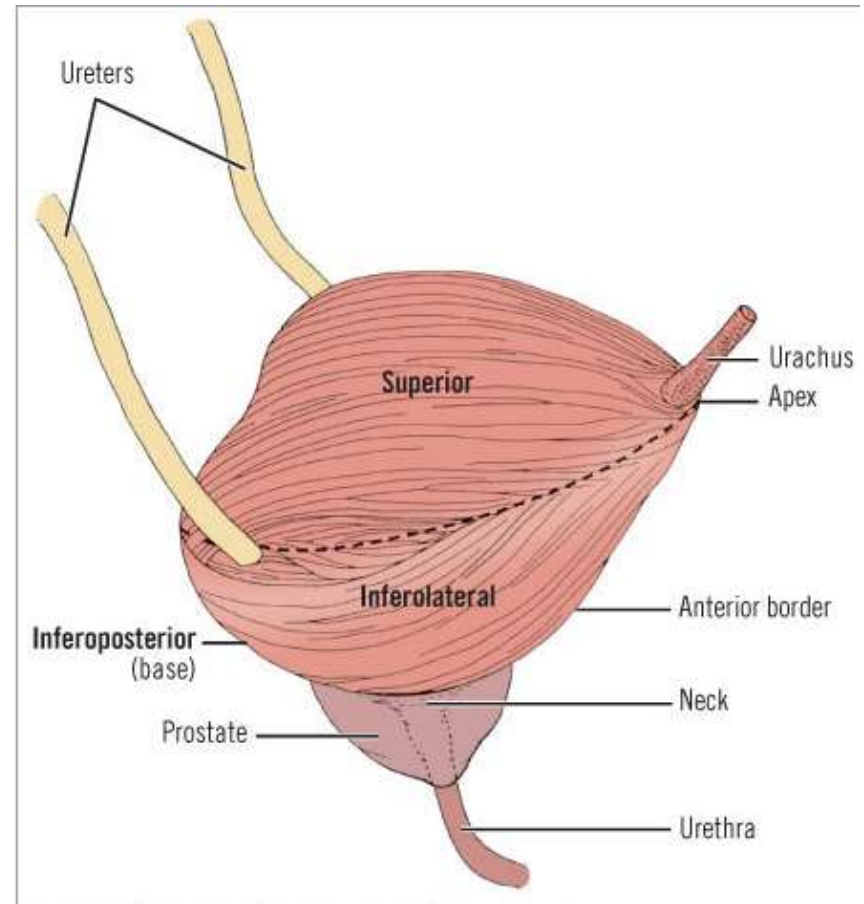
- The urinary bladder is a muscular, saccular organ for storage of urine.
- Characterized by its distensibility
- The urinary bladder has folds (rugae) that disappear as the bladder fills.

The urinary bladder

- Position and relations are determined by:
 - **Age:** Entirely abdominal at birth. Becomes a pelvic organ between 5 and 6 years
 - **Sex:** Between pubis and rectum in the male. Between pubis and vagina in the female
 - **Volume of urine it contains:** Normal capacity is between 300 and 500mls. The empty bladder is entirely within the pelvis, but the full bladder may extend up to the periumbilical area

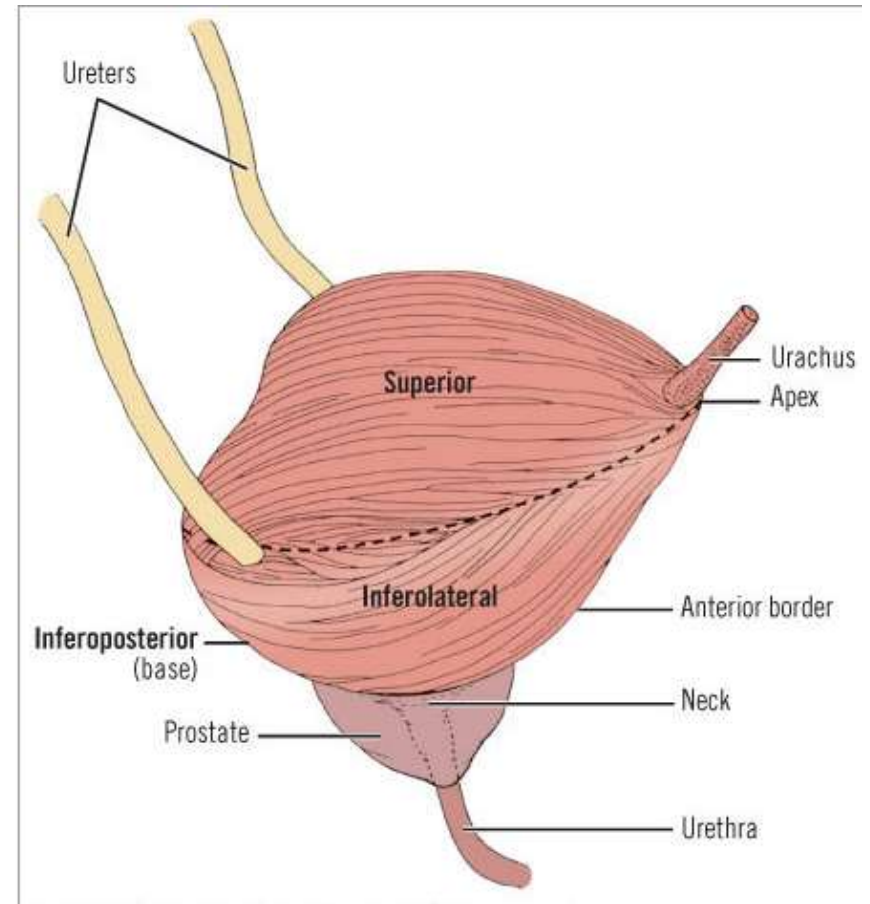
The urinary bladder

- The empty bladder has the following characteristics:
 - Four divisions
 - Four surfaces
 - Four ducts
 - Four angles or junctions



Divisions

- Has 4 divisions:
 - Apex
 - Body
 - Fundus
 - Neck.

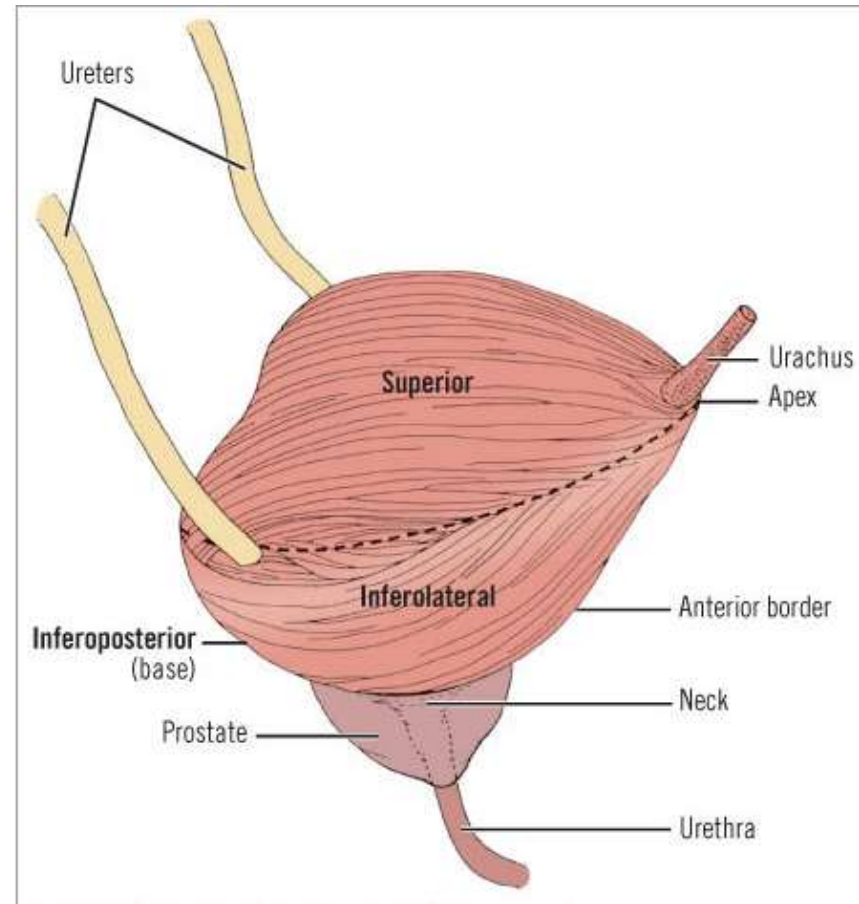


Divisions: apex

- Directed towards the top of the symphysis pubis
- Superior and the two inferolateral surfaces meets here
- Site of beginning of the median umbilical ligament which is the remnant of the urachus.
- The median umbilical ligaments extends up to the umbilicus

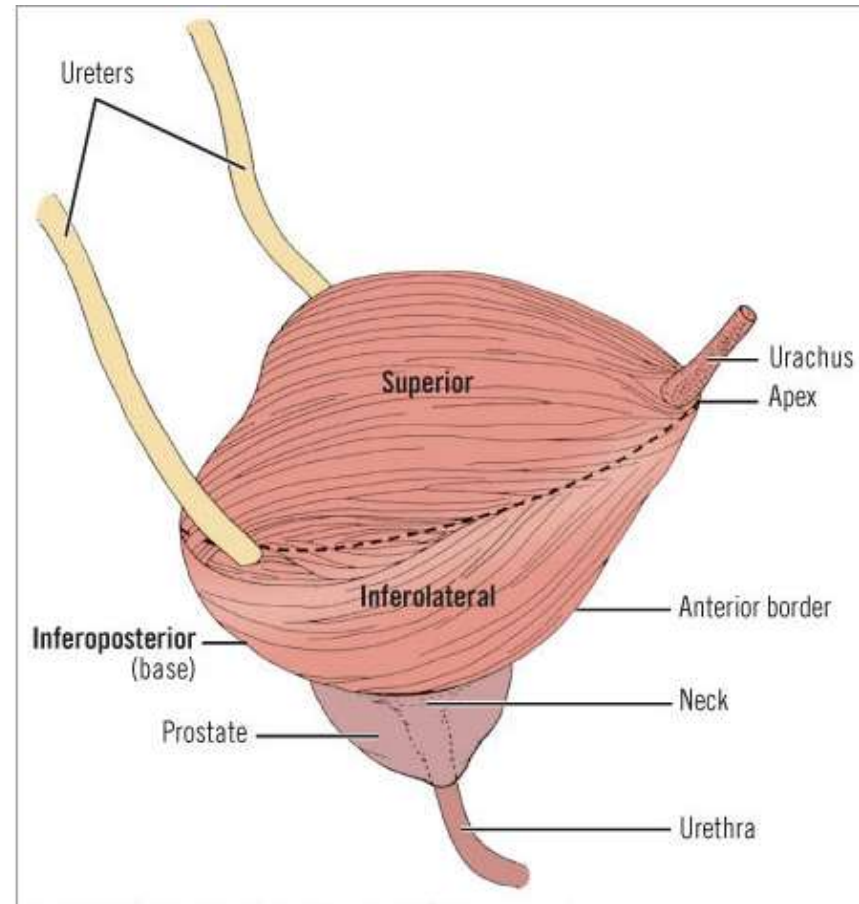
Divisions: Neck

- The midline meeting point of the right and left inferolateral surfaces.
- Most inferior part of the bladder
- Most fixed part of the bladder
- Attached to the pelvic diaphragm by the fibromuscular pubovesical fascia (female) or the puboprostatic fascia (males).



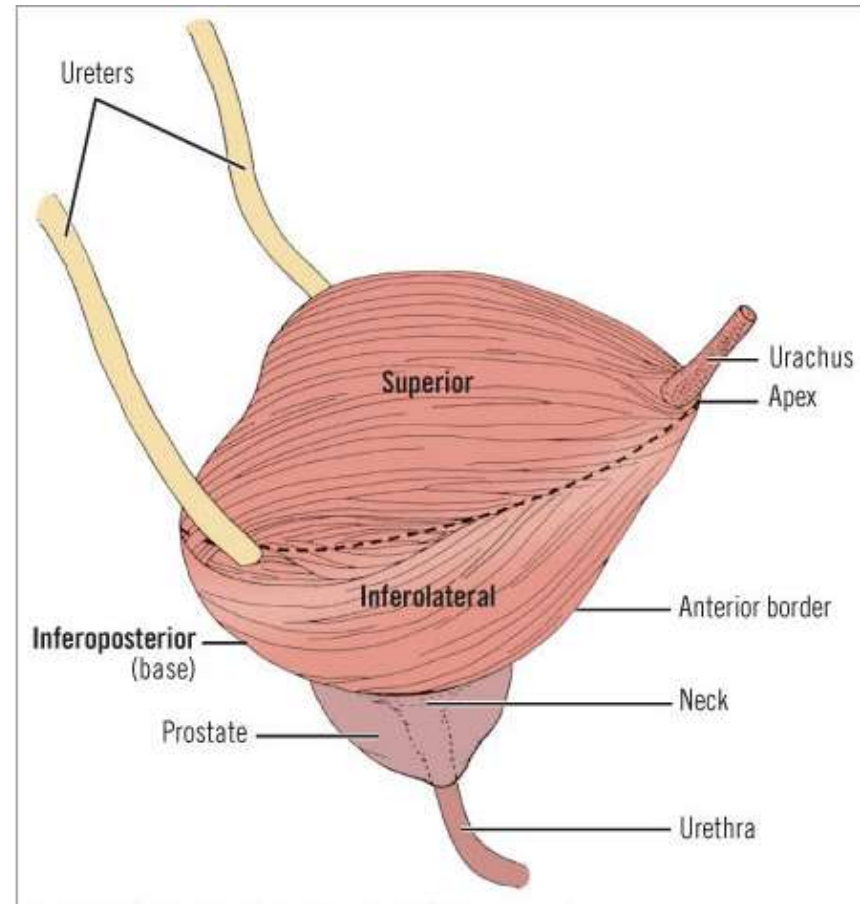
Divisions: Fundus

- The fundus of the bladder is opposite the apex
- It is formed by the convexity of the posterior wall (or the base)



Divisions: body

- Also known as the corpus
- Part of the urinary bladder between the fundus and the apex.



Surfaces

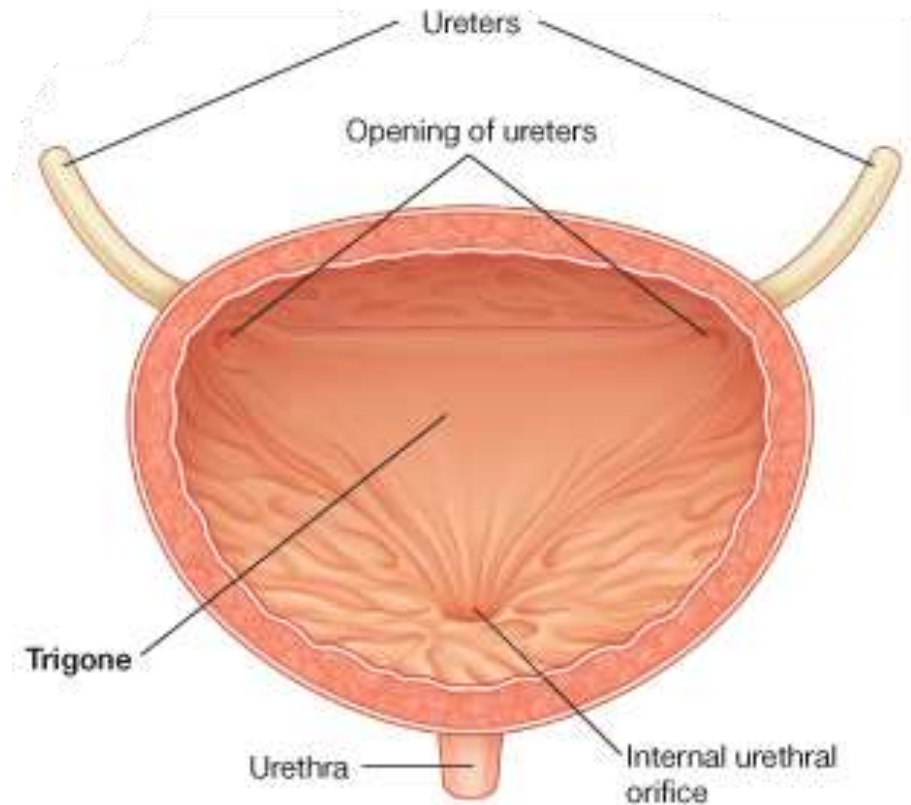
- The empty bladder is tetrahedral (pyramidal) and has 4 surfaces:
 - Superior
 - Right inferolateral
 - Left inferolateral
 - Posterior.

Bladder base

- Shaped like an inverted triangle and faces posteroinferiorly.
- The two ureters enter the bladder at each of the upper corners of the base
- The urethra drains inferiorly from the lower corner of the base.
- The mucosal lining on the base of the bladder is smooth and firmly attached to the underlying smooth muscle coat of the wall (elsewhere in the bladder the mucosa is folded and loosely attached to the wall).

Trigone

- The smooth triangular area between the openings of the ureters and urethra on the inside of the bladder is the trigone
- Part of the bladder base



Ducts and the angles

- *Four Ducts*
 - Two ureters
 - One urachus (**median umbilical ligament**)
 - One urethra
- *Four Angles or junctions*
 - One urachovesical junction (apex)
 - Two ureterovesical junctions
 - One urethrovesical junction (neck)

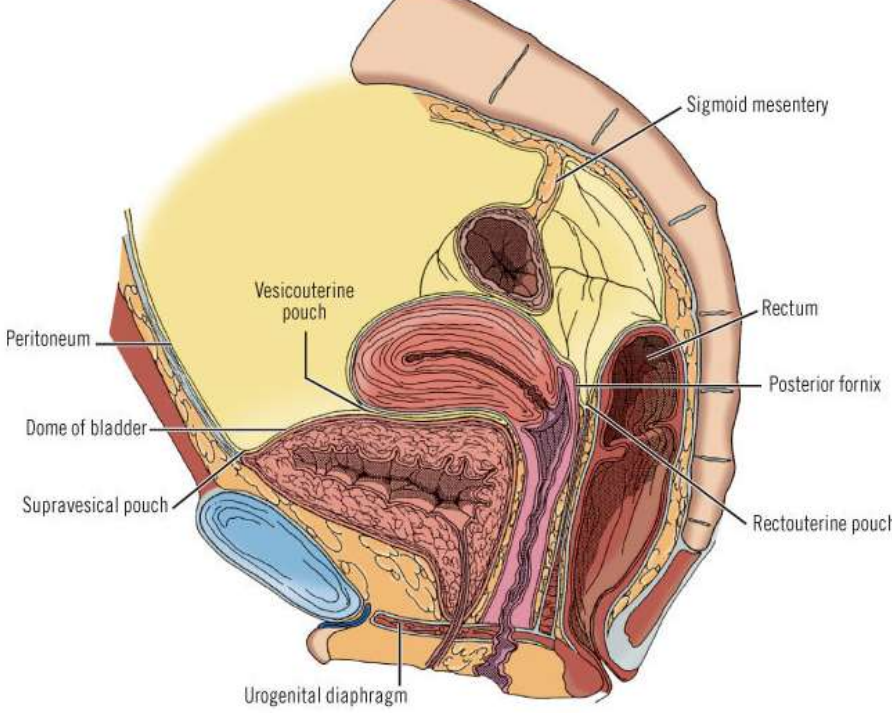
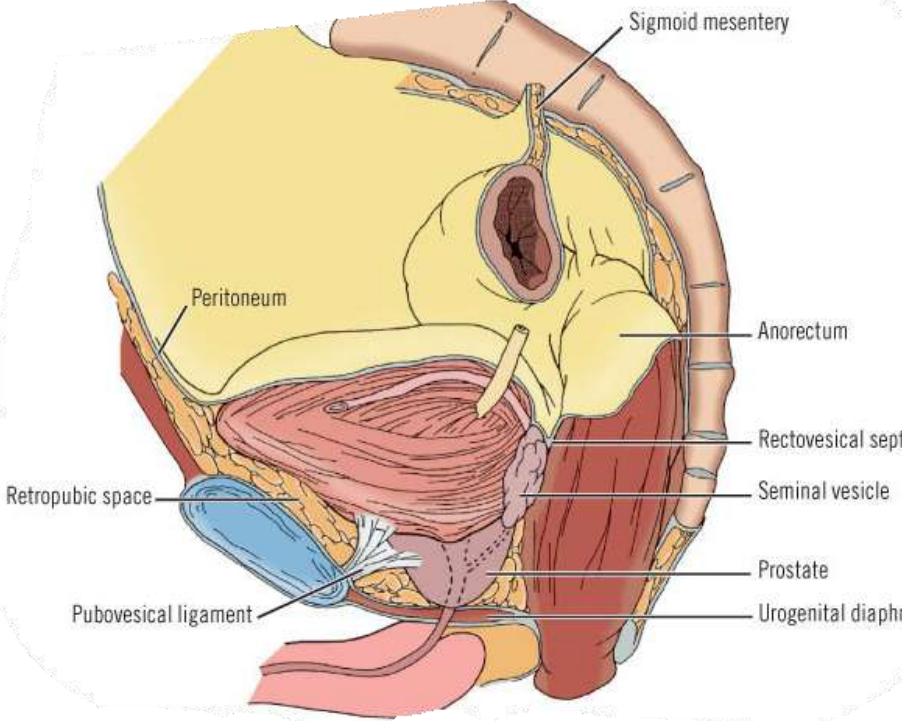
Ducts and the angles

- Each angle is associated with one of the ducts:
- The anterior angle (apex) is related to the urachus (median umbilical fold), which continues up to the umbilicus
- The posterolateral angles are related to both ureters
- The inferior angle which is on the neck is related to the urethra

Anterior relations

- Symphysis pubis
- Pubic bones
- Both are separated from the bladder by the prevesical space of Retzius.

Relations of the bladder in both sexes



Posterior Relations

- Different in males and females:
 - *Males:*
 - i. The seminal vesicles
 - ii. Ductus deferens
 - iii. Rectovesical space
 - iv. Prostatic fascia
 - v. Rectum
 - *Females:*
 - i. Anterior vaginal wall
 - ii. Cervix

Lateral Relations

- i. Pubic bone
- ii. Obturator internus
- iii. Levator ani muscles (just above the obturator internus).

Relations to the Base

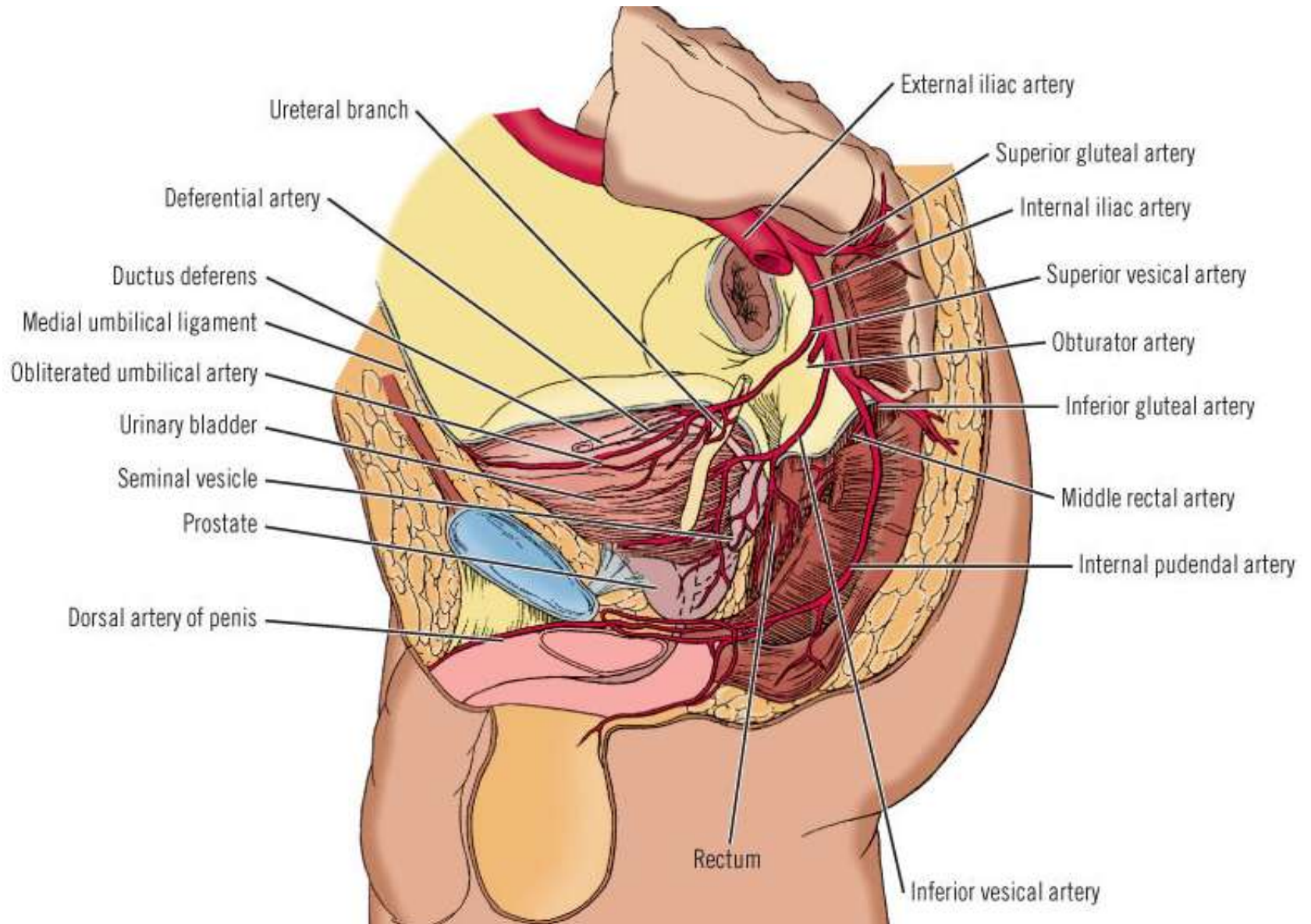
- Male
 - The rectum separated by the rectovesical fascia
- Female
 - Anterior vaginal wall and the cervix.
 - The fundus and body of uterus
 - (Note: the fundus of the uterus which is anteverted and anteflexed is also related to the superior surface of the bladder.)

Arterial supply of the bladder

- The superior vesical arteries supply anterosuperior parts of the bladder.
- In males, inferior vesical arteries supply the fundus and neck of the bladder.
- In females, the vaginal arteries replace the inferior vesical arteries and send small branches to posteroinferior parts of the bladder
- The obturator and inferior gluteal arteries also supply small branches to the bladder

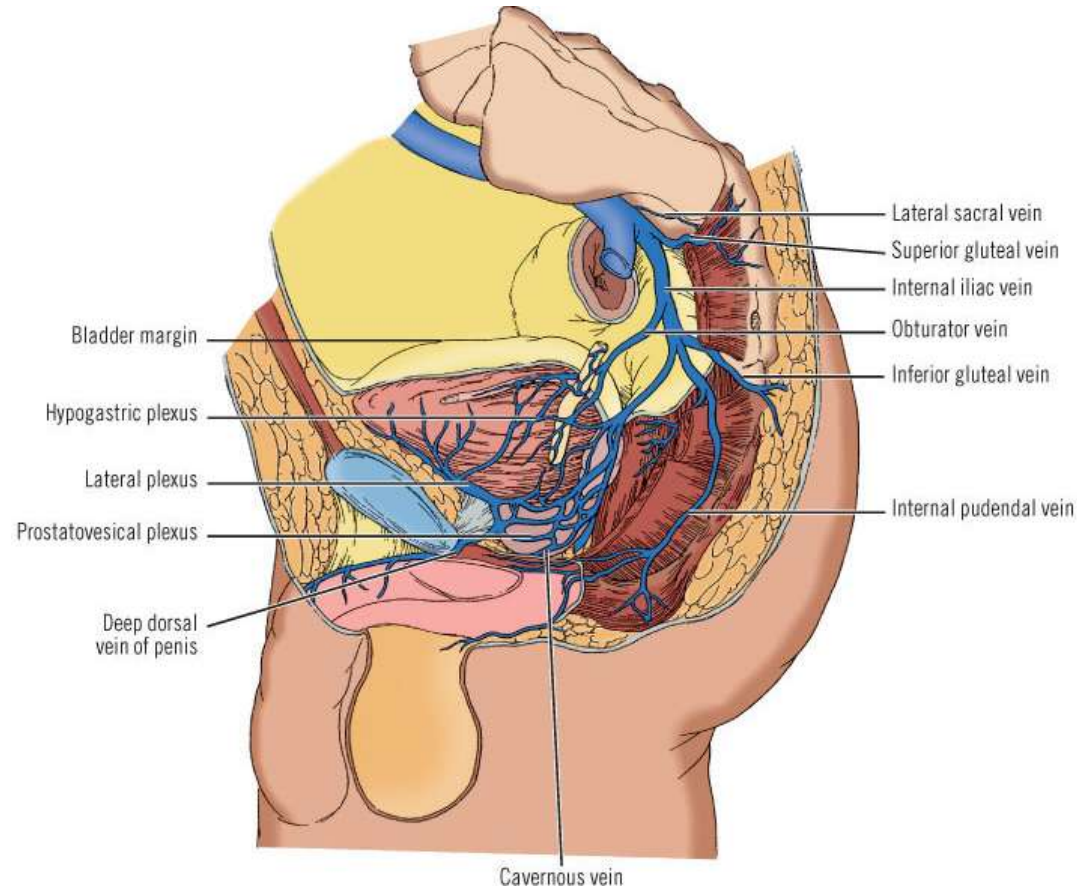
(All are branches of the internal iliac artery)

Arterial supply



Venous drainage

- The names of the veins correspond to the arteries and are tributaries of the internal iliac veins.
- The drainage is via the cervical venous plexus



Vesical venous plexus (Males)

- Vesical venous plexus is continuous with the prostatic venous plexus and the combined plexus complex envelops the fundus of the bladder and prostate, the seminal glands, the ductus deferentes, and the inferior ends of the ureters.
- It also receives blood from the deep dorsal vein of the penis, which drains into the prostatic venous plexus.
- Mainly drains through the inferior vesical veins into the internal iliac veins
- May also drain through the sacral veins into the internal vertebral venous plexuses

Vesical venous plexus (Females)

- In females, the vesical venous plexus envelops the pelvic part of the urethra and the neck of the bladder, receives blood from the dorsal vein of the clitoris, and communicates with the vaginal or uterovaginal venous plexus

Lymph drainage of the bladder

- Lymphatic vessels from the superolateral aspects of the bladder pass to the external iliac lymph nodes
- Those from the fundus and neck pass to the internal iliac lymph nodes.
- Some vessels from the neck of the bladder drain into the sacral or common iliac lymph nodes

Innervation of the Bladder

- Sympathetic
 - T12, L1, L2
- Parasympathetic
 - Pelvic splanchnic nerves (also called nervi erigentes) from S 2, 3, 4
- Sensory afferents
 - Distension carried to the cord (S 2,3,4) by the way of pelvic splanchnic nerve and
 - Pain carried to the cord by both pelvic splanchnic nerve and sympathetics (dual pathways)

THE URETHRA

The urethra

- Begins at the bladder neck
- Ends in the perineum
- Both the anatomy as well as the path taken by the urethra are different in both sexes

The Male Urethra

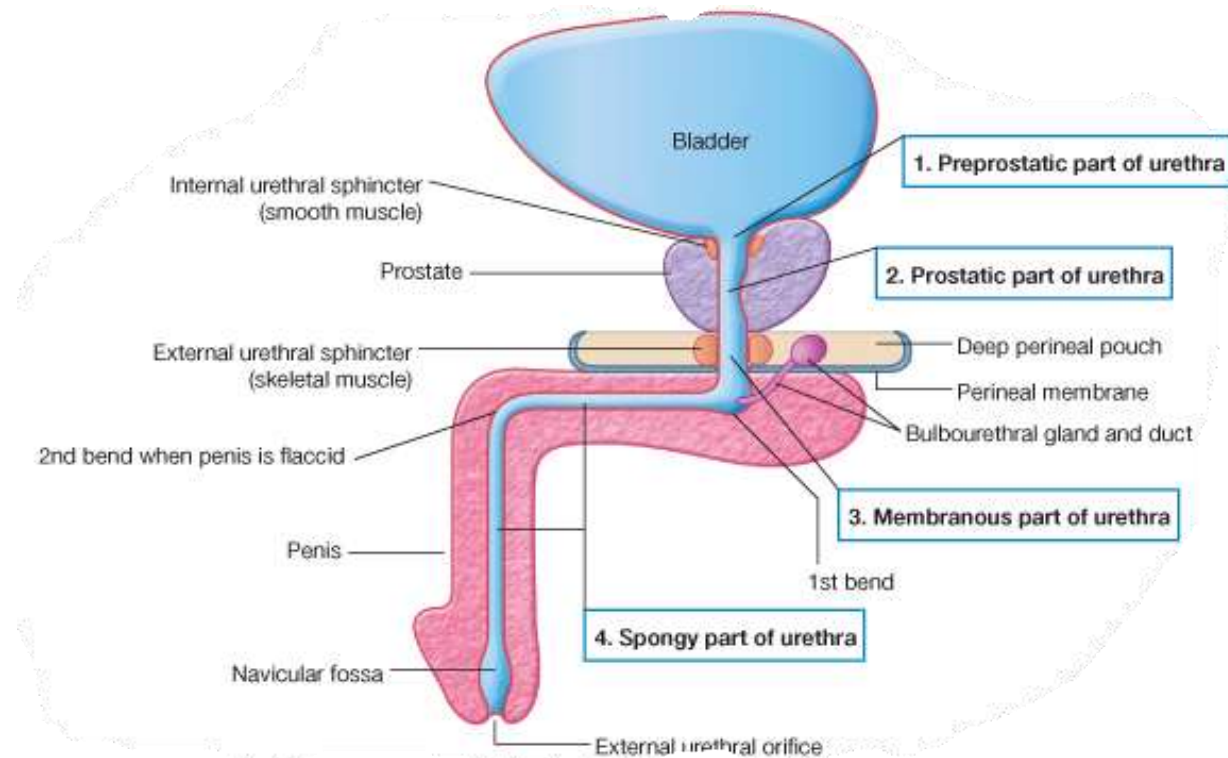
- Approximately 20 cm
- Has two curves
- Begins at the base of the bladder
- Passes inferiorly through the prostate, the deep perineal pouch and perineal membrane and enters the root of the penis.

The Male Urethra

- 1st curve: As the urethra exits the deep perineal pouch, it bends forward to course anteriorly in the root of the penis.
- 2nd curve: (seen only in the flaccid penis) bends inferiorly from the root to the body of the penis. During erection, the bend between the root and body of the penis disappears.

The Male Urethra

- The urethra in men is divided into 4 parts:
 - preprostatic
 - prostatic
 - membranous
 - spongy



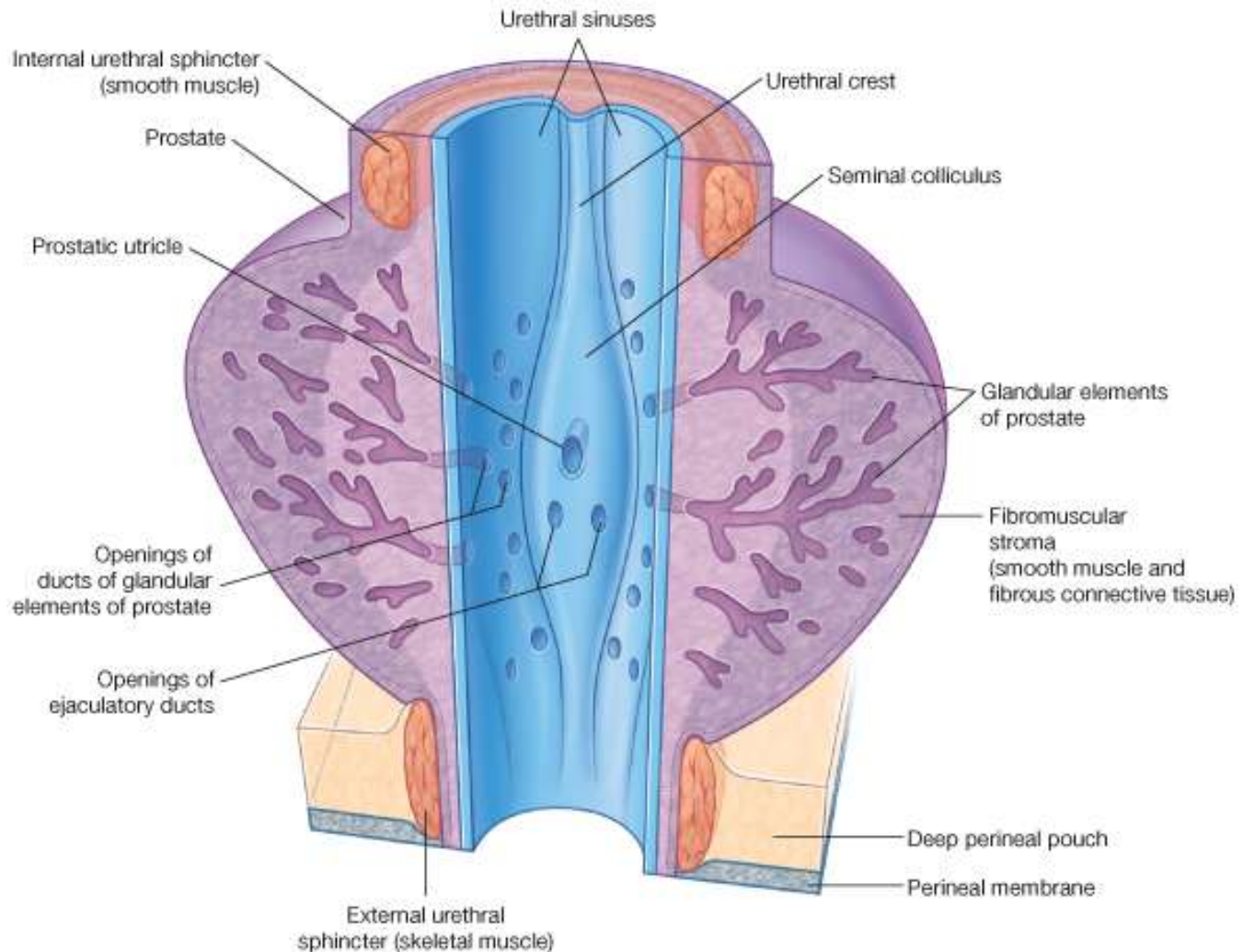
The Male Urethra

- **The preprostatic part of the urethra is**
 - about 1 cm long
 - extends from the base of the bladder to the prostate
 - Surrounded by the internal urethral sphincter which is a circular cuff of smooth muscle fibers.
 - Contraction of this sphincter prevents retrograde movement of semen into the bladder during ejaculation.

The Male Urethra

- **Prostatic part**
 - About 3-4 cm long
 - Surrounded by the prostate.
 - Has a longitudinal midline fold of mucosa called the **urethral crest**.
 - The depression on each side of the crest is the **urethral sinus**
 - The ducts of the prostate empty into the two sinuses.

The Male Urethra: prostatic part



The Male Urethra

- **Prostatic part**

- Midway along its length, the urethral crest is enlarged to form a roughly circular elevation called the seminal colliculus.
- In men, the seminal colliculus is used to determine the position of the prostate gland during transurethral transection of the prostate

The Male Urethra

- **The membranous part**
 - Narrow and
 - Passes through the deep perineal pouch
 - Surrounded by skeletal muscle of the external urethral sphincter.

The Male Urethra

- **The spongy urethra**

- Surrounded by the corpus spongiosum, the erectile tissue of the penis.
- Has two enlargement at either ends: bulb at the base of the penis and the navicular fossa at the end
- The two bulbourethral glands in the deep perineal pouch (part of the male reproductive system) into the bulb of the spongy urethra.
- The external urethral orifice is the sagittal slit at the end of the penis.

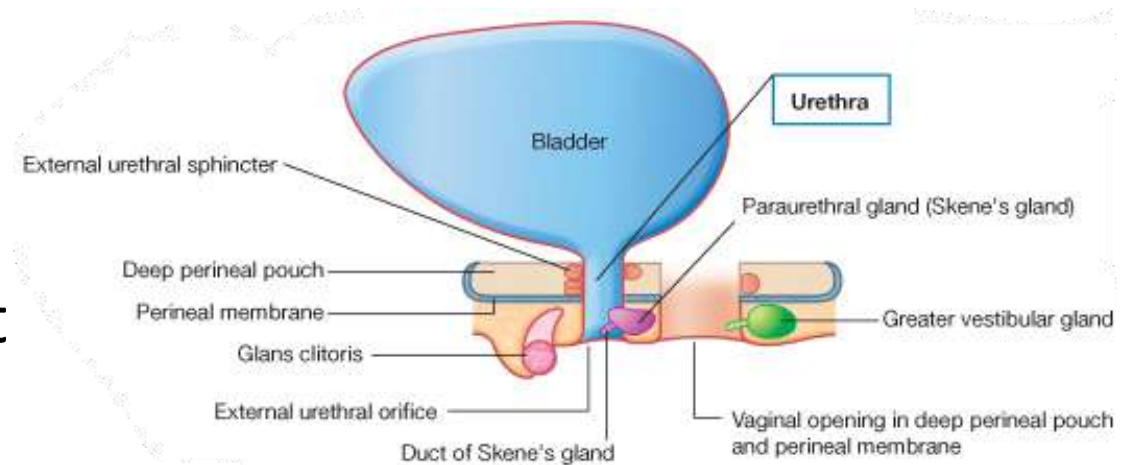
The female urethra

- About 4 cm long.
- Passes inferiorly through the pelvic floor into the perineum
- Then through the deep perineal pouch and perineal membrane
- Opens in the vestibule that lies between the labia minora anterior to the vaginal opening.
- The inferior aspect of the urethra is bound to the anterior surface of the vagina.

The female urethra

Skene's glands

- Two small paraurethral mucous glands, associated with the lower end of the urethra.
- Each drains into a duct that opens onto the lateral margin of the external urethral orifice.



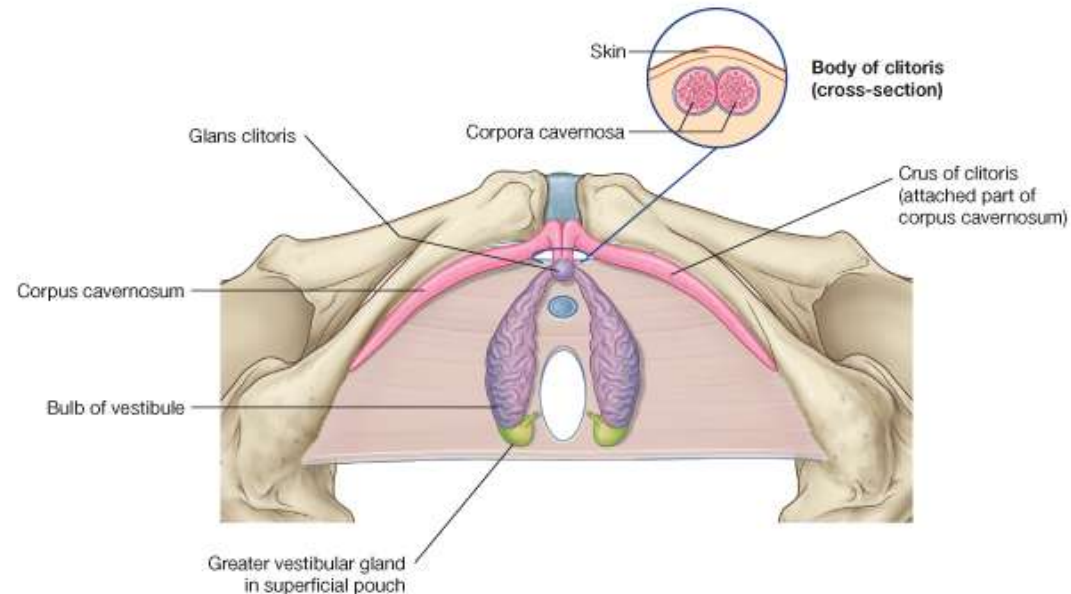
MALE EXTERNAL GENITALIA

The male external genitalia

- The male external genitalia are found in the urogenital triangle

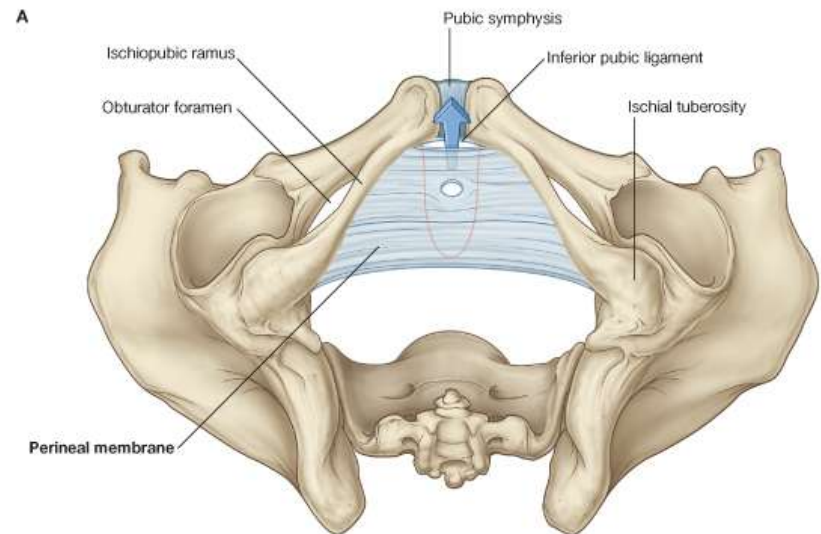
The urogenital triangle

- Bordered :
- **Laterally** by the ischiopubic rami
- **Posteriorly** by an imaginary line between the ischial tuberosities and
- **Anteriorly** by the inferior margin of the pubic symphysis.
- **Roof** is the levator ani muscle



The urogenital triangle: perineal membrane

- Triangularly shaped fascia
- Attached to the pubic arch
- It is oriented in the horizontal plane
- Has a free posterior margin.
- Anteriorly, there is a small gap between the membrane and the pubic arch
- Serves as attachment of the root of external genitalia
- It is perforated by the urethra and the vagina in females

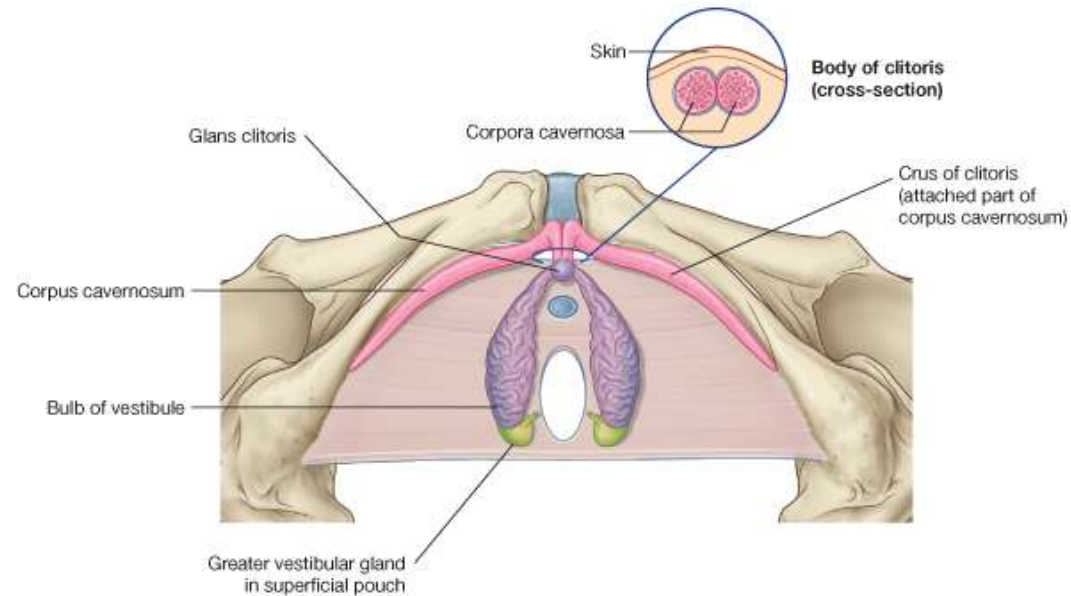


The urogenital triangle: Divisions

- It is divided into 2 compartments by the perineal membrane into:

A. SUPERFICIAL PERINEAL COMPARTMENT

B. DEEP PERINEAL COMPARTMENT



The urogenital triangle: Deep perineal pouch

- It is divided into 2 compartments by the perineal membrane into:

A. SUPERFICIAL PERINEAL COMPARTMENT

B. DEEP PERINEAL COMPARTMENT

