



Development of Genitalia, Pelvic Parts of the GI & Urinary Tracts & the Internal Iliac Artery

Dr. Paulette Bernd
November 2nd, 2021

Variations in Reproductive Anatomy

It is important to note that **internal and external genitalia** exist on a **spectrum** as do **sex and gender**

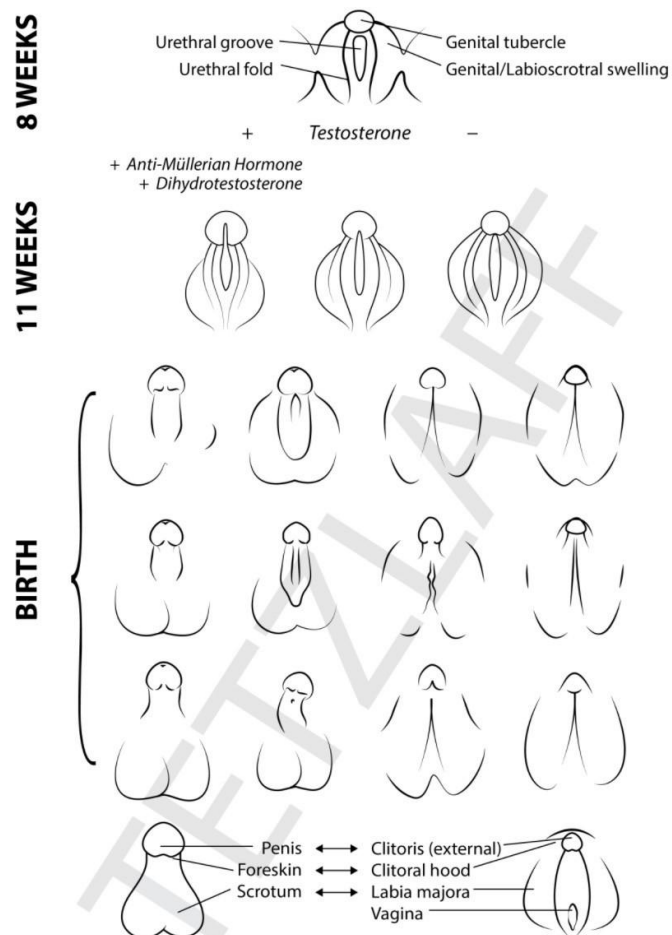
Some people with variations in reproductive anatomy identify as **intersex**, but the definition of intersex is broad and includes other differences in sex traits

About 1.7% people are born intersex (about the same as identical twins, red hair, green eyes)

Throughout the lecture the terms “male” and “female” will be used. These represent the **extreme ends of the sex spectrum**. One word to describe these ends is “**endosex**,” which is used for sex characteristics the way “cisgender” is used for gender.

Those who identify in the middle of the spectrum may identify as **intersex**.

External Genitals: Fetal Sex Development



<https://ktetzlaff.com/intersex/>

Intersex Health Care

Studies have shown that **up to 80 percent of intersex patients have changed their care based on discomfort with their medical providers**. Solid policy that takes into consideration the needs of the community is essential to giving intersex patients the care that they deserve. One of my urologic colleagues once said that **no single specialist can provide all the answers when it comes to intersex medical care**, and truer words were never spoken. Quality care of intersex patients **must be truly multidisciplinary**, seeing to the needs of the whole patient and their family. And the key to understanding this whole patient is the provision of peer support.”

—Ilene Wong, M.D.

Intersex Health Care

The **main issue** raised by members of the intersex community is the **continued performance of medically unnecessary genital-”normalizing” surgery on intersex infants** before they are old enough to participate in the decision-making process.

Rather than calling for immediate surgical intervention upon the birth of an intersex child, leading practitioners in patient-centered care recommend promptly **implementing a long-term management strategy** that involves a range of **pediatric subspecialists**, including **intersex-affirming mental health providers, pediatricians, and the parent(s)**.

Leading medical associations, recognizing that **irreversible and deeply life-altering procedures can be safely delayed** to both **ensure best outcomes and avoid the potential ramifications of anesthesia on the developing brain**, are developing policies informed by the patient community to delay harmful, medically unnecessary procedures.

- [Intersex Affirming Hospital Guide](#)

Additional Resources

InterACT: Advocates for Intersex Youth

- <https://interactadvocates.org/>
- [Affirming Primary Care for Intersex People](#)
- [What We Wish Our Doctors Knew](#)

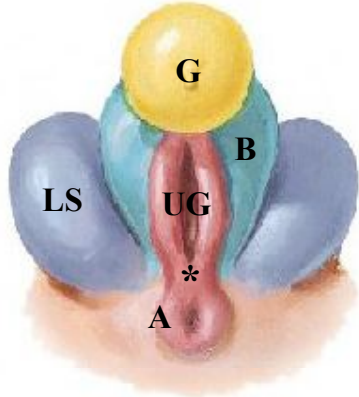
Intersex Justice Project

- <https://www.intersexjusticeproject.org/> Katja

Tetzlaff, Medical Illustrator and Educator

- <https://ktetzlaff.com/>

The Embryonic Perineum



Embryonic Perineum

The external genitalia of female & male embryos are **identical**

The differentiation into the male phenotype is dependent upon the presence of a **Y chromosome & testosterone**

The female phenotype is a result of the relative absence of testosterone

* - Perineal body

A - Anus

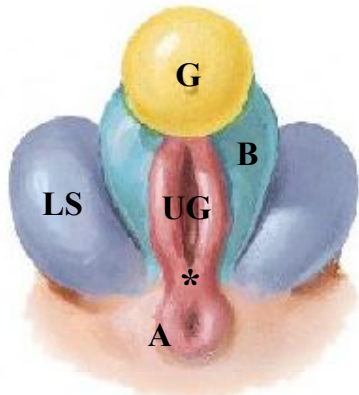
B - Body

G - Glans

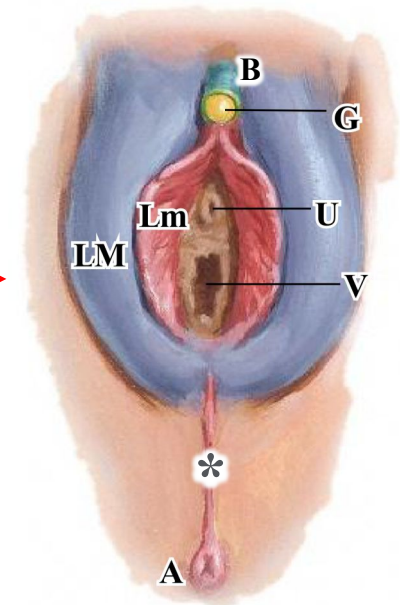
LS - Labioscrotal swelling

UG - Urogenital opening

Development of the Female Perineum



Embryonic Perineum



Adult Female

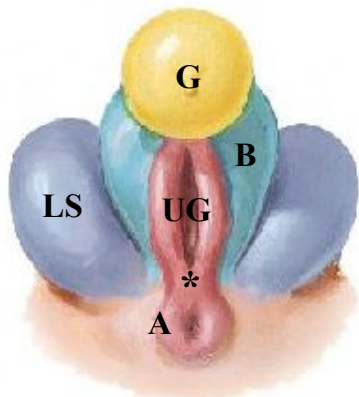
- * - Perineal body
- A - Anus
- B - Body
- G - Glans
- LM - Labia majora
- Lm - Labia minora
- LS - Labioscrotal swelling
- U - Urethra
- UG - Urogenital opening
- V - Vagina

The labioscrotal swellings do not fuse in the female & become the **labia majora**

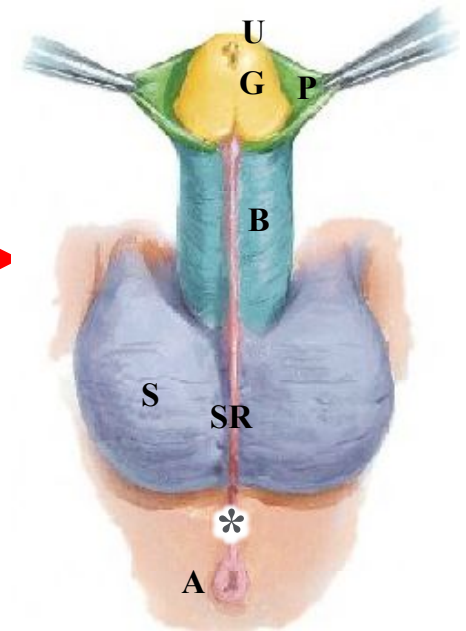
As a result, the **labia minora** persist & they surround the vestibule of the vagina that contains the openings of the urethra & vagina

The **body** and the **glans** give rise to the body (not seen) & glans of the **clitoris**

Development of the Male Perineum



Embryonic Perineum



Adult Male

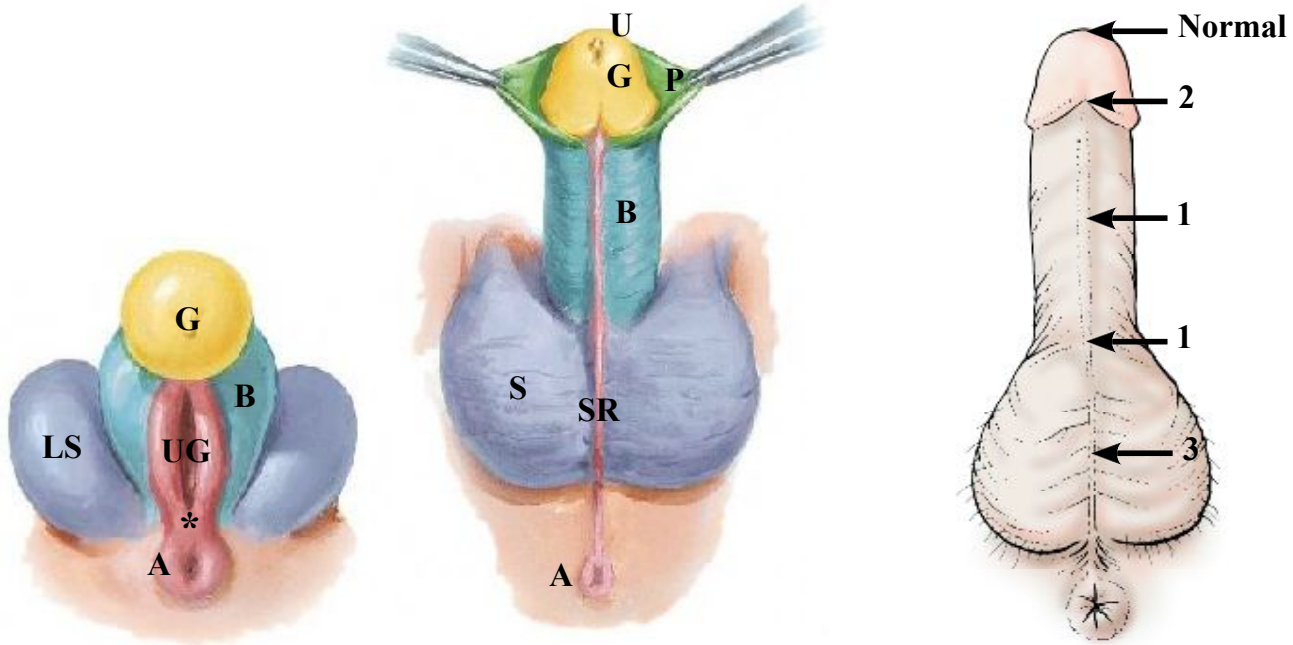
- * - Perineal body
- A - Anus
- B - Body
- G - Glans
- LS - Labioscrotal swelling
- P - Prepuce (foreskin)
- S - Scrotum
- SR - Scrotal raphe
- U - Urethra
- UG - Urogenital opening

The labioscrotal swellings & body fuse in the male forming the **scrotum**, **scrotal raphe** & **body of the penis**

As a result, the **urethra** is incorporated into the body of the penis

The **external urethral orifice** is at the distal end of the glans penis

Hypospadias



Possible Sites of Hypospadias
(these are always on the ventral surface of the penis)

If fusion does not occur properly, the infant may have **hypospadias**

This is a congenital defect where the external urethral orifice is **NOT** at the distal end of the glans penis; (it is one of the most common defects, occurring in ~1 in 250 newborns)

Some individuals born with hypospadias may identify as **intersex**. Surgical intervention is **not medically necessary** unless urine cannot pass through the urethra. Surgery also has the potential for **long term complications**.

* - Perineal body

A - Anus

B - Body

G - Glans

LS - Labioscrotal swelling

P - Prepuce (foreskin)

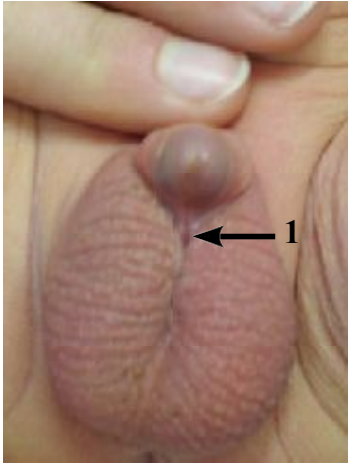
S - Scrotum

SR - Scrotal raphe

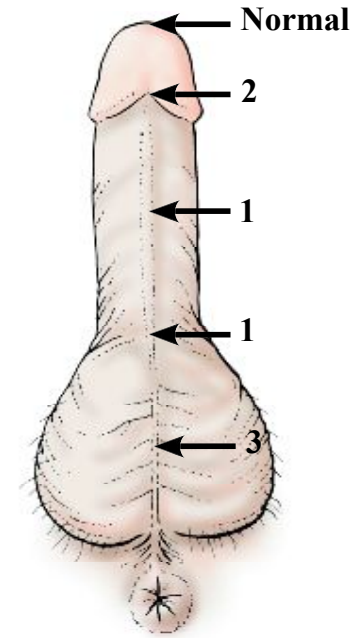
U - Urethra

UG - Urogenital opening

Hypospadias

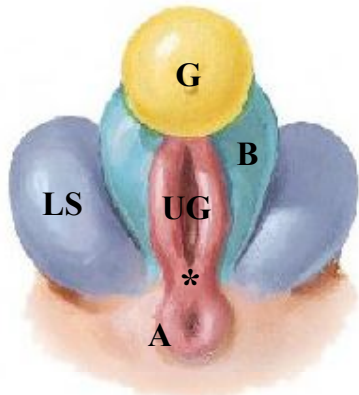


Examples of Hypospadias

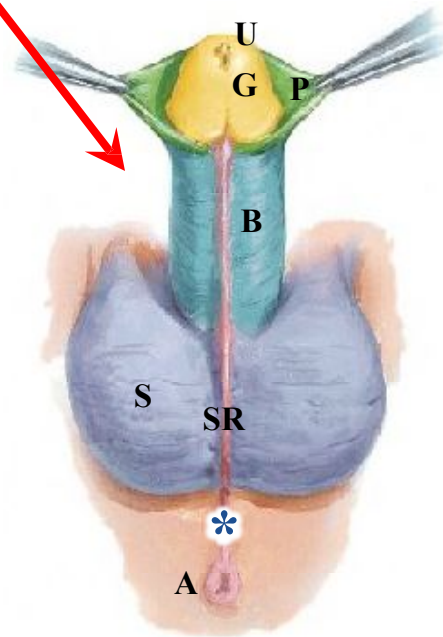


Possible Sites of Hypospadias
(these are always on the ventral surface of the penis)

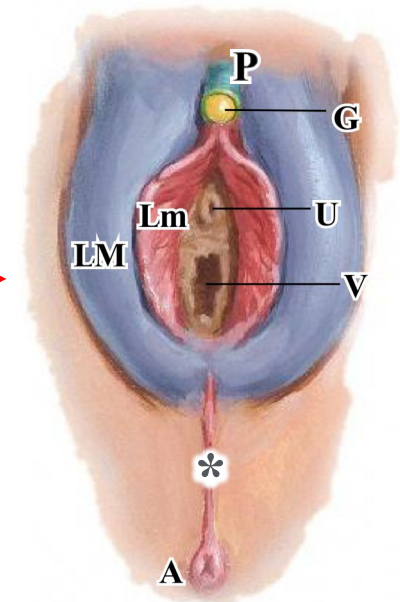
The Prepuce



Embryonic Perineum



Adult Male



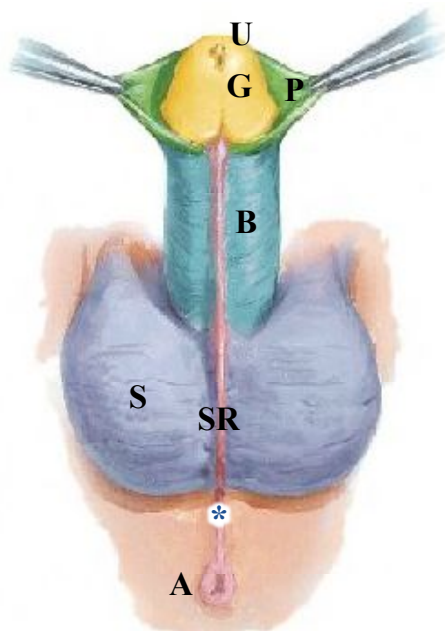
Adult Female

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- U - Urethra
- UG - Urogenital opening
- V - Vagina

At the proximal limit of the glans, there is a redundancy of skin that forms in both females & males called the **prepuce**

The prepuce is also called the **hood** of the clitoris in the female or the **foreskin** in the male

The Prepuce



Adult Male



Uncircumcised



Circumcised

The foreskin covers the glans of the flaccid penis at all ages
At birth, the foreskin is fused to the glans but is usually retractable by puberty

The foreskin retracts completely upon erection

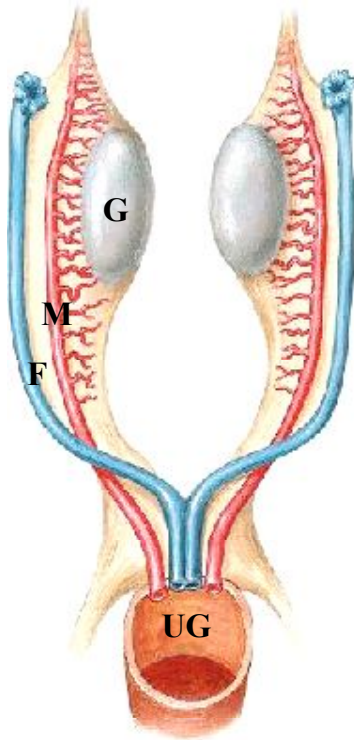
The function of the foreskin is controversial, but it is believed to enhance sexual pleasure & provide lubrication during intercourse

Circumcision involves surgical removal of the foreskin; this affects both the appearance & sensitivity of the penis; it **may** protect against acquiring **HIV**, genital herpes, human papillomavirus (**HPV**) & genital ulcer disease

- * - Perineal body
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Development of the Internal Genitalia

Embryonic Internal Genitalia



Anterior View
(embryo)

F - Female duct
G - Gonad
M - Male duct
UG - Urogenital space

In the early female & male embryo:

The developing **internal genitalia** are **identical**

The **gonads** are **identical** & are located on the posterior abdominal wall (retroperitoneal)

There are **two pairs of tubes** running parallel to one another that open into the urogenital space that becomes the bladder & urethra

Female tubes (blue; Mullerian/Paramesonephric ducts) develop into:

Uterus

Uterine tubes

Superior half of the vagina

Male tubes (red; Wolffian/Mesonephric ducts) develop into:

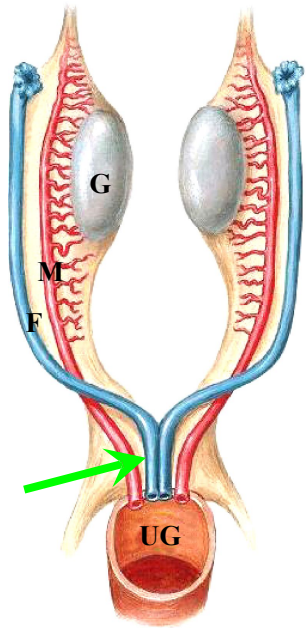
Epididymis

Ductus (vas) deferens

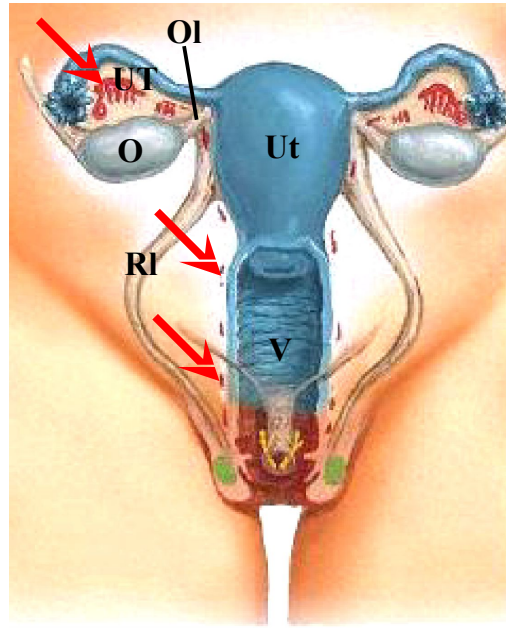
Seminal glands

Ejaculatory ducts

Development of Female Internal Genitalia



Anterior View
(embryo)



Anterior View
(adult female)

- F - Female tubes
- G - Gonad
- M - Male tubes
- O - Ovary
- Ol - Ovarian ligament
- RI - Round ligament of the uterus
- UG - Urogenital space
- Ut - Uterus
- UT - Uterine tube
- V - Vagina

Fusion of the inferior part of the female ducts forms the **uterus** and **upper vagina** (green arrow)

The unfused part of the female ducts become the **uterine tubes**

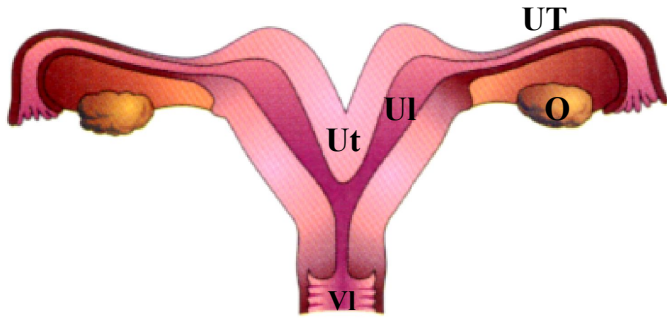
The gonad differentiates into an **ovary**

The gubernaculum becomes the **ovarian ligament & round ligament of the uterus**

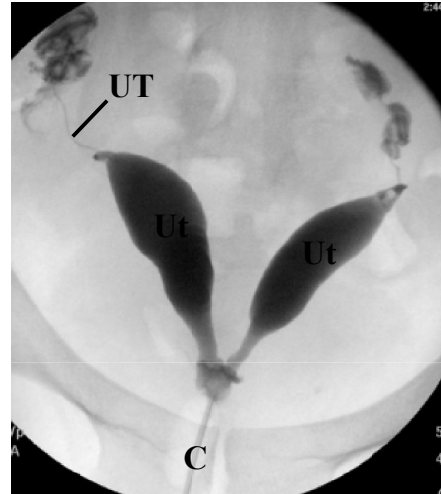
The male ducts **degenerate** during development of the female

Remnants of the male ducts may remain (red arrows); these remnants may become enlarged & cystic

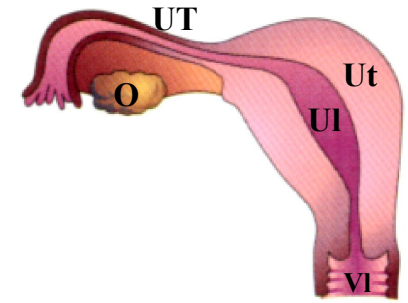
Variations in the Development of Female Internal Genitalia



Partially Bicornuate Uterus



Bicornuate Uterus



Unicornuate Uterus

Failure of fusion of the inferior part of the female duct system can result in a uterus with two lumina (**bicornuate uterus**)

If one of the female ducts does not appear during development (above right), the individual will have only one uterine tube (**unicornuate uterus**)

Women with these anatomical anomalies can still bear children

C - Catheter within vagina

O - Ovary

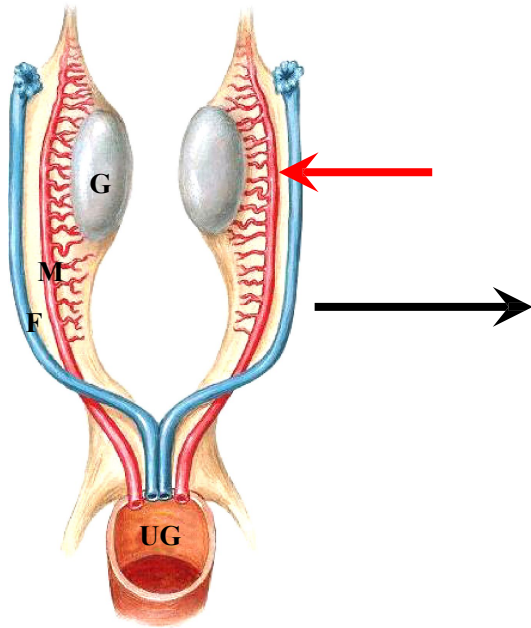
UI - Uterine lumen

Ut - Uterine wall

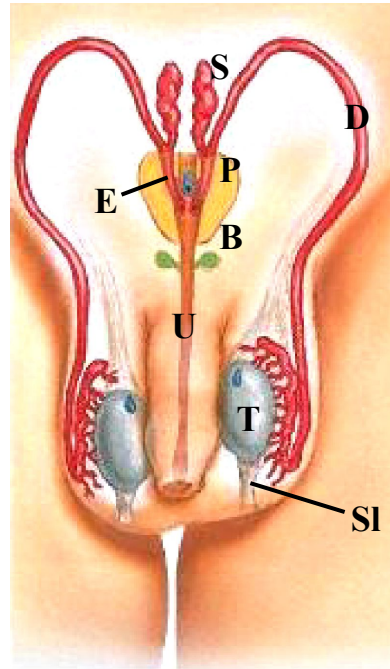
UT - Uterine tube

VI - Vaginal lumen

Development of Male Internal Genitalia



Anterior View
(embryo)



Anterior View
(adult male)

- B** - Bulbourethral gland
- D** - Ductus (vas) deferens
- E** - Ejaculatory duct
- F** - Female tubes
- G** - Gonad
- M** - Male tubes
- P** - Prostate gland
- S** - Seminal gland
- SI** - Scrotal ligament
- T** - Testis
- U** - Urethra
- UG** - Urogenital space

As the testes descend, the male ducts follow

The superior part of the male ducts adjacent to the gonad gives rise to the **epididymis**

The inferior part of the male ducts gives rise to the **ductus (vas) deferens**

The gonad develops into a **testis**

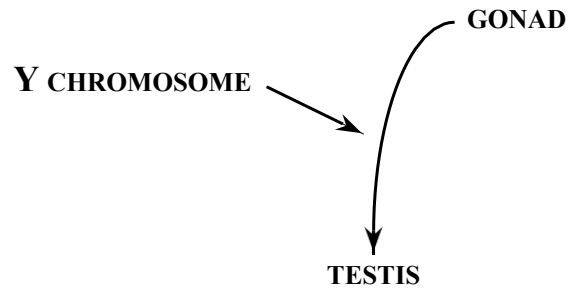
The **seminal glands** form as outgrowths from the male ducts

The gubernaculum becomes the **scrotal ligament**

The female ducts **degenerate** during development of the male

Remnants of the female ducts may remain

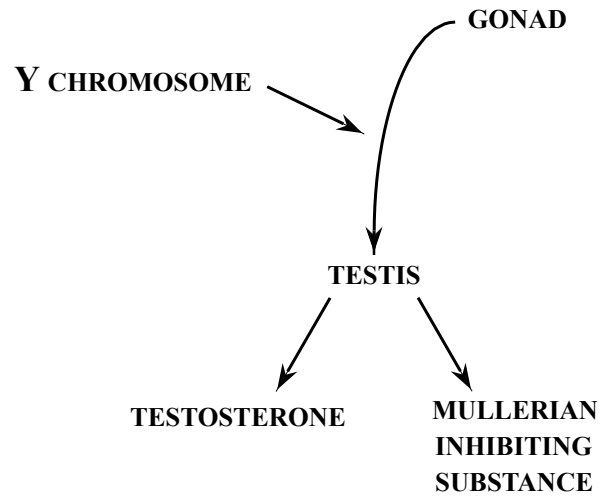
Sexual Differentiation



The presence of the Y chromosome initiates the differentiation of the gonad into a testis

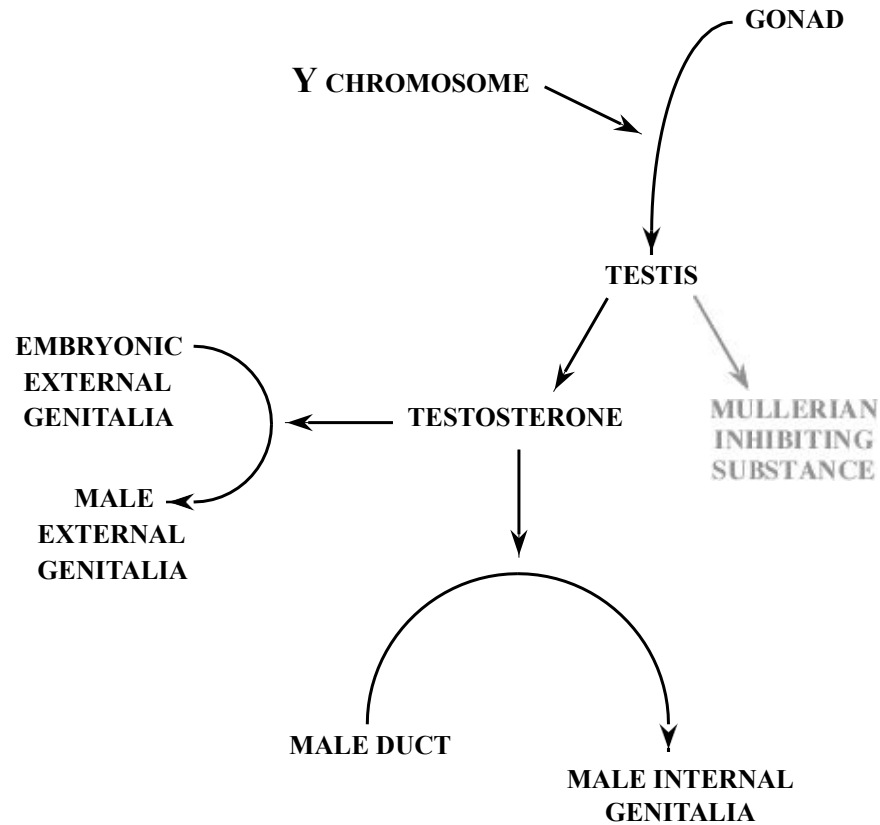
In the absence of a Y chromosome, the gonad differentiates into an ovary

Sexual Differentiation



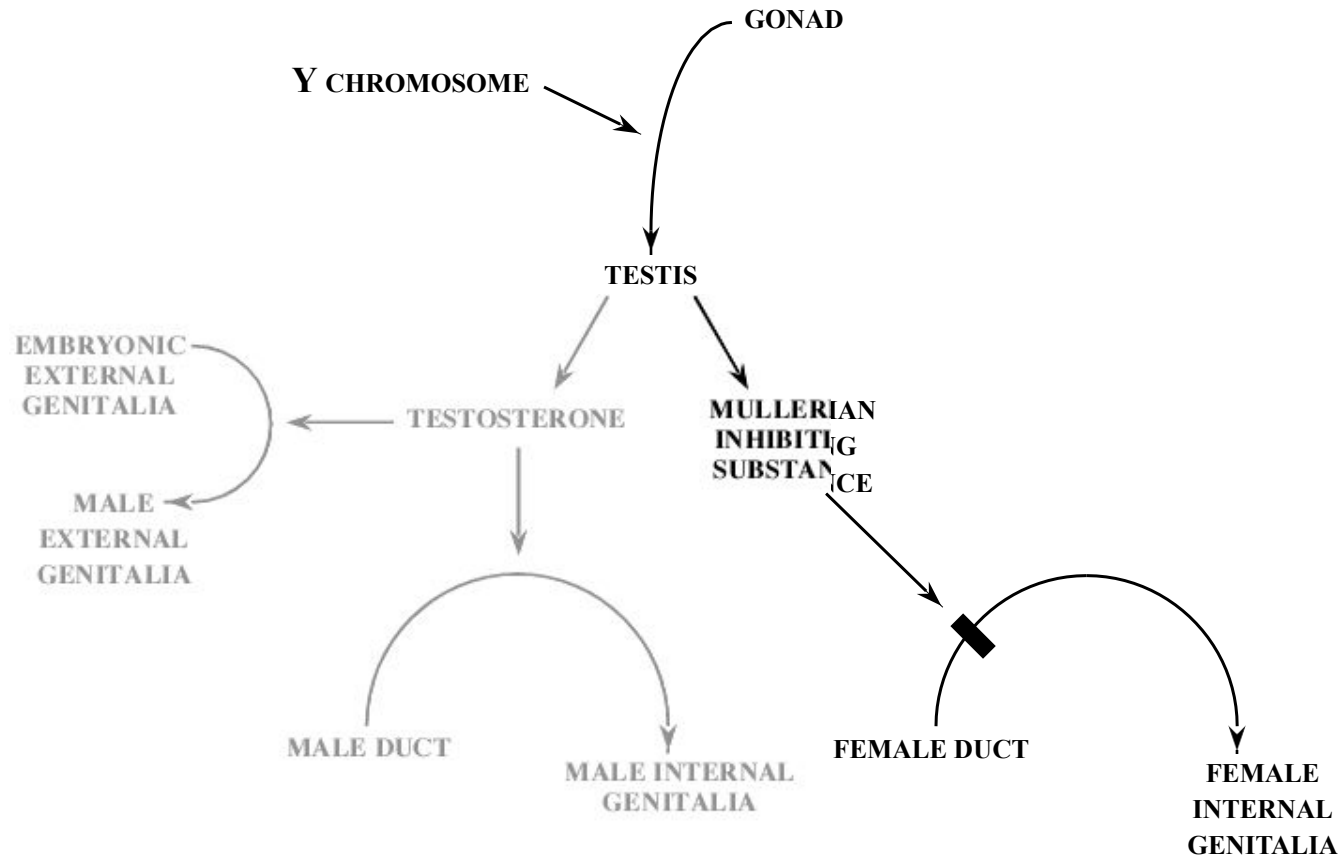
The testis produces testosterone & Mullerian inhibiting substance

Sexual Differentiation



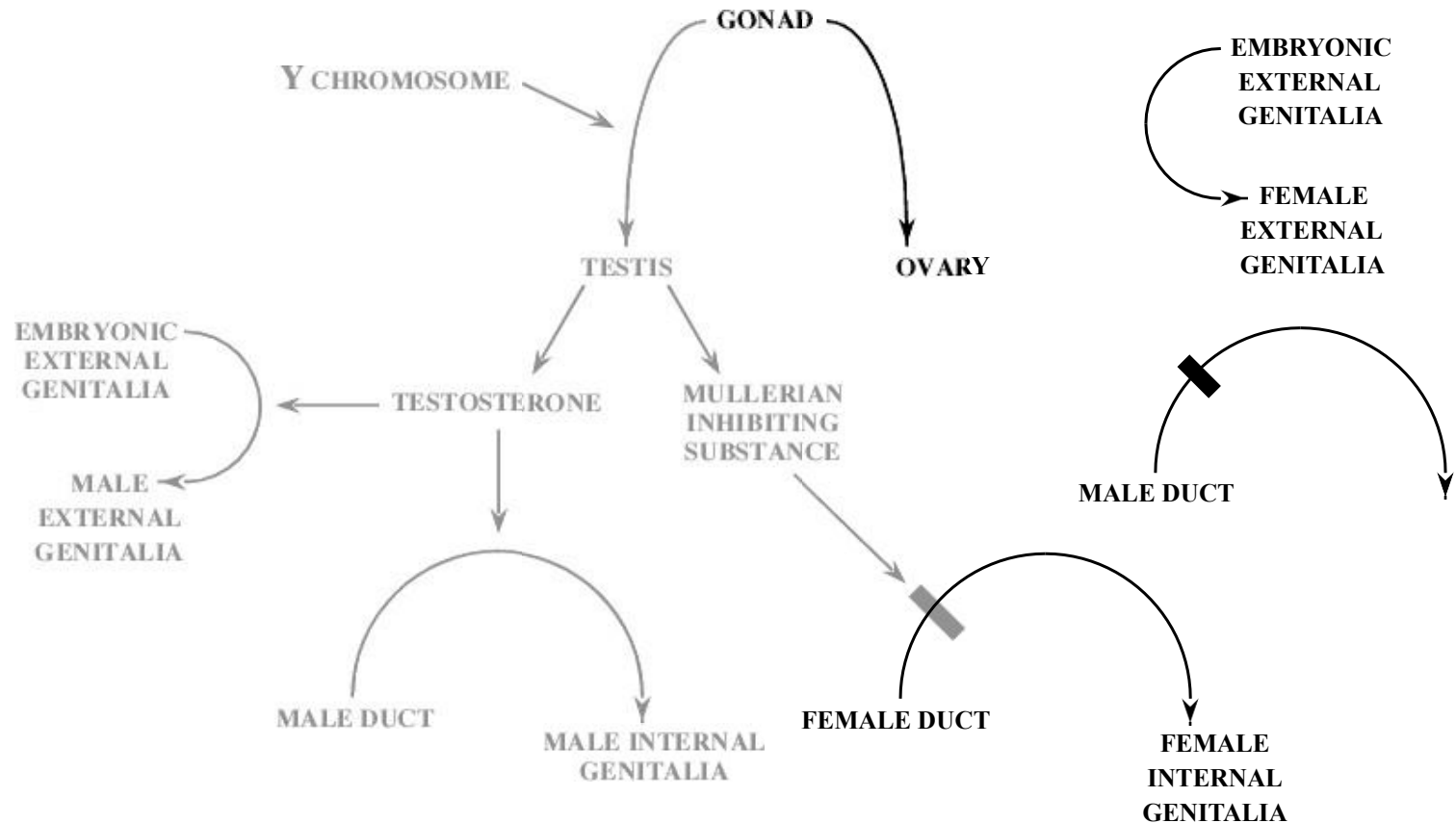
Testosterone causes differentiation of the embryonic external genitalia into male external genitalia, as well as the differentiation of the male ducts into male internal genitalia (epididymis, ductus deferens, seminal glands)

Sexual Differentiation



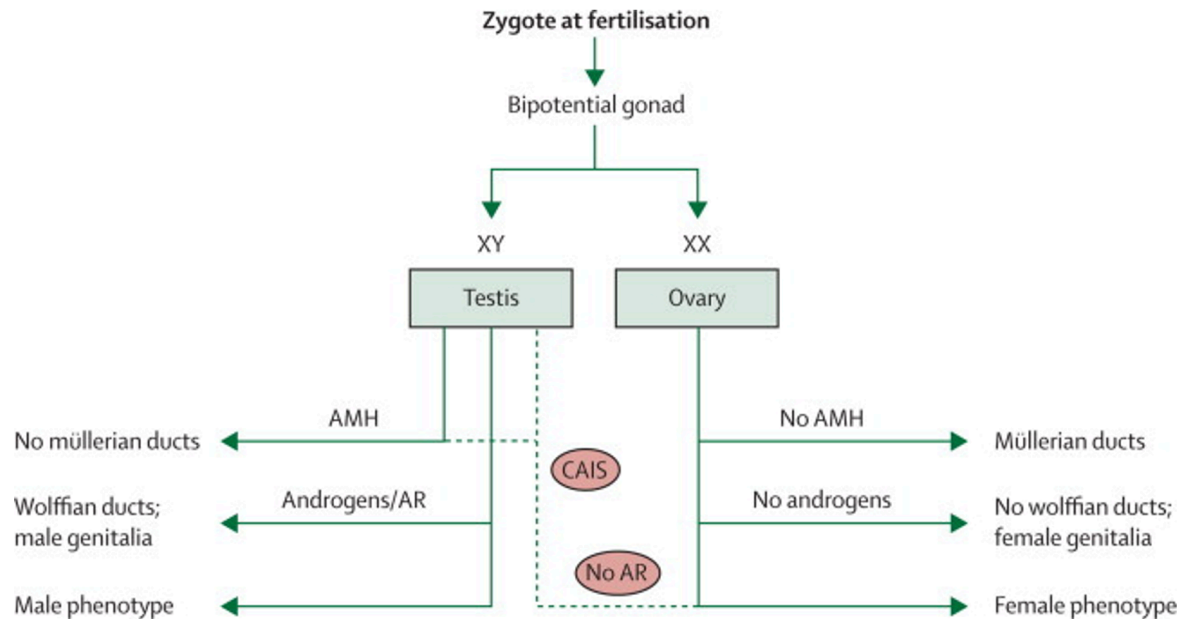
Mullerian inhibiting substance causes **degeneration** of the female ducts

Sexual Differentiation



In the absence of a Y chromosome, the gonad differentiates into an **ovary**, the embryonic external genitalia differentiate into **female external genitalia**, the female ducts differentiate into **female internal genitalia** (uterus, uterine tubes, superior half of the vagina) & the **male ducts degenerate**

Summary of Sexual Differentiation



Hughes IA, Davies JD, Bunch TI, Pasterski V, Mastroiannopoulou K, MacDougall J. Androgen insensitivity syndrome. *The Lancet*. 2012;380(9851):1419-1428.

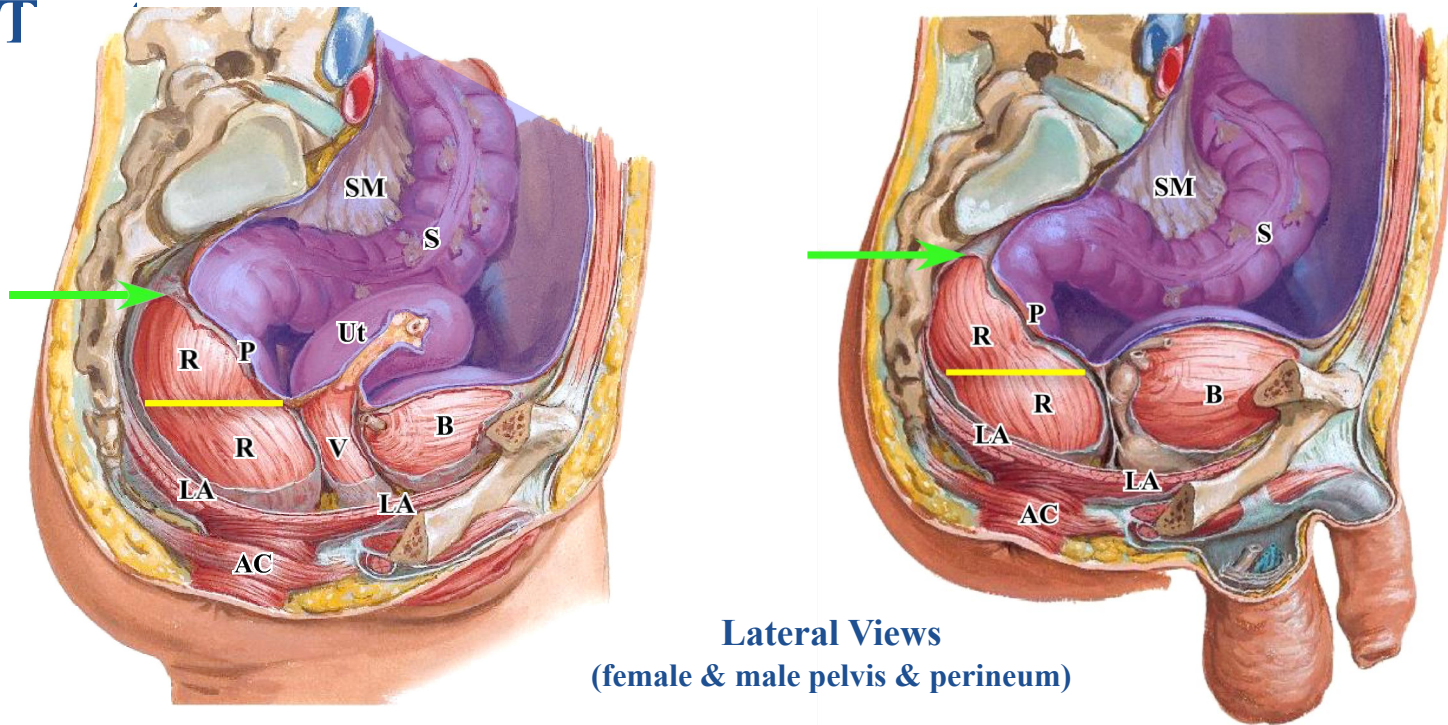
Some **intersex** variations are the result of cells partially responding or not responding to the testosterone produced by testes. Others also involve variations in the Wolffian/Müllerian pathways. Some examples include **androgen insensitivity syndrome** (partial or complete; indicated by dashed line) and **5-alpha-reductase deficiency**.

Slide provided by Columbia Students for Intersex Justice

The Gastrointestinal Tract in the Pelvis & Perineum

The Pelvic & Perineal Parts of the Gastrointestinal

T



Lateral Views
(female & male pelvis & perineum)

The **rectosigmoid junction** (green arrows) is at the level of **S3** (part of sigmoid colon is in the pelvis)

The **upper half** of the **rectum** (above yellow line) is **retroperitoneal** (its anterior surface is covered with parietal peritoneum [blue line])

The **lower half** of the **rectum** (below yellow line) is **subperitoneal**

The **anal canal** is within the **perineum** (below the levator ani)

AC - Anal canal (surrounded by anal sphincters)

B - Bladder

LA - Levator ani

P - Peritoneum

R - Rectum

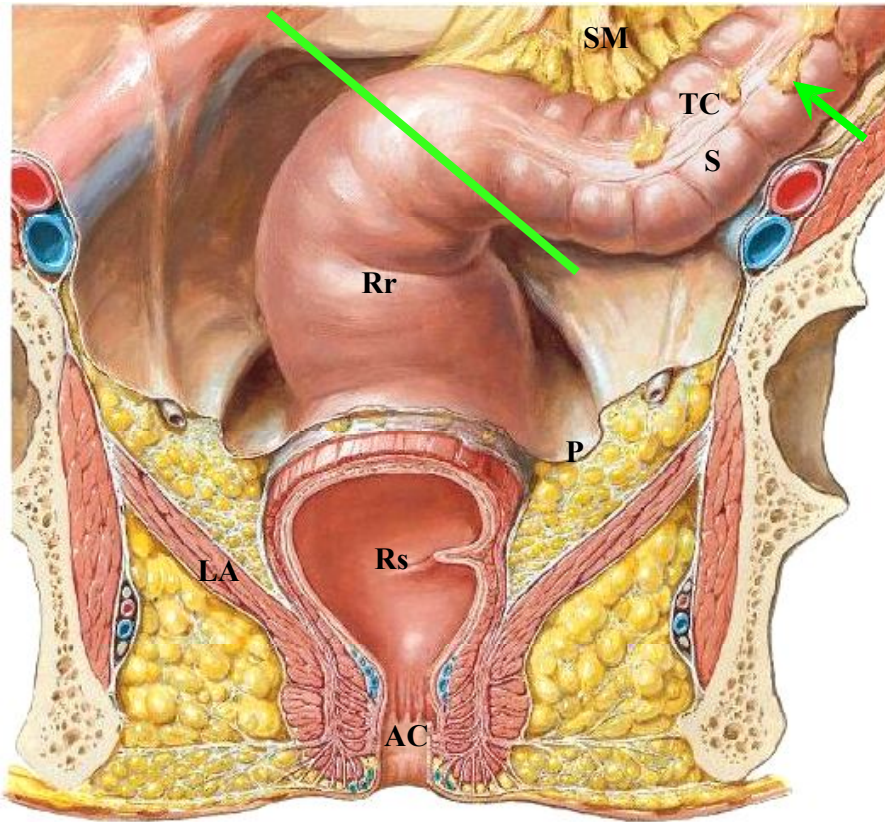
S - Sigmoid colon

SM - Sigmoid mesocolon

Ut - Uterus

V - Vagina

The Sigmoid Colon & Rectum



Coronal Section

The green line indicates the **rectosigmoid junction**

The rectum & sigmoid colon can be distinguished based on their **external** characteristics

Unlike the colon, the rectum does **NOT** have **omental tags of fat** (appendices epiploicae; green arrow), **teniae coli** (thickened longitudinal strips of smooth muscle) or **haustra**

AC – Anal canal (surrounded by anal sphincters)

LA – Levator ani

P – Peritoneum

Rr – Rectum (retroperitoneal)

Rs – Rectum (subperitoneal)

S – Sigmoid colon

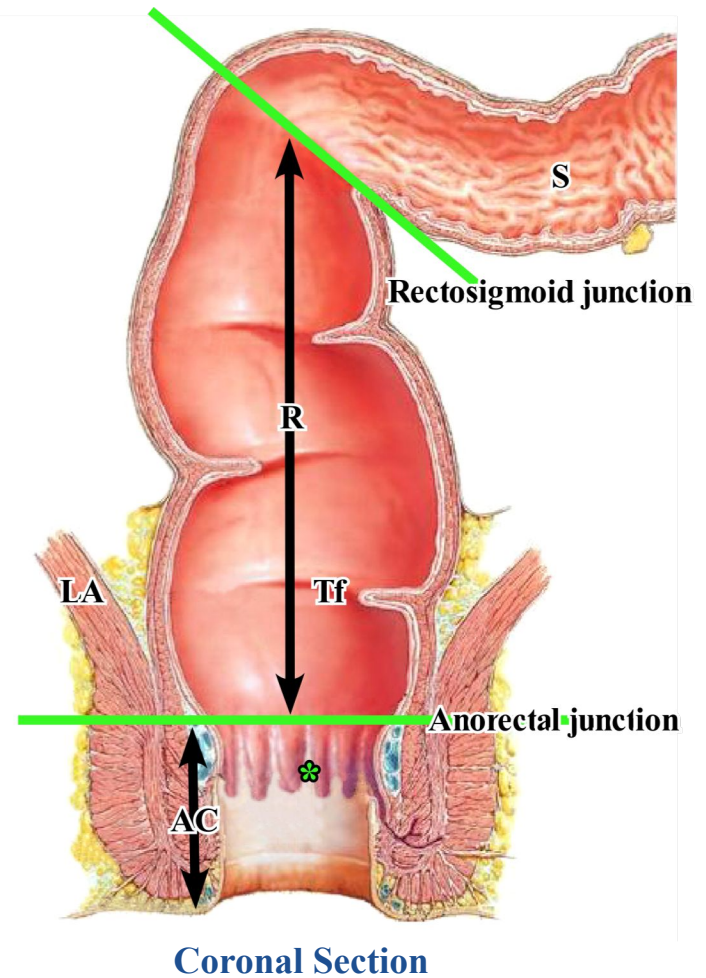
SM – Sigmoid mesocolon

TC – Teniae coli

The Sigmoid Colon & Rectum

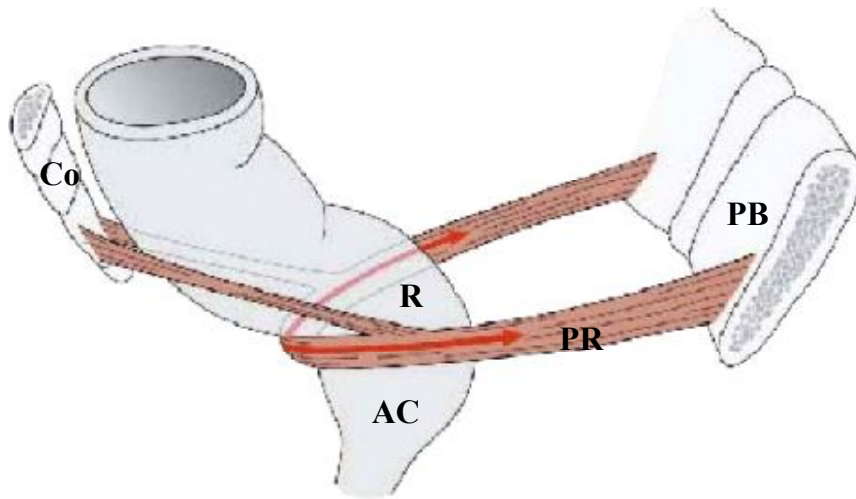
The rectum & sigmoid colon can also be distinguished based on their **internal** characteristics

Internally, the **mucosa** of the sigmoid colon is irregular in appearance & thickness, while that of the rectum is **smooth**; the rectum is characterized by a few incomplete **transverse folds**



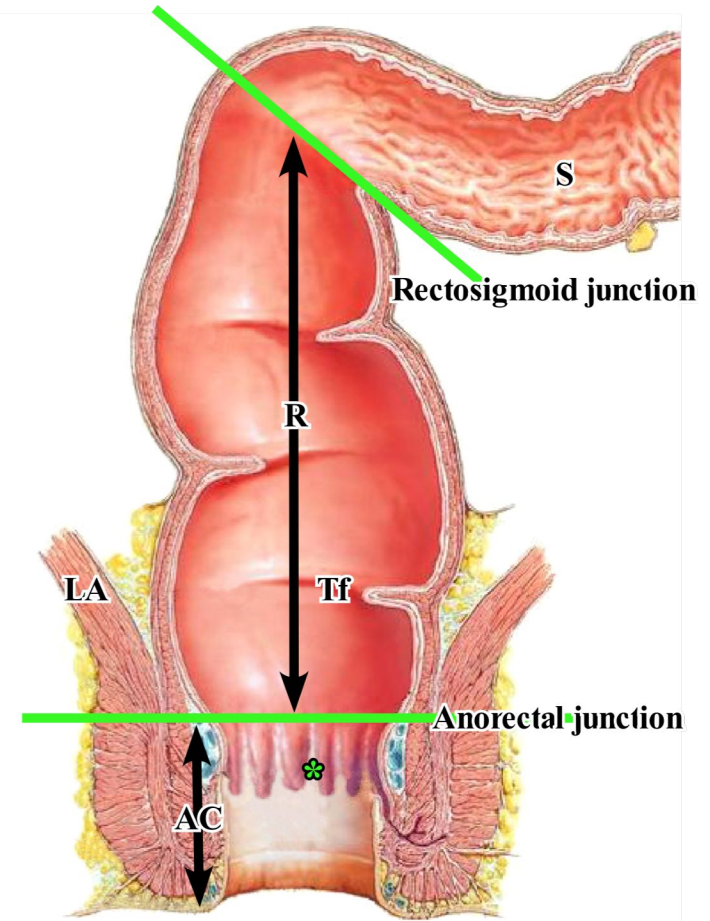
- ✿ - Anal columns
- AC - Anal canal (surrounded by anal sphincters)
- LA - Levator ani
- R - Rectum
- S - Sigmoid colon
- Tf - Transverse fold

The Sigmoid Colon & Rectum



The puborectalis portion of the levator ani encircles the **anorectal junction** forming a **puborectal sling**, that decreases the size of the lumen & keeps the rectum & anal canal at an acute angle to one another

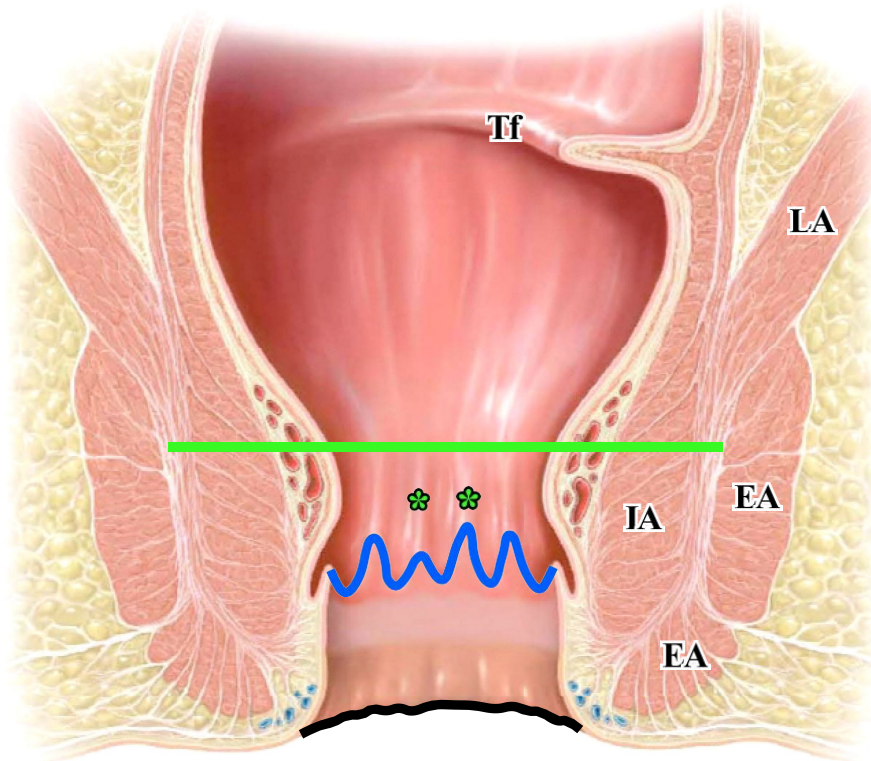
The puborectalis must **relax** in order for defecation to occur, as must the internal & external anal sphincters



Coronal Section

- ✿ - Anal columns
- AC - Anal canal (surrounded by anal sphincters)
- Co - Coccyx
- EA - External anal sphincter
- IA - Internal anal sphincter
- LA - Levator ani
- PB - Pubic bone
- PR - Puborectalis
- R - Rectum
- S - Sigmoid colon
- Tf - Transverse fold

The Anal Canal



Coronal Section

The **anal canal** extends from the superior limit of the **anal columns** (green asterisks) to the **anus** (black line), the external opening of the termination of the gastrointestinal tract

The inferior border of the anal columns is the **pectinate line** (blue line)

Tissue superior to the pectinate line is derived from embryonic **endoderm** & tissue inferior to the pectinate line is derived from embryonic **ectoderm**

The **blood & nerve supply differ above & below the pectinate line**

- ✿ - Anal columns
- EA - External anal sphincter
- IA - Internal anal sphincter
- LA - Levator ani
- Tf - Transverse fold

Blood Supply of the Gastrointestinal Tract in the Pelvis & Perineum

Inferior Mesenteric Blood Supply:

Sigmoidal arteries

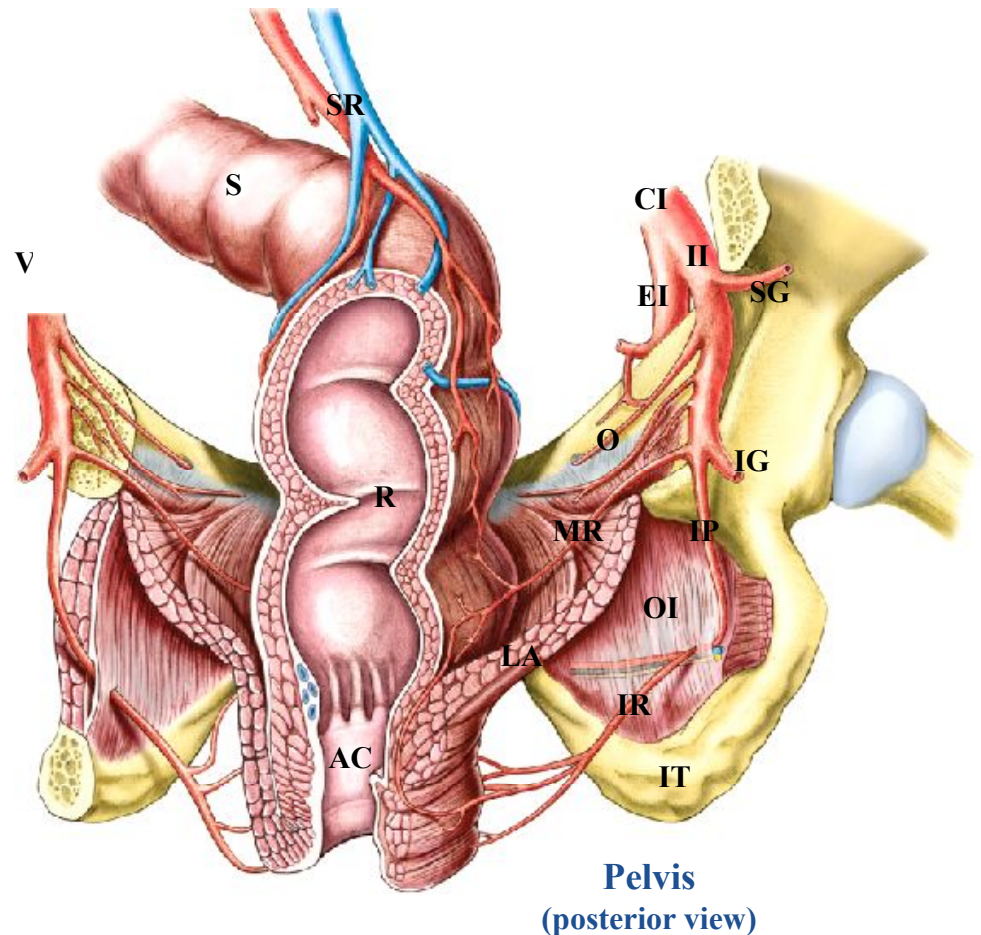
Superior rectal artery

Internal Iliac Blood Supply:

Middle rectal artery

Inferior rectal arteries

Sigmoidal, superior & middle rectal arteries are superior to the pelvic diaphragm (within the abdomen and/or pelvis) while the inferior rectal vessels are inferior to the pelvic diaphragm (within the perineum)



AC - Anal canal
CI - Common iliac
EI - External iliac
IG - Inferior gluteal
II - Internal iliac
IR - Inferior rectal
IT - Ischial tuberosity
LA - Levator ani

MR - Middle rectal
O - Obturator
OI - Obturator internus
R - Rectum
S - Sigmoid colon
SG - Superior gluteal
SR - Superior rectal

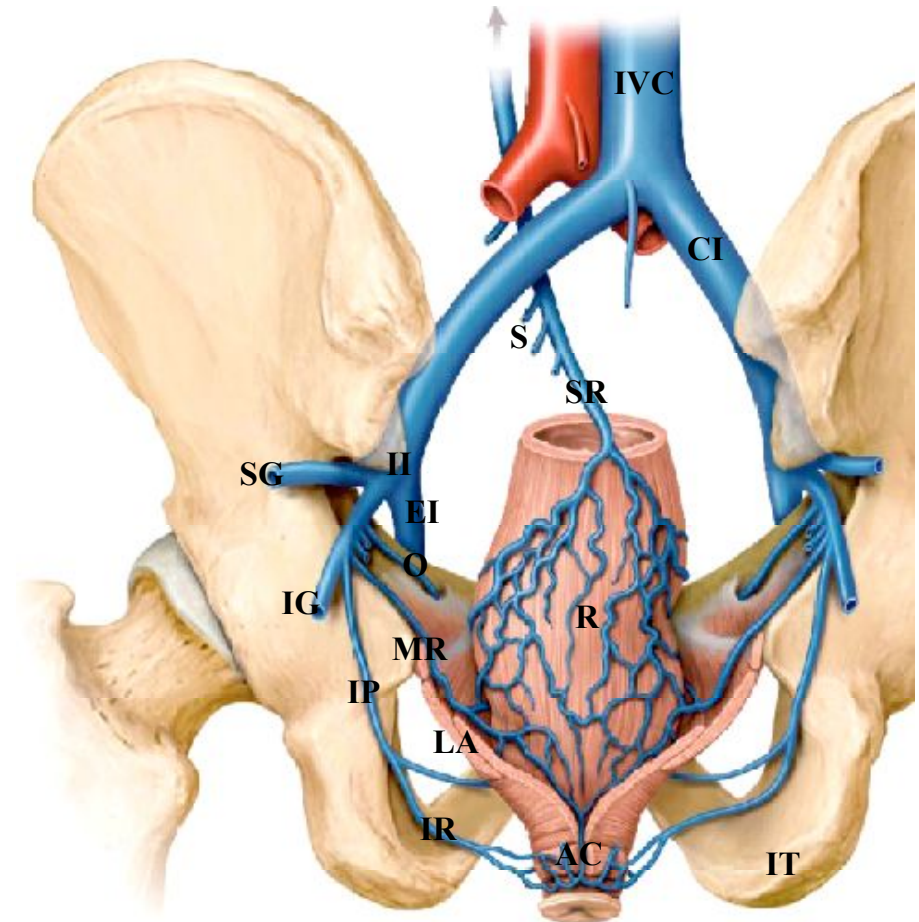
Venous Drainage of the Gastrointestinal Tract

The venous drainage mirrors the arterial supply

Drainage of the sigmoid colon & superior rectum is via the sigmoidal & superior rectal tributaries of the **inferior mesenteric vein** of the **portal system**

Drainage of the remainder of the rectum & anal canal is via the middle & inferior rectal tributaries of the **internal iliac** venous system

Hematogenous metastasis of tumors in the sigmoid colon and superior rectum are likely to metastasize to the **liver** via the **portal vein**, while metastases from the lower rectum & anal canal are likely to metastasize to the **lungs** via the **inferior vena cava**



Pelvis
(posterior view)

AC - Anal canal
CI - Common iliac
EI - External iliac
IG - Inferior gluteal
II - Internal iliac
IVC - Inferior vena cava
IR - Inferior rectal
IT - Ischial tuberosity

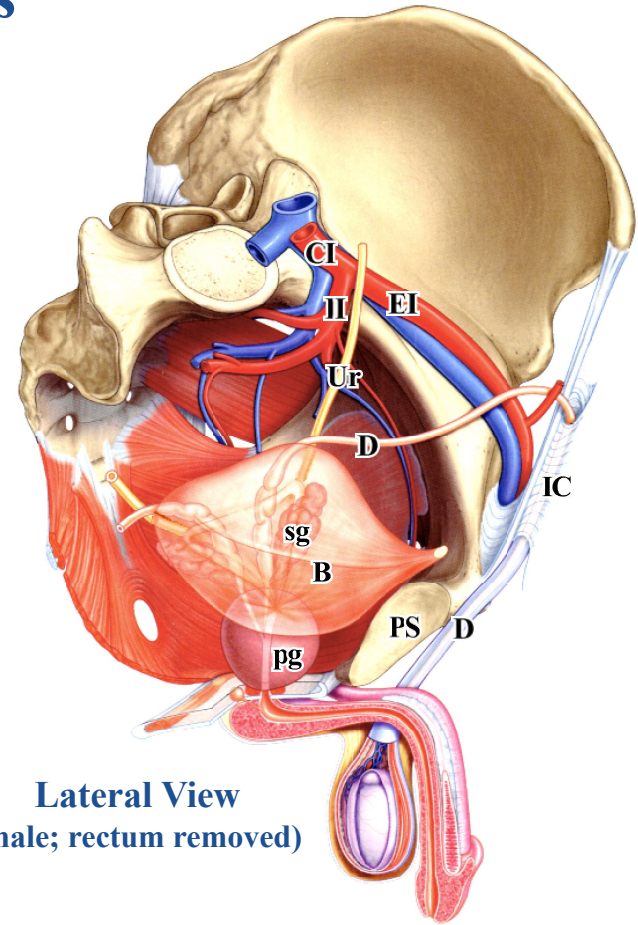
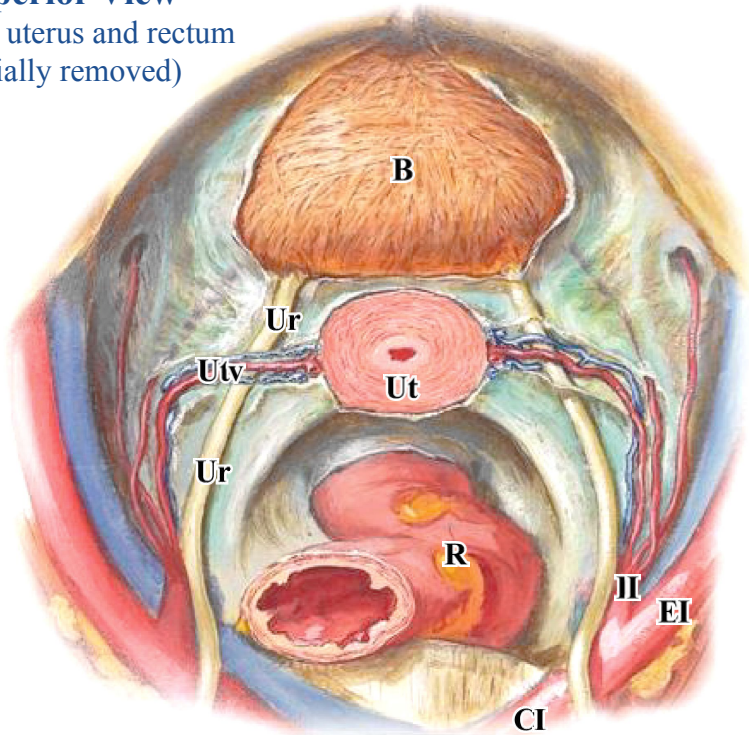
LA - Levator ani
MR - Middle rectal
O - Obturator
R - Rectum
S - Sigmoidal veins
SG - Superior gluteal
SR - Superior rectal

The Urinary Tract in the Pelvis & Perineum

The Ureters

Superior View

(female; uterus and rectum partially removed)



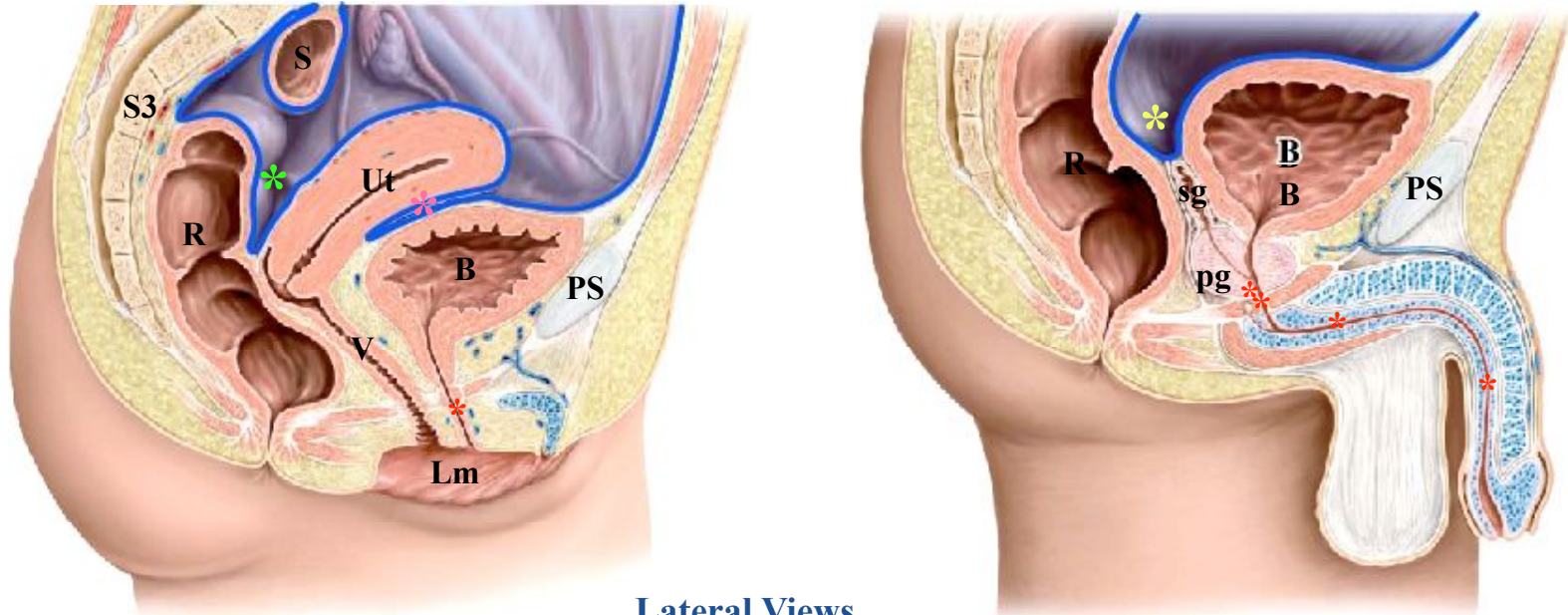
Lateral View
(male; rectum removed)

- B - Bladder
- CI - Common iliac artery
- D - Ductus (vas) deferens
- EI - External iliac artery
- IC - Inguinal canal
- II - Internal iliac artery
- pg - Prostate gland
- PS - Pubic symphysis
- R - Rectum
- sg - Seminal glands
- Ur - Ureter
- Ut - Uterus
- Utv - Uterine vessels





The ureters cross the pelvic brim to enter the pelvis near the bifurcation of the common iliac artery into its external and internal branches (the only “NOT Bridge over Water”)

Note that the **uterine arteries** in the female and the **ductus deferens** in the male are both superior to the ureters as they cross it (“Bridge over Water”)

The Bladder



Lateral Views
(female & male pelvis & perineum)

-  - Rectouterine pouch
-  - Rectovesical pouch
-  - Urethra
-  - Vesicouterine pouch
- B** - Bladder
- Lm** - Labium minus
- pg** - Prostate gland
- PS** - Pubic symphysis
- R** - Rectum
- S** - Sigmoid colon
- S3** - Third sacral vertebra
- sg** - Seminal glands
- Ut** - Uterus
- V** - Vagina

The **urinary bladder** is **subperitoneal** and covered with parietal peritoneum on its superior surface

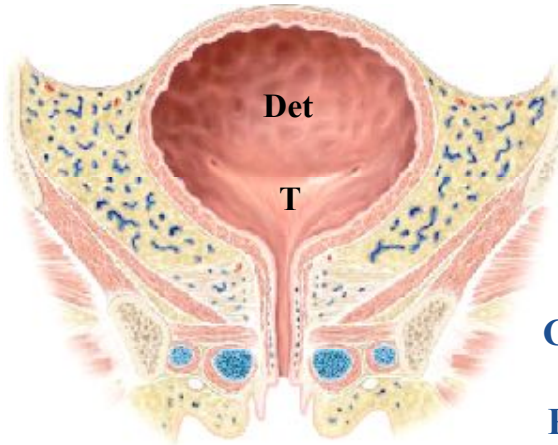
The size of the bladder varies considerably based on its content of urine

When empty the bladder is posterior to the **pubic bones & pubic symphysis**, however when full the bladder can rise well above the pubic bones as in the image on the right

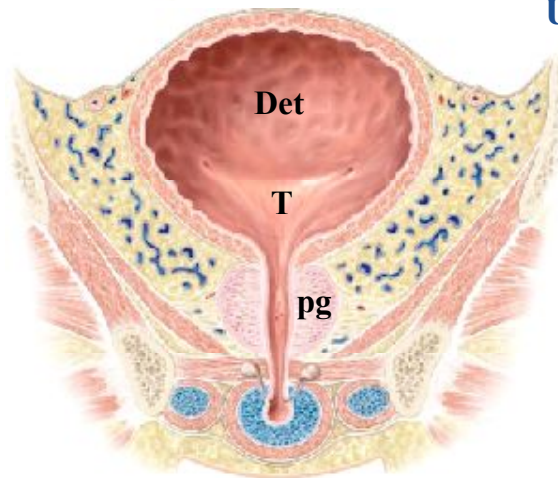
Note that the female urethra is **relatively short** as compared to the male urethra

The Bladder

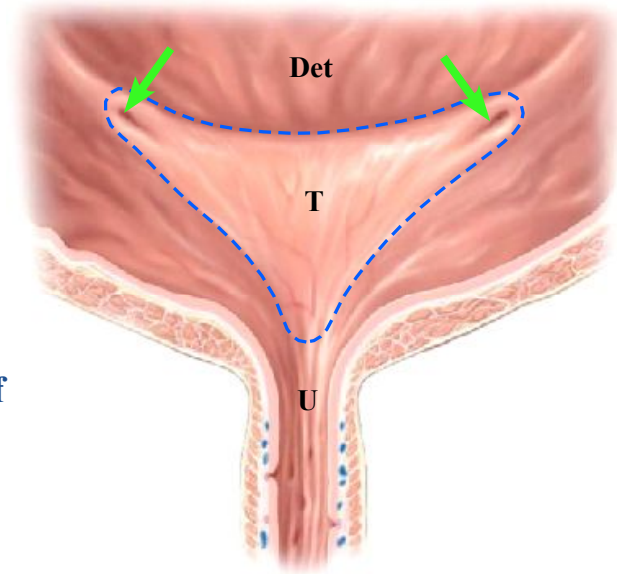
Female



Male



Coronal Sections showing the Posterior Wall of Urinary Bladder





The bladder is made up of **smooth muscle**:

Trigone muscle - in a triangular area between the ureteral openings & the urethra

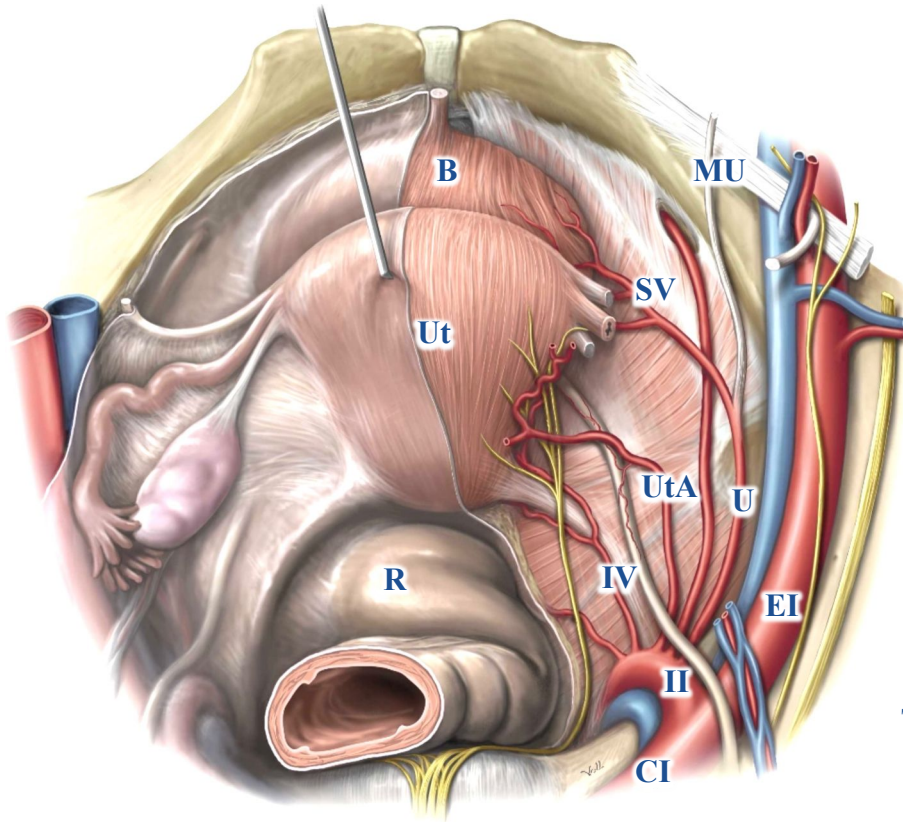
Detrusor muscle - in the remainder of the bladder wall

During **filling** of the bladder, the detrusor muscle expands & the trigone is contracted

During **micturition** (urination) the detrusor muscle contracts & the trigone relaxes; contraction of the ureters in the wall of the bladder during micturition **prevents** retrograde flow of urine

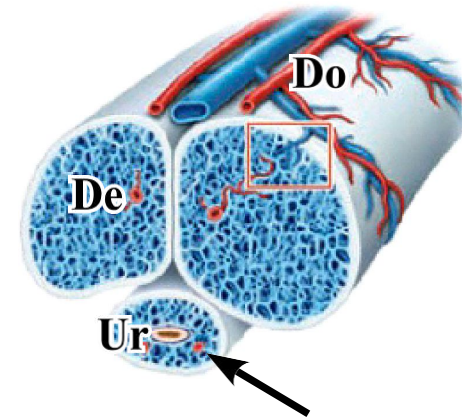
-  - Ureteral openings
-  - Trigone
- Det** - Detrusor muscle
- pg** - Prostate gland
- T** - Trigone
- U** - Urethra

Blood Supply of the Bladder & Urethra



**Pelvis
(superior view)**

- | | |
|---------------------------------|-----------------------|
| B - Bladder | R - Rectum |
| CI - Common iliac | SV - Superior vesical |
| Do - Dorsal artery of the penis | U - Umbilical |
| EI - External iliac | Ur - Urethra |
| II - Internal iliac | Ut - Uterus |
| IV - Inferior vesical | UtA - Uterine artery |
| MU - Medial umbilical ligament | |



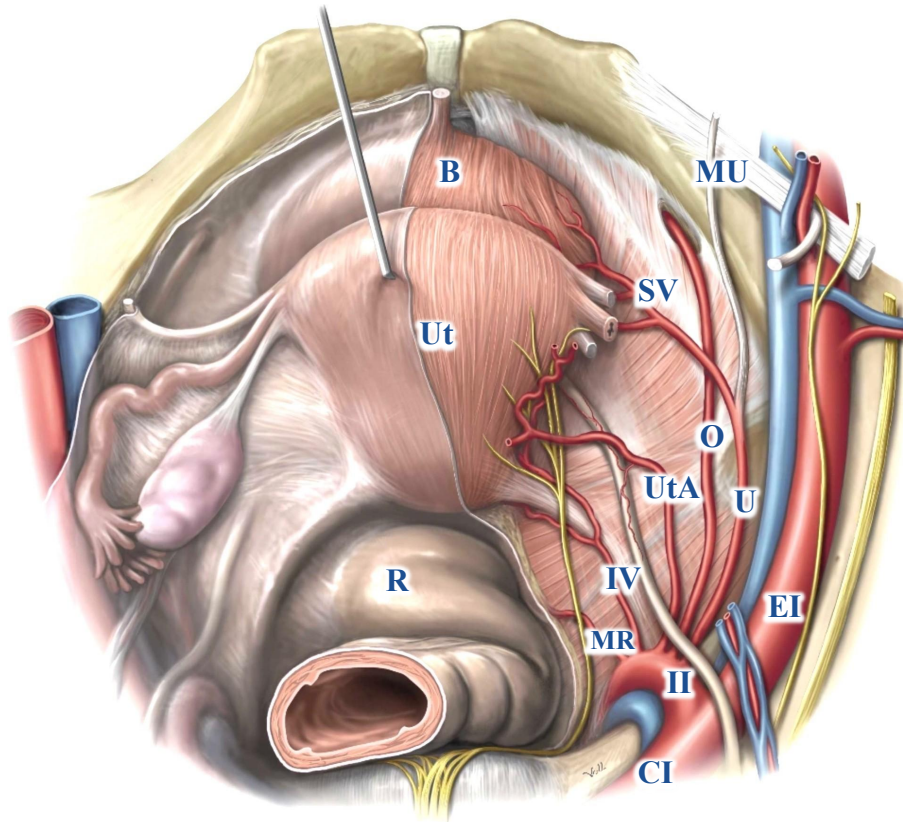
**Body of the penis
(cross section)**

The bladder & urethra are supplied by multiple branches of the internal iliac artery:

Superior & inferior vesical arteries (branches of the umbilical artery & internal iliac, respectively) - both male & female

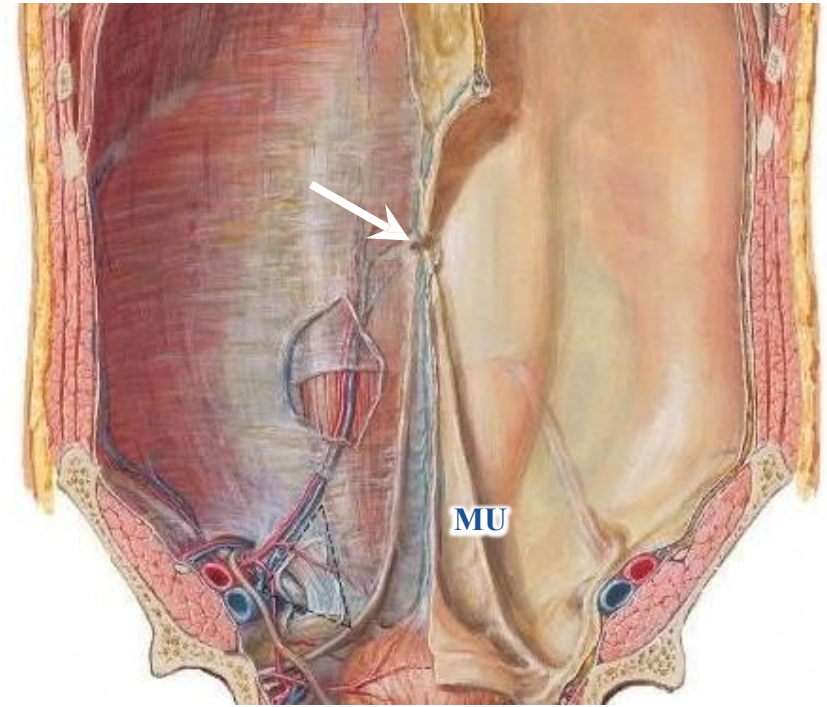
Urethral arteries of the penis (arrow; run within the corpus spongiosum; branches of the internal pudendal artery)

Anterior Abdominal



Pelvis
(superior view)

- | | |
|---------------------------------------|------------------------------|
| B - Bladder | O - Obturator |
| CI - Common iliac | R - Rectum |
| EI - External iliac | SV - Superior vesical |
| II - Internal iliac | U - Umbilical |
| IV - Inferior vesical | Ut - Uterus |
| MR - Middle rectal | UtA - Uterine artery |
| MU - Medial umbilical ligament | |



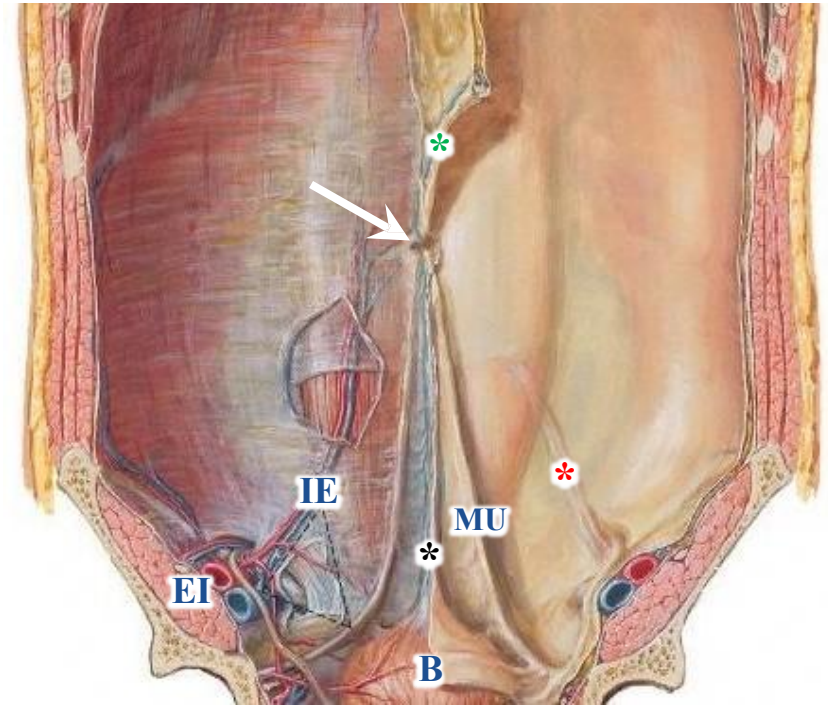
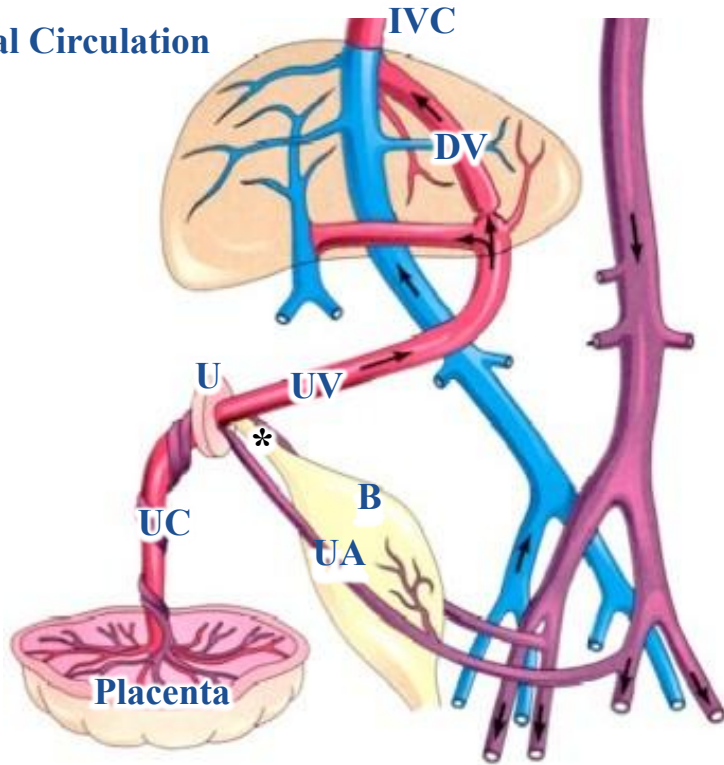
Adult Anterior Abdominal Wall
(internal view)

The **superior vesical** arteries are branches of the **umbilical** artery that persists into adulthood

After giving off the superior vesical arteries, the umbilical artery becomes a fibrous cord that runs to the umbilicus (white arrow) on the inner surface of the anterior abdominal wall, the **medial umbilical fold**

Anterior Abdominal Wall

Fetal Circulation



Adult Anterior Abdominal Wall
(internal view)

The **median umbilical fold** (black asterisks at right & left) is the remnant of the **urachus**, a fetal connection between the bladder & umbilicus

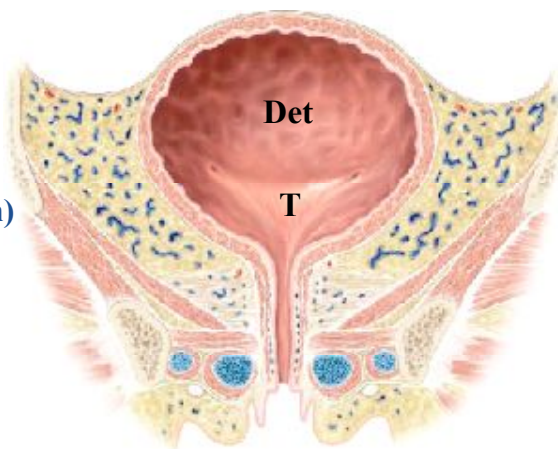
The **round ligament** (green asterisk) is the obliterated **umbilical vein**

The **lateral umbilical fold** (red asterisk) is created by the underlying **inferior epigastric** arteries

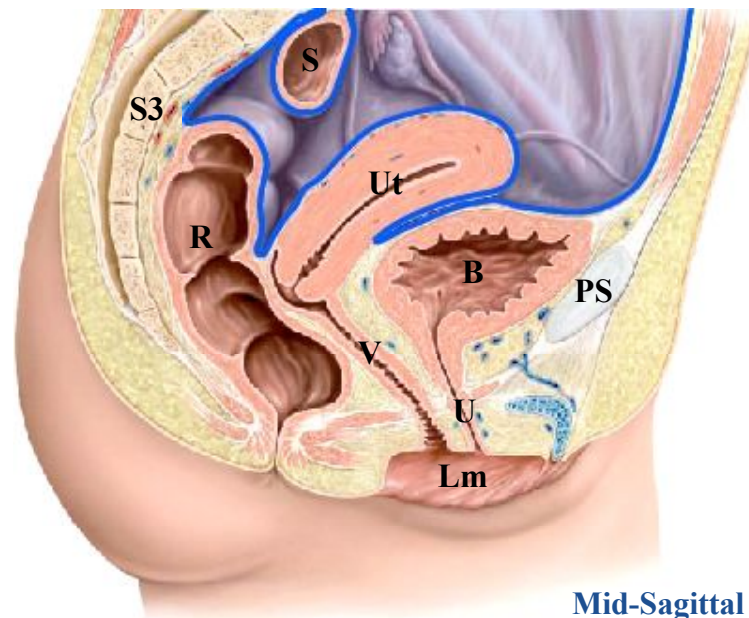
- B - Bladder
- DV - Ductus venosus
- EI - External iliac vessels
- IE - Inferior epigastric vessels
- IVC - Inferior vena cava
- MU - Medial umbilical fold
- U - Umbilicus
- UA - Umbilical artery
- UC - Umbilical cord
- UV - Umbilical vein

The Female Bladder & Urethra

Female
(coronal section)



Posterior Wall of
Urinary Bladder



Mid-Sagittal Section

- A - Anus
- B - Bladder
- Det - Detrusor muscle
- G - Glans of the clitoris
- Lm - Labia minora
- LM - Labia majora
- P - Prepuce of the clitoris
- PS - Pubic symphysis
- R - Rectum
- S - Sigmoid colon
- T - Trigone
- U - Urethra
- Ut - Uterus
- V - Vagina

The female urethra is relatively **short** (~4 cm) & straight as compared to the male urethra

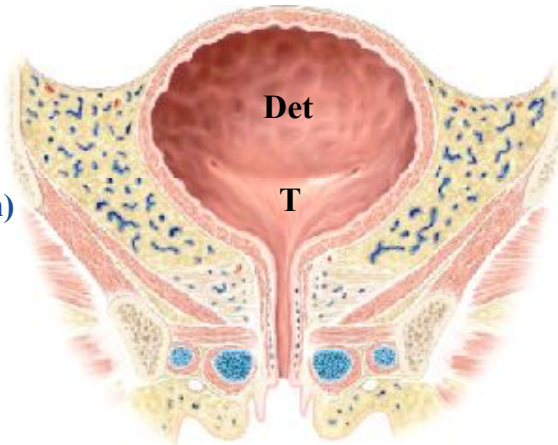
The proximity of the urethra to the anus probably explains why women are more prone to **urinary tract infections**

The urethra passes through the pelvic diaphragm (levator ani) & is surrounded by an **external urethral sphincter** in the urogenital triangle

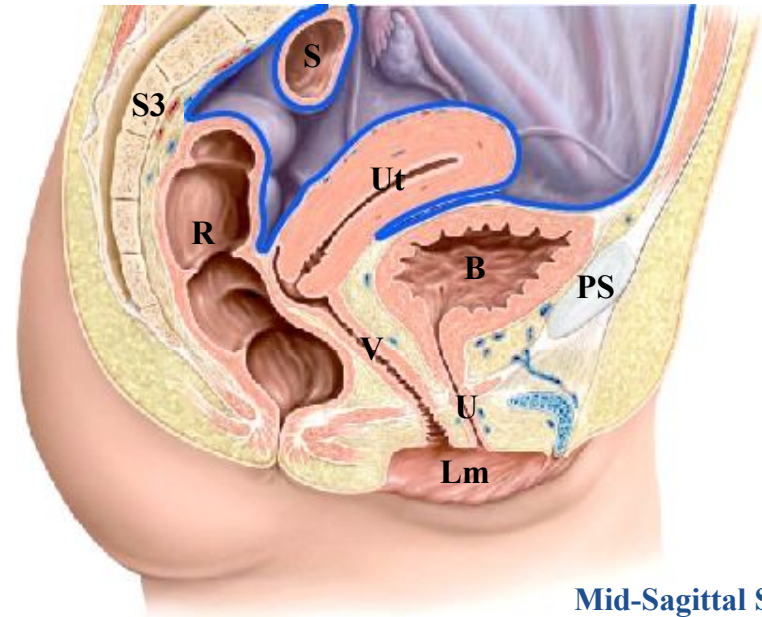
Note: The presence of an **internal urethral sphincter** surrounding the urethra as it exits the bladder is questionable in females; if present, it is not as well developed as in males

The Female Urethra

Female
(coronal section)

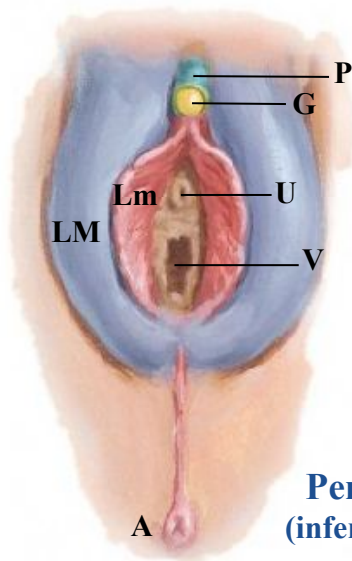


Posterior Wall of
Urinary Bladder



Mid-Sagittal Section

- A - Anus
- B - Bladder
- Det - Detrusor muscle
- G - Glans of the clitoris
- Lm - Labia minora
- LM - Labia majora
- P - Prepuce of the clitoris
- PS - Pubic symphysis
- R - Rectum
- S - Sigmoid colon
- T - Trigone
- U - Urethra
- Ut - Uterus
- V - Vagina

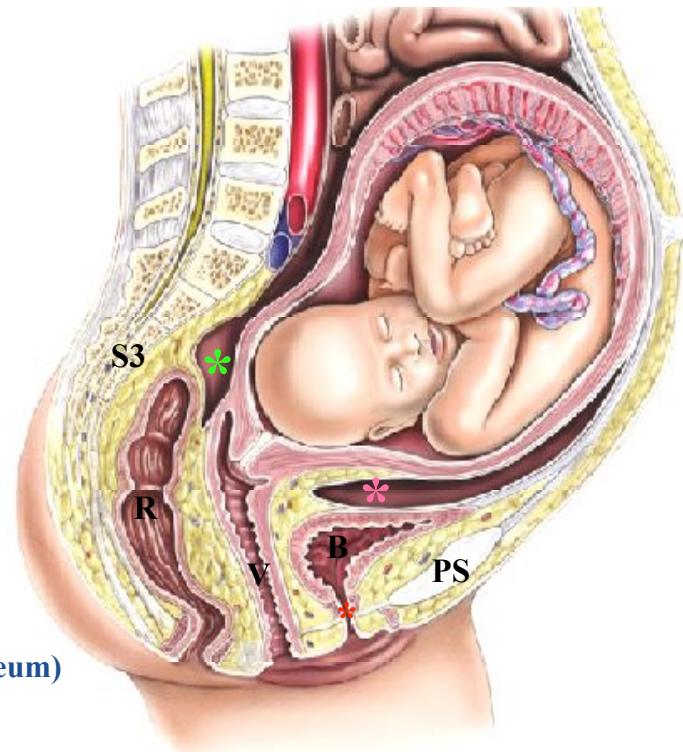
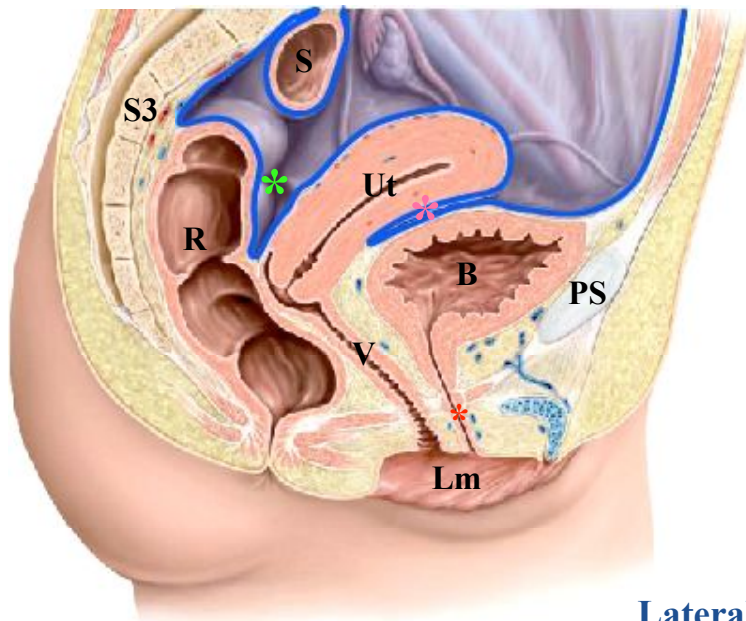


Perineum
(inferior view)





The **external urethral orifice** is within the **vestibule of the vagina** between the labia minora, posterior to the clitoris & anterior to the vaginal orifice

There is a high level of **urinary incontinence** in women who have given birth due to weakening of the **pelvic diaphragm** & the **external urethral sphincter**

The Bladder During Pregnancy



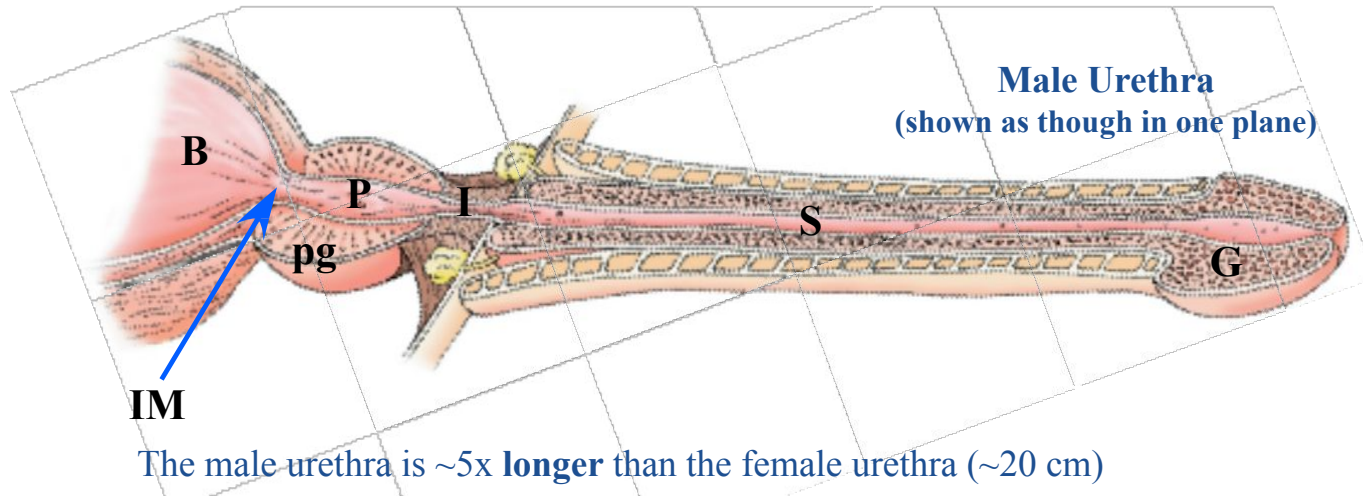
Lateral Views
(female pelvis & perineum)

-  - Rectouterine pouch
-  - Rectovesical pouch
-  - Urethra
-  - Vesicouterine pouch
- B** - Bladder
- Lm** - Labium minus
- pg** - Prostate gland
- PS** - Pubic symphysis
- R** - Rectum
- S** - Sigmoid colon
- S3** - Third sacral vertebra
- sg** - Seminal glands
- Ut** - Uterus
- V** - Vagina

In the female, the **vesicouterine pouch** intervenes between the bladder and the uterus; a uterus in the usual position (anteverted and anteflexed, as shown) rests on the superior surface of the bladder

The position of the uterus with respect to the bladder can be problematic during pregnancy causing a need for frequent urination

The Male Urethra



The male urethra is ~5x longer than the female urethra (~20 cm)

The male urethra is divided into anatomical parts:

- **Intramural part** – where it leaves the bladder & is surrounded by the **internal urethral sphincter**
- **Prostatic part** – within the **prostate gland**
- **Intermediate part** – within the **perineum** where it is surrounded by the **external urethral sphincter**
- **Spongy part** – within the **bulb, corpus spongiosum & glans penis**

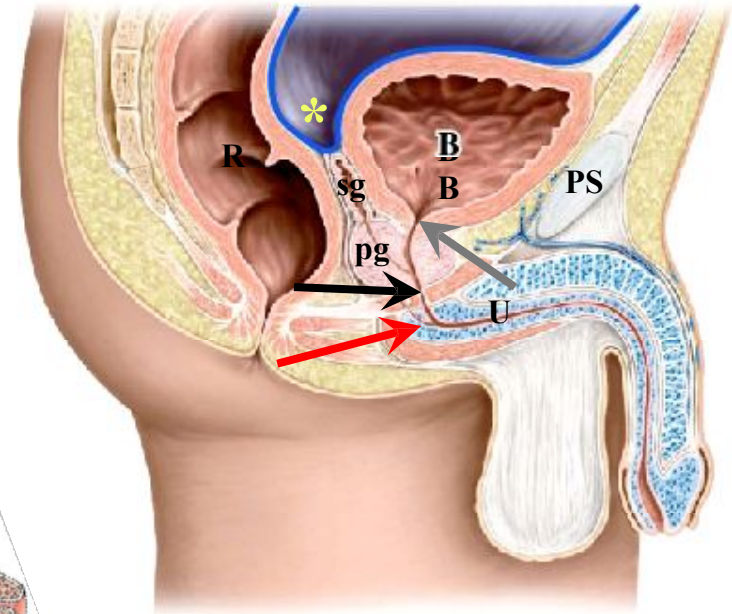
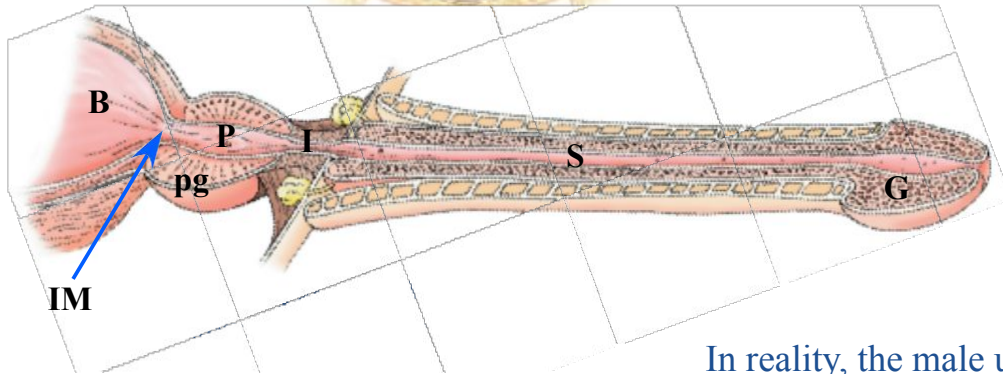
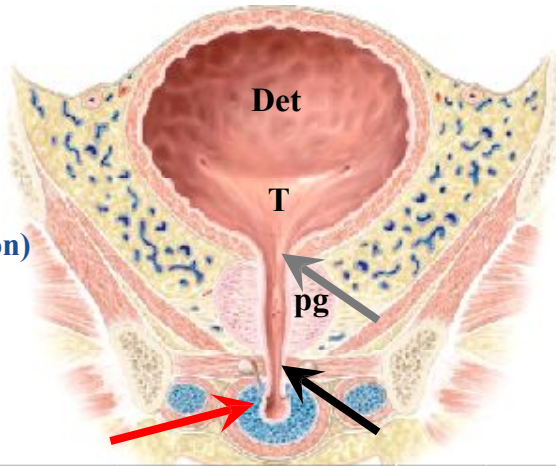
Note that the urethra is **narrowest** where it is surrounded by the **internal & external urethral sphincters**

Note that the urethra is **widest** within the **prostate gland & glans of the penis** (navicular fossa)

B - Bladder
G - Glans penis
I - Intermediate part of urethra
IM - Intramural part of urethra
P - Prostatic part of urethra
pg - Prostate gland
S - Spongy part of urethra

The Male Urethra

Male
(coronal section)



Mid-Sagittal Section

In reality, the male urethra is not in one plane

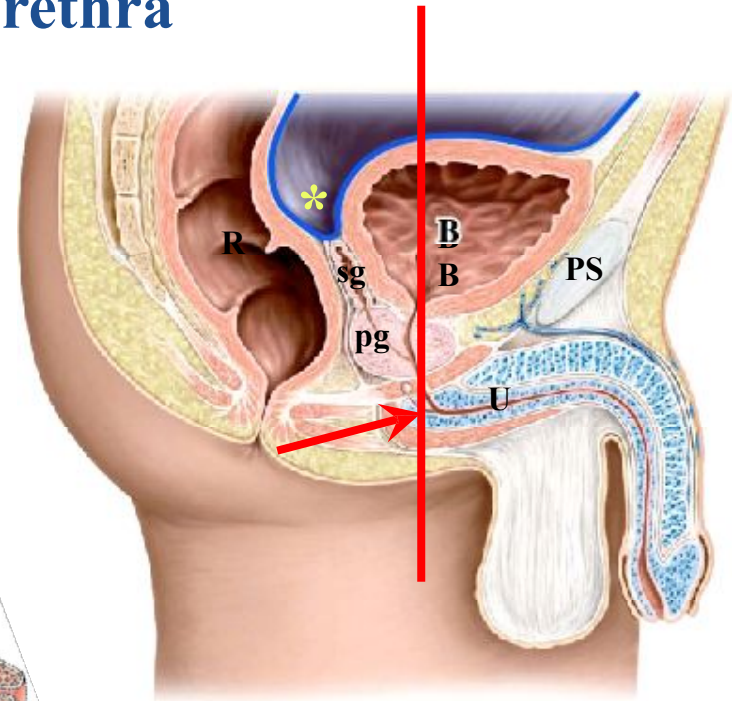
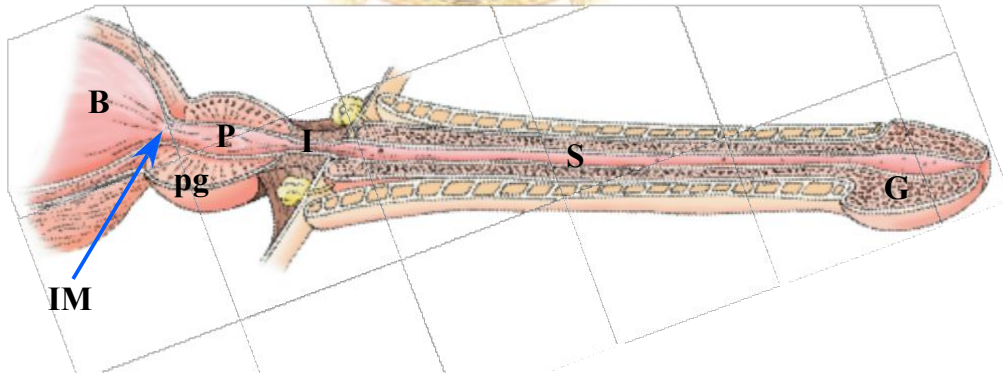
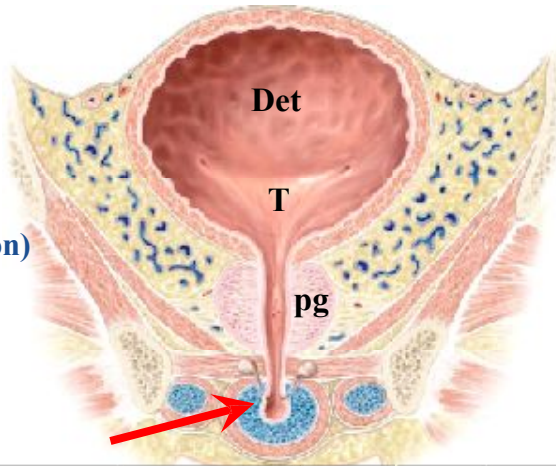
The urethra makes a **90-degree bend** as it goes through the bulb of the penis (red arrow)

The urethra is surrounded by an **internal urethral sphincter** (gray arrow) as it exits the bladder & by an **external urethral sphincter** (black arrow) as it passes through the pelvic diaphragm (levator ani)

- | | |
|---|-----------------------------------|
| B - Bladder | PS - Pubic symphysis |
| Det - Detrusor muscle | R - Rectum |
| G - Glans penis | S - Spongy part of urethra |
| I - Intermediate part of urethra | Sg - Seminal glands |
| IM - Intramural part of urethra | T - Trigone |
| P - Prostatic part of urethra | U - Urethra |
| pg - Prostate gland | |

The Male Urethra

Male
(coronal section)

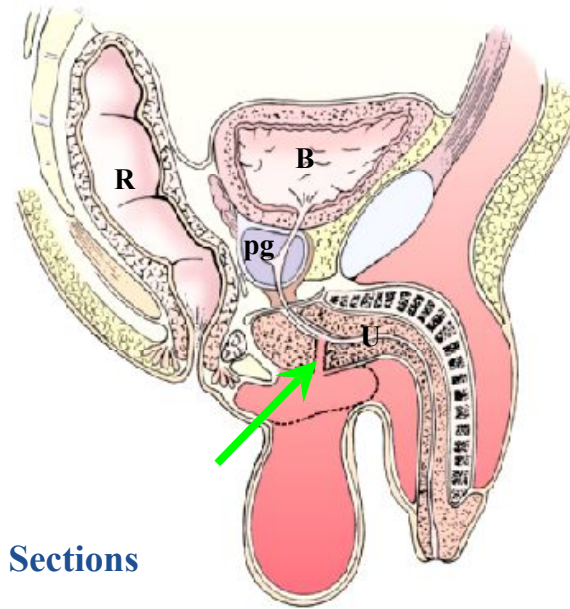
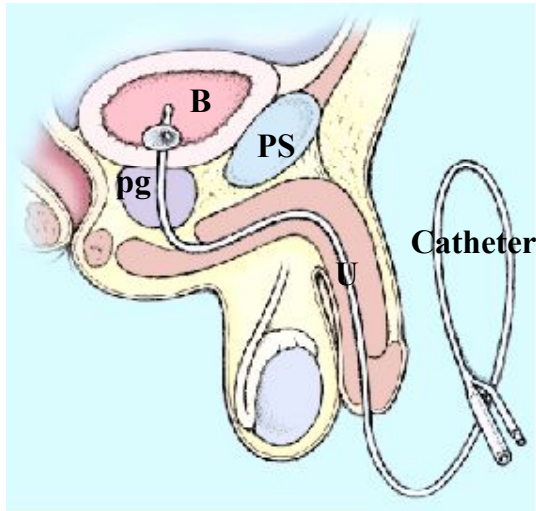


Mid-Sagittal Section

Because the urethra makes a 90-degree bend in the bulb of the penis (red arrows), it appears to end in the bulb in a coronal section such as above

- | | |
|---|-----------------------------------|
| B - Bladder | PS - Pubic symphysis |
| Det - Detrusor muscle | R - Rectum |
| G - Glans penis | S - Spongy part of urethra |
| I - Intermediate part of urethra | Sg - Seminal glands |
| IM - Intramural part of urethra | T - Trigone |
| P - Prostatic part of urethra | U - Urethra |
| pg - Prostate gland | |

Catheterization of the Male Urethra



Mid-Sagittal Sections

The 90-degree bend in the urethra complicates **catheterization**

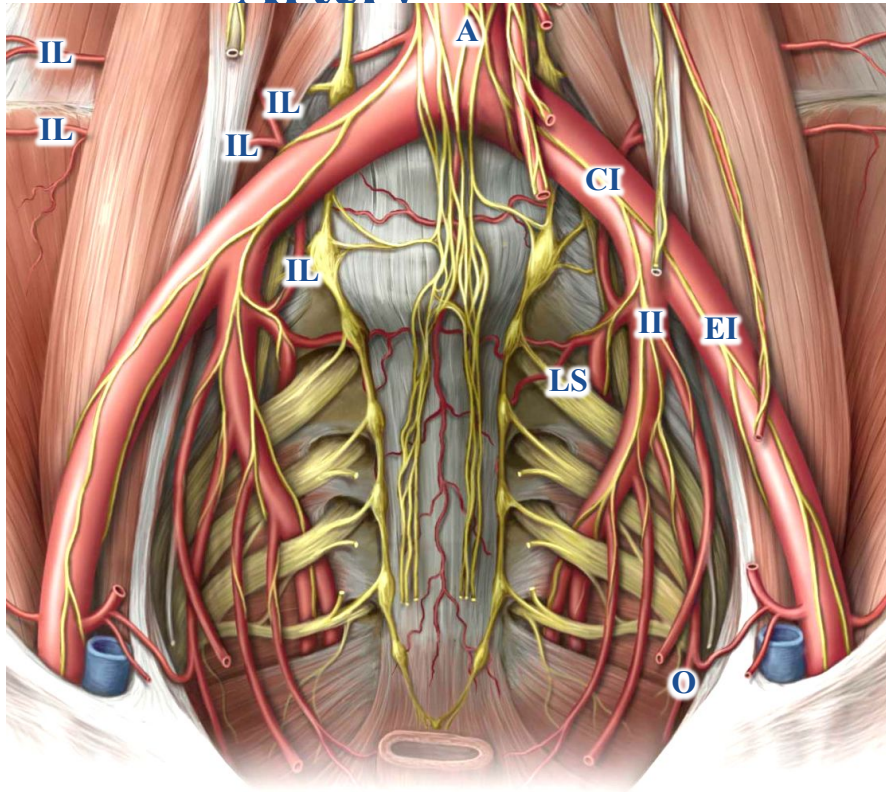
The **posterior wall** of the urethra is particularly vulnerable within the bulb of the penis (red arrow)

This can cause **rupture of the urethra** (green arrow) & subsequent pooling of urine within the perineum, scrotum & anterior abdominal wall

B - Bladder
pg - Prostate gland
PS - Pubic symphysis
R - Rectum
U - Urethra

**Branches of the Internal Iliac
Artery Supplying the Body
Wall**

Body Wall Branches of the Internal Iliac Artery



Anterior View

Some of the branches of the internal iliac artery within the pelvis that supply the **body wall**:

Iliolumbar - runs superiorly & laterally to the iliac fossa

Lateral sacral - descends along the anterior sacral foramina

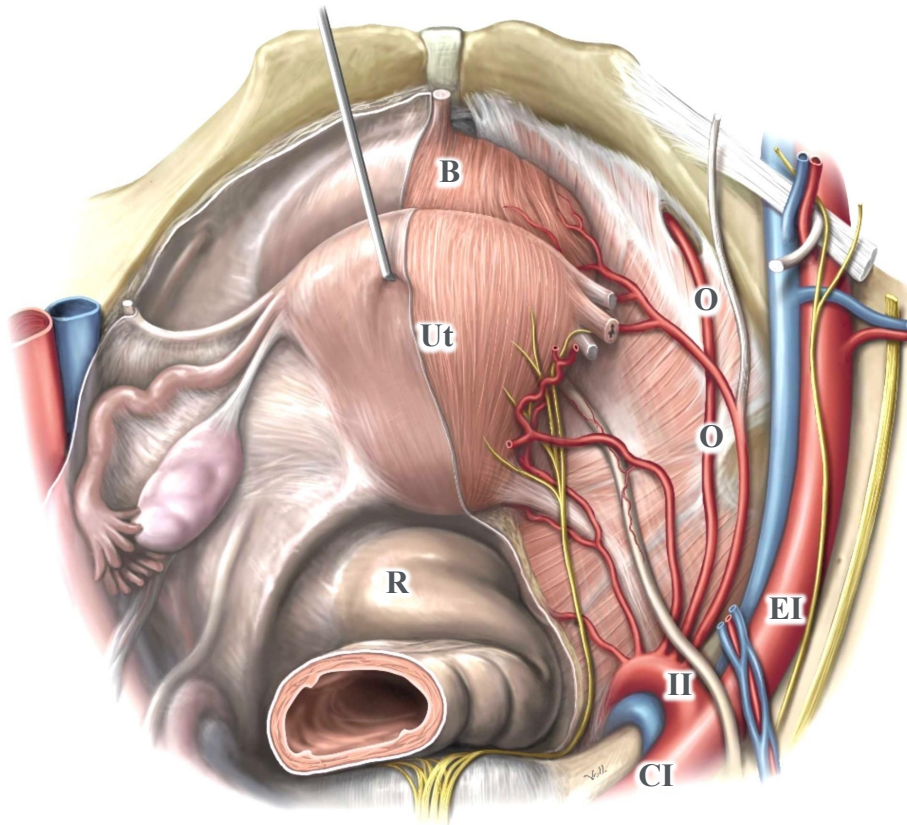
Obturator - goes through the obturator canal with the obturator nerve

Internal pudendal - goes through the greater sciatic foramen to enter the gluteal region & through the lesser sciatic foramen to enter the perineum

Arteries must be identified based on their route & what they supply!!!

A – Aorta
CI – Common iliac
EI – External iliac
IL - Iliolumbar
II – Internal iliac
LS - Lateral sacral
O - Obturator

Body Wall Branches of the Internal Iliac



Pelvis
(superior view)

- A – Aorta
- B - Bladder
- CI – Common iliac
- EI – External iliac
- II – Internal iliac
- O - Obturator
- R - Rectum
- Ut - Uterus

Some of the branches of the internal iliac artery within the pelvis that supply the **body wall**:

Iliolumbar - runs superiorly & laterally to the iliac fossa

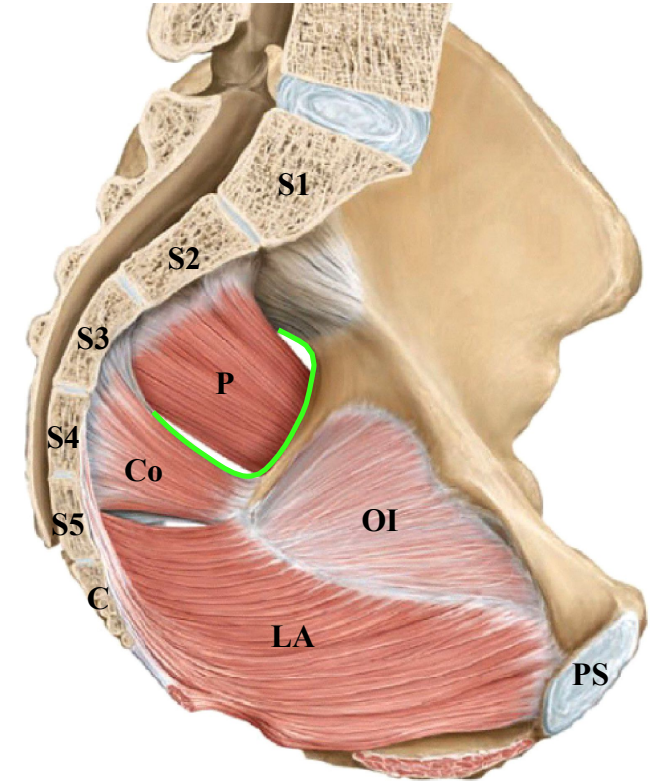
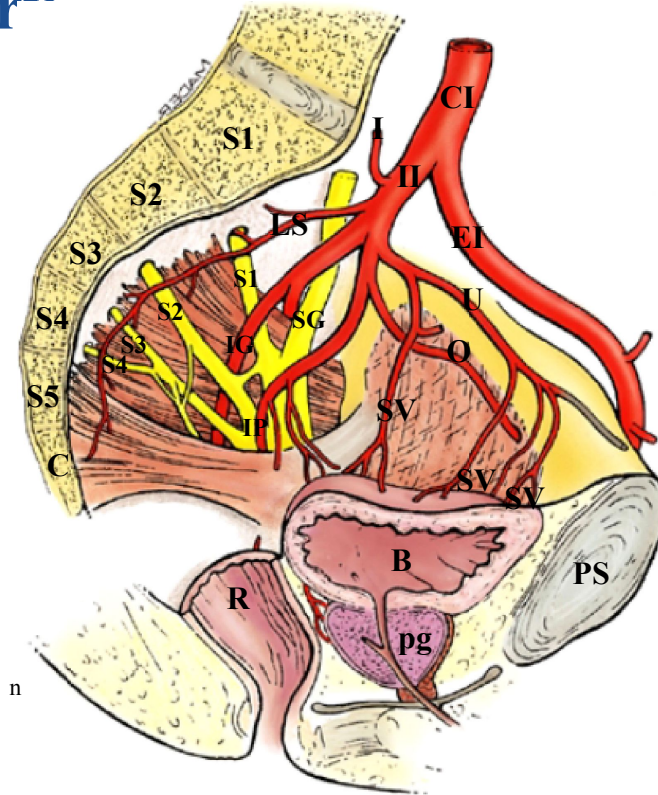
Lateral sacral - descends along the anterior sacral foramina

Obturator - goes through the obturator canal with the obturator nerve

Internal pudendal - goes through the greater sciatic foramen to enter the gluteal region & through the lesser sciatic foramen to enter the perineum

Arteries must be identified based on their route & what they supply!!!

Body Wall Branches of the Internal Iliac Artery



- Greater sciatic foramen
- B - Bladder
- C - Coccyx
- CI - Common iliac artery
- Co - Coccygeus
- EI - External iliac artery
- I. - Iliolumbar artery
- IG - Inferior gluteal artery
- II. - Internal iliac artery
- IP - Internal pudendal artery
- LA - Levator ani
- LS - Lateral sacral artery
- O - Obturator artery
- OI - Obturator internus
- P - Piriformis
- pg - Prostate gland
- PS - Pubic symphysis
- R - Rectum
- SG - Superior gluteal artery
- SV - Superior vesical artery
- U - Umbilical artery

These body wall branches go through the **greater sciatic foramen**:

- Superior gluteal** (usually goes between the lumbosacral trunk & ventral ramus of S1)
- Inferior gluteal** (goes between ventral rami of S1 & S2 or S2 & S3)
- Internal pudendal** (is adjacent to the sciatic nerve & does not go between ventral rami)