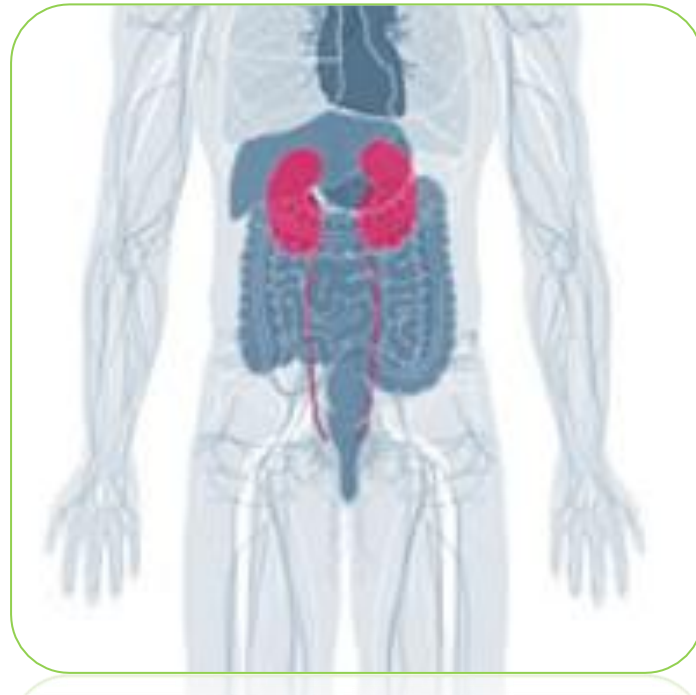


Embryology

Renal Block



Lecture2- Development of the urinary bladder and urethra

[Development of urinary Bladder & urethra]

OBJECTIVES

At the end of the lecture the student is able to :

Describe the cloaca and the formation of the urogenital sinus.

#Discuss the division of the urogenital sinus into various parts and name the adult organs that are derived from each part.

#Describe how the caudal parts of the mesonephric ducts and ureters are absorbed into the urogenital sinus and the significance of this embryonic event.

#Discuss the position of the urachus and its significance and fate.

#Describe the various anomalies concerned with the urinary bladder and urethra.

[Development of urinary Bladder & urethra]

Urethral Anomalies:

1-Hypospadias : is the most common anomaly, with incomplete fusion of the urethral folds, and abnormal openings of the urethra occur along the ventral (inferior) aspect of the penis.

2-Epispadias: is a rare abnormality, in which the urethral meatus is found on the dorsum of penis, it is most often associated with extrophy of the bladder.

Urachal anomalies:

- 1) Urachal cyst persistence or remnant of epithelial lining of urachus
- .2) Urachal sinus, discharge serous fluid from the umbilicus.
- 3) Urachal fistula, the entire urachus remains patent and allows urine to escape from the umbilicus.

Extrophy of the bladder (Ectopiae vesica):

exposure of the posterior wall of the bladder due to a defect in the anterior abdominal wall and anterior wall of the bladder.

In infants and children the bladder is an abdominal organ. It starts to enter the greater pelvis at about 6 years and becomes a pelvic organ until after puberty.

Male:

* 2 urethral folds in male fuse with each other to close the penile urethra.

*The genital tubercle elongates forming the phallus, which is the precursor of the penis.

* Most of the male urethra : prostatic, membranous and spongy parts is derived from endoderm of the pelvic middle part of urogenital sinus.

Female:

* 2 urethral folds in female remain separate to form labia minora

* The external urethral orifice opens dorsal to the glans clitoris

* The entire female urethra is derived from endoderm of the pelvic part of the urogenital sinus.

Indifferent stage:

*The genital tubercle (mesenchymal elevation) develops at the cranial end of the cloacal membrane.

*Two urethral folds, develop on either side of the urogenital membrane.

*Laterally two labioscrotal folds develop on either side of the urethral folds

MIND MAB

Anomalies

Urethra

The Cloaca

Urinary bladder

*The allantois is at first continues with the bladder, then it becomes a thick fibrous cord urachus (median umbilical ligament in adults)
*the ureters open separately in the bladder after absorption of the mesonephric ducts.

It develops mainly from the vesical part of the urogenital sinus

- *The trigone from > the absorbed caudal ends of the mesonephric ducts
- *The epithelium from > endoderm
- *The other layers from > the splanchnic mesoderm

is the dilated terminal part of the hind gut >> It receives the allantois and the mesonephric ducts and its floor is closed by the cloacal membrane.

they are divided BY mesodermal urorectal septum

Is divided into three parts: □

- cranial; vesical part; forms most of the bladder and continuous with the allantois.
- middle; pelvic part; forms main part of male urethra and entire female urethra.
- caudal; phallic part grows towards genital tubercle.

Ventral part :
the primitive urogenital sinus > Its floor is the urogenital membrane

Dorsal part :
forms the rectum and upper part of anal canal > Its floor is the anal membrane

[Development of urinary Bladder & urethra]

#Cloaca

#The cloaca is the dilated terminal part of the **hind gut**.

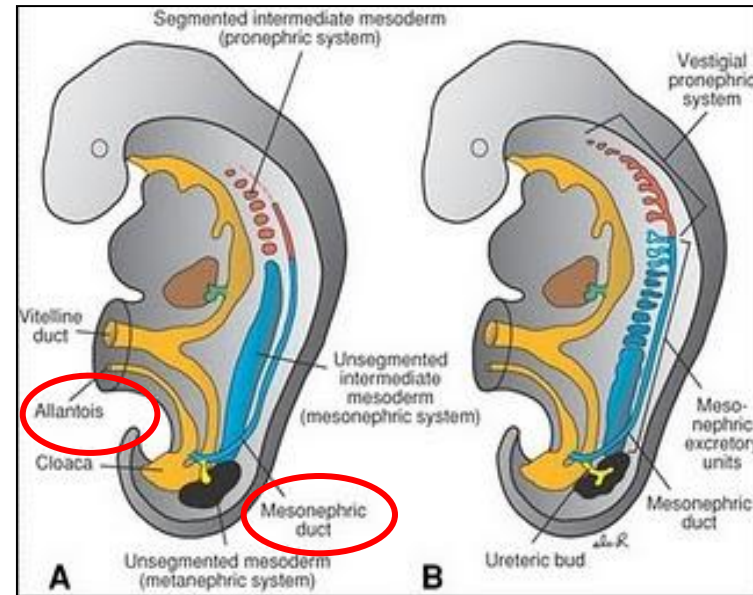
*It receives the **allantois** and the **mesonephric ducts** *the photo is side view. So, there is 2 mesonephric ducts (one for each side)*

*Its floor is closed by the **cloacal membrane**.

A **mesodermal urorectal septum** divides the cloaca and the cloacal membrane into :

Ventral part

Dorsal Part



• the **primitive urogenital sinus** that communicates with the **allantois** and the **mesonephric ducts**.

• Its floor is the **urogenital membrane**.

• forms the **rectum** and **upper part of anal canal**.

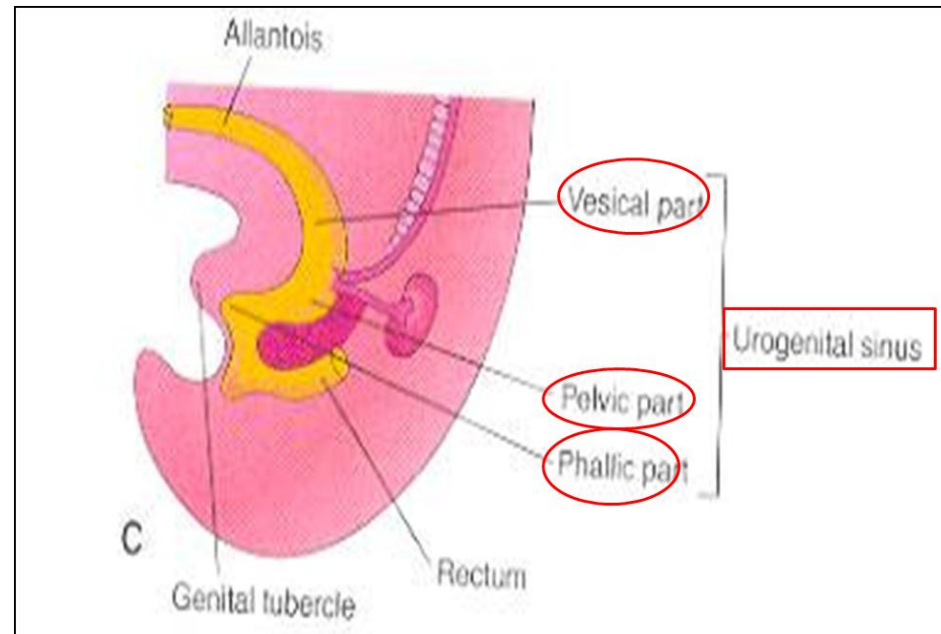
• Its floor is the **anal membrane**.

[Development of urinary Bladder & urethra]

#Primitive urogenital sinus

Is divided into three parts;

Cranial-vesical part	forms <u>most of the bladder</u> and continuous with <u>the allantois</u> .
Middle-pelvic part	forms <u>main part of male urethra</u> and <u>entire female urethra</u> .
Caudal-phallic part	grows towards <u>genital tubercle</u> .



[Development of urinary Bladder & urethra]

#Urinary Bladder

Mainly

from the vesical part of the urogenital sinus. •
The upper part mentioned in previous page •

Trigon

is derived from the absorbed caudal ends of the mesonephric ducts. •

Epithelium

is endodermal in origin •

Other
Layers

are derived from the splanchnic mesoderm •

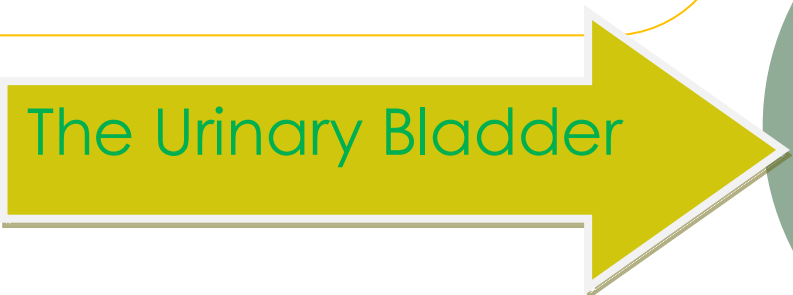
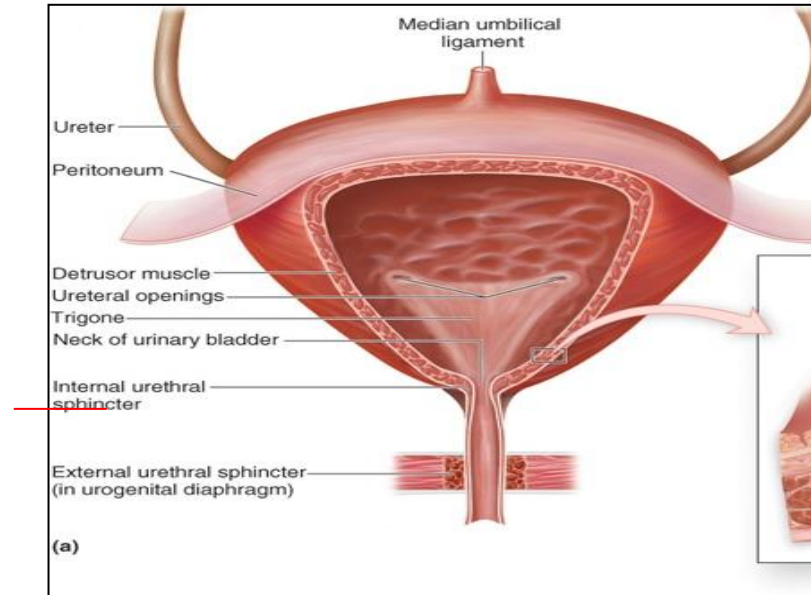


[Development of urinary Bladder & urethra]

#Urinary Bladder

*The **allantois** : is at first continues with the **bladder** , then it becomes a **thick fibrous cord urachus** which extends from apex of the bladder to the **umbilicus**, in adult it is represented by the **median umbilical ligament**.

*After **absorption of the mesonephric ducts** to form the **trigone**, the **ureters** open separately in the bladder.



In infants and children

It is an **abdominal organ**

At about 6 years

it starts to enter the **greater pelvis** and becomes a **pelvic organ** until after **puberty**

[Development of urinary Bladder & urethra]

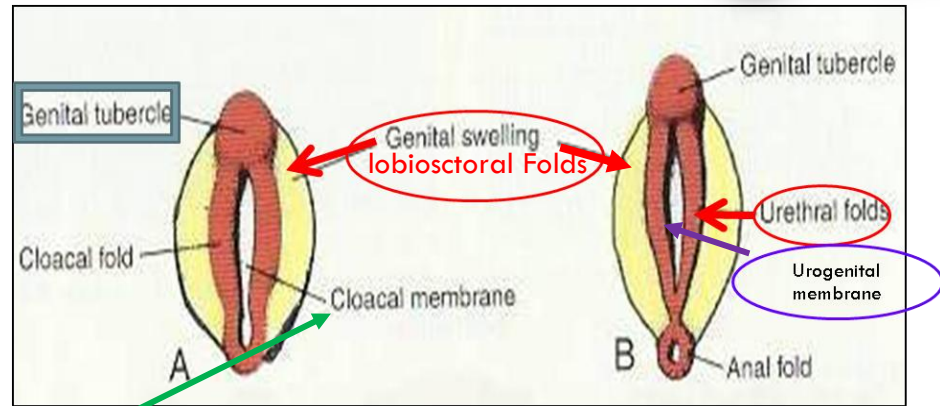
#Urethra

#Indifferent stage

*The **genital tubercle** (mesenchymal elevation) develops at the cranial (superior to) end of the **cloacal membrane**.

***Two urethral folds**, develop on either side of the **urogenital membrane**.

*Laterally **two labioscrotal folds** develop on either side of the urethral folds.



#Medial to lateral : urogenital membrane => urethral Fold => lobioscrotal Folds.

Urethral Folds

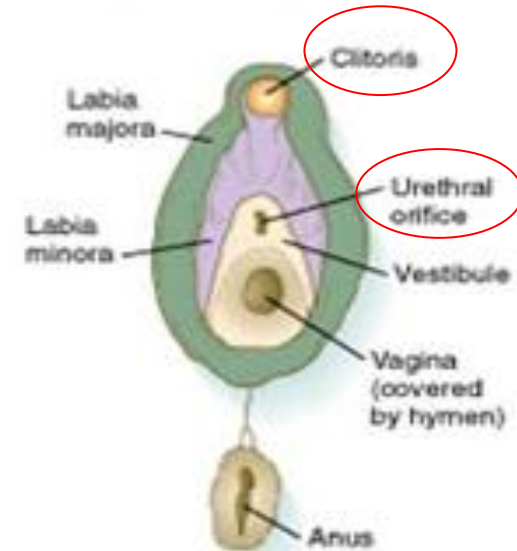
In Male	In Female
fuse with each other to close the penile urethra	remain separate to form labia minora .

[Development of urinary Bladder & urethra]

#Female Urethra

*The **entire female urethra** is derived from endoderm of the pelvic part of the urogenital sinus. (The Middle Part)

*The **external urethral orifice** opens dorsal to the **glans clitoris** (the clitoris was genital tubercle)



#Male Urethra

Additional
Explanation

Before we explain the development of male urethra you should know that it consists of many parts (**Prostatic ,Membranous ,Penile *spongy***) urethra.

*the **penile or spongy** has 2 parts distal and proximal – the proximal part will develop with the other parts while the distal part will grow towards the root of penis.* Explained in the next page *

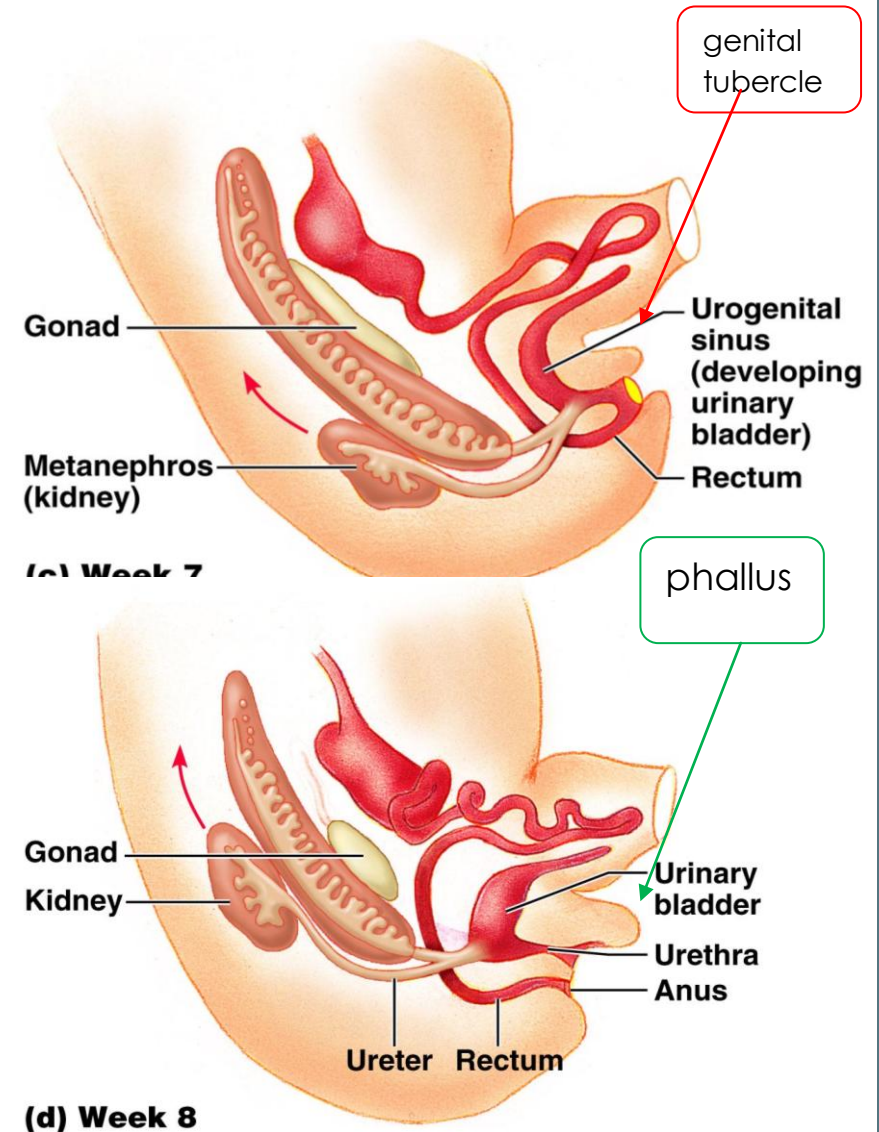
[Development of urinary Bladder & urethra]

#Male Urethra

*The **genital tubercle** (mesenchymal elevation) elongates forming the **phallus**, which give rise the **penis** later.

Most of the male urethra** (prostatic, membranous and spongy parts) is derived from **endoderm of the pelvic middle part of urogenital sinusSame as female urethra*

*The **distal part of male penile urethra** in glans penis starts as **ectodermal solid cord** that grows towards the root of penis to meet the spongy urethra , later it canalizes.

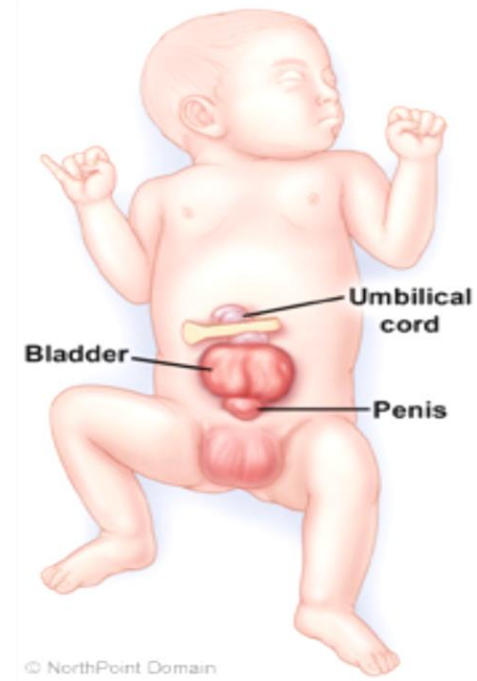


Anomalies

The anomalies in this lecture are divided into three parts :

- ✓ Extrophy of the bladder
- ✓ Urethral Anomalies.
- ✓ Urachal Anomalies.

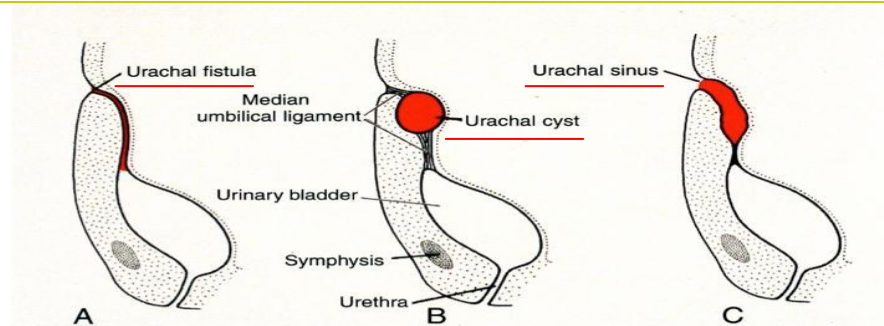
First: Extrophy of the bladder (*Ectopiae vesicae*); exposure of the posterior wall of the bladder due to a defect in the anterior abdominal wall and anterior wall of the bladder.



[Development of urinary Bladder & urethra]

Anomalies

Second : Urachal Anomalies



a- Urachal cyst

remnant of epithelial lining of urachus.

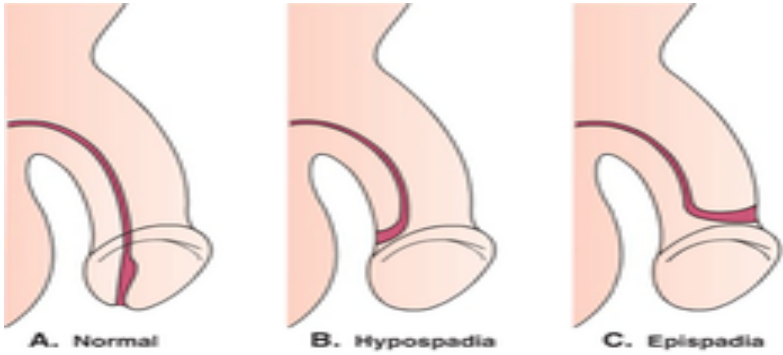
b- Urachal sinus

Discharge serous fluid from the umblicus.

c- Urachal fistula

The entire urachus remains patent and allows urine to escape from the umbilicus.

Anomalies

<p>Third : Urethral Anomalies</p>	 <p>A. Normal B. Hypospadias C. Epispadias</p>
<p>a- Hypospadias</p>	<ul style="list-style-type: none"> ✓ the most common anomaly ✓ with incomplete fusion of the urethral folds ✓ abnormal openings of the urethra ✓ occur along the ventral (inferior) aspect of the penis.
<p>b- Epispadias</p>	<ul style="list-style-type: none"> ✓ a rare abnormality ✓ in which the urethral meatus is found on the dorsum of penis ✓ it is most often associated with extrophy of the bladder.



Summary

- ✓ The **cloaca** is the **dilated terminal part of the hind gut** and it will be divided by **mesodermal urorectal septum** to give : **primitive urogenital sinus + rectum and upper part of anal canal.**
- ✓ Primitive urogenital sinus will give : **vesical part, pelvic part and phallic part.**
- ✓ Urinary bladder it develop mainly from the **vesical part** of the urogenital sinus except **trigone.**
- ✓ The **entire female urethra** is derived from **endoderm of the pelvic part of the urogenital sinus.**
- ✓ Most of the male urethra : **prostatic, membranous and spongy** parts is derived from **endoderm of the pelvic middle part of urogenital sinus.**



[Development of urinary Bladder & urethra]

Quiz yourself

1- The cloaca is the dilated terminal part of the :

A- hind gut. B- middle gut . C- cranial gut .

2- In the primitive urogenital sinus the cranial part (vesical part) forms :

A- male urethra. B- genital tubercle . C- most of the bladder .

3- In the primitive urogenital sinus the middle part (pelvic part) forms :

A- male urethra. B- genital tubercle . C- most of the bladder .

4- In the primitive urogenital sinus the caudal part (phallic part) forms :

A- male urethra. B- genital tubercle . C- most of the bladder .

5-Which one of the following forms the entire female urethra :

A-Genital tubercle. B-Vesical part of the urogenital sinus. C-Pelvic part of the urogenital sinus.



[Development of urinary Bladder & urethra]

6-The trigone of the urinary bladder is developed from :

a-Mesonephric ducts. B- Allantois c-Urogenital sinus.

7. The urethra in glans penis is developed from :

A-The vesical part of urogenital sinus. B-The pelvic part of urogenital sinus. C-The ectoderm.

8-2 urethral folds in male fuse with each other to close the :

A-penile urethra B-labia minor C-clocal

9- 2 urethral folds in female remain separate to form

A-penile urethra B-labia minor C-clocal

Answers;

1.A 2.C 3.A 4.B 5.C 6.A 7.C 8.A 9.B

Best wishes

Done By :

Rawan Alotaibi

Amani Alotaibi

Sara Alseneidi

Noura Alnajashi

Baraah Alqarni