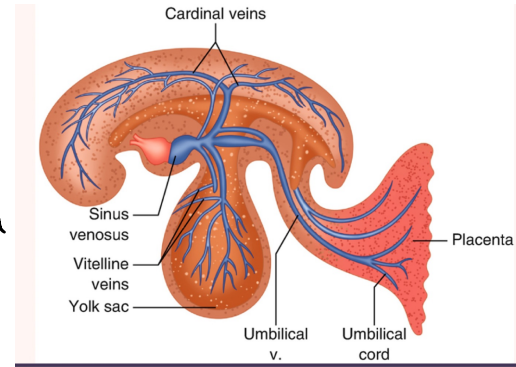
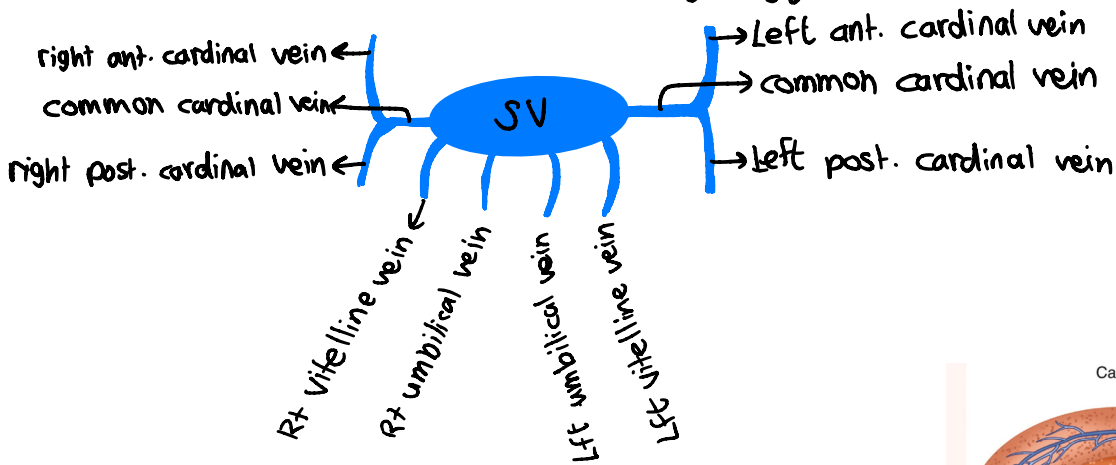


lecture 4 embryology



- 2 vitelline veins: drains the yolk sac & gut
- 2 umbilical veins: carry oxygenated blood from placenta
- Cardinal veins: drain the body of the embryo

Vitelline Veins

↳ arise from yolk sac

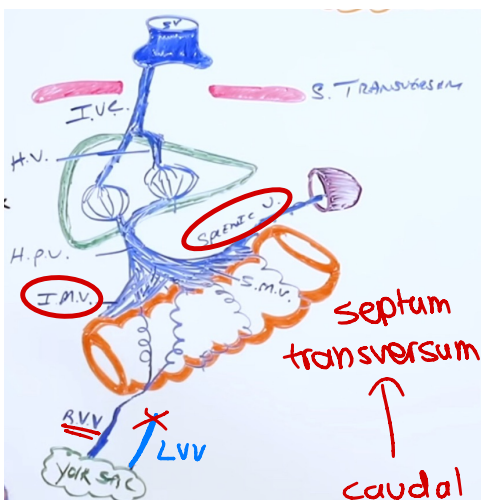
- transverse septum transversum to end in corresponding horn of sinus venosus
↳ becomes diaphragm later

right vitelline vein → right horn
left vitelline vein → left horn

Fate :-

1. caudal to septum transversum:

- ↳ 2 veins are connected by 3 anastomoses (2 ventral, 1 dorsal)
- ↳ degeneration of 3 anastomoses leads to formation of: **Splenic & superior mesenteric veins**

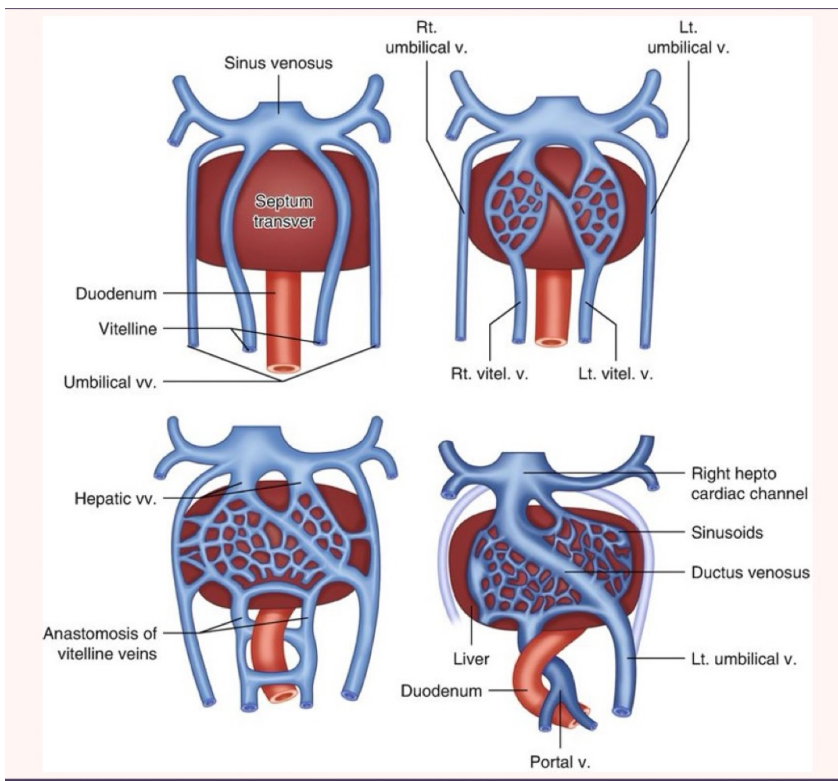


2. In the Septum Transversum:

- ↳ the 2 veins are broken into **hepatic sinusoids** by proliferating hepatic cords

3. Cranial to Septum Transversum:

- ↳ left vitelline disappears (degenerates)
- ↳ Right vitelline forms **terminal part of IVC**



- Right vitelline : persists
- Left vitelline : degenerate

Umbulical Veins

placenta → 2 veins → septum transversum → sinus venosus

Fate :-

- ↳ right umbilical : degenerates completely
- ↳ left umbilical :

1. Cranial to Septum Transversum:

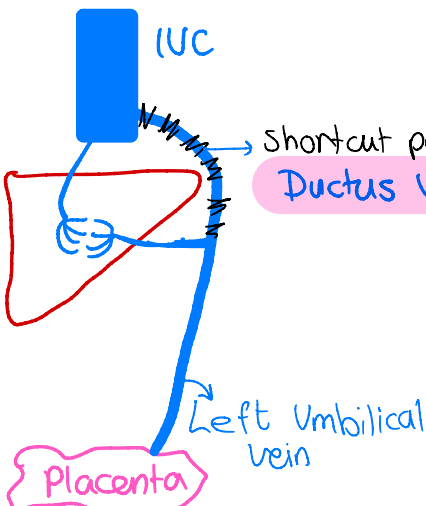
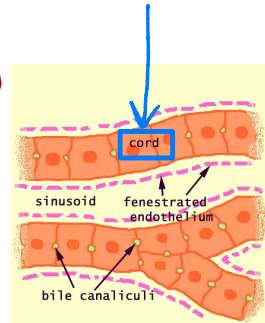
↳ disappears

2. Within Septum Transversum:

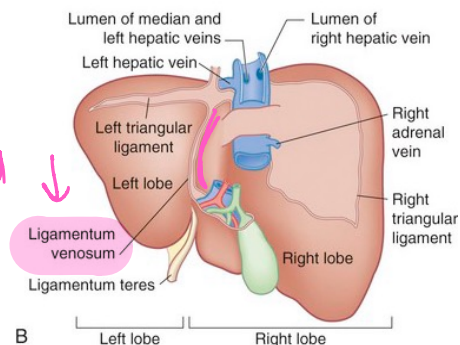
- ↳ transformed into hepatic sinusoids by invading liver cords
- ↳ a large venous channel develops, connecting the left umbilical with IVC

Extra (not mentioned by Dr)

columns of hepatocytes extending from the portal region to central vein. The spaces between the plates contain the liver sinusoids, or "capillaries" of the liver.



later gets obliterated and converted to :
• Ligamentum Venosum



3. Caudal to Septum Transversum:

↳ becomes left umbilical vein

Cardinal Veins

Cardinal veins involve:

1. anterior cardinal v.
2. posterior cardinal v.
3. common cardinal v.
4. supra-cardinal v. → drain upper part of the body
5. subcardinal v. → drain the kidneys
6. sacrocardinal v. → drain the lower extremities

1. ant. cardinal v.:

↳ drain cephalic part of embryo

↳ 2 anteriors are connected by **transverse anastomosis**

this anastomosis form the Lt brachiocephalic vein

Right

Left

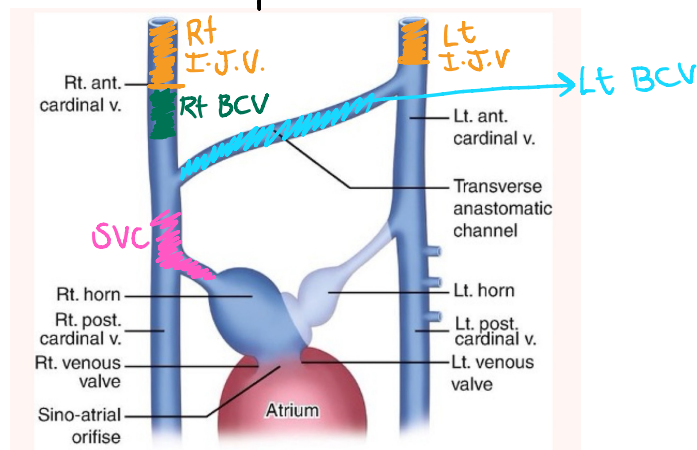
right internal jugular v.

Left internal jugular v.

right brachiocephalic

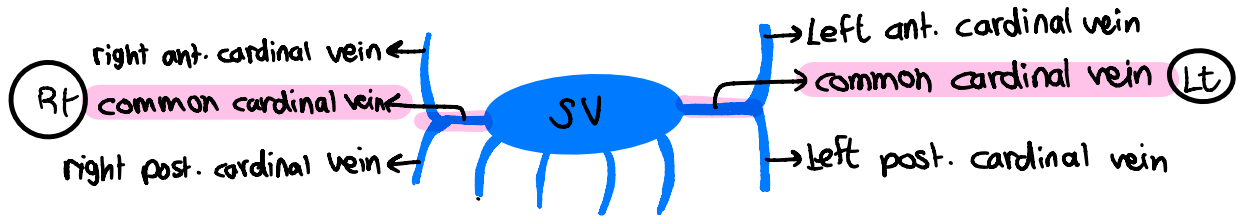
proximal part of Lt. sup. intercostal v.

distal part of SVC



2. Common Cardinal V. :

↳ formed by union of ant. & post. cardinal veins



Right

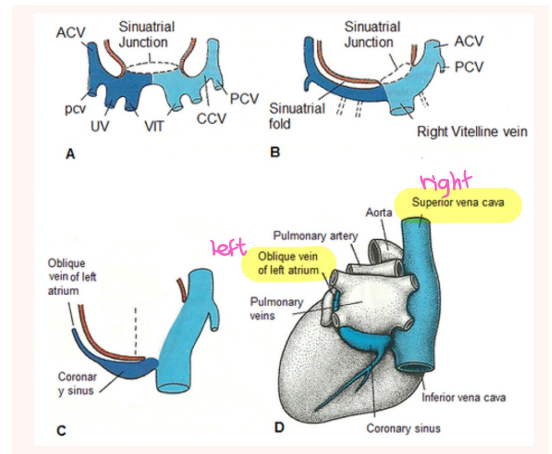
Left

forms proximal part of SVC

forms oblique vein of Lt atrium

SVC:

→ distal: Rt. ant. cardinal V.
→ proximal: Rt CCV



3. Post Cardinal V. :

↳ drain caudal part of embryo

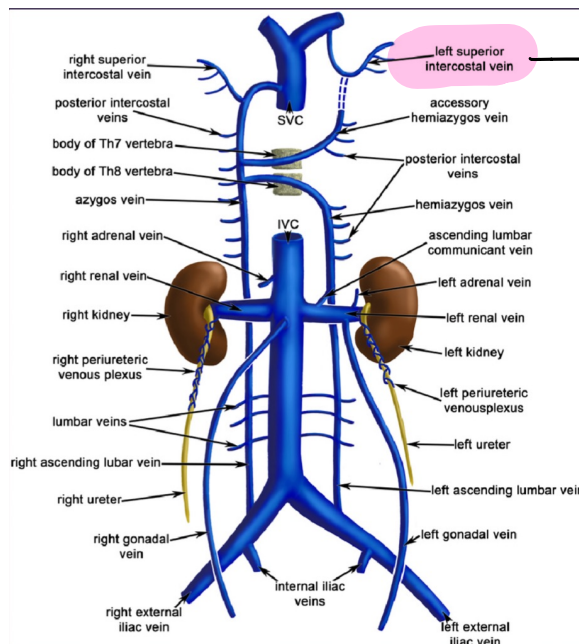
Right

Left

degenerates



degenerate Except cranial part of Lt sup. intercostal V.

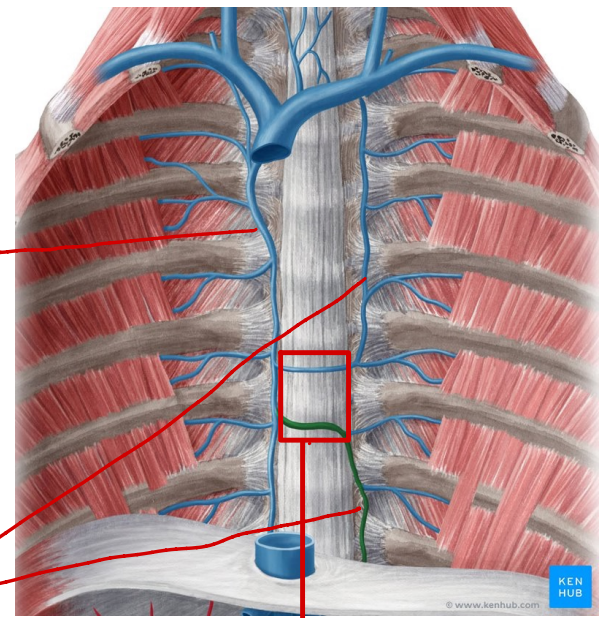


→ the only thing that remain from Lt. Post. Cardinal V.

4. Supracardinal V. :

↳ dorsolateral to aorta

↳ the 2 supracardinal veins are connected by intersupracardinal anastomosis



sup.+inf.
hemiazygos

intersupracardinal
anastomosis

Right

Left

most of the azygos

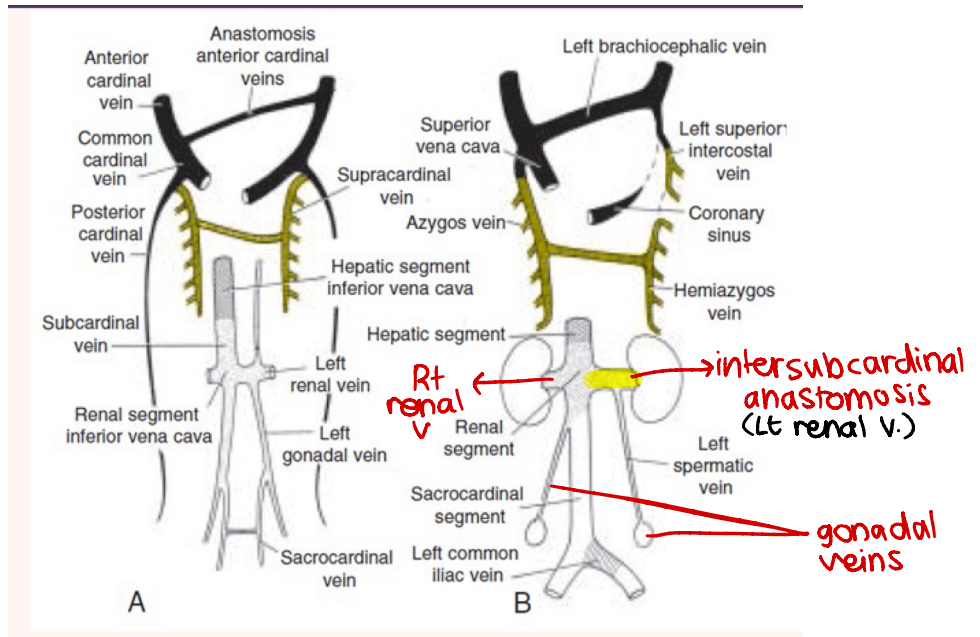
sup+inf hemiazygos V.

* The transverse anastomosis (intersupracardinal) forms connection btwn azygos & hemiazygos (anastomosis)

5. Subcardinal V. :

↳ one on each side, ventrolateral to abdominal aorta

↳ 2 subcardinal V. connected to each other by intersubcardinal anastomosis.



Right

Left

forms renal part of IVC

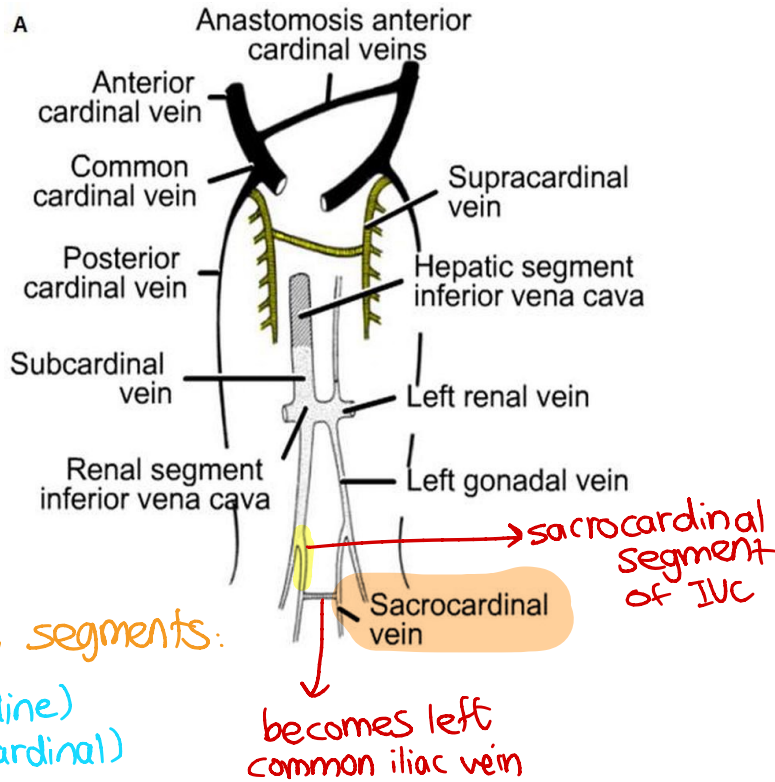
forms left gonadal vein

intersubcardinal anastomosis: forms Lt renal vein

6. Sacrocardinal V. :

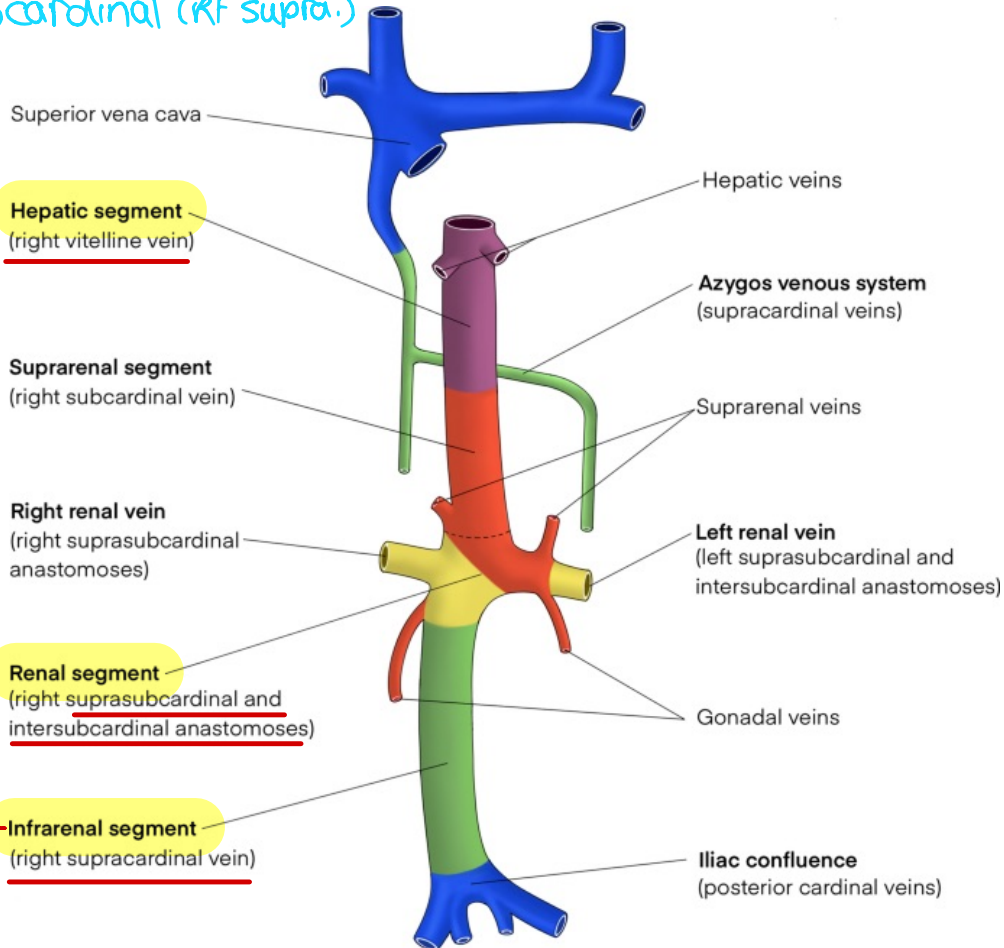
↳ **Right** sacrocardinal vein becomes sacrocardinal segment of IVC

↳ anastomosis btwn sacrocardinal veins forms left common iliac v.



IVC formed by 3 segments:

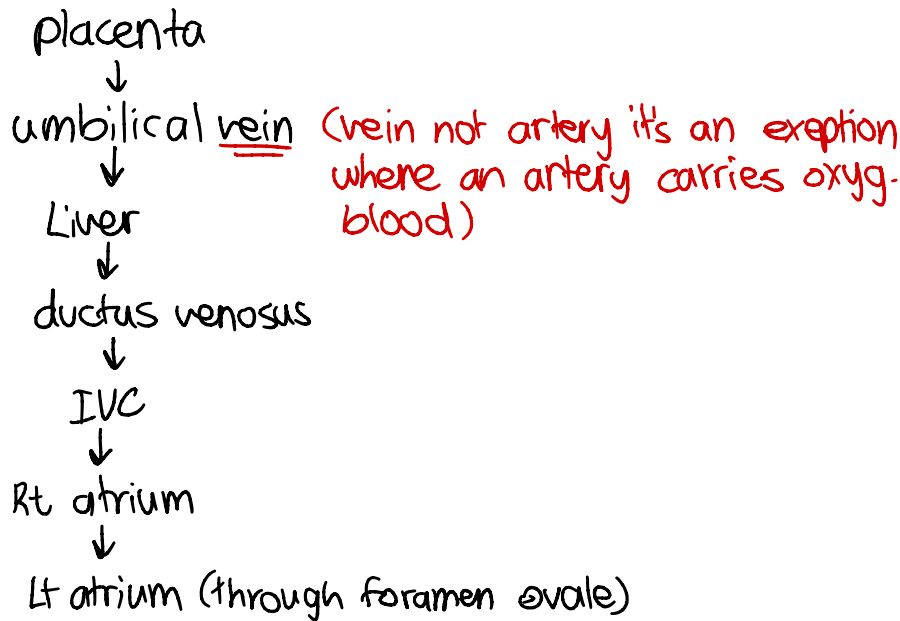
- ↳ hepatic (Rt vitelline)
- ↳ renal (Rt subcardinal)
- ↳ sacrocardinal (Rt supra.)



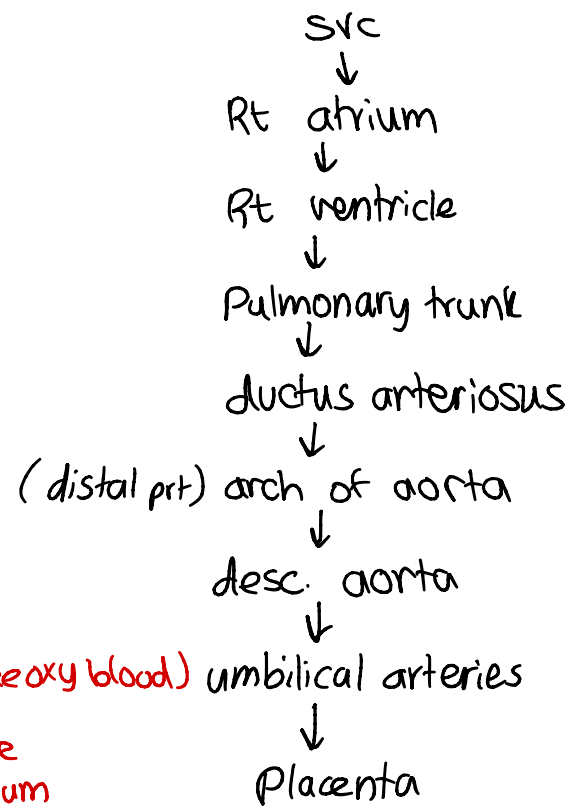
Sacrocardinal Segment

Fetal Circulation

Oxygenated

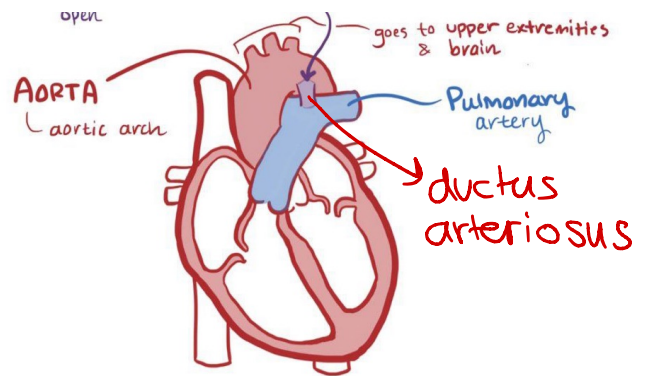
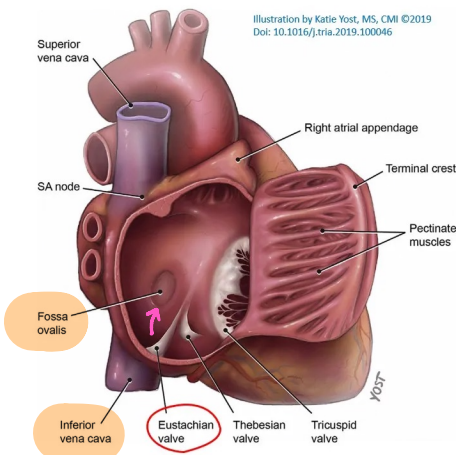


Deoxygenated



due to:

- ↳ value of IVC direct blood to foramen ovale
- ↳ pressure inside Rt atrium $\uparrow\uparrow\uparrow$ than Lt atrium



Changes in the circulation after birth:

1) Immediate changes:

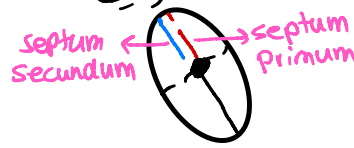
- establishment of pulmonary circulation: respiration starts & lungs expand.
- functional closure of foramen ovale: occurs as a result of firm apposition of septum primum to septum secundum due to:

- ↳ increased pressure inside Lt atrium
- ↳ decreased pressure inside Rt atrium

الجين بالرغم ما يكون عن developed pulmonary circulation فالأوعية الدموية تكون vasoconstricted مما يؤدي إلى ارتفاع الضغط في ال pulmonary arteries وبالتالي في ال right atrium و ventricle ، لذلك الدم يروح من :

Rt atrium → Lt atrium through foramen ovale

لكن بعد الولادة تستغل ال pulmonary circulation ويصير vasodilation للأوعية الدموية الرئوية فيقل الضغط في ال rt atrium و ventricle و يصير الضغط أعلى في ال Lt atrium مما يؤدي إلى محاولة الدم للعبور من Lt atrium → Rt atrium لكن تنسكب ال foramen عن طريقه التمام ال septum primum و secundum و يصبح . fibrotic



iii) functional closure of ductus arteriosus:
close due to contraction in its muscular wall

2) Late Fibrotic changes:

- i) Left umbilical vein: becomes lig. teres of liver
- ii) ductus venosus: becomes lig. venosum of liver
- iii) ductus arteriosus: becomes lig. arteriosus
- iv) distal part of umbilical arteries: becomes medial umbilical ligament

