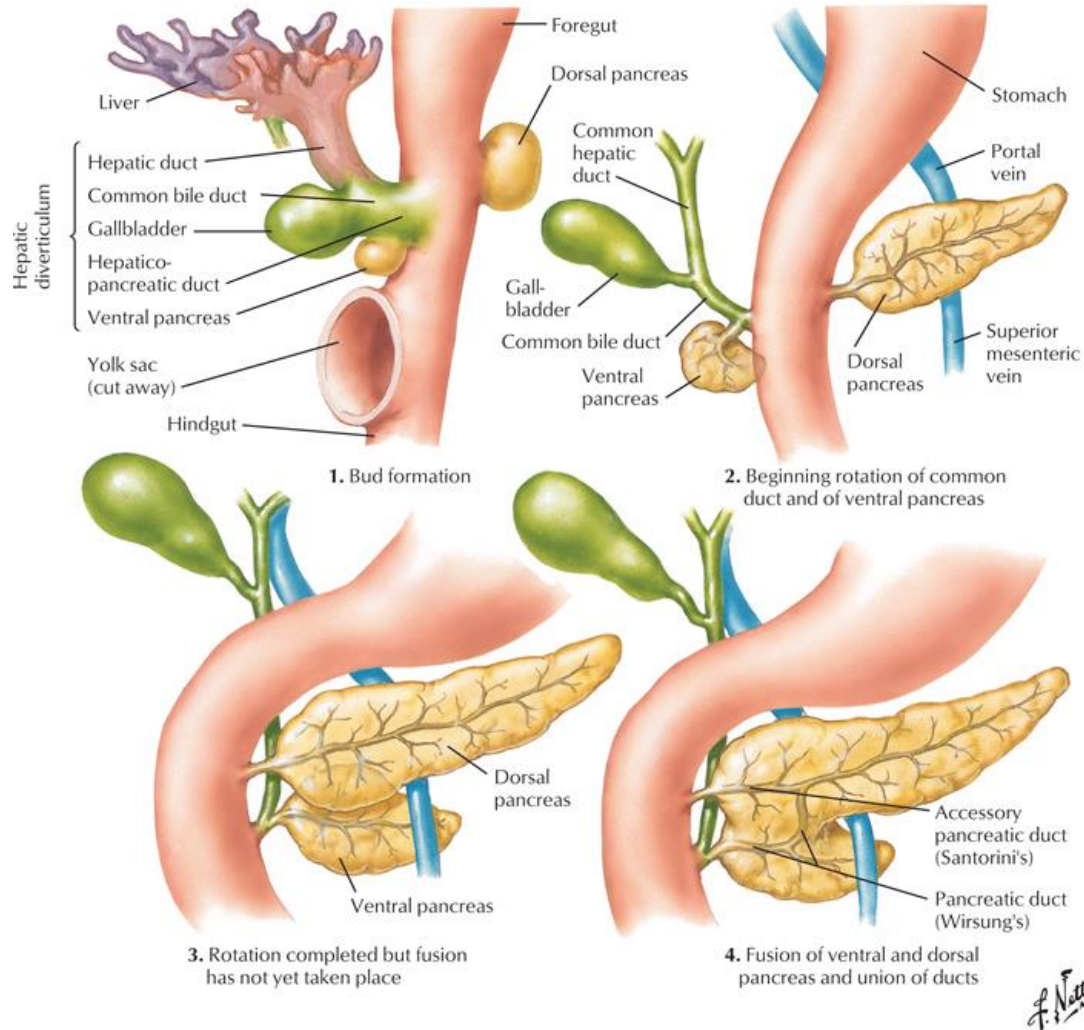


DEVELOPMENT OF GASTROINTESTINAL AND RESPIRATORY SYSTEM, COELOM



ANATOMY, HISTOLOGY,

EMBRYOLOGY

28. 2. 2024

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What are we going to talk about?

Primitive gut and its divisions

Foregut: stomach, liver + gallbladder, pancreas, duodenum

Spleen

Midgut and hindgut: gut rotations, cloaca

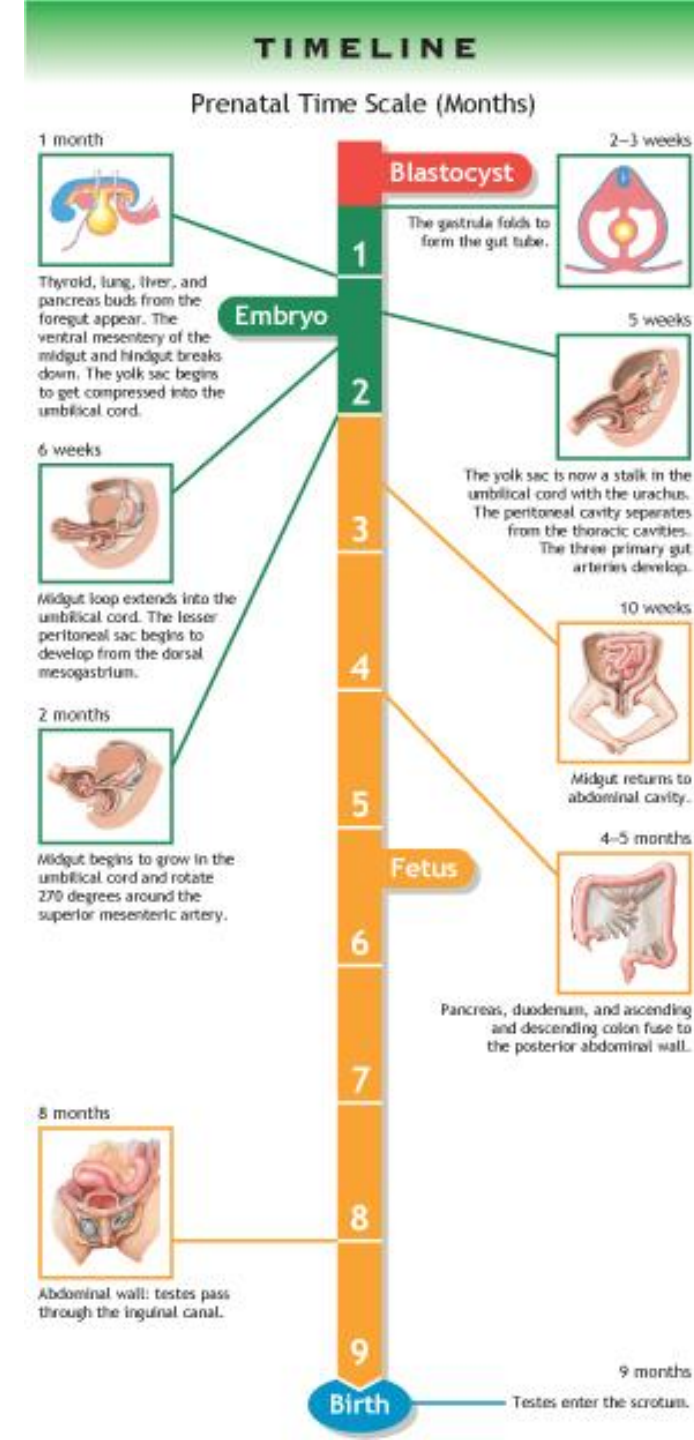
Abdominal wall and body cavities

Peritoneal cavity, pleural cavities

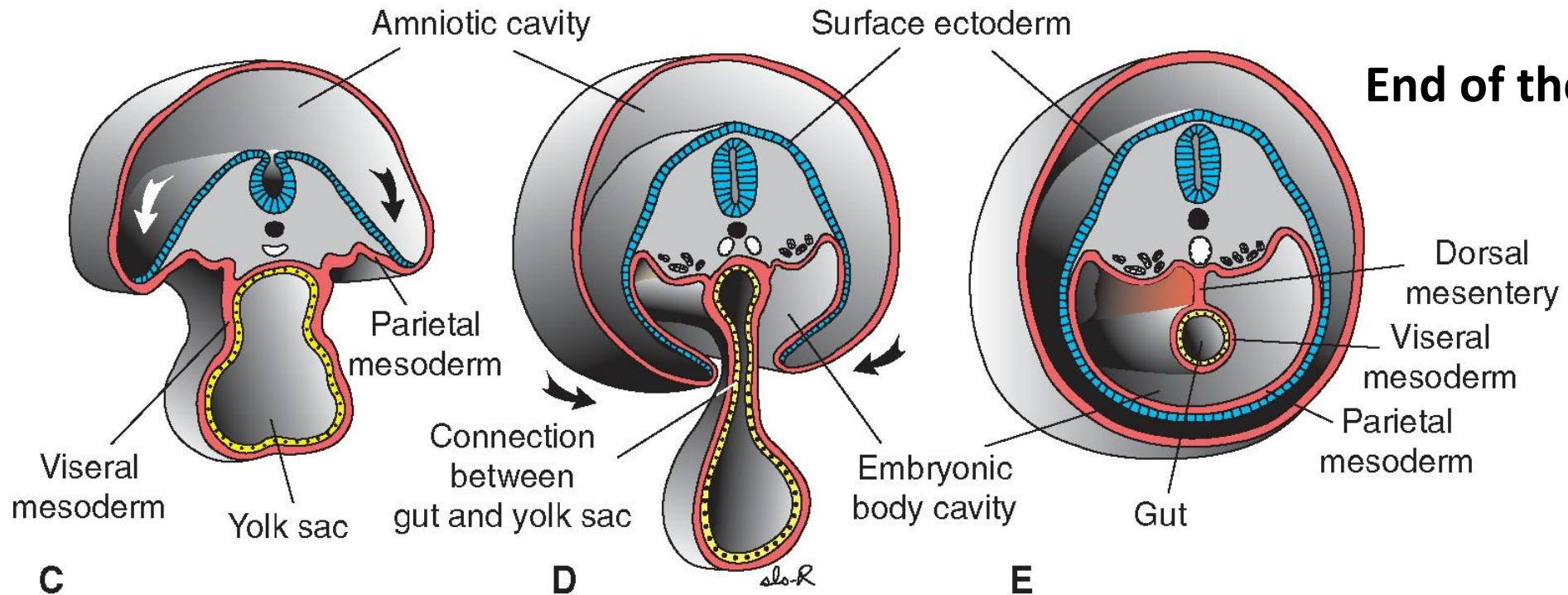
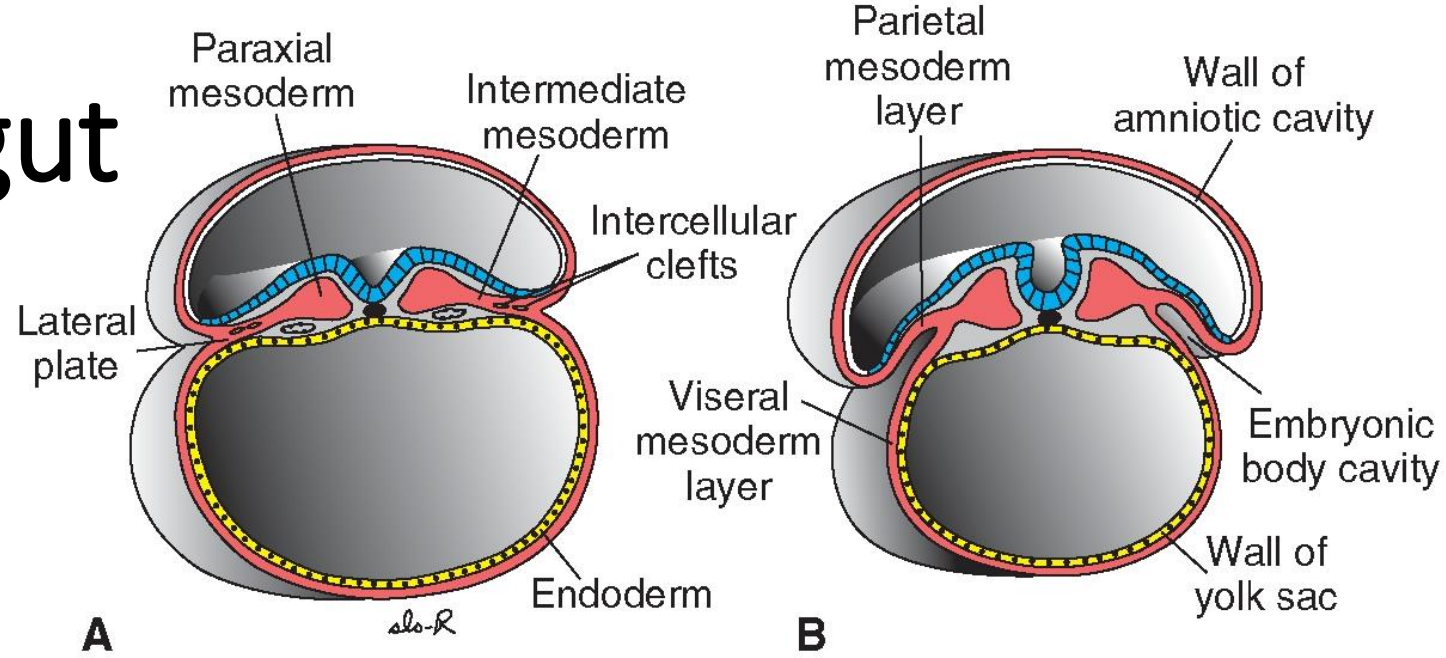
Diaphragm

Mesenteries

Respiratory system



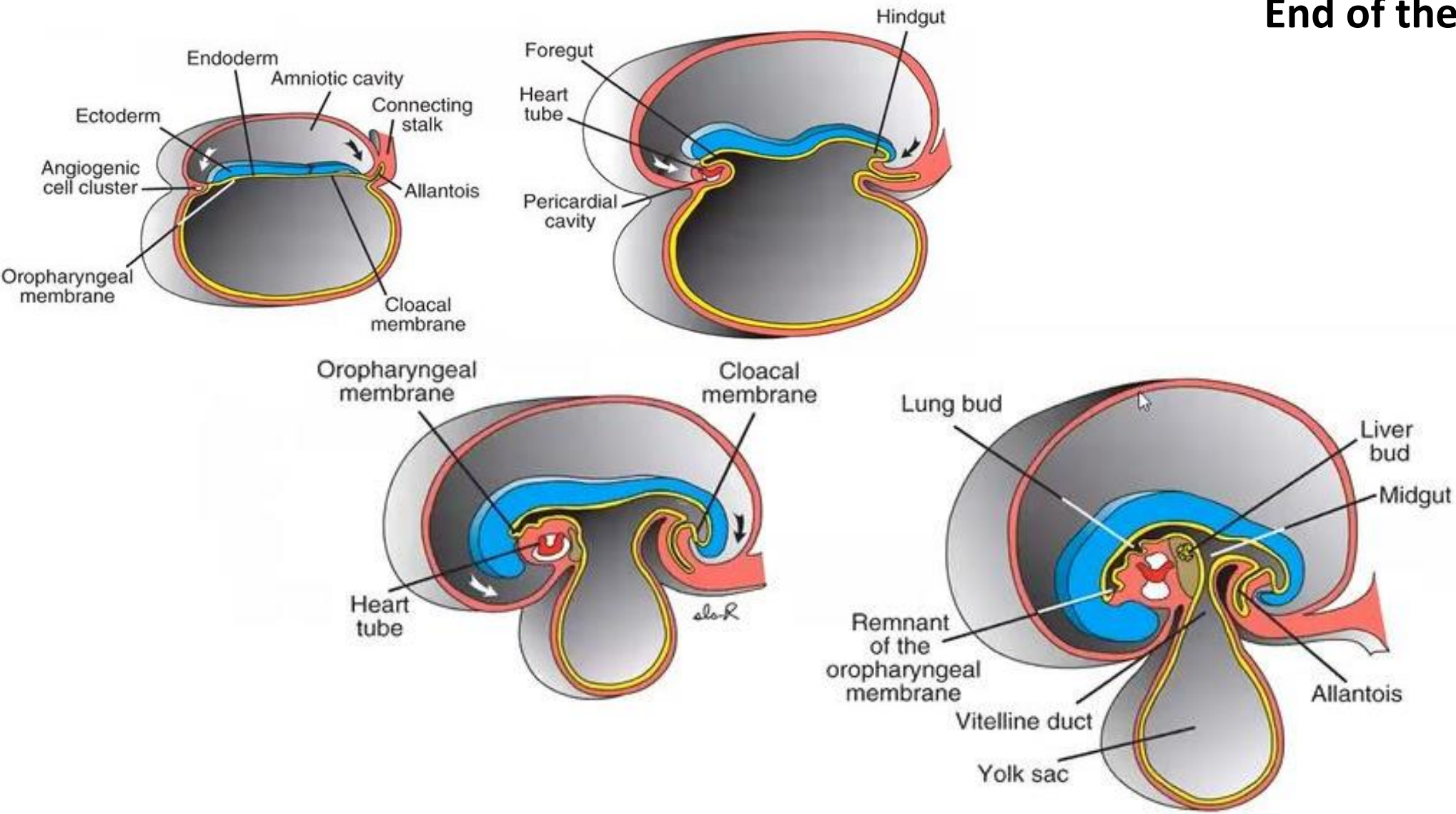
Primitive gut



End of the 4th week

Primitive gut

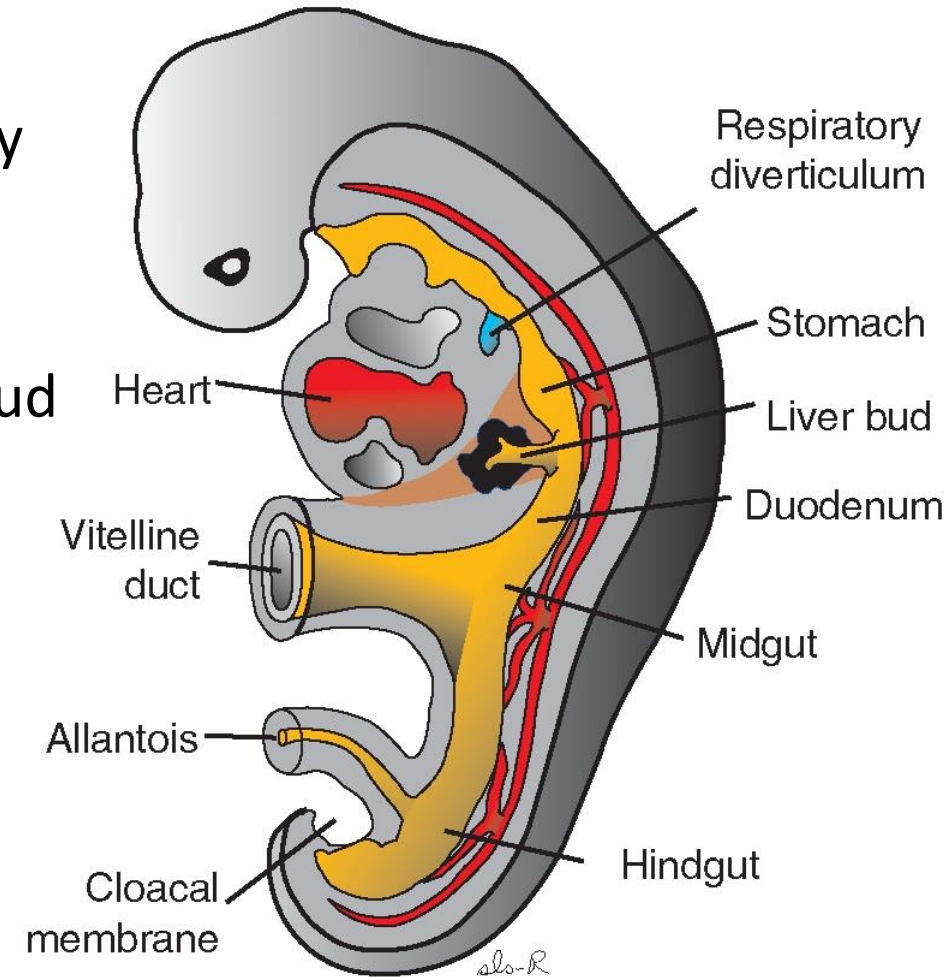
End of the 4th week



Divisions of the gut

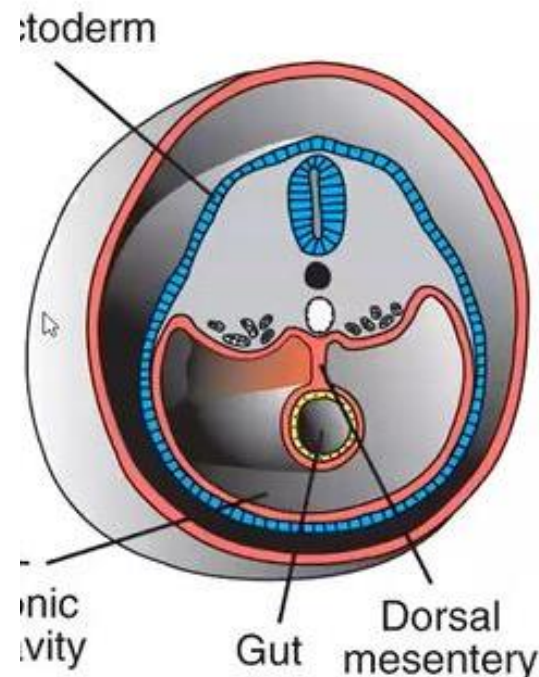
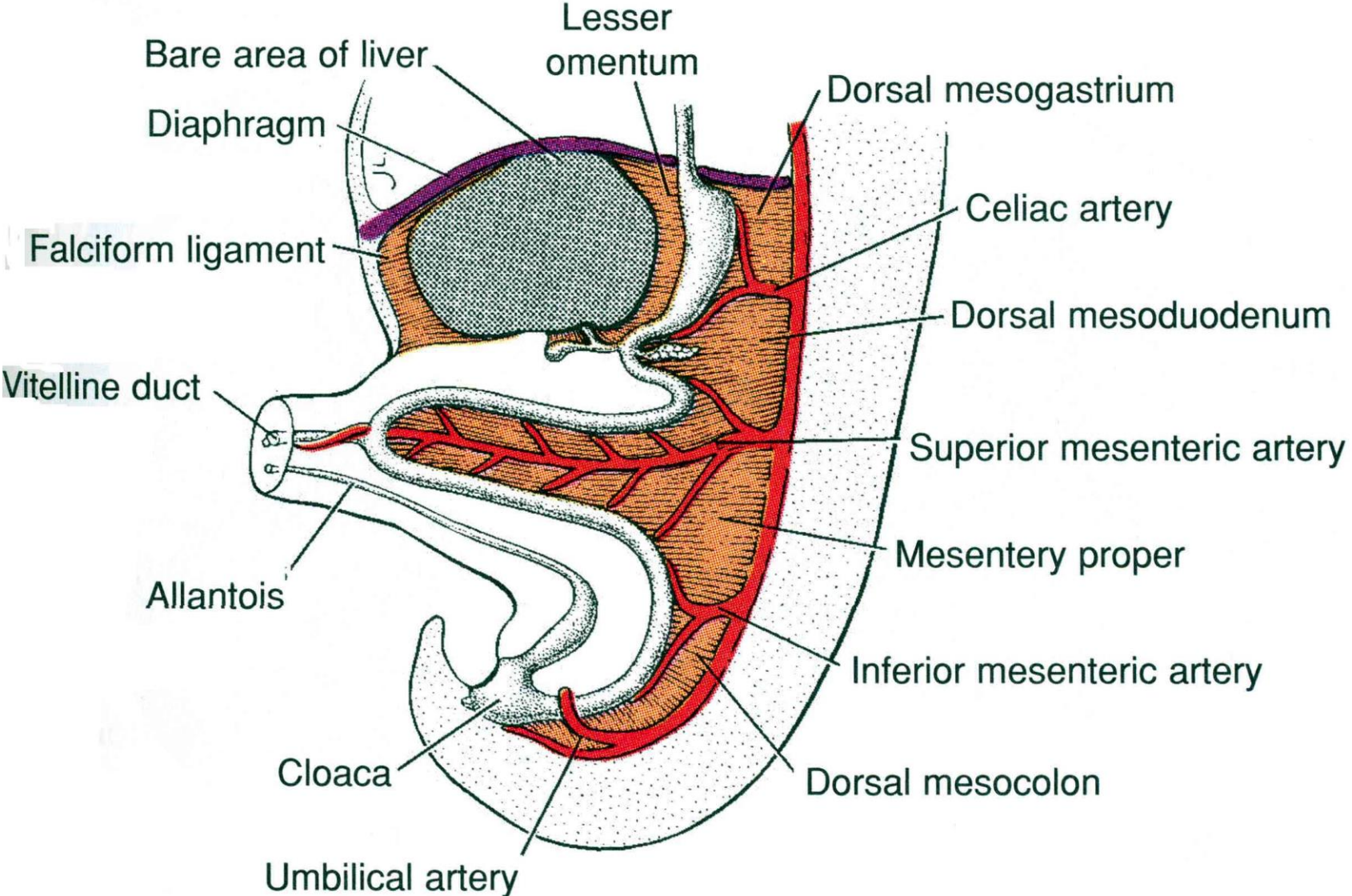
- Pharynx
 - from the oropharyngeal membrane to the respiratory (tracheobronchial) diverticulum
- Foregut
 - from the tracheobronchial diverticulum to the liver bud
 - oesophagus, stomach, 1st half of duodenum
 - + liver, gallbladder, pancreas
 - coeliac trunk
- Midgut
 - from the liver bud to the 2/3 of the transverse colon
 - superior mesenteric artery
- Hindgut
 - caudal 1/3 of colon to the cloacal membrane
 - inferior mesenteric artery

4 weeks

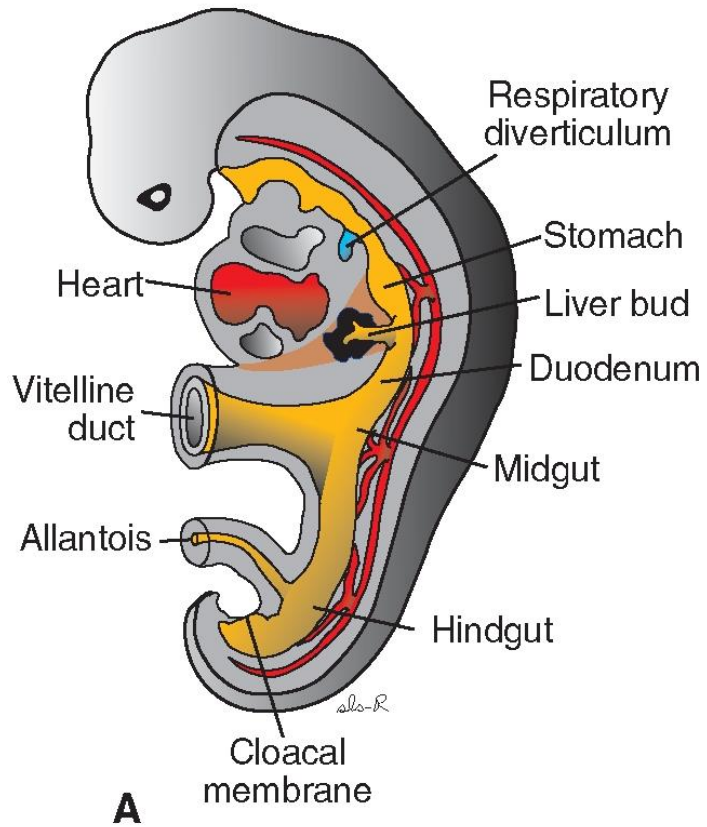


A

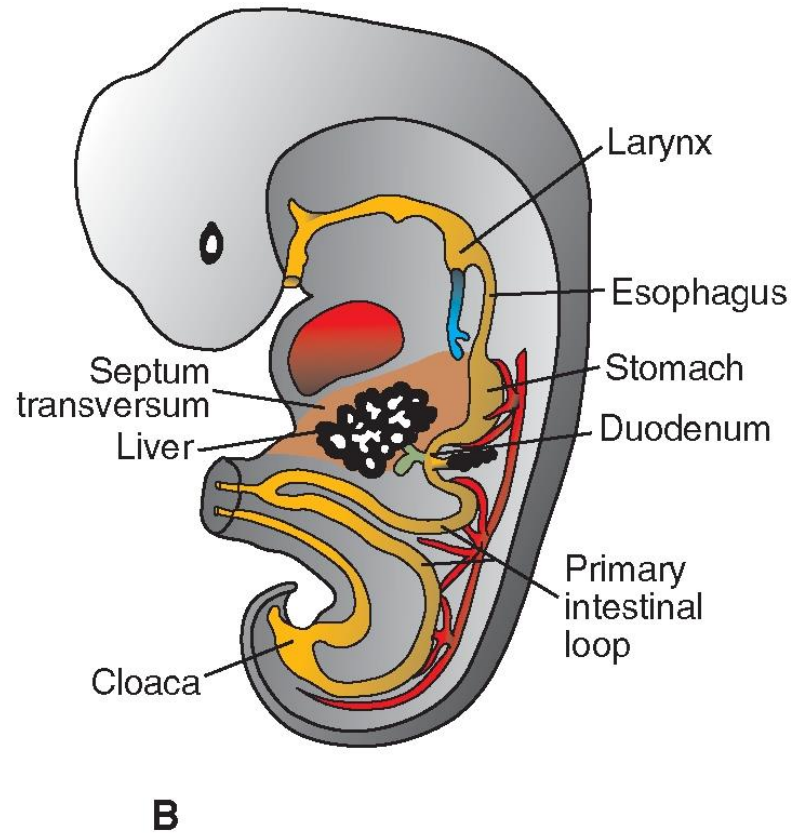
Primitive gut blood supply, mesenteries



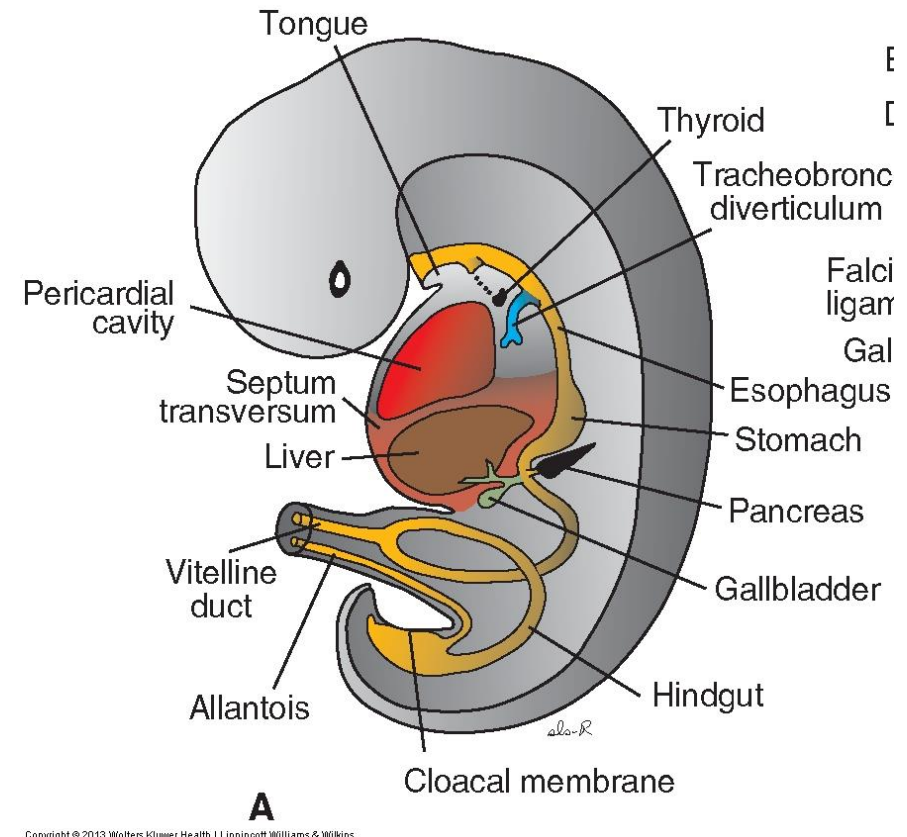
4 weeks



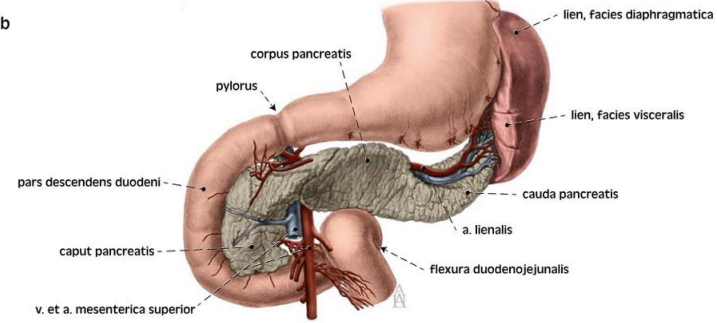
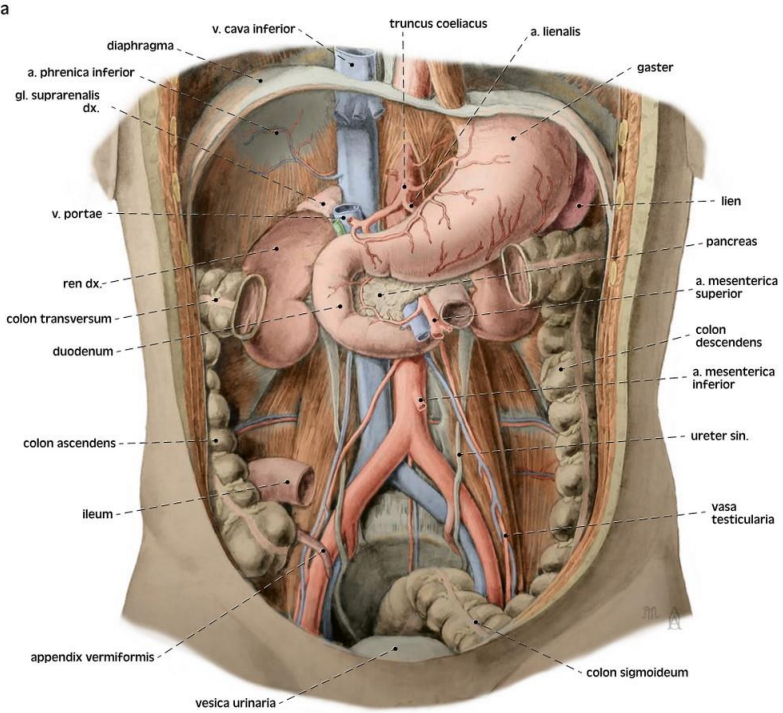
5 weeks



6 weeks



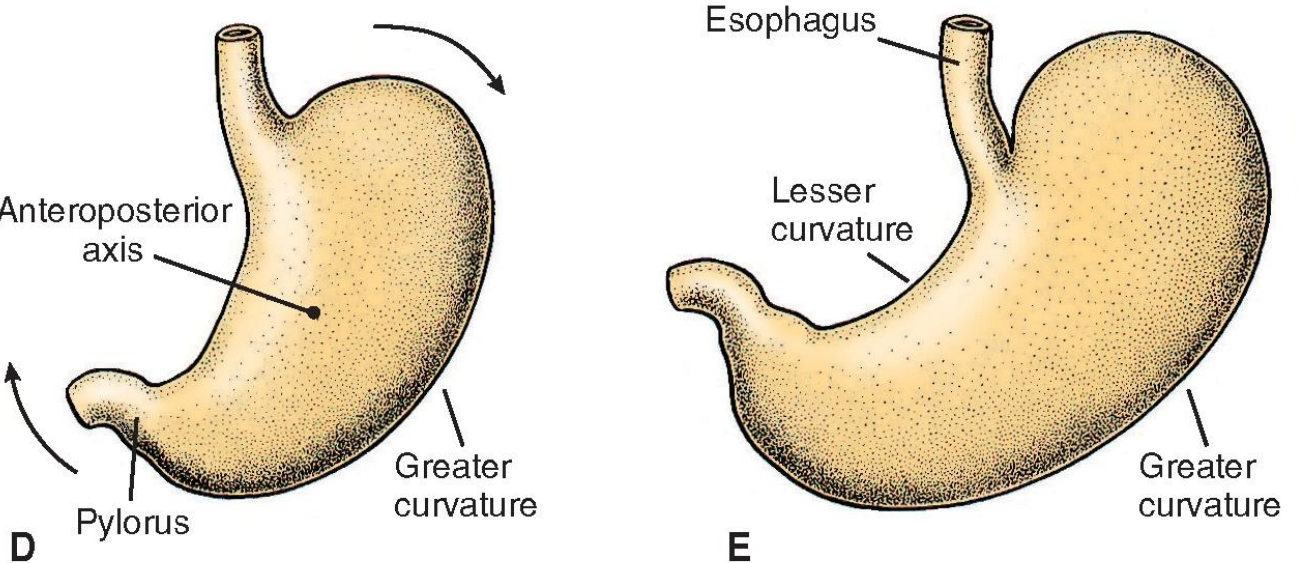
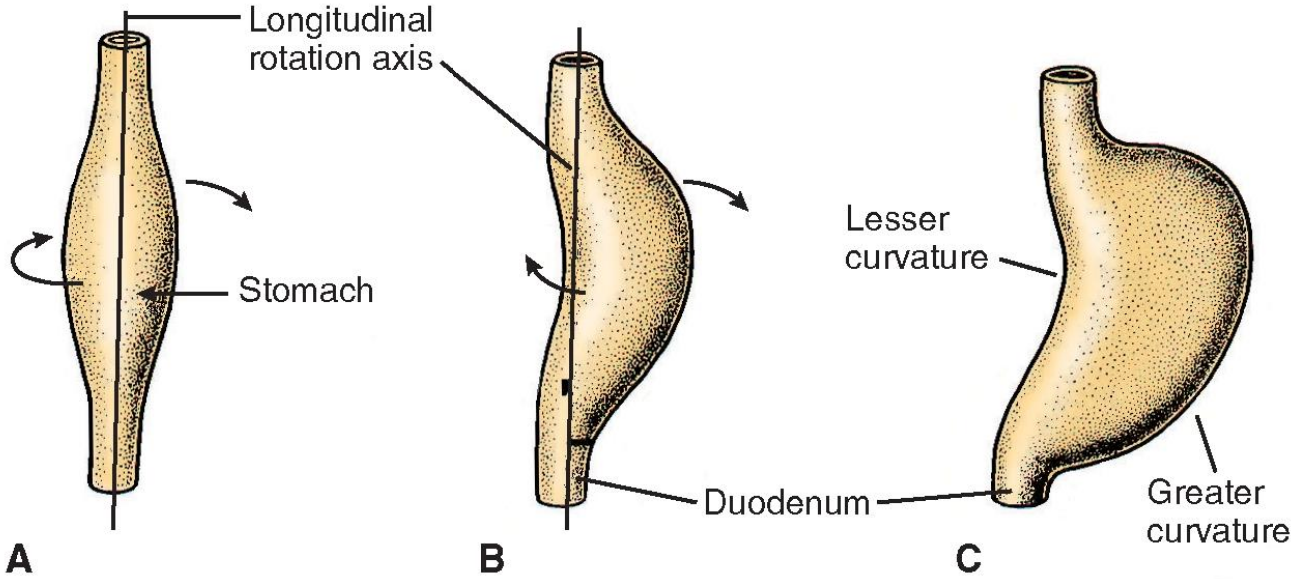
Stomach, spleen, duodenum



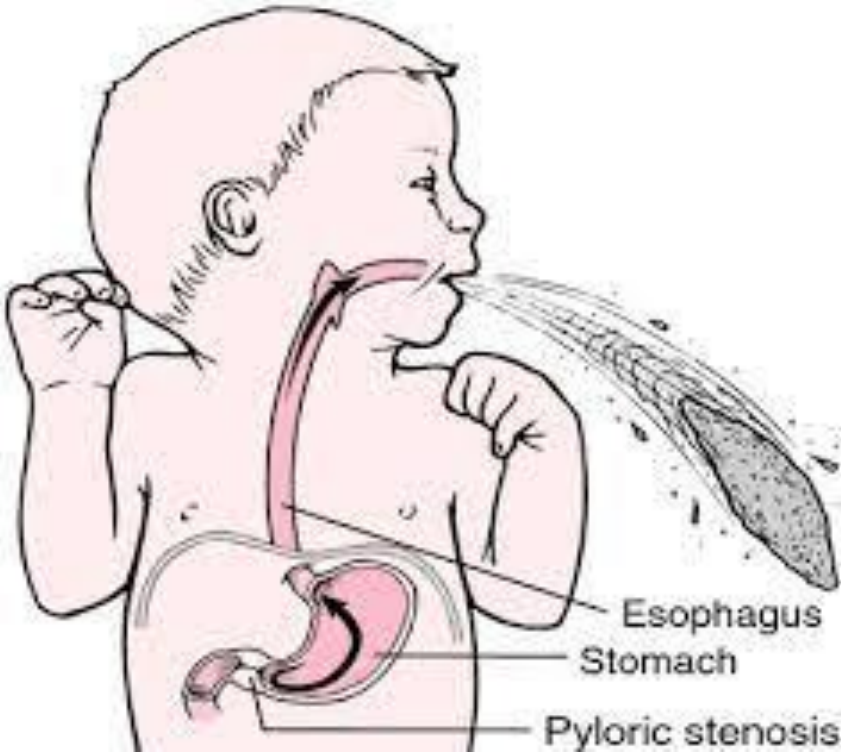
a Situs viscerum abdominis, poloha břišních orgánů, intraperitoneální orgány zčásti odstraněny
b Pancreas, duodenum, lien, slinivka břišní, dvanáctník, slezina, pohled zředu

a Syntopy of the abdominal organs, intraperitoneal organs partly removed
b Pancreas, duodenum and spleen, anterior view

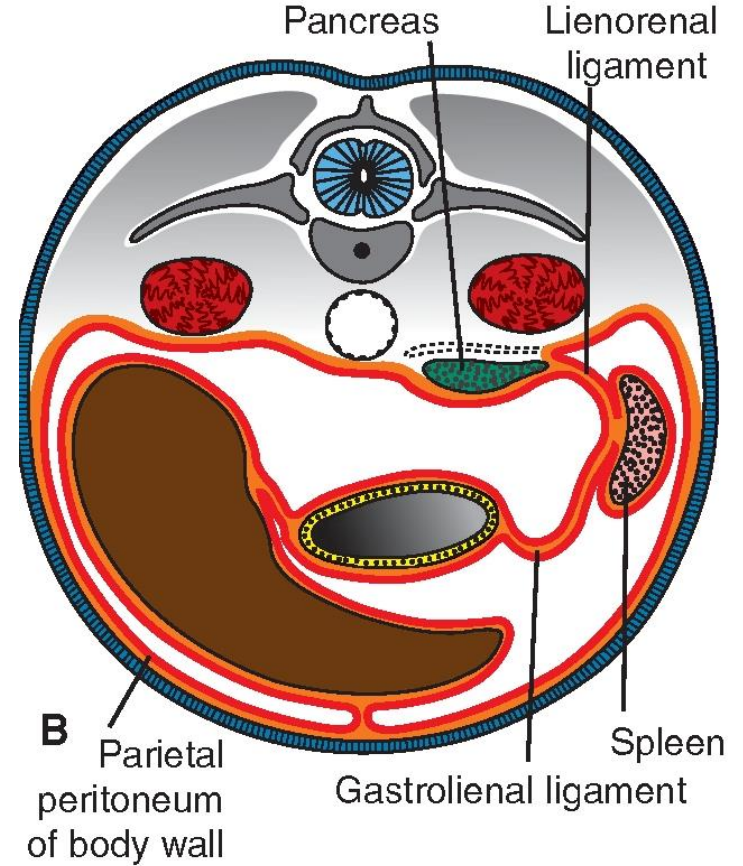
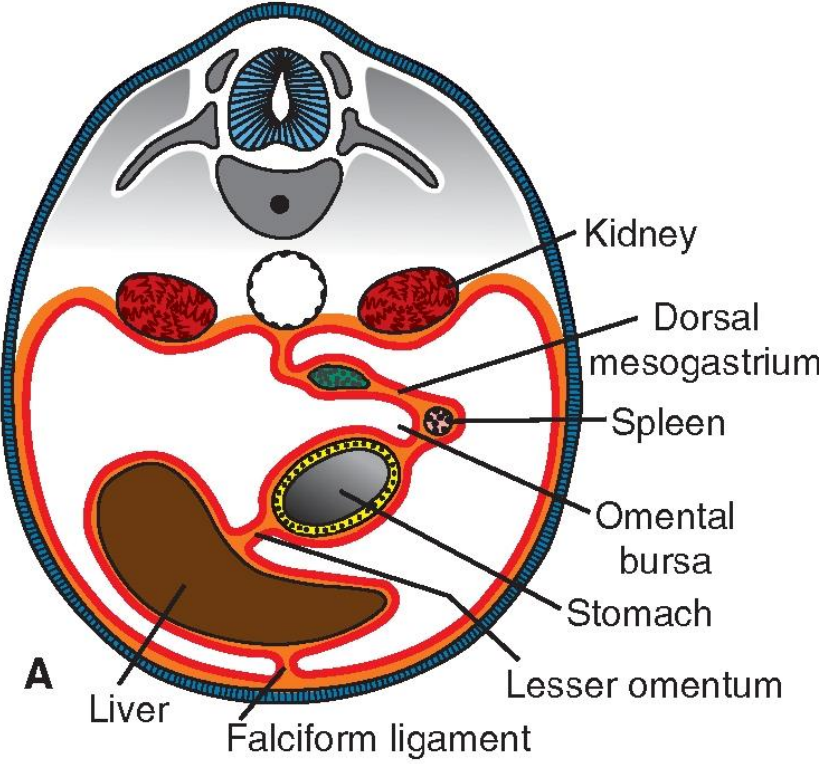
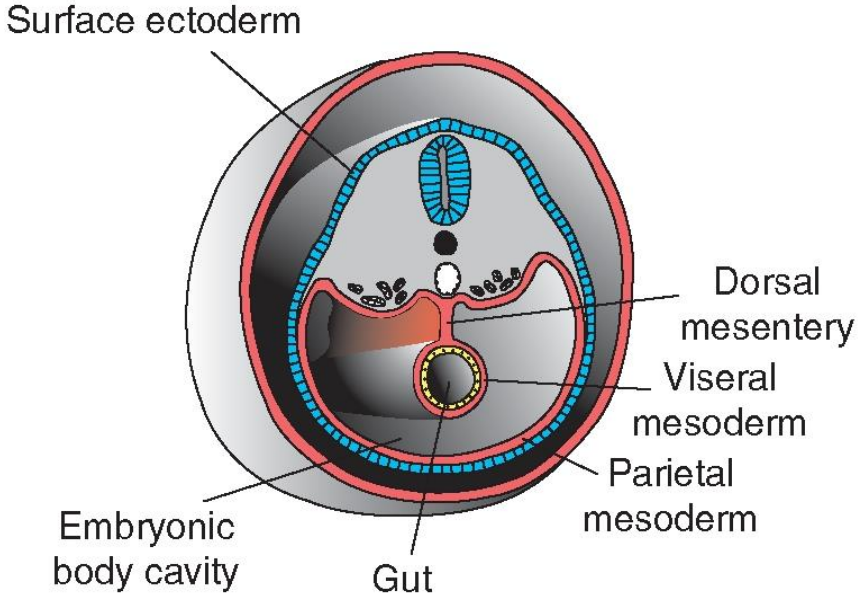
Grim Miloš, Naňka Ondřej, Helekal Ivan: Atlas anatomie člověka II. - Atlas of Human Anatomy I. ISBN: 978-80-247-4012-6, Grada



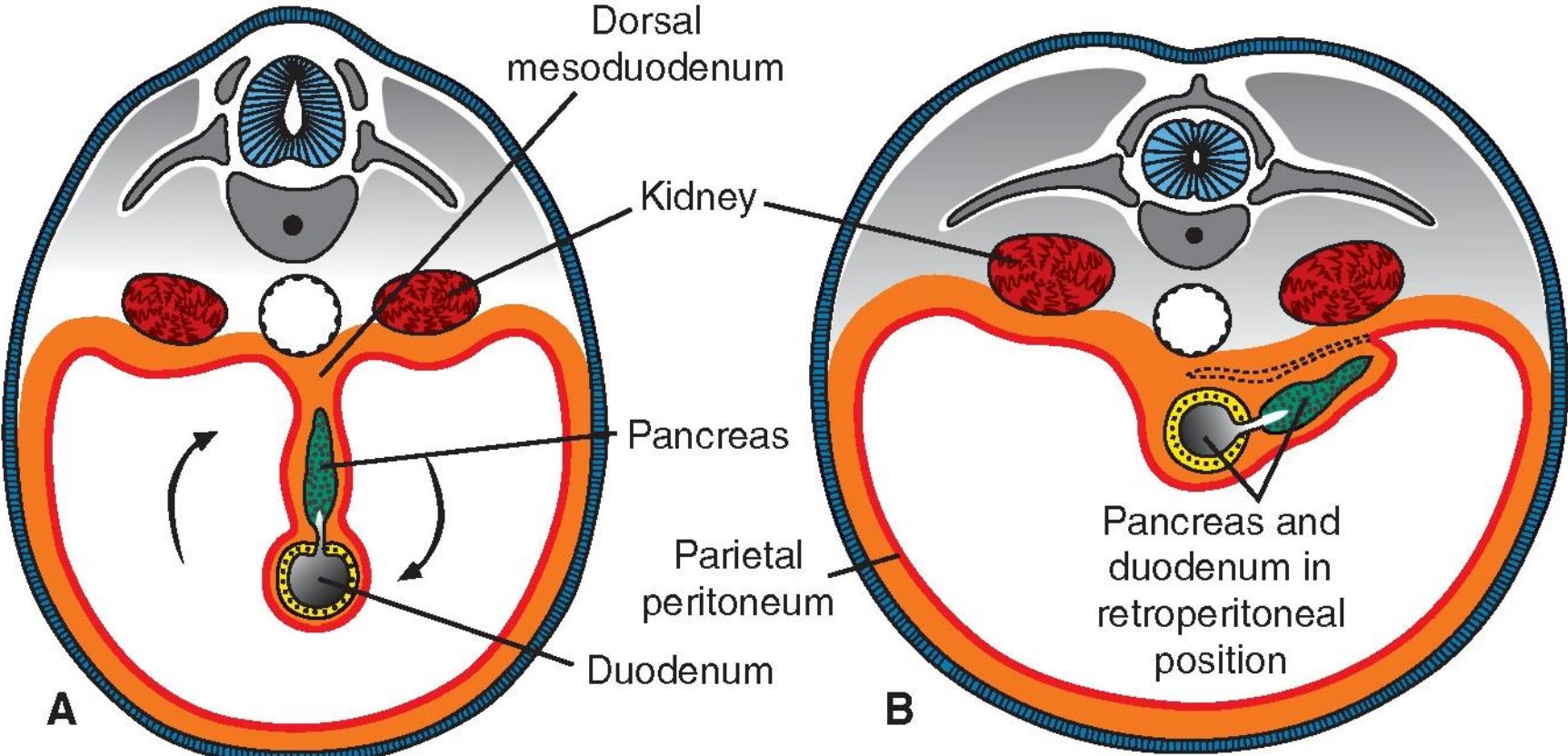
Pyloric stenosis



Stomach, spleen, duodenum

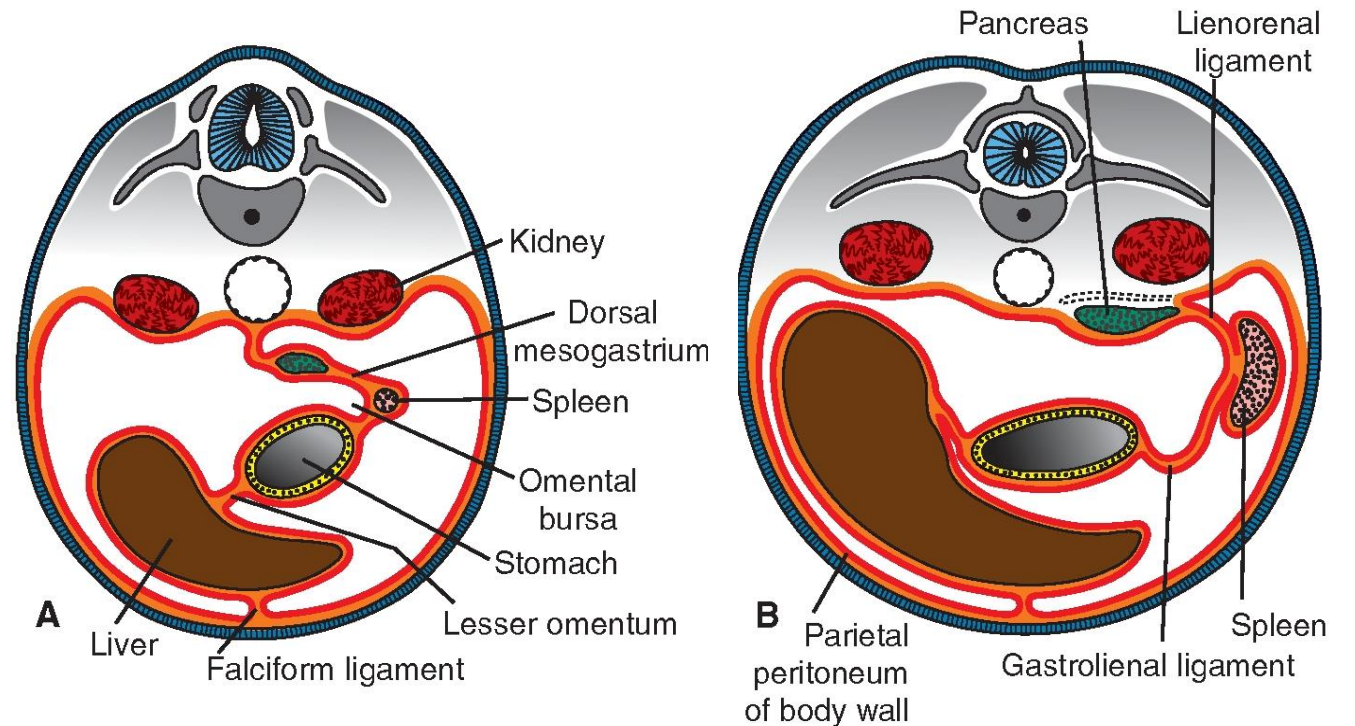
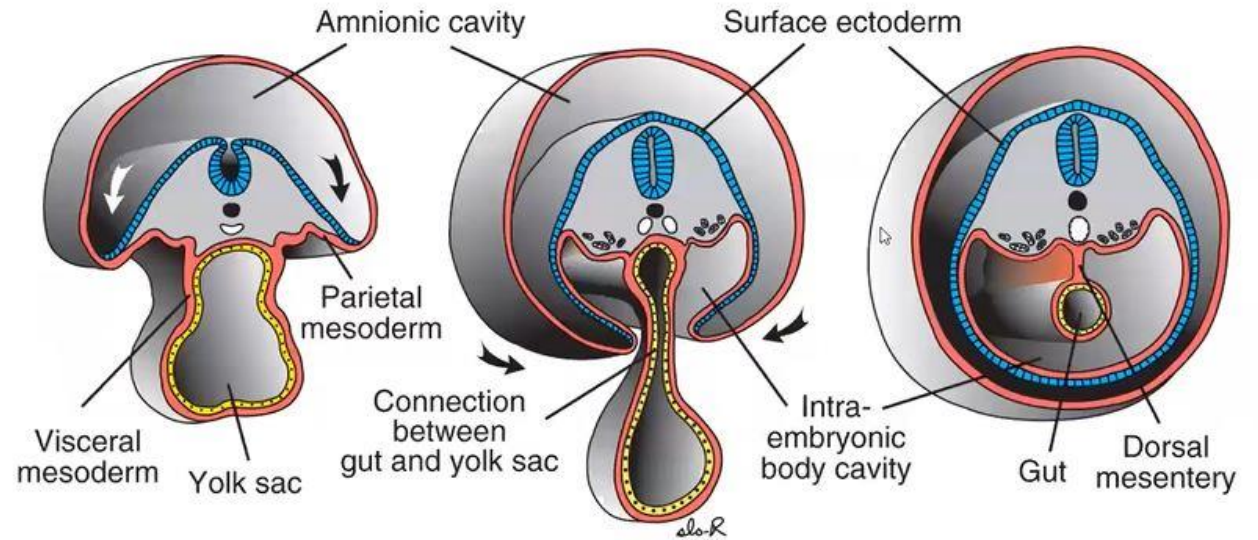


Pancreas, duodenum = secondarily retroperitoneal organs

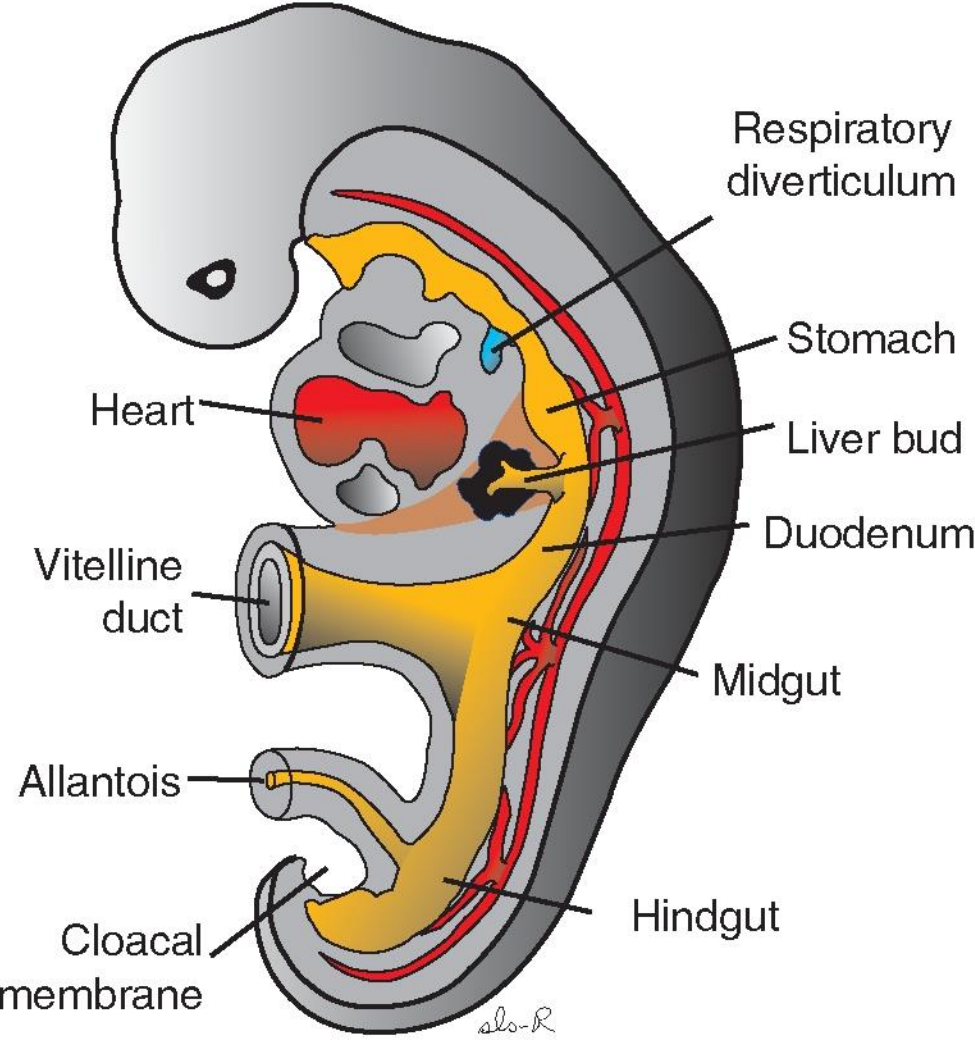


Spleen

- develops in the splanchnic mesoderm within the dorsal mesentery (mesogastrium)
- shifted to the left
- thickened spleen islands growing together
- later on filled with lymphoid elements
 - T-lymfocytes surrounding the central arteries
 - B-lymfocytes –lymphoid follicles
- lienal haemopoiesis (2nd trimester)

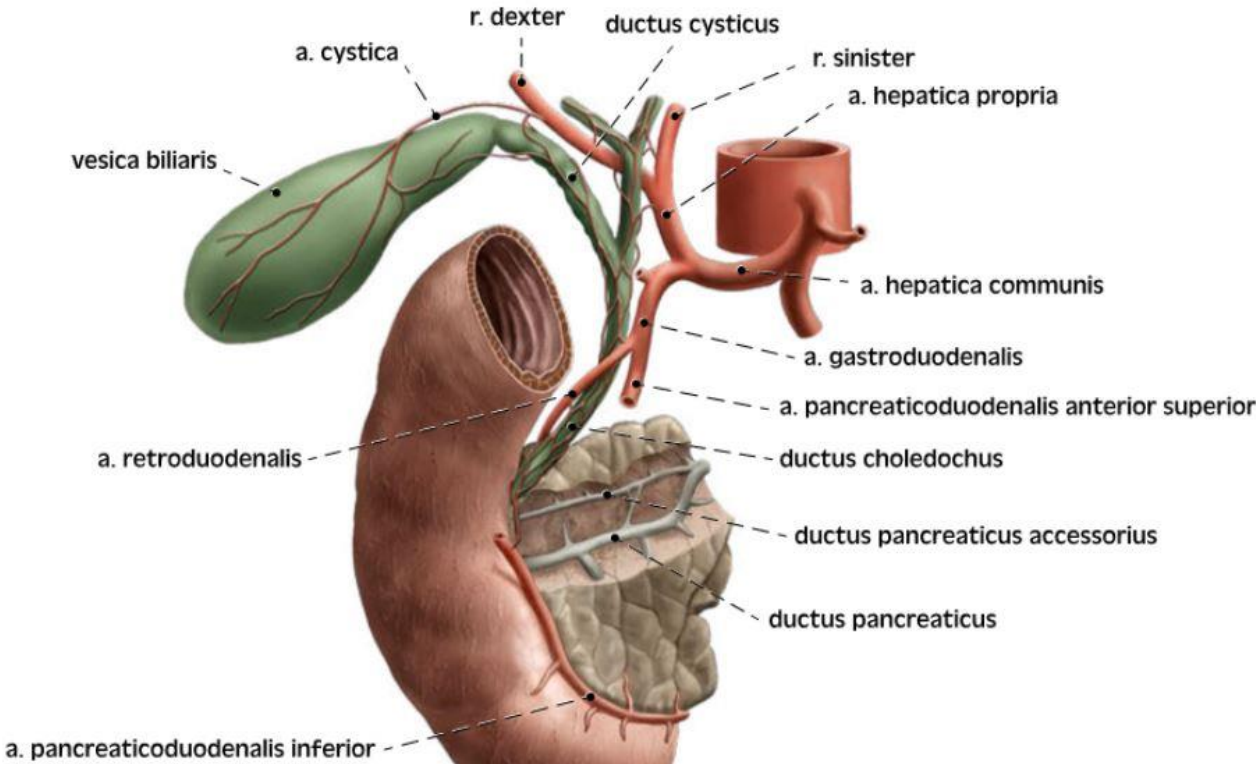


Liver, gallbladder, pancreas



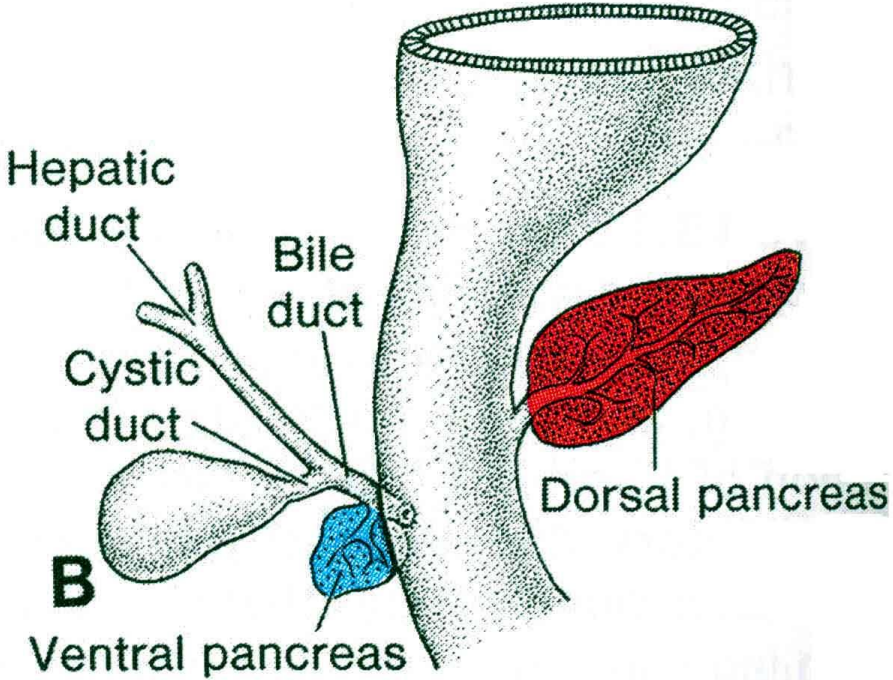
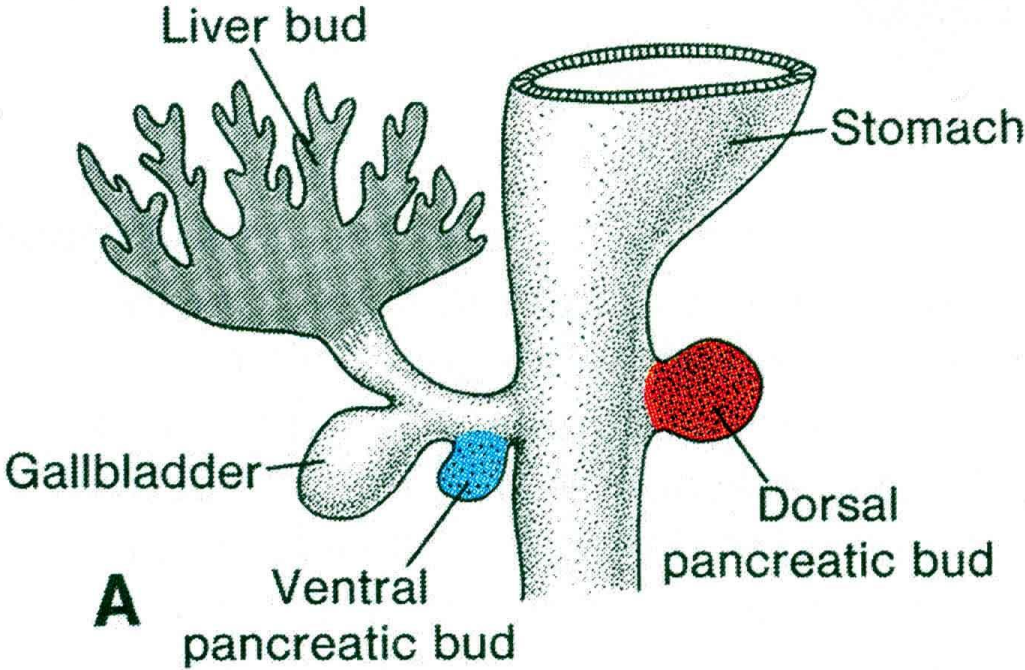
A

4 weeks

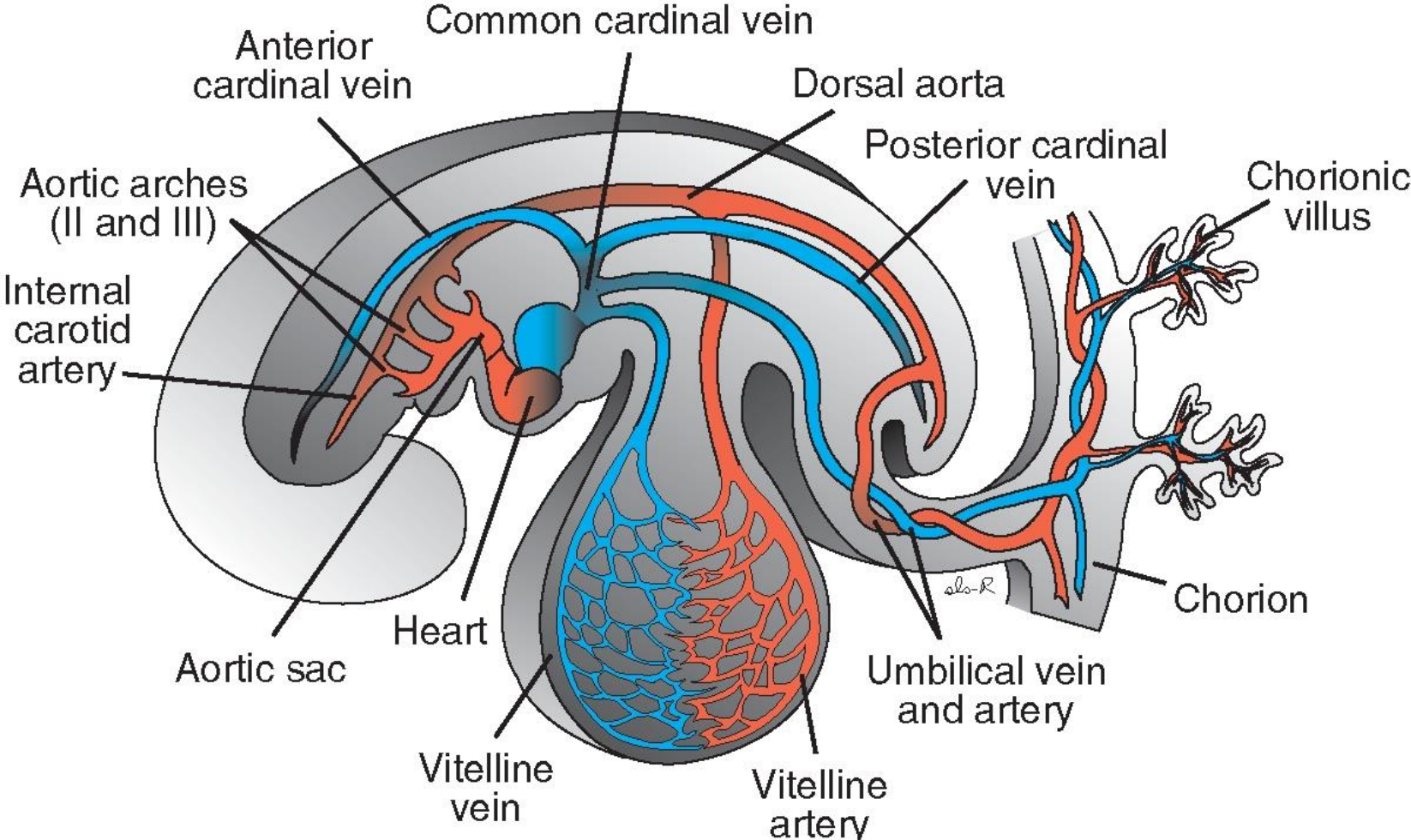


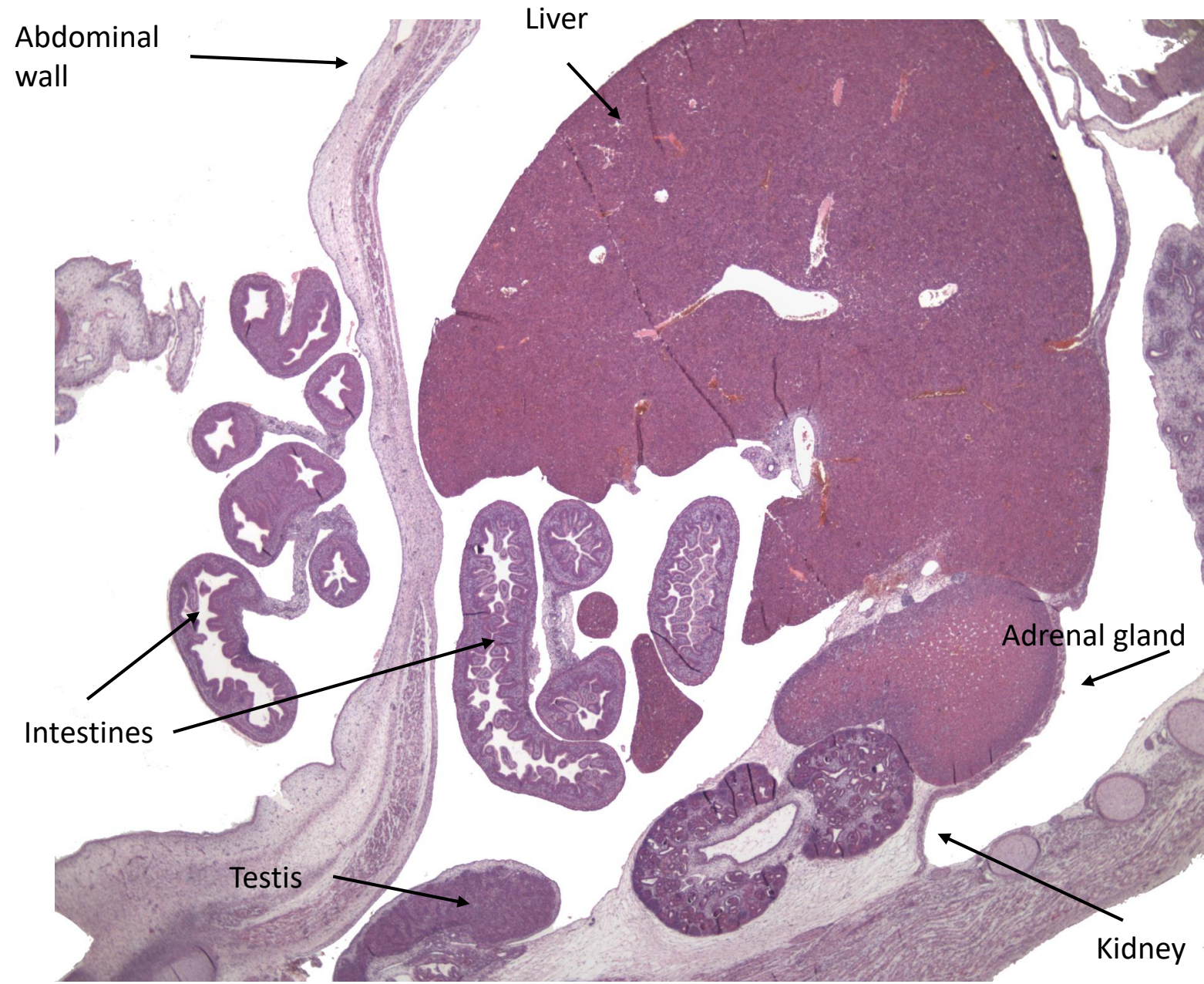
Grim Miloš, Naňka Ondřej, Helekal Ivan:
 Atlas anatomie člověka II. - Atlas of Human
 Anatomy I. ISBN: 978-80-247-4012-6, Grada

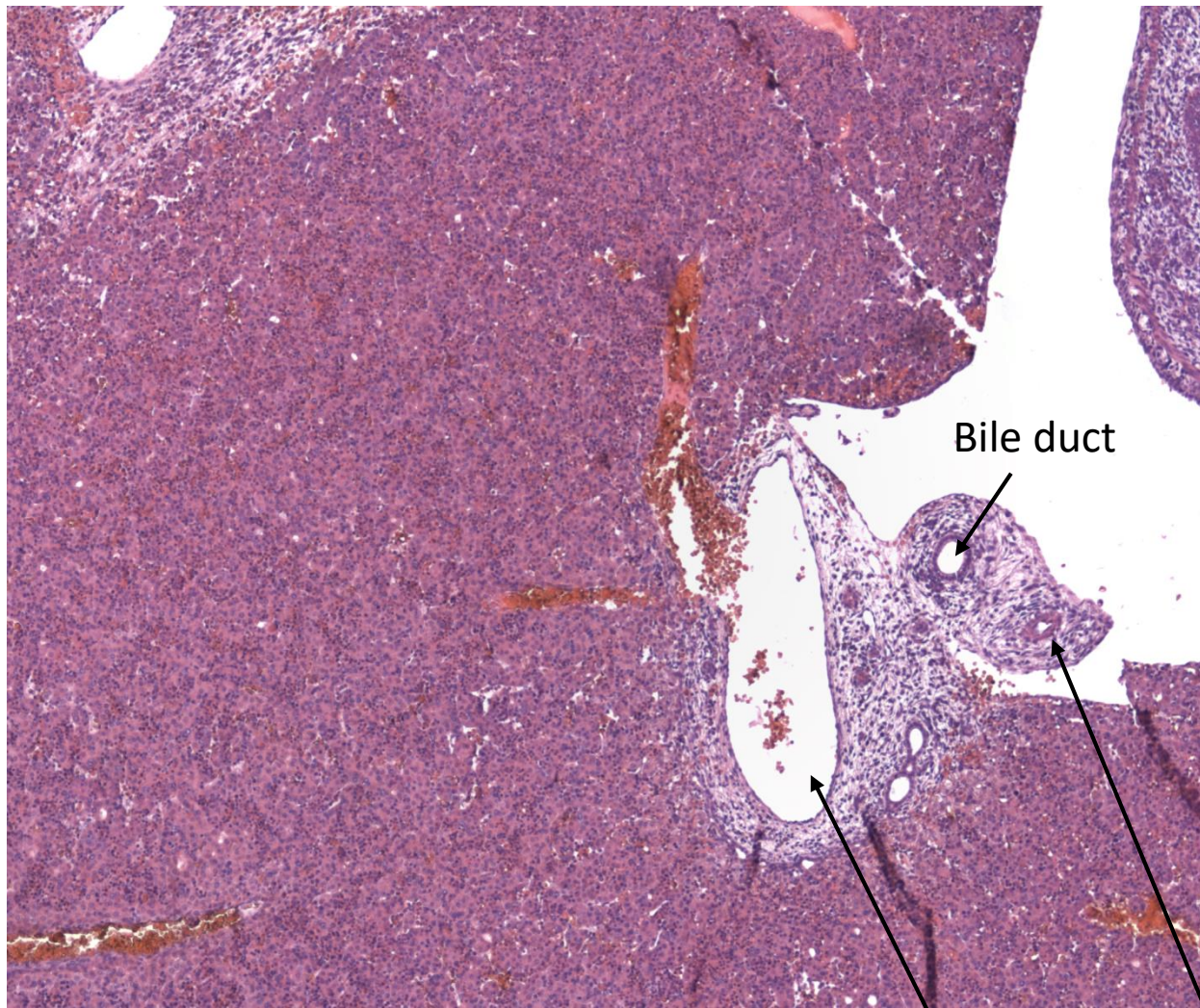
Liver, gallbladder, pancreas



Liver, gallbladder, pancreas



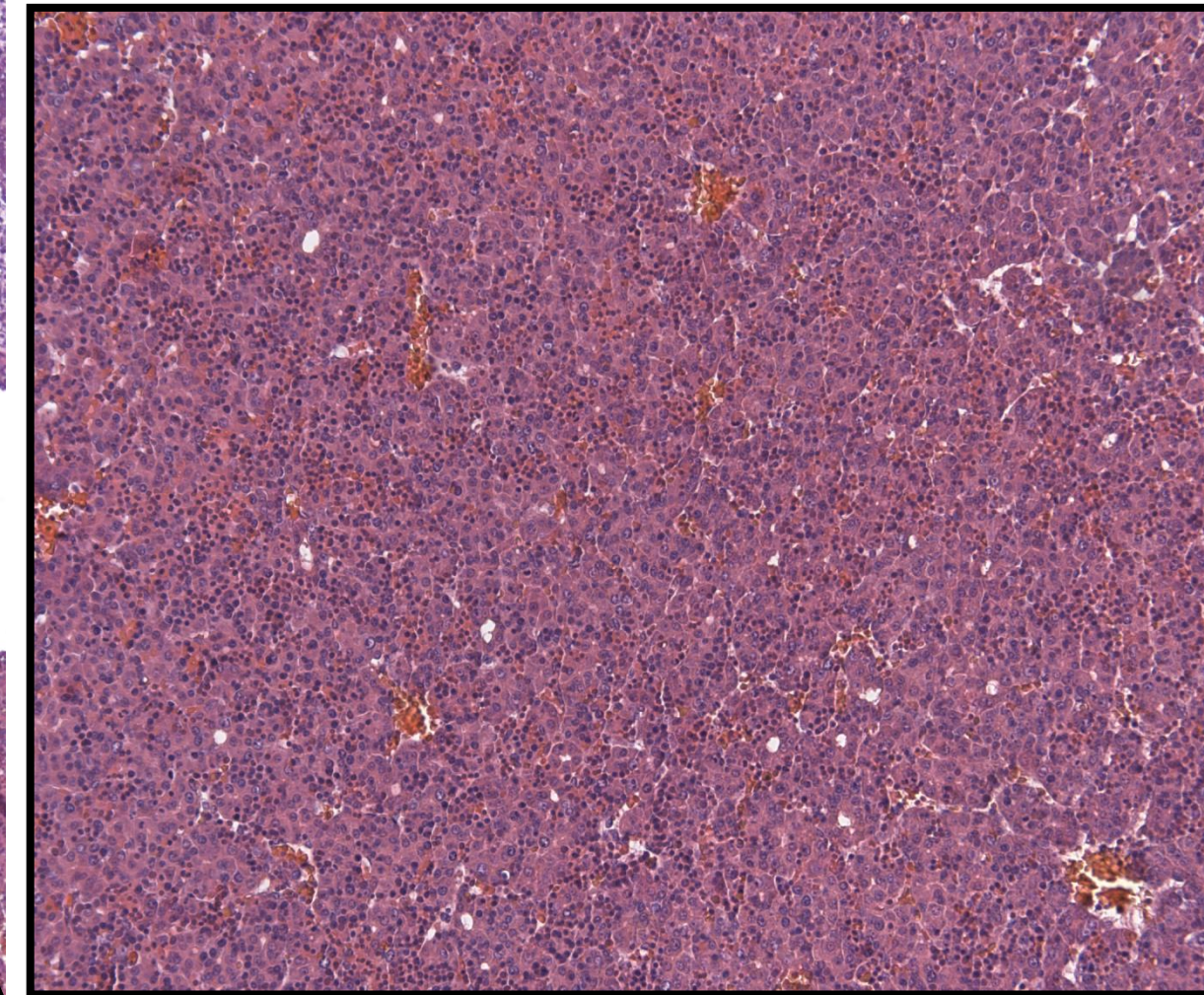




Liver

Vena portae

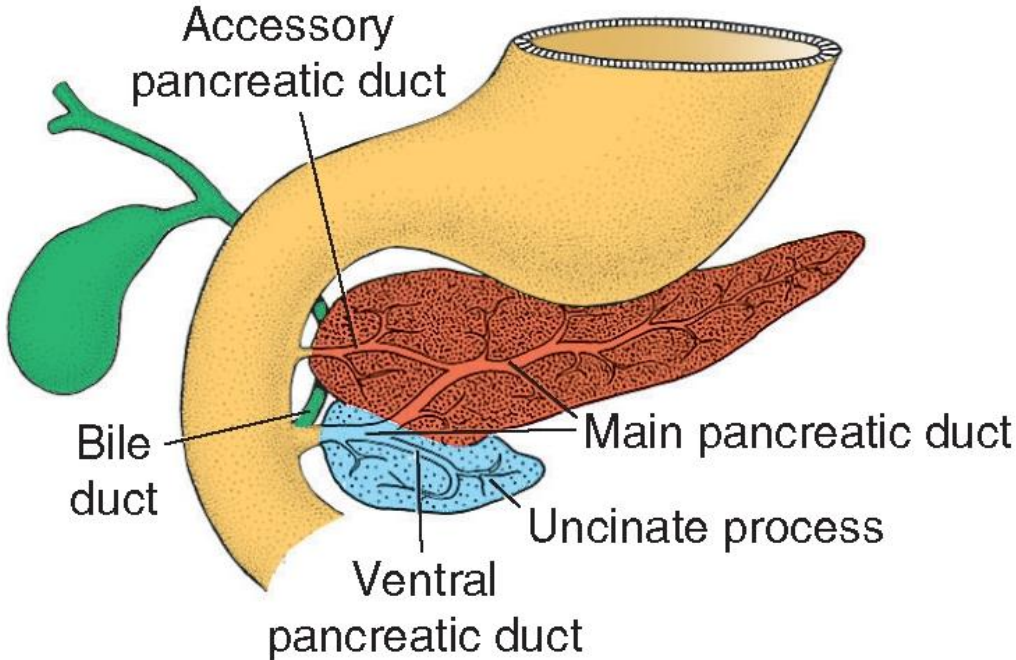
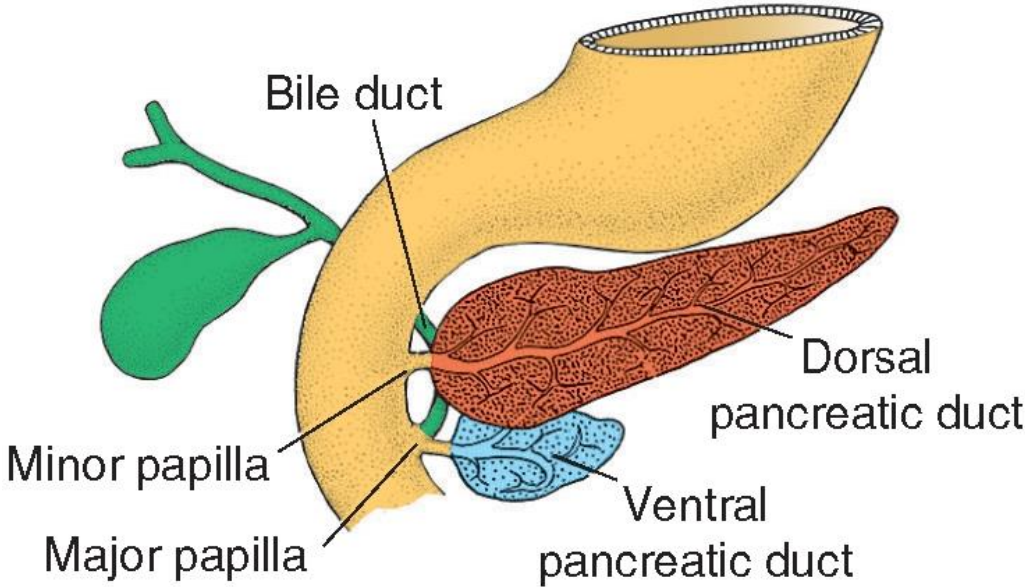
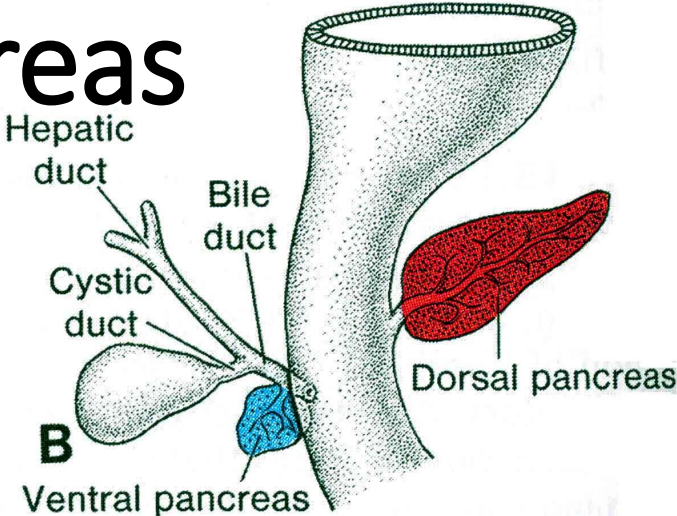
Bile duct



Hemopoiesis

Arteria hepatica

Liver, gallbladder, pancreas

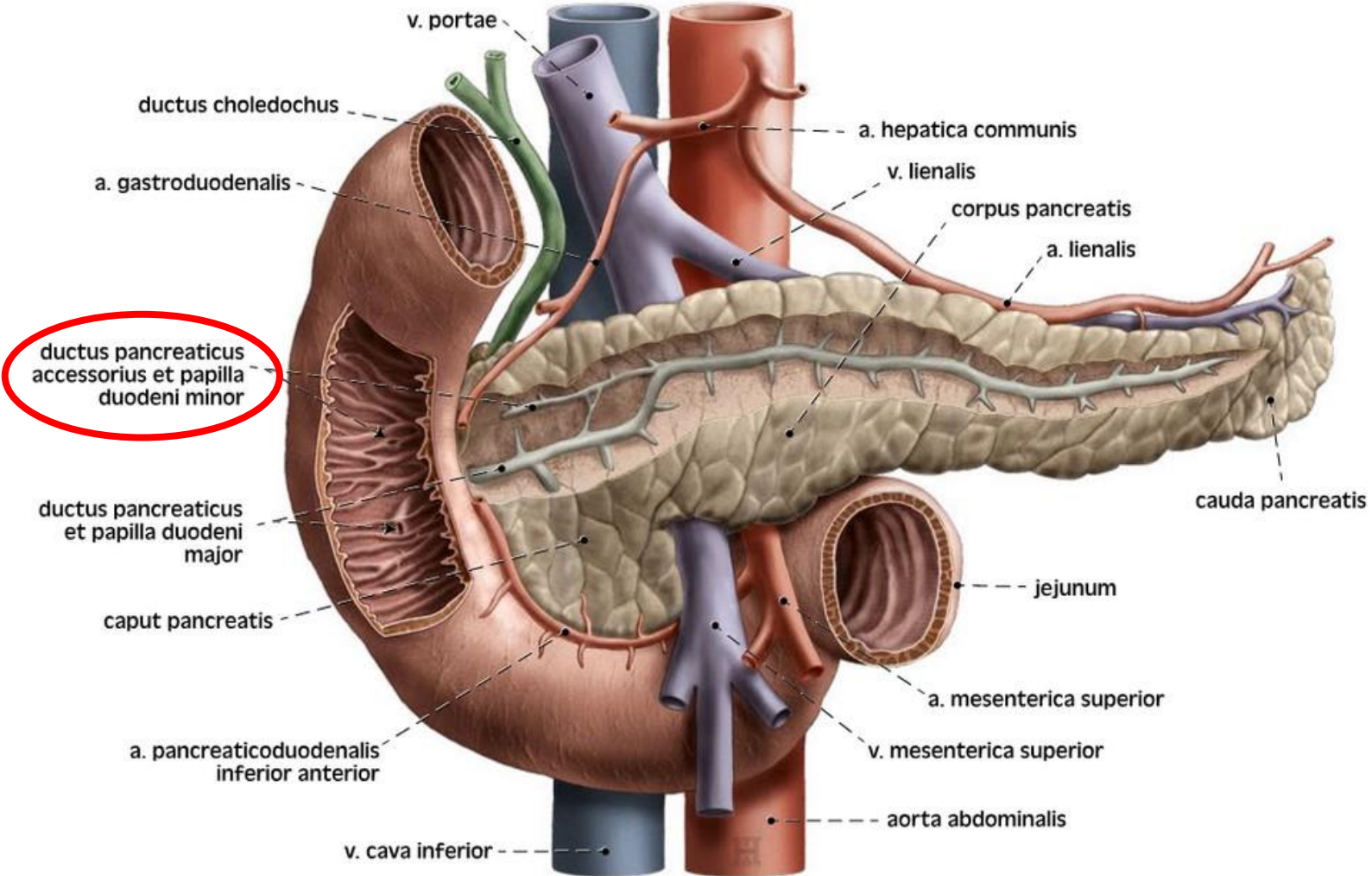


A

B

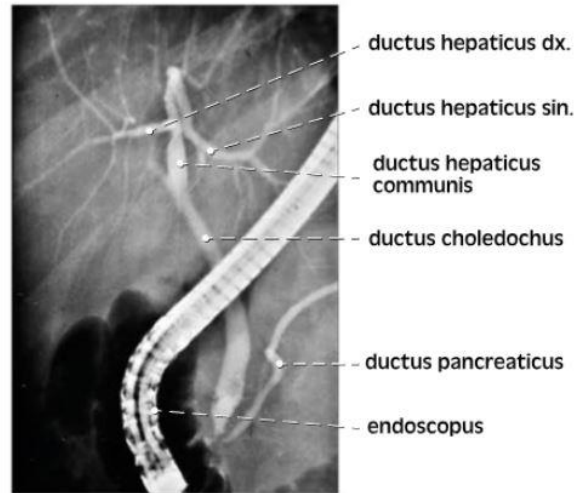
Ductus pancreaticus accessorius (of Santorini)

a

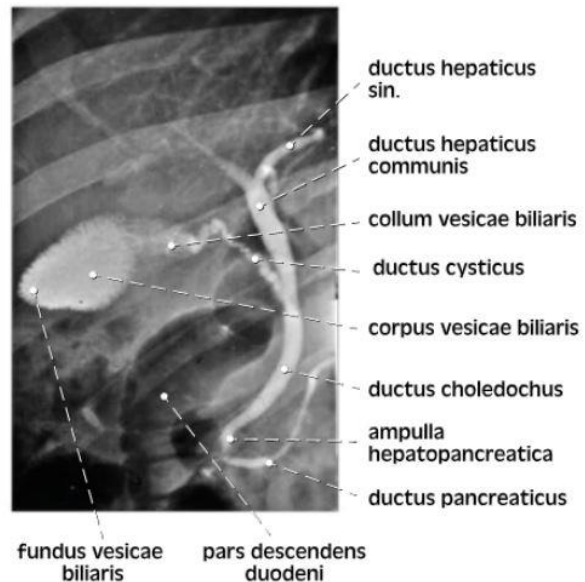


Grim Miloš, Naňka Ondřej,
Helekal Ivan: Atlas
anatomie člověka II. - Atlas
of Human Anatomy I. ISBN:
978-80-247-4012-6, Grada

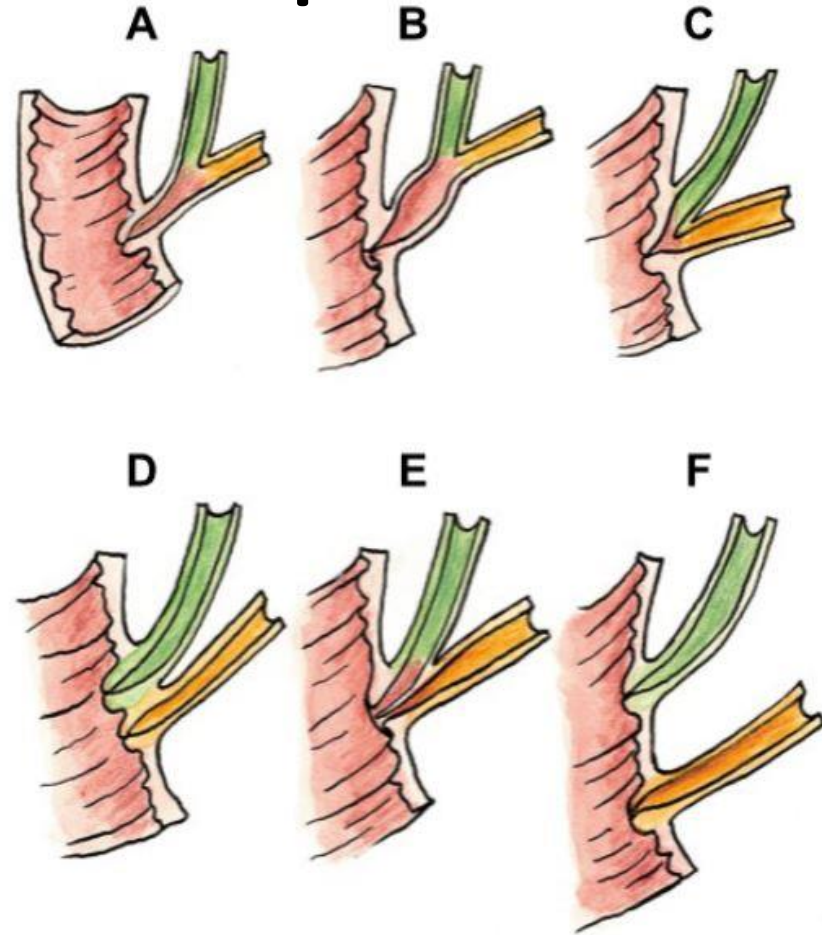
Variations in union of bile and pancreatic ducts



b



Grim Miloš, Naňka Ondřej,
Helekal Ivan: Atlas
anatomie člověka II. - Atlas
of Human Anatomy I. ISBN:
978-80-247-4012-6, Grada

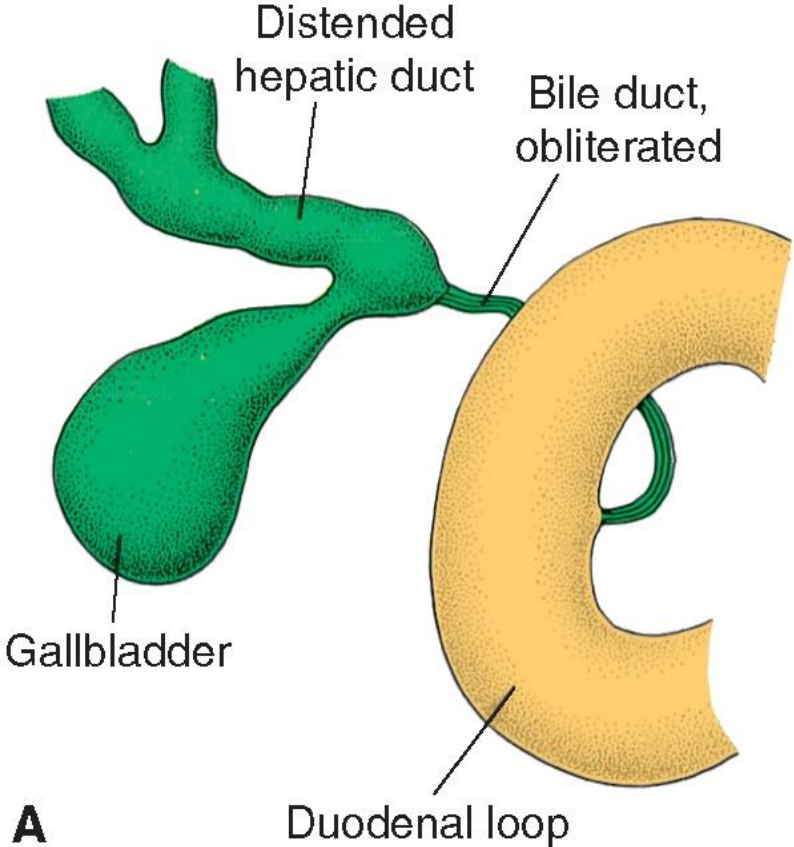


Obr. 105. VARIACE ZPŮSOBU VYÚSTĚNÍ DUCTUS CHOLEDOCHUS A DUCTUS PANCREATICUS NA PAPILLA DUODENI MAJOR; schema

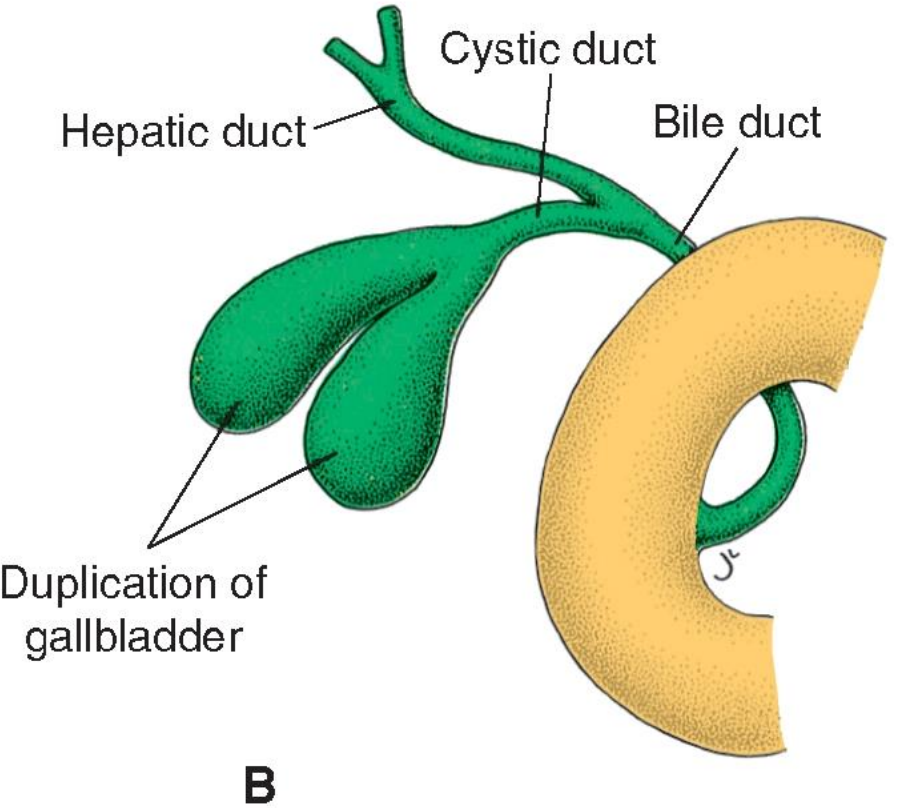
A–C formy společného vústění
B rozšířená ampulla hepatopancreatica
D–F formy odděleného vústění

Čihák R, Anatomie 2, Druhé, upravené a
doplňené vydání, Grada, 2002

Liver and gallbladder abnormalities



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Pancreatic abnormalities

Accessory pancreatic tissue



Fig. 1 Enhanced computed tomography showing a 4 × 4 cm heterogeneous solid submucosal tumor (arrowheads) arising from the posterior wall of the pyloric antrum

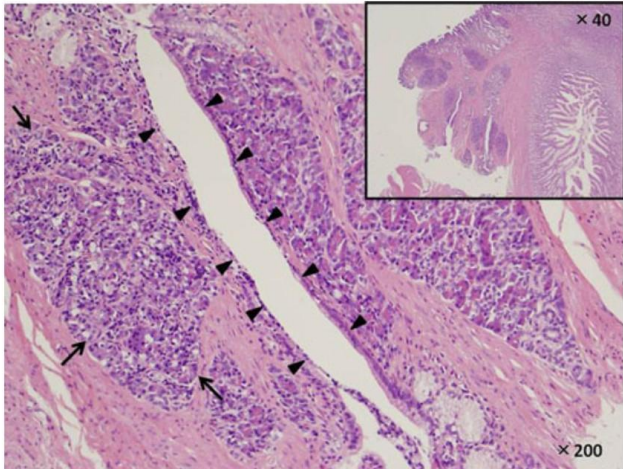
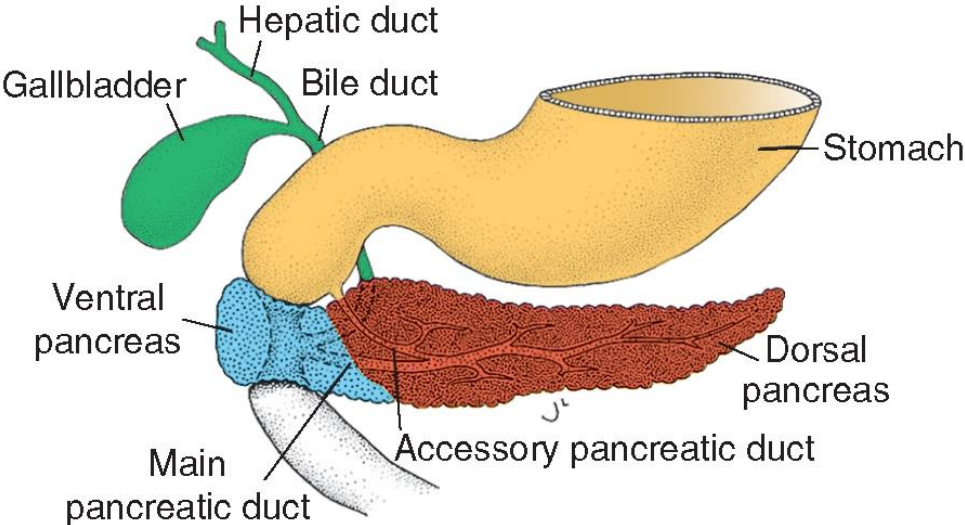


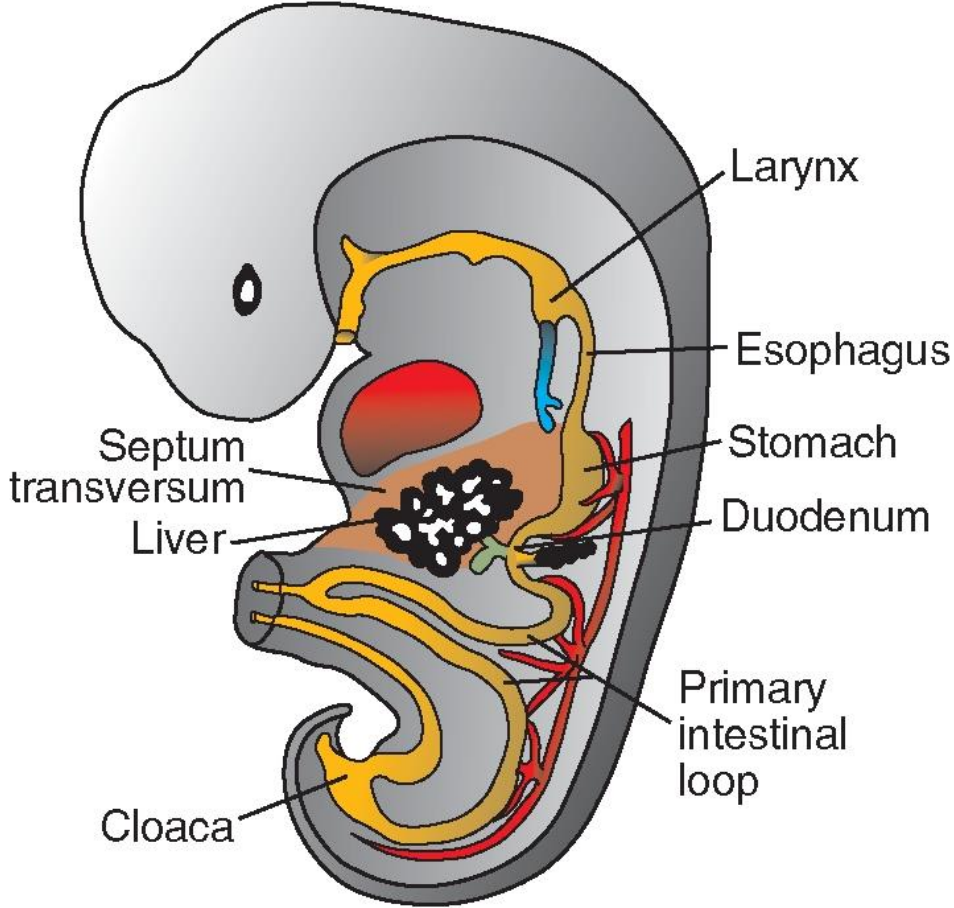
Fig. 2 Histopathology shows aberrant pancreatic tissue (arrows) with acini and ductal components (arrowheads)

<https://pubmed.ncbi.nlm.nih.gov/20862586/>

Pancreas annulare (= annular pancreas)



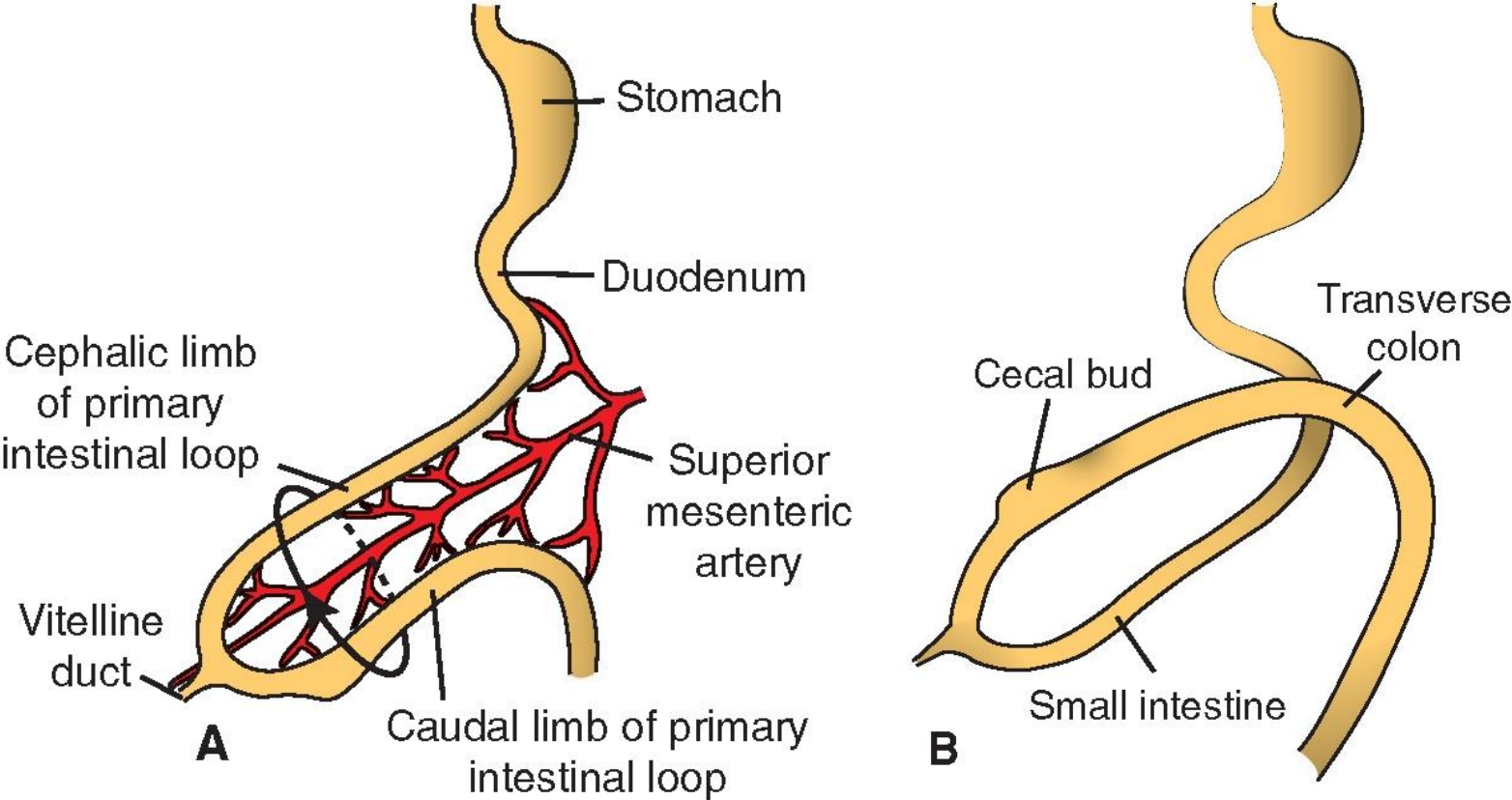
Midgut and hindgut



B

5 weeks

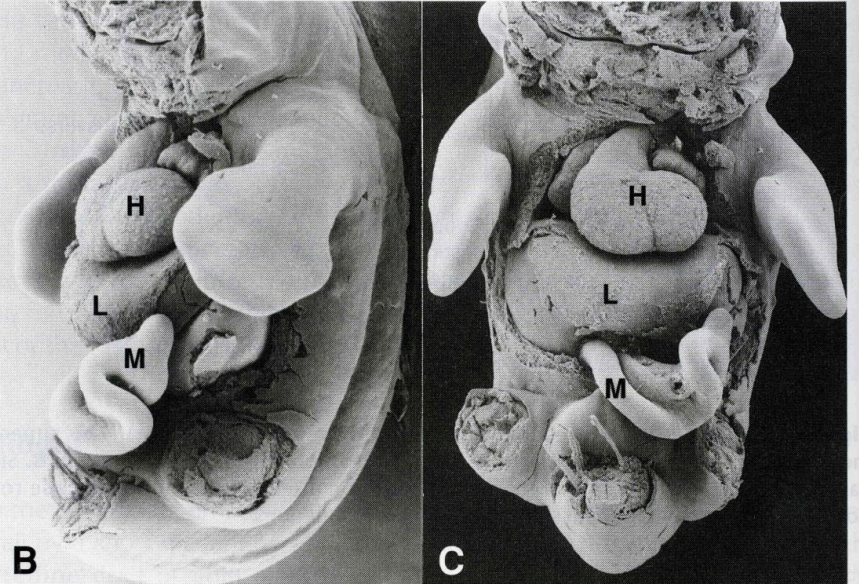
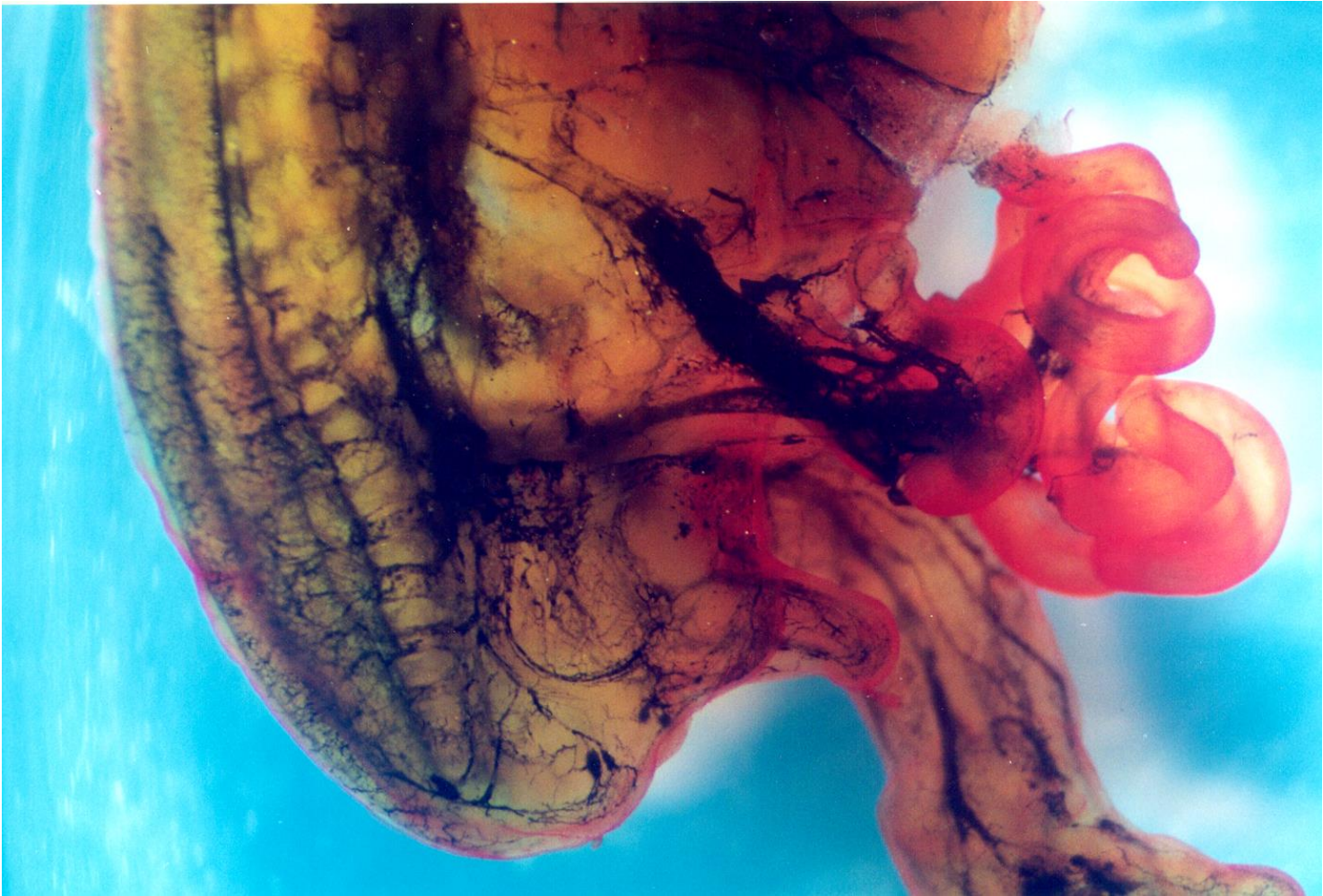
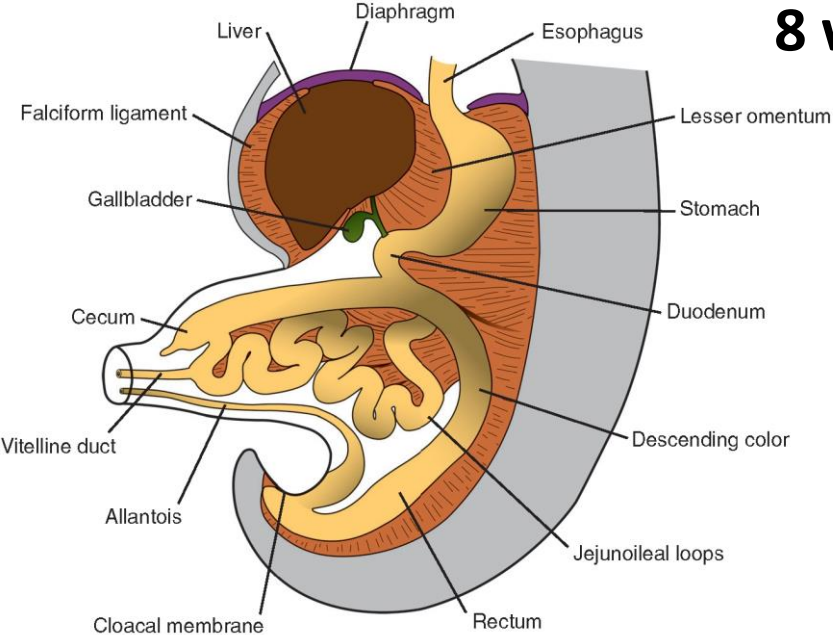
Midgut and hindgut rotation

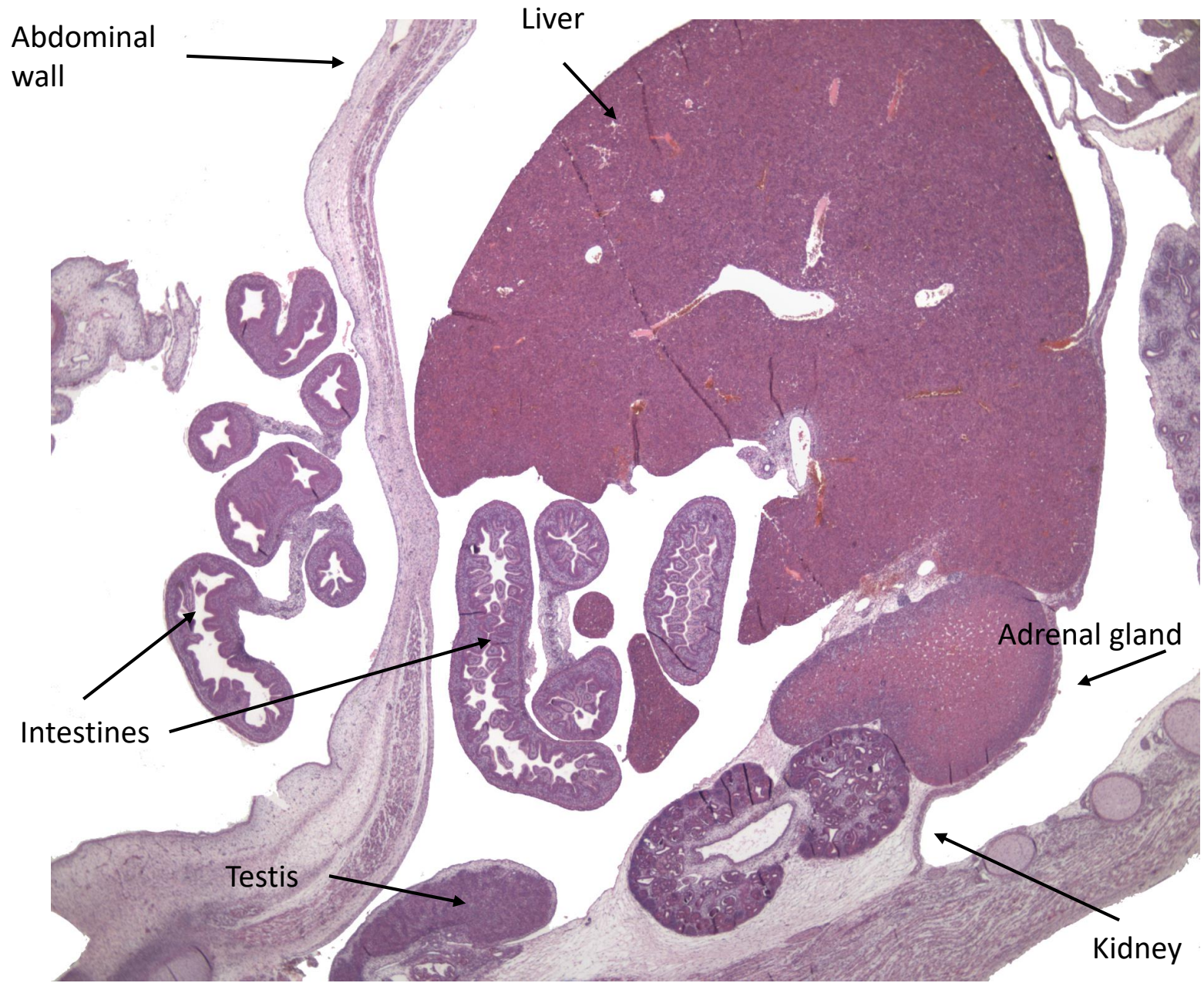




Midgut and hindgut rotation

8 weeks





Abdominal wall

Liver

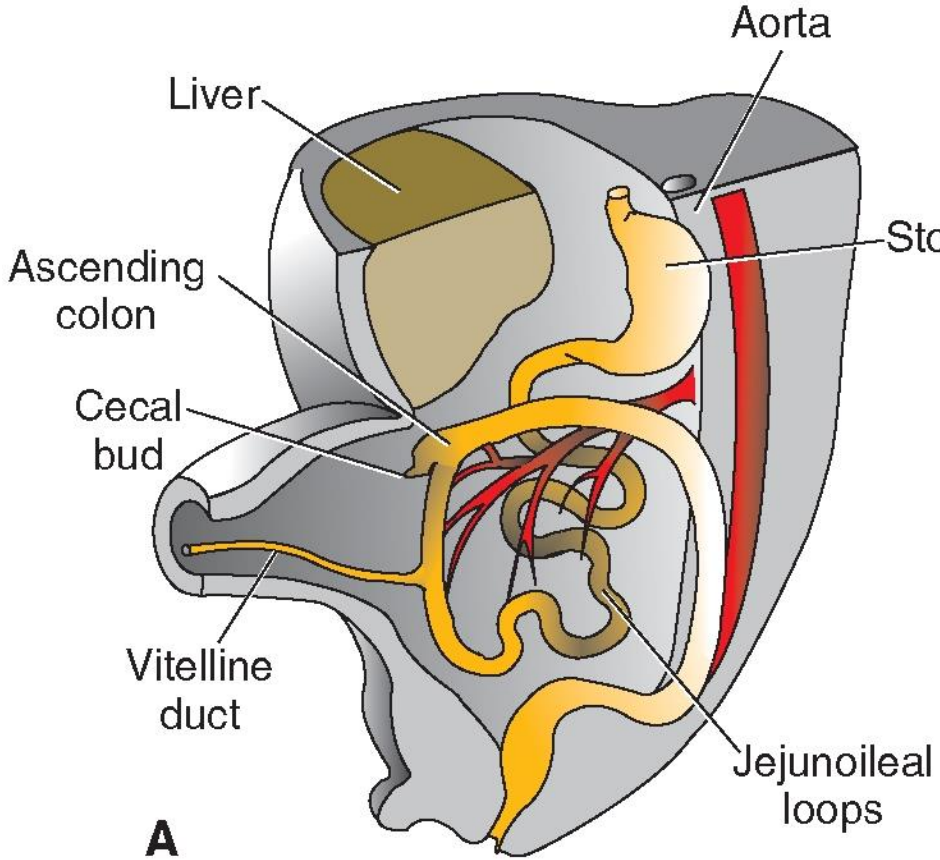
Intestines

Testis

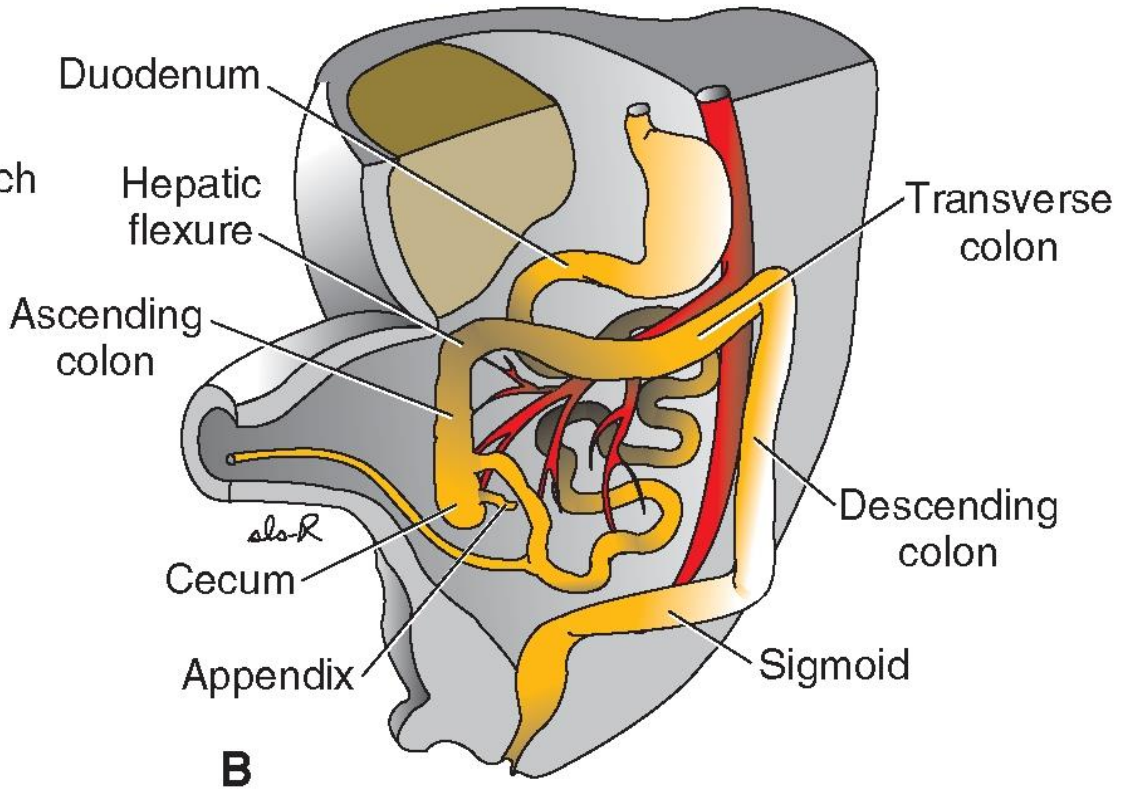
Adrenal gland

Kidney

Midgut and hindgut rotation



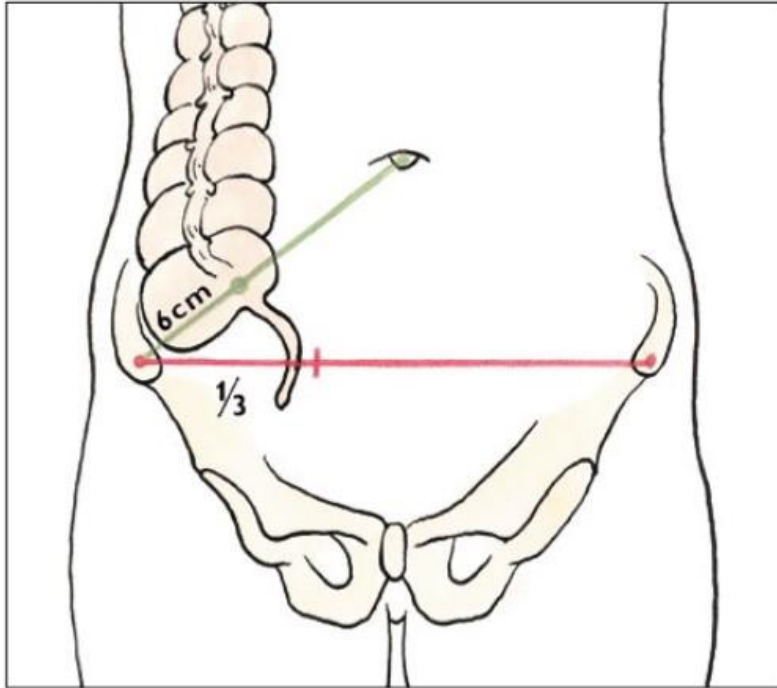
10 týdnů



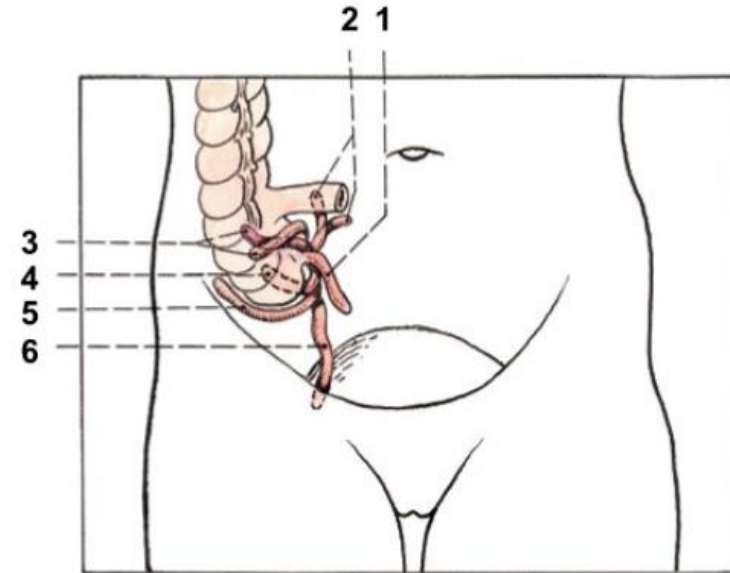
11 týdnů

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Positions of appendix



Obr. 74. BODY PRO VYHLEDÁNÍ APENDIXU; schema
zeleně – McBurneyův bod
červeně – Lanzův bod

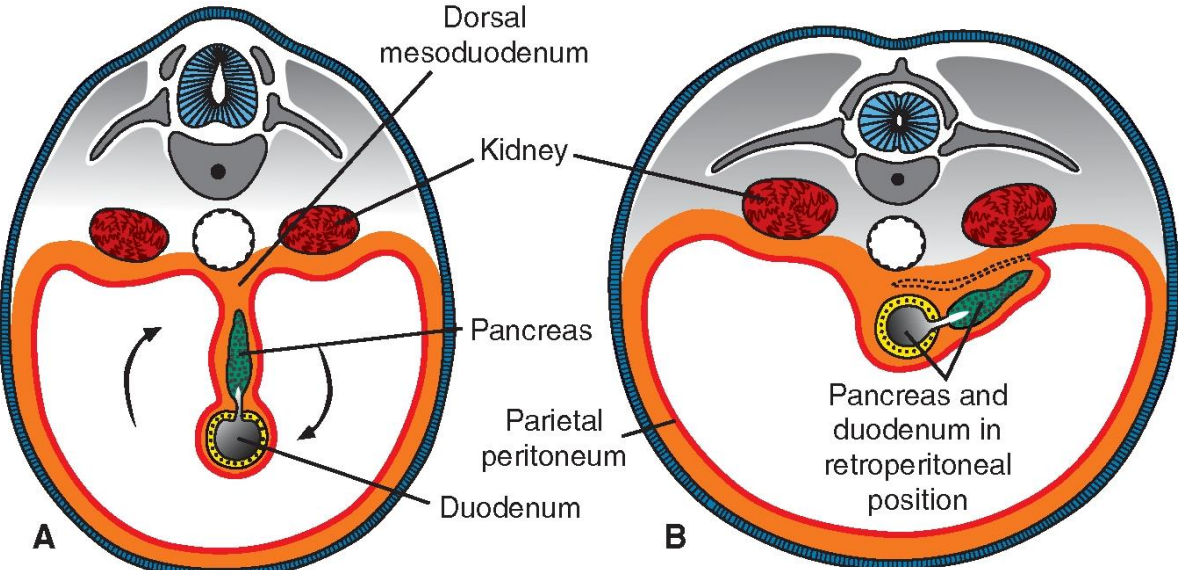


Obr. 75. TYPICKÉ POLOHY APENDIXU; schema

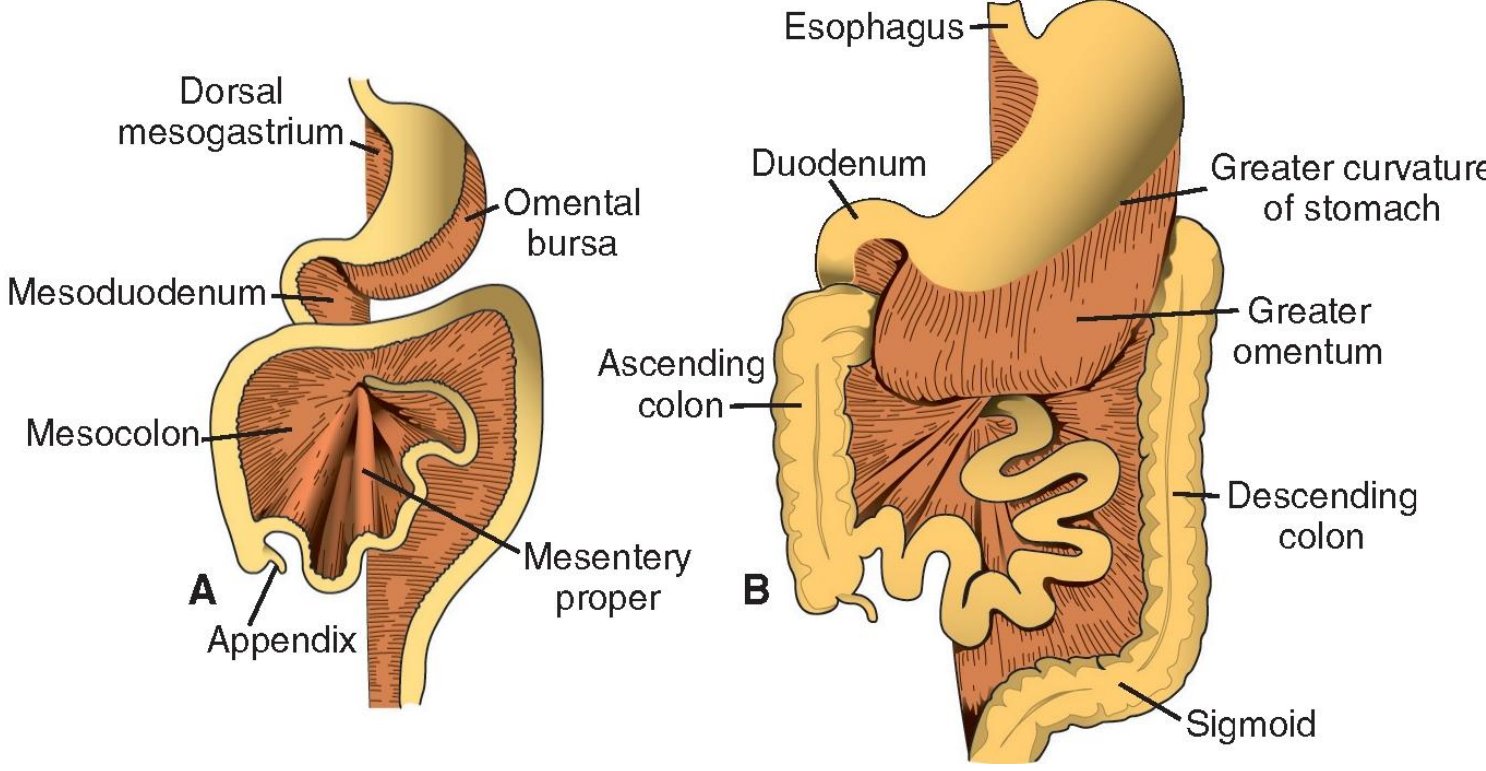
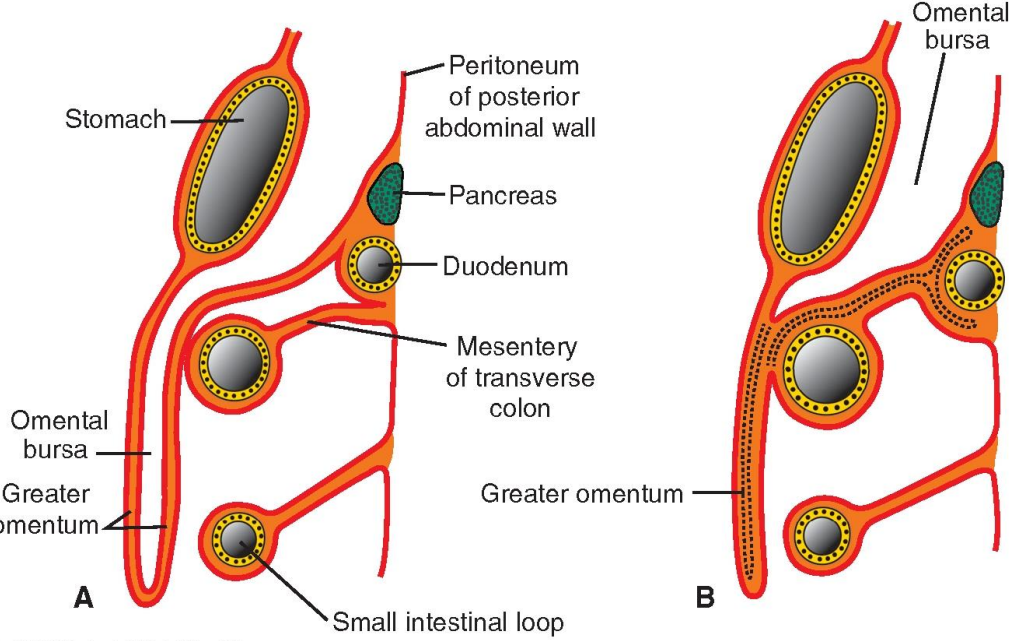
- 1 positio subcaecalis
- 2 positio ileocaecalis
- 3 positio precaecalis
- 4 positio retrocaecalis
- 5 positio laterocaecalis
- 6 positio pelvina

(u ileocaekální a precaekální posice jsou znázorněny různé možné směry konce appendixu)

Mesenteries

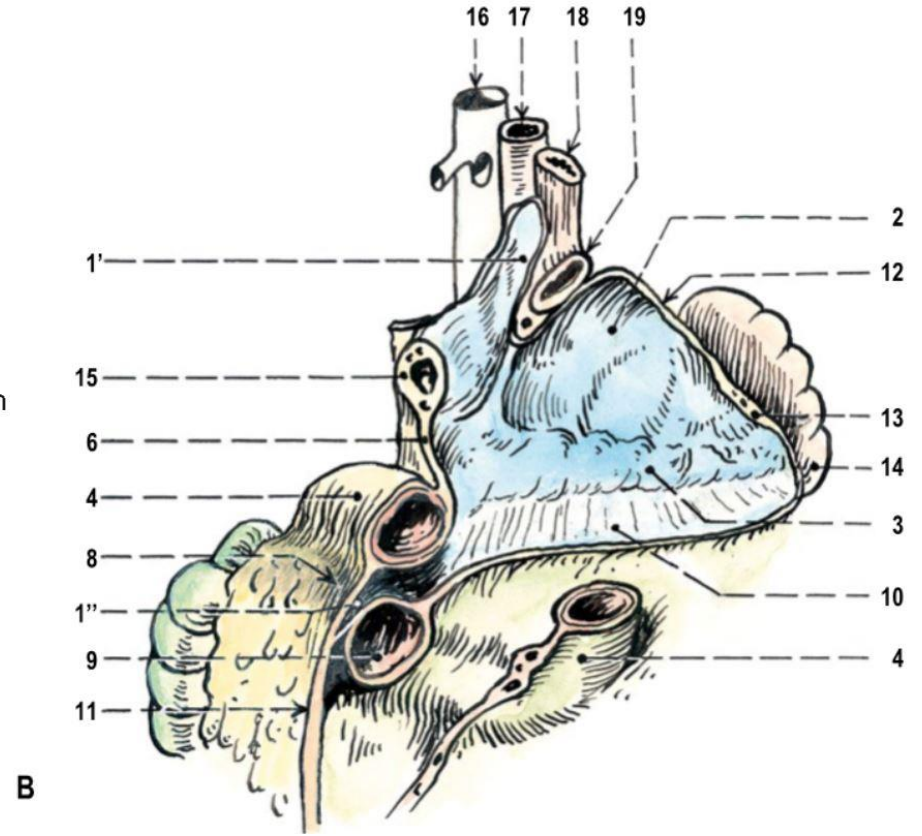
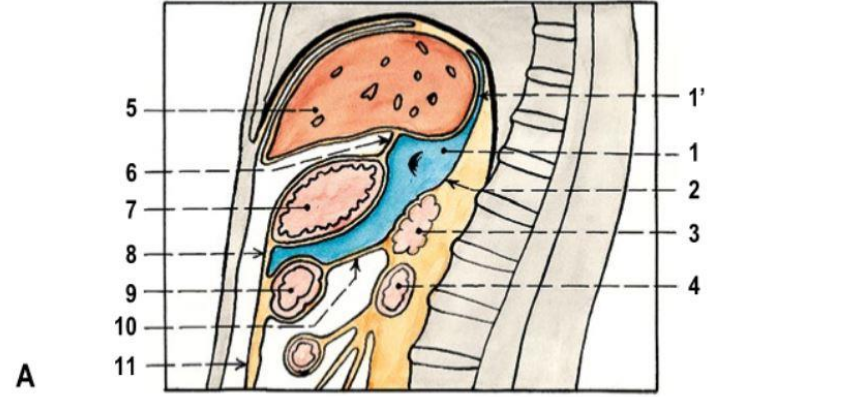
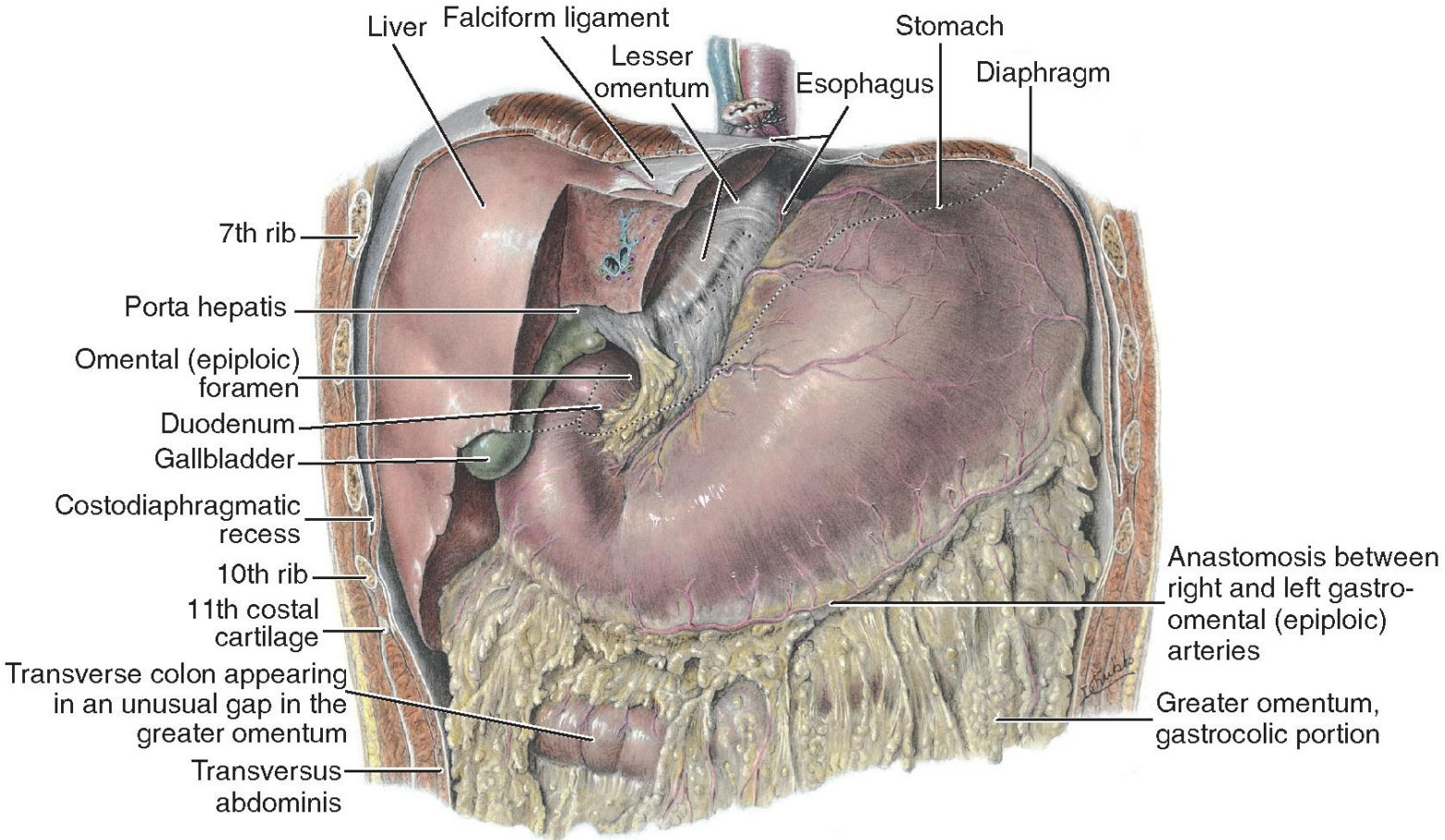


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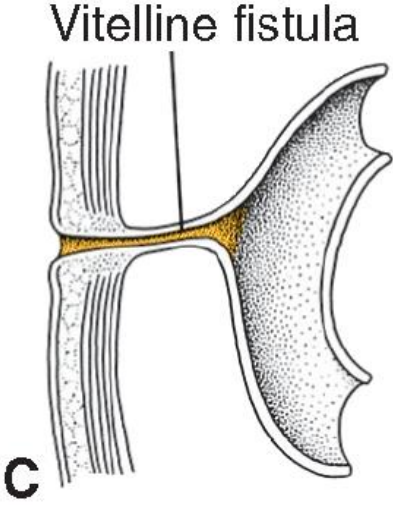
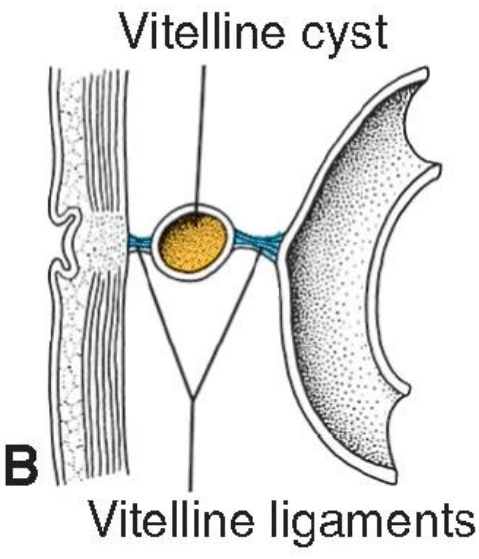
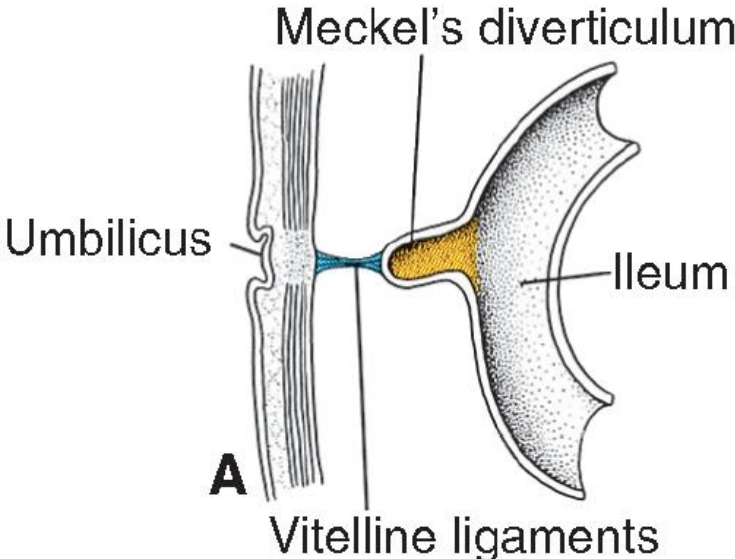


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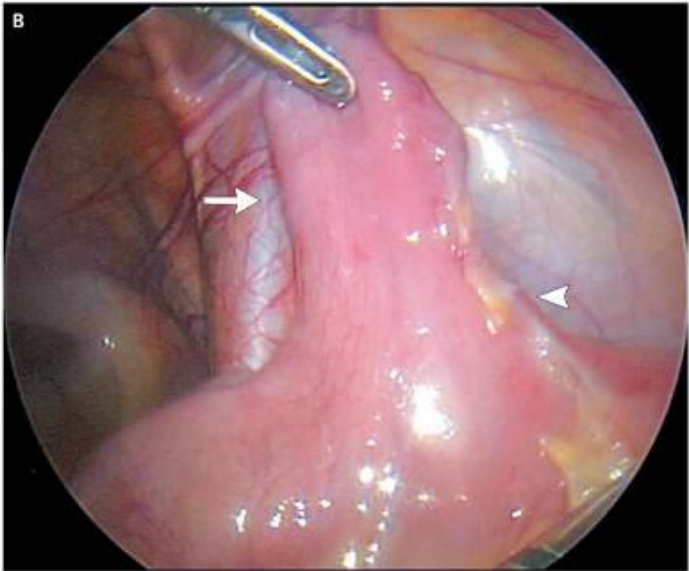
Mesenteries



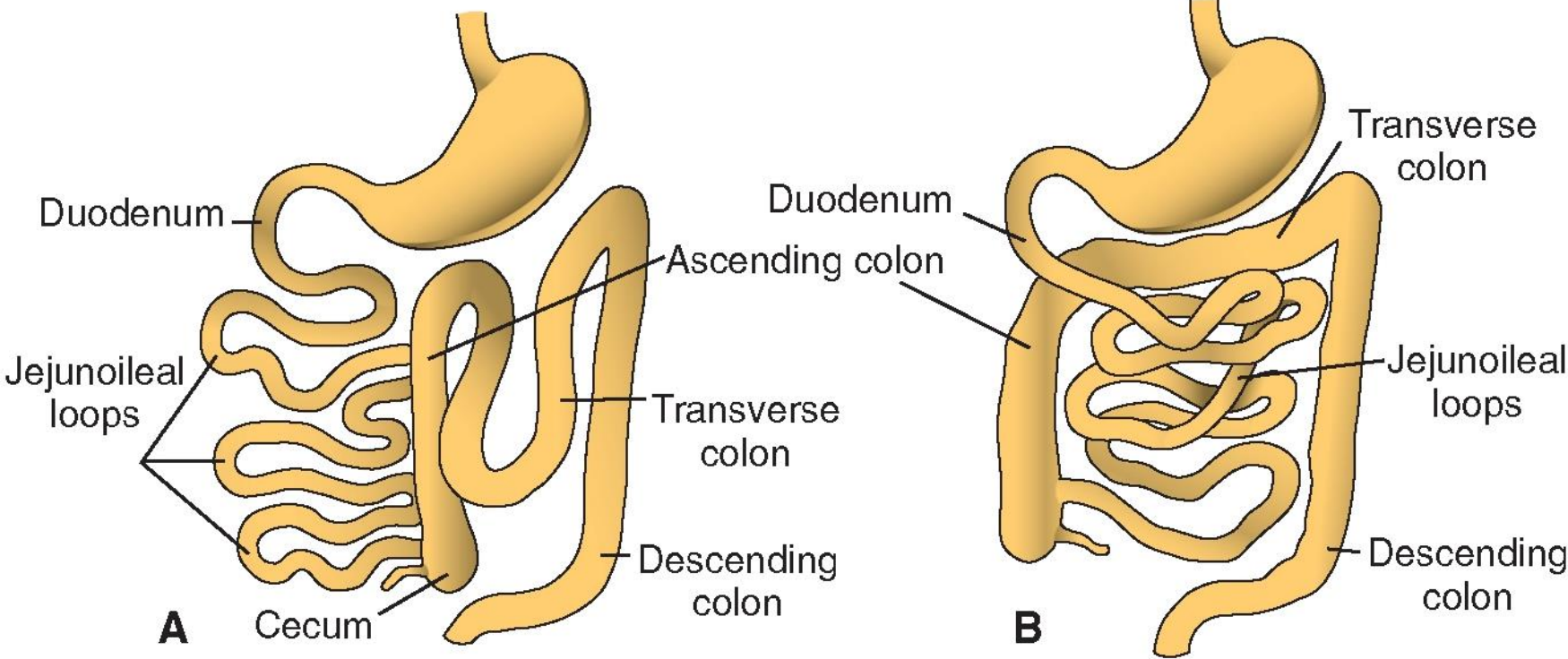
Vitelline duct abnormalities



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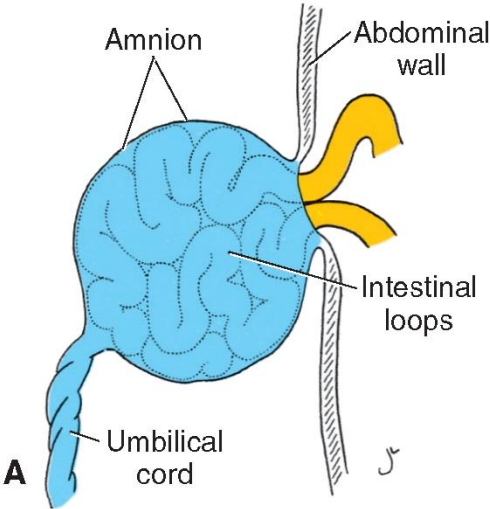


Gut rotation defects



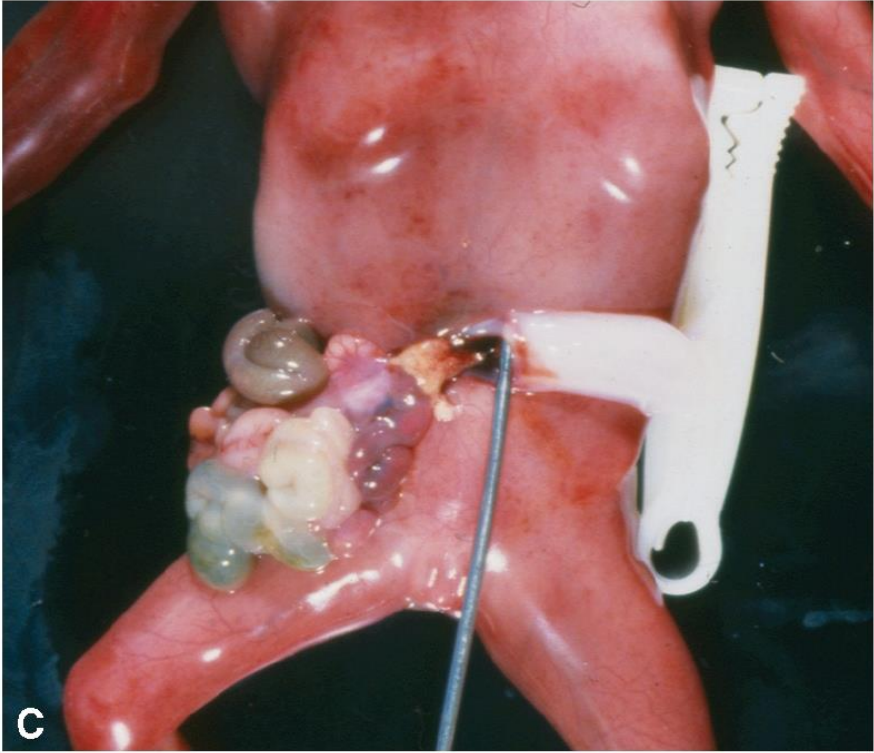
Body wall defects

Omfalocele

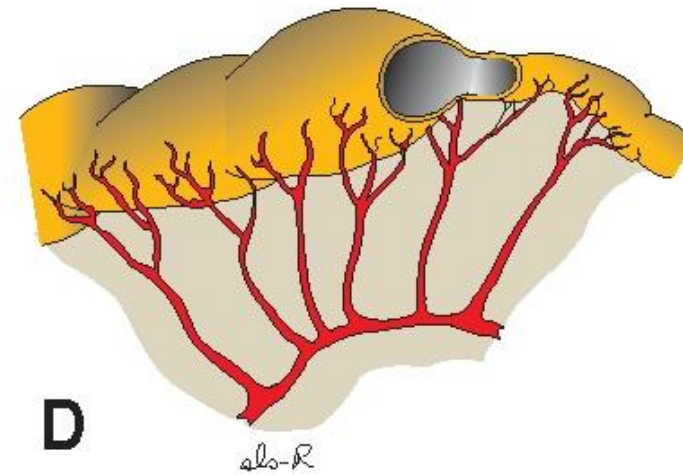
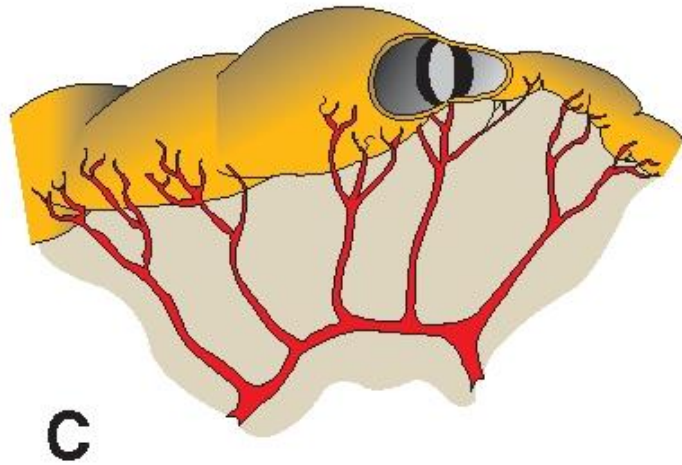
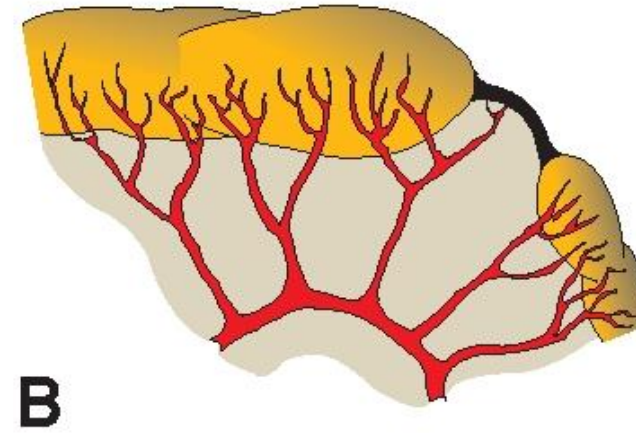
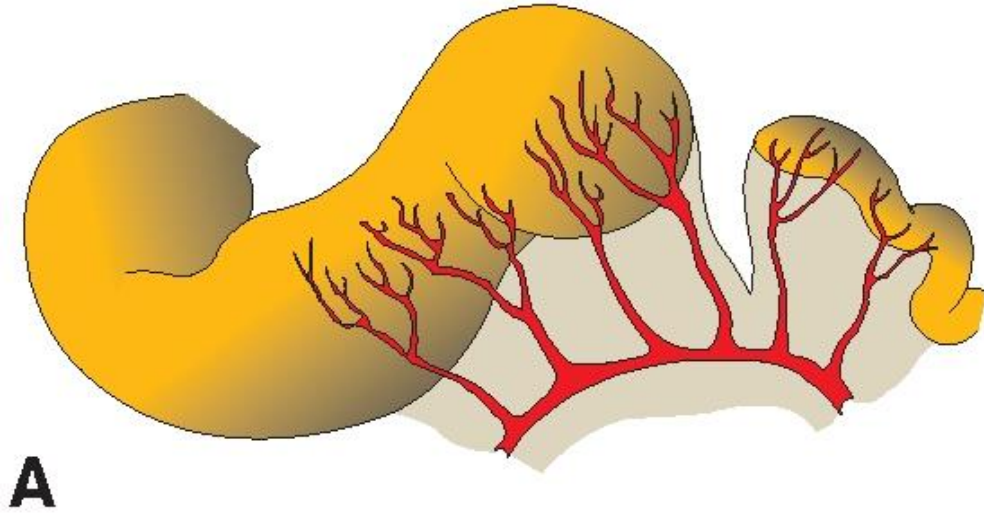


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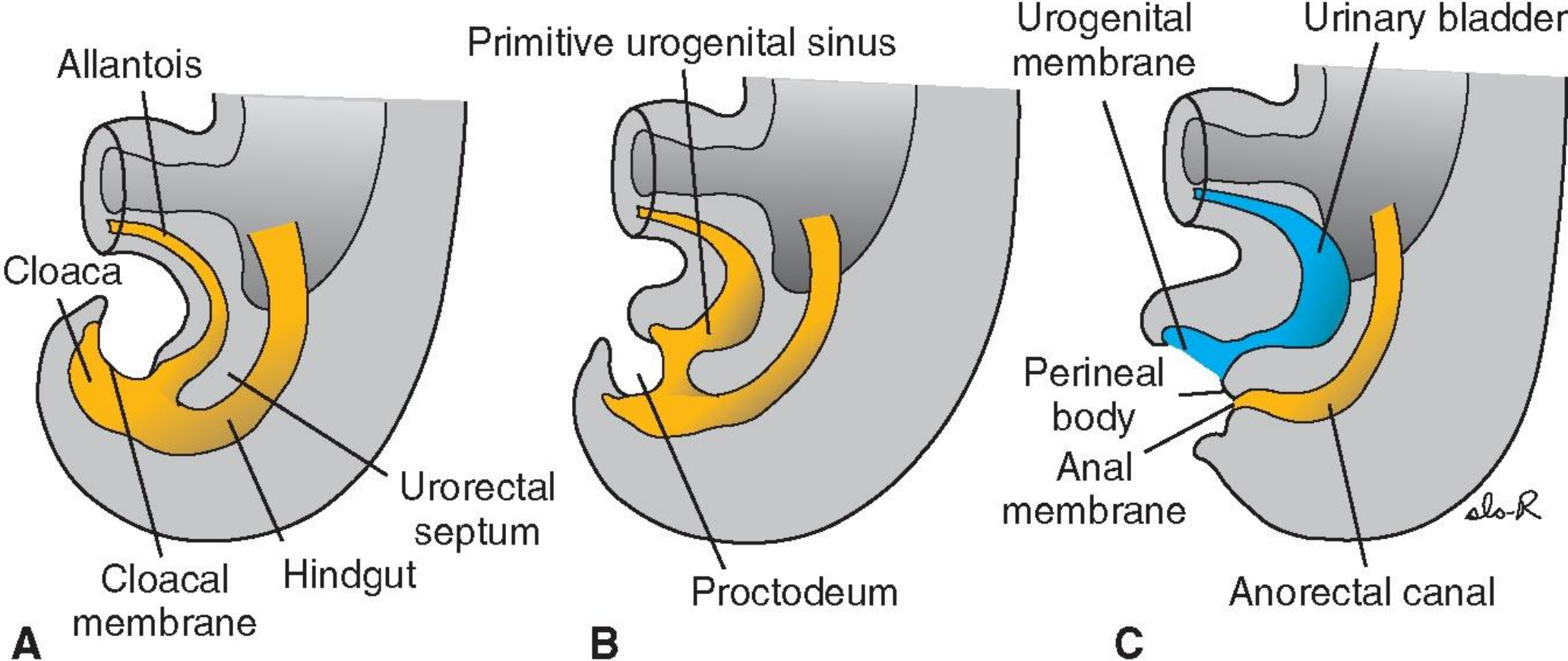
Gastroschisis



„Vascular accidents“ – atresias and stenoses

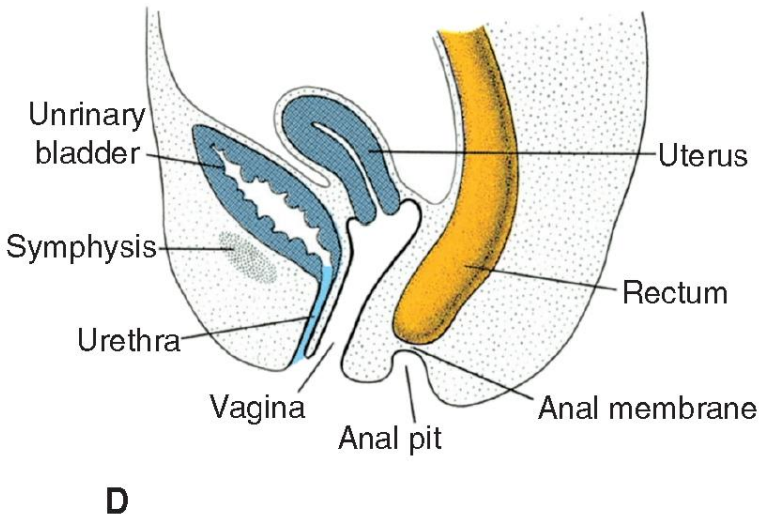
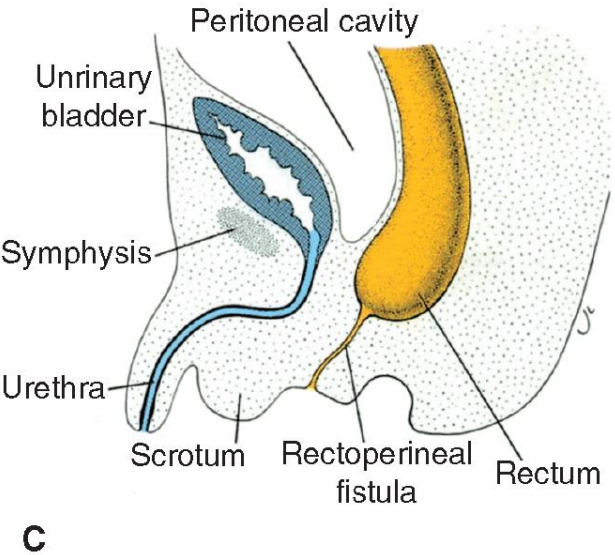
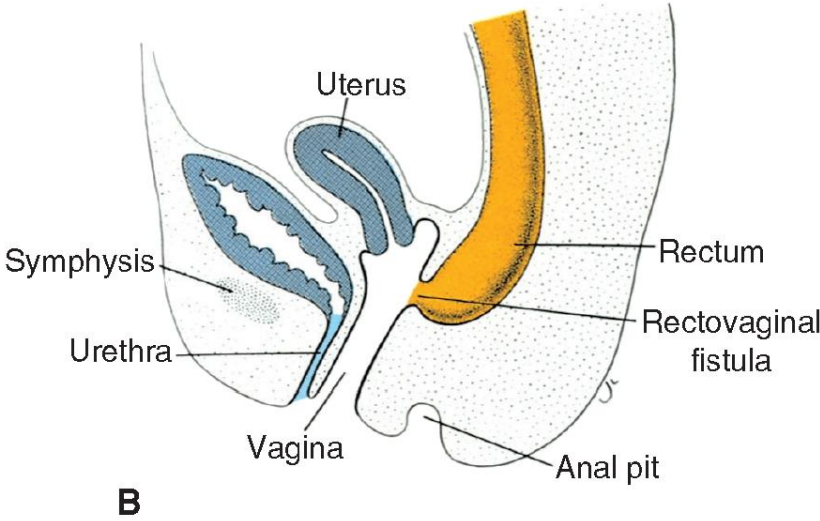
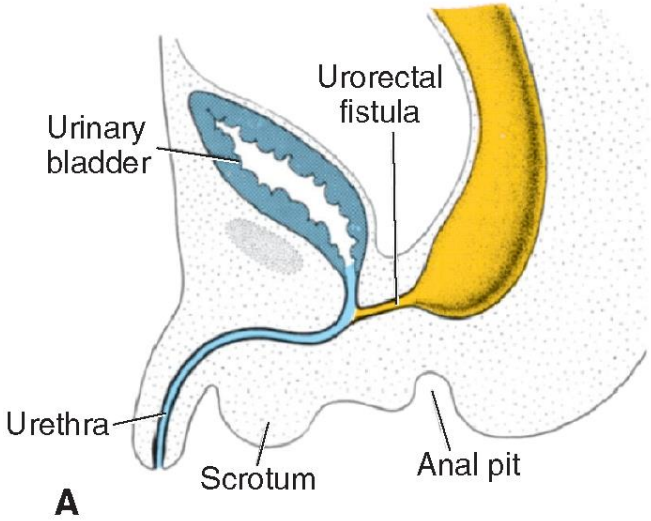


Urorectal septum

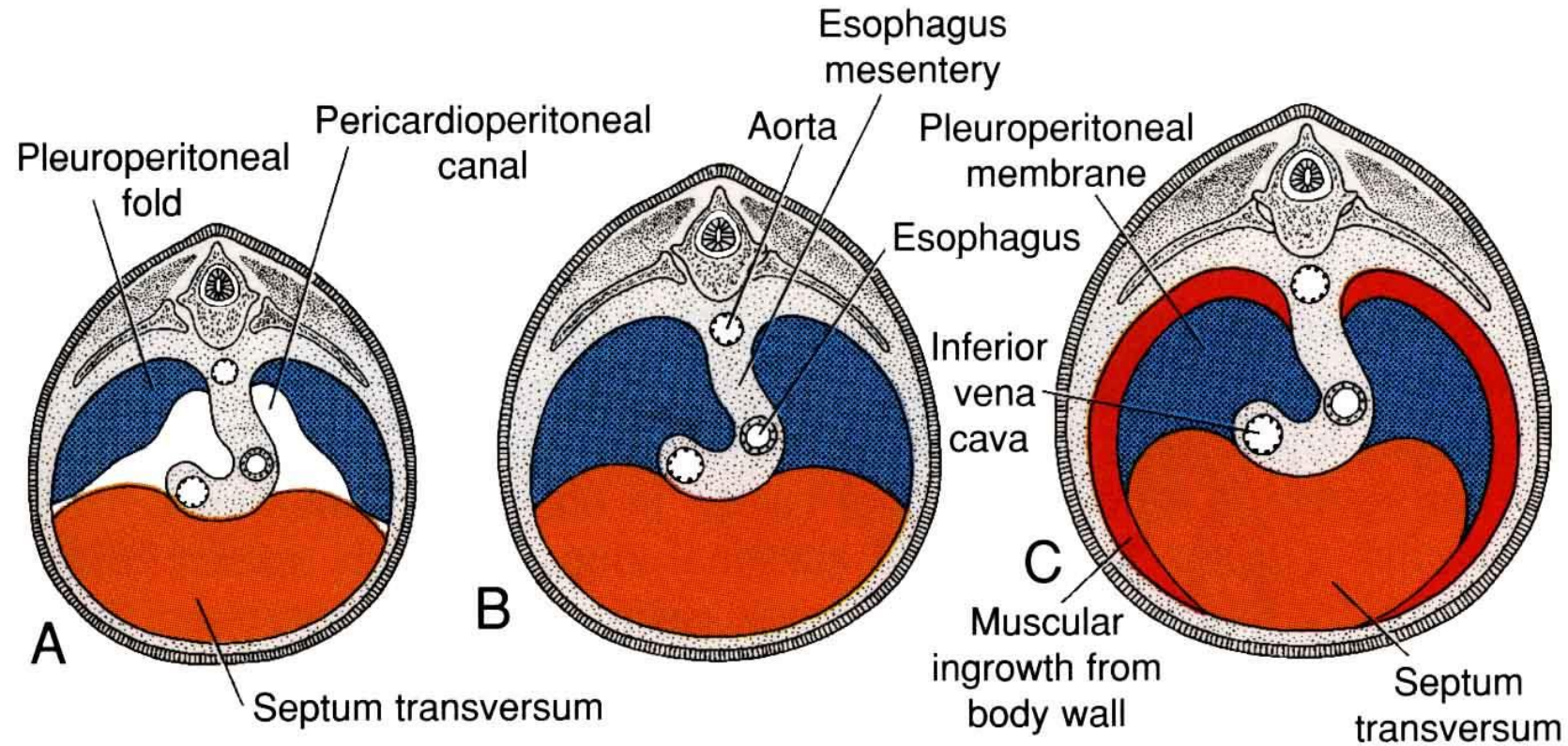


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Abnormal development of urorectal septum

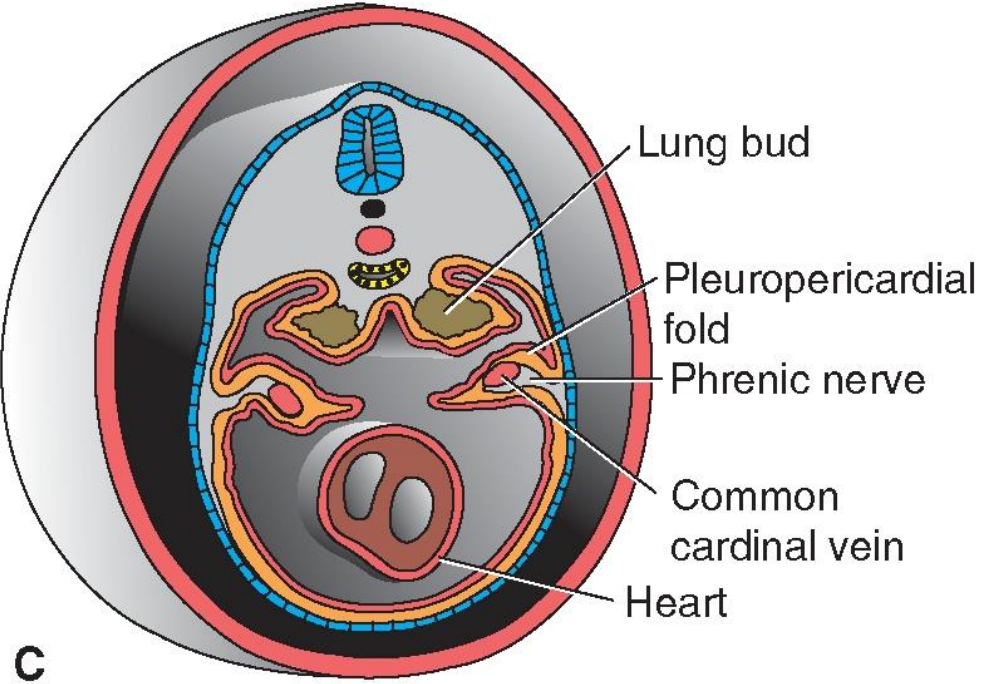
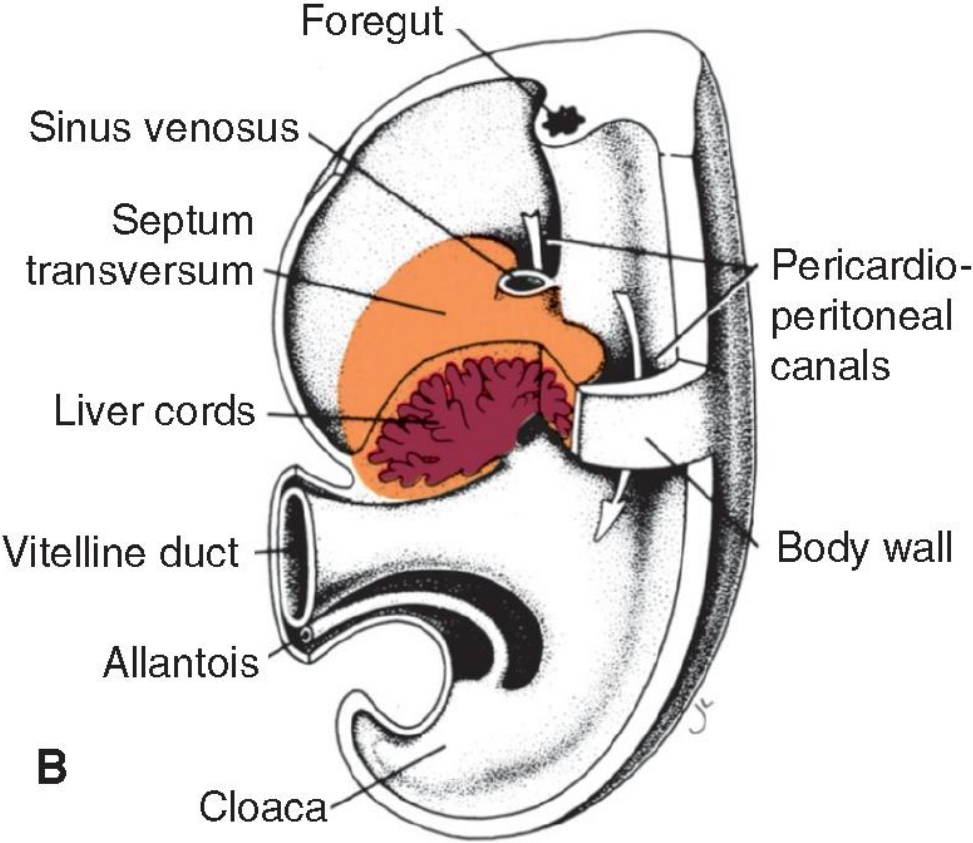


Formation of diaphragm

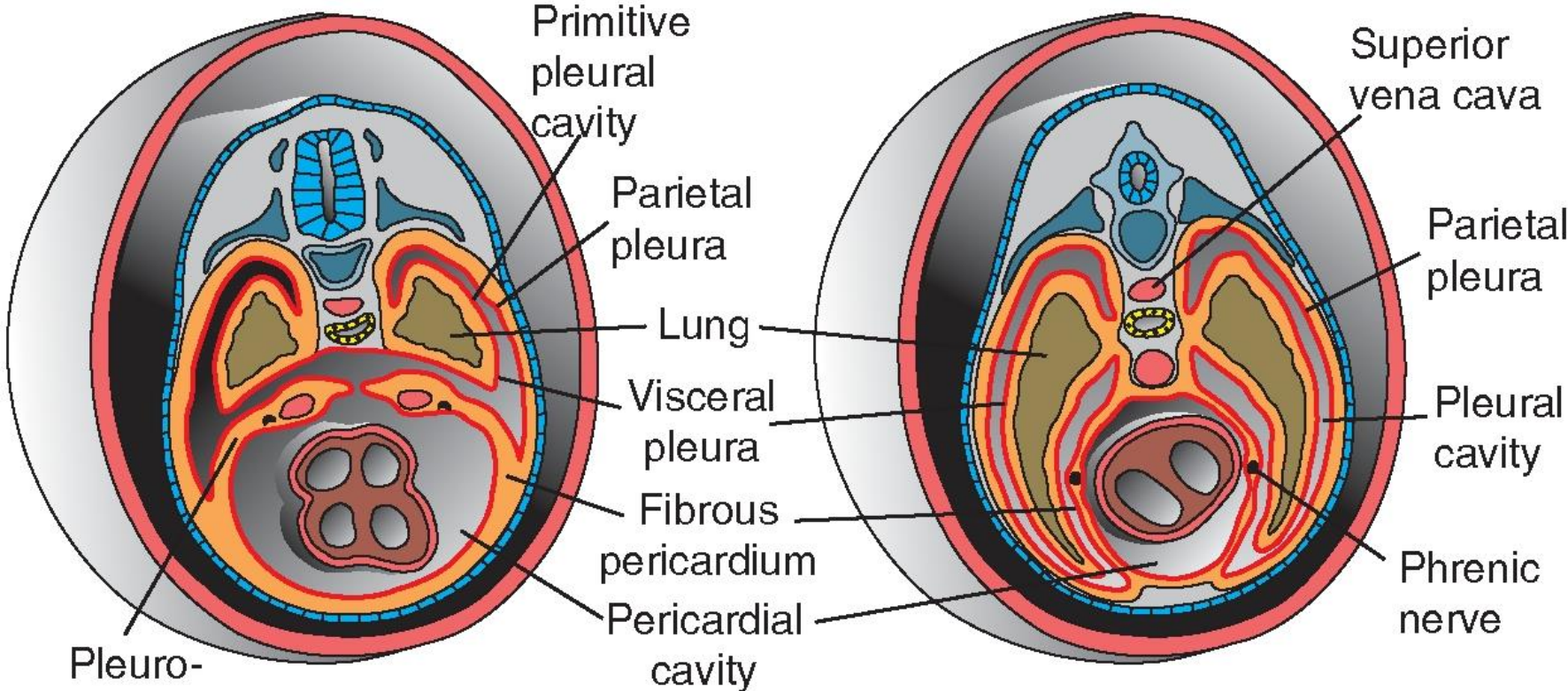


The diaphragm develops from 4 primordia:
Septum transversum (splanchnic mesoderm)
Pleuroperitoneal membranes (somatic mesoderm)
Mesentery of oesophagus (splanchnic mesoderm)
Cervical somite myotomes

Formation of diaphragm and body cavities



Formation of diaphragm and body cavities



A

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6 weeks

B

7 weeks

Congenital diaphragmatic hernias

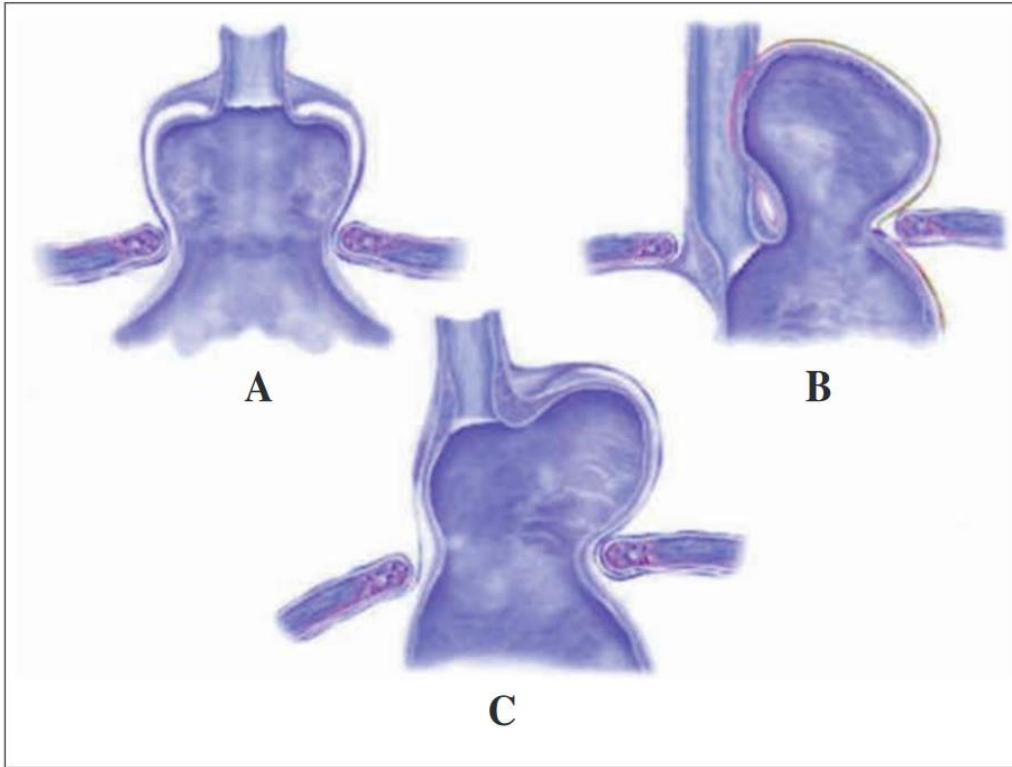


Figure 1. Schematic diagram of the various types of hiatal hernias: sliding hernia (A), paraesophageal hernia (B), and mixed hernia (C).

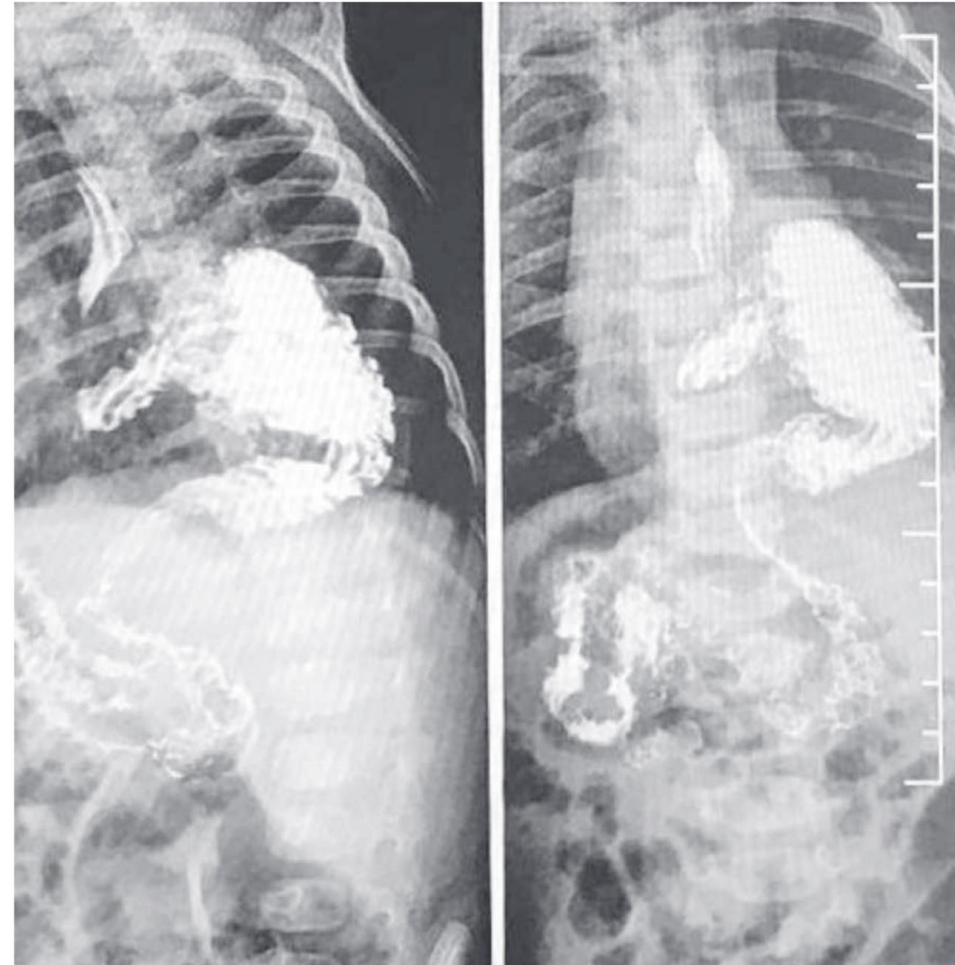
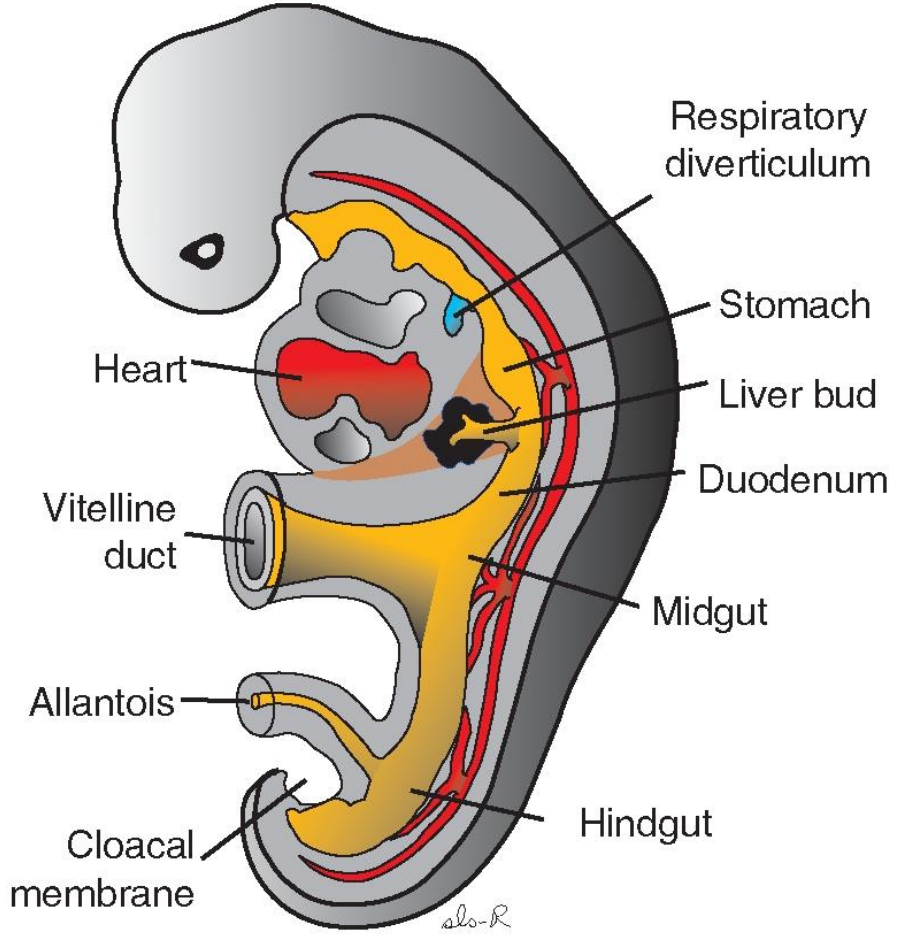


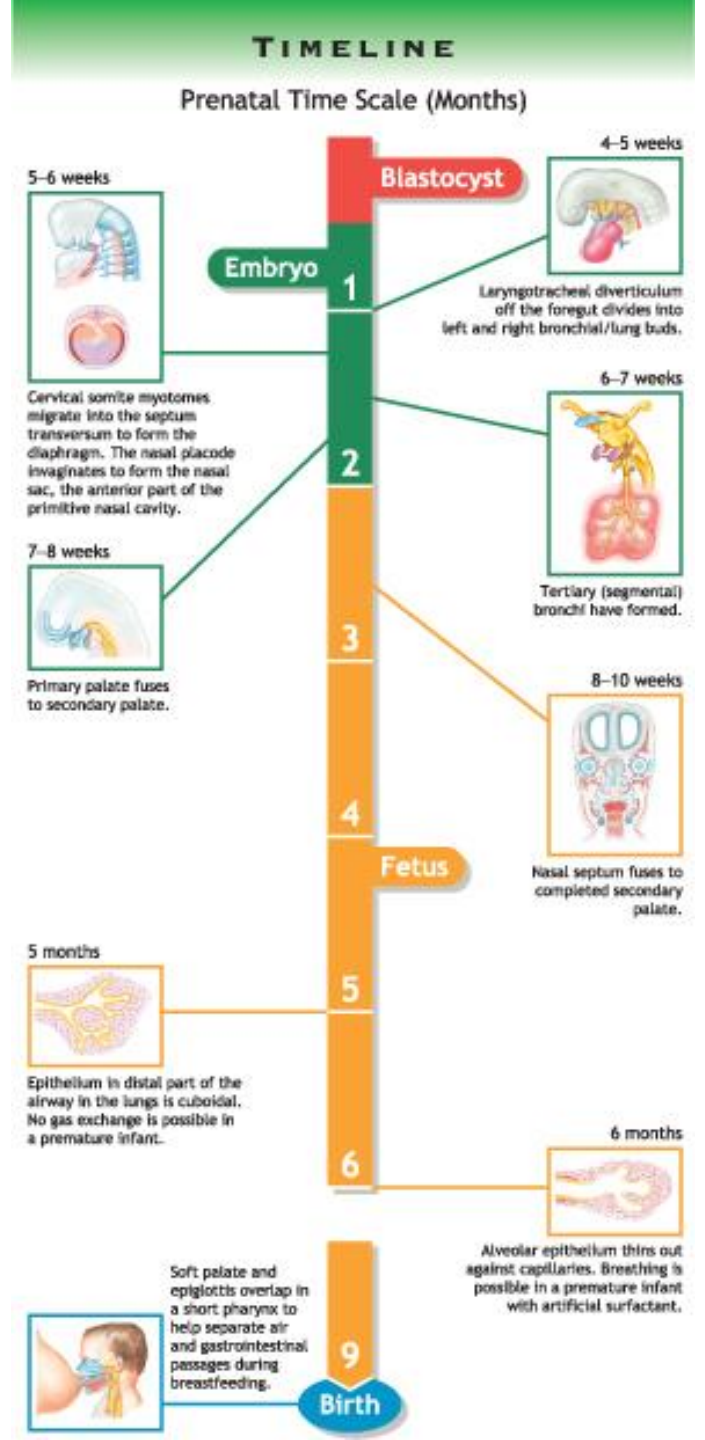
Figure 2. Esophago-gastro-duodenal contrast study showing the rise of the esophago-gastric junction and of 2/3 of the gastric pouch towards the thoracic cavity.

Respiratory system

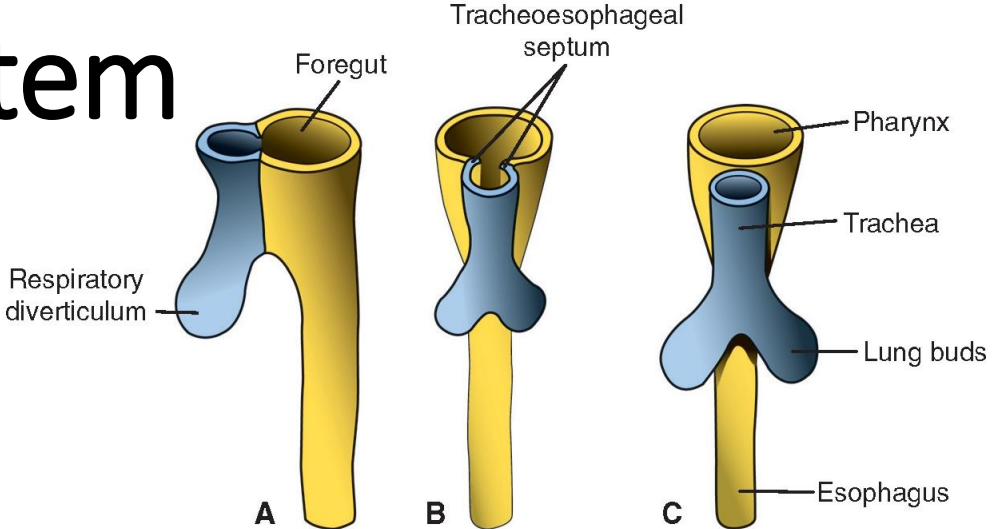
4 weeks



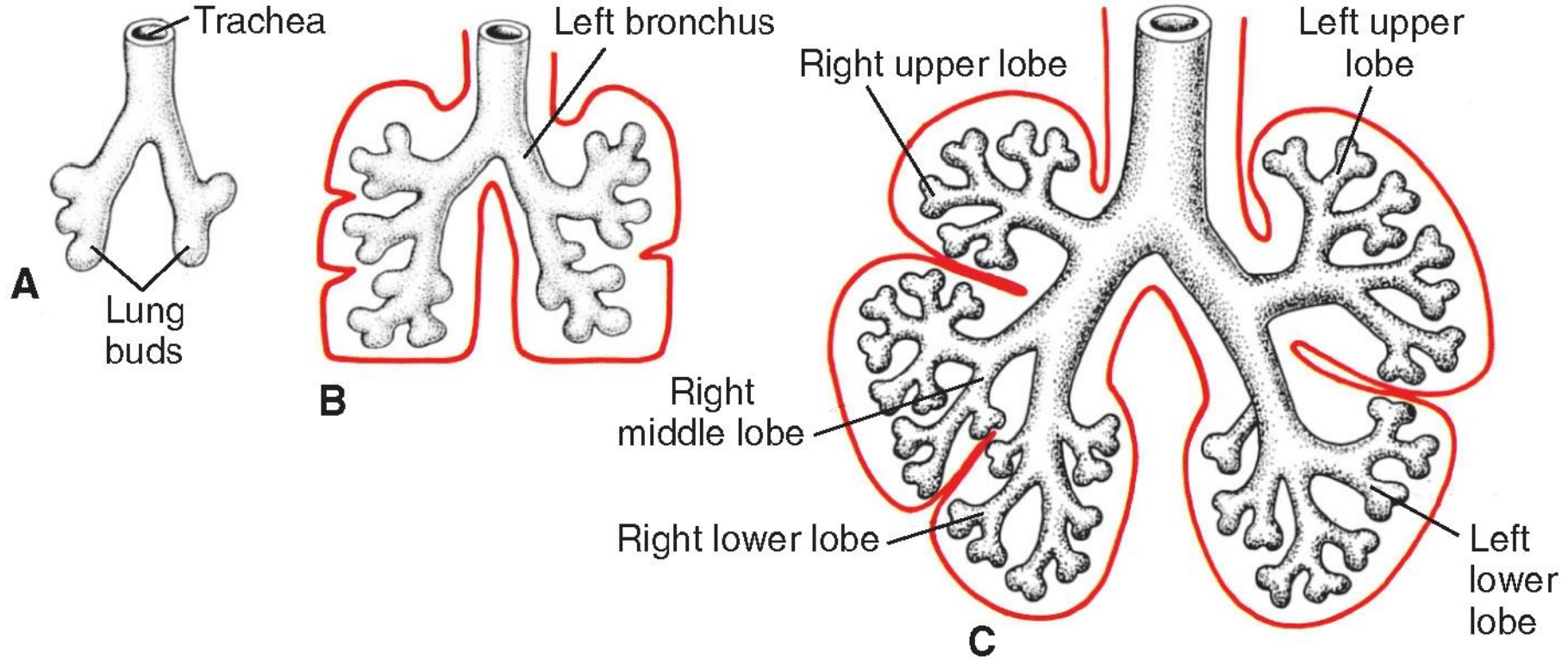
A



Respiratory system



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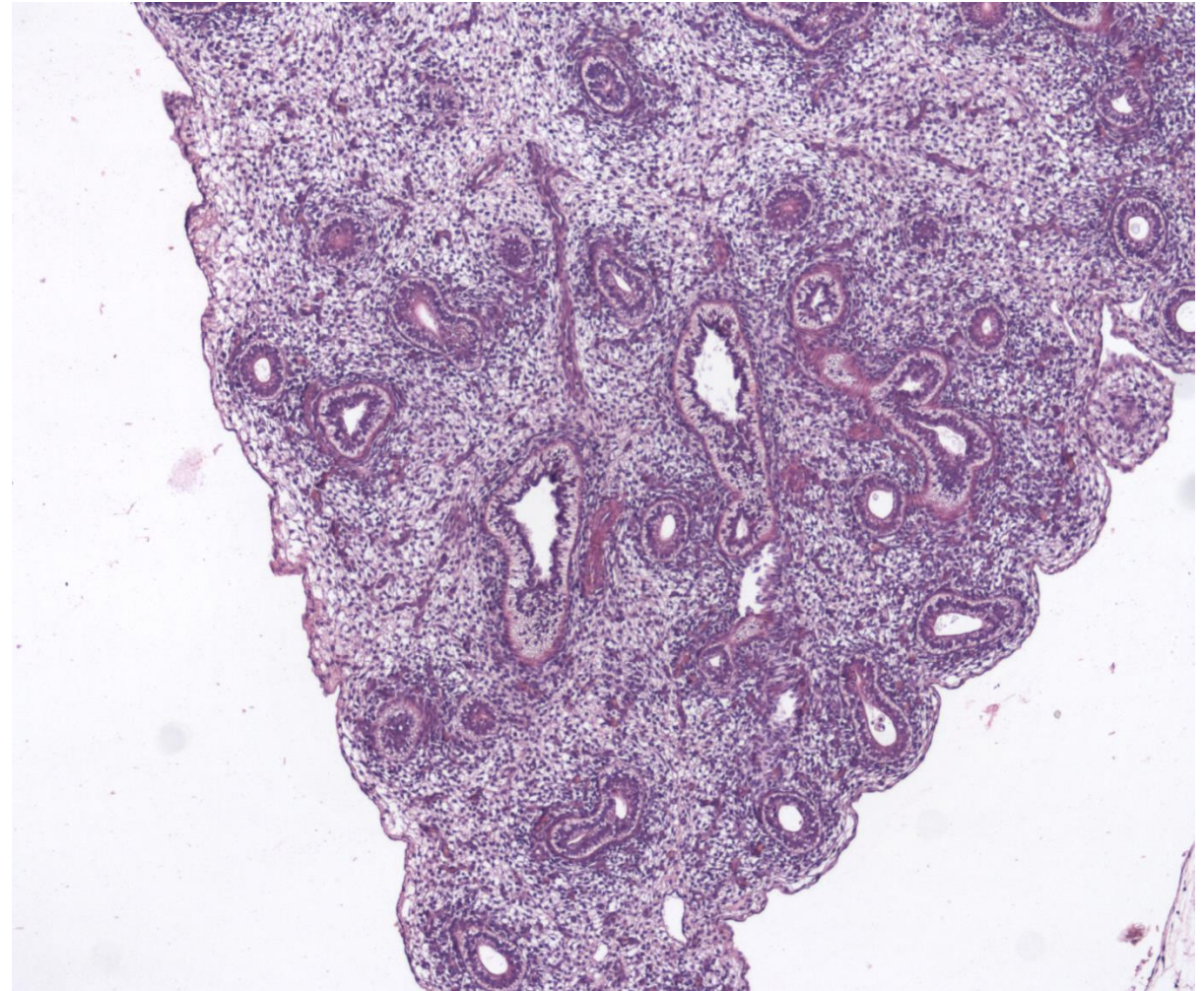
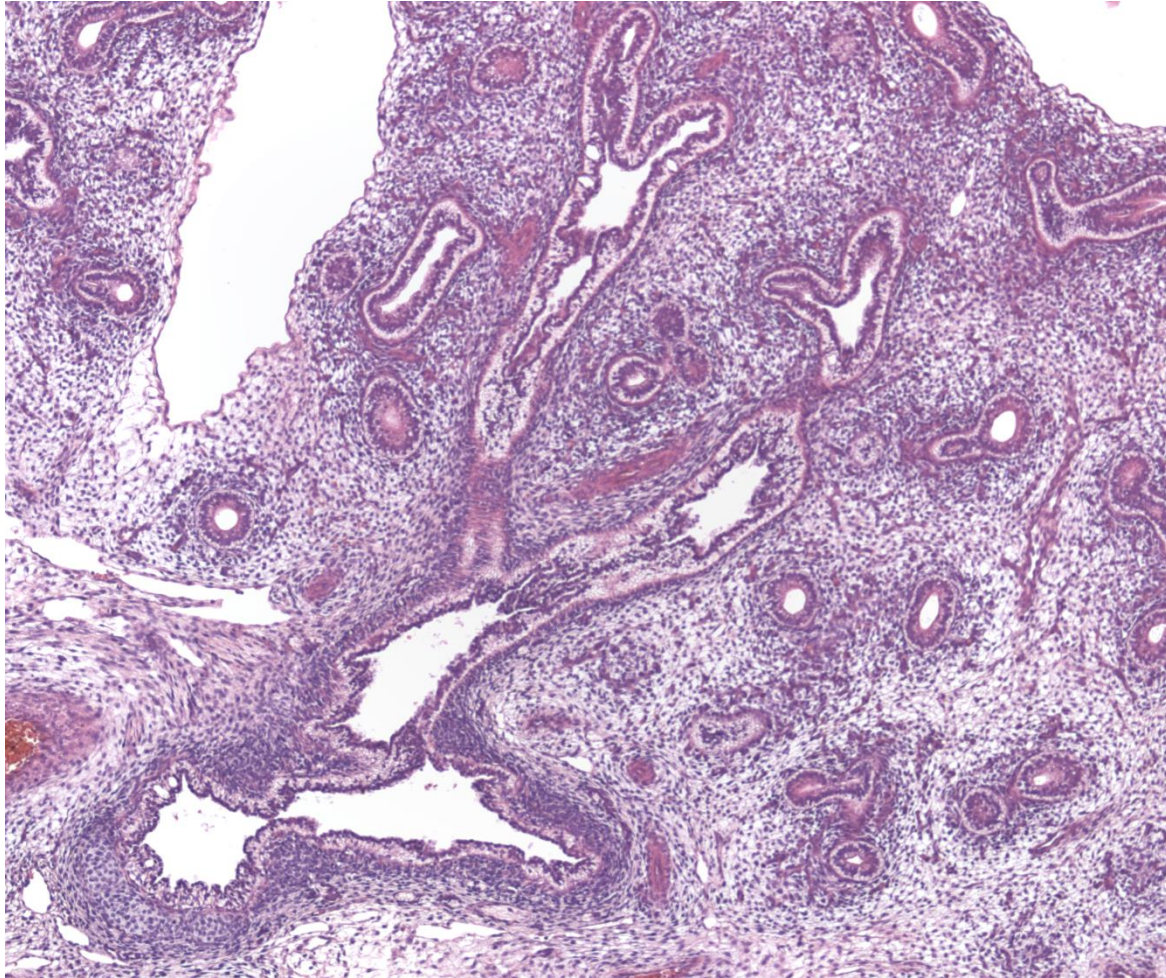


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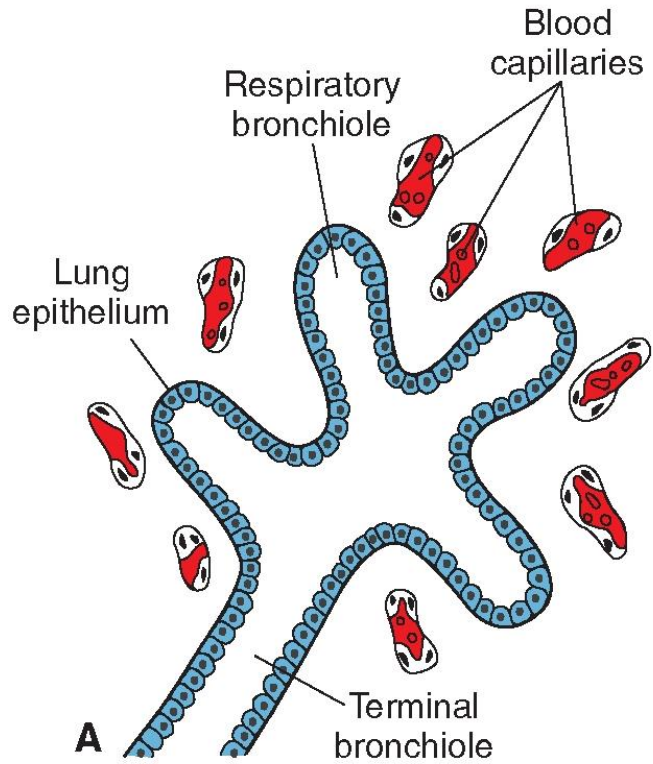
Maturation of the lungs

Pseudoglandular period

- 5 – 16 weeks
- terminal bronchioles



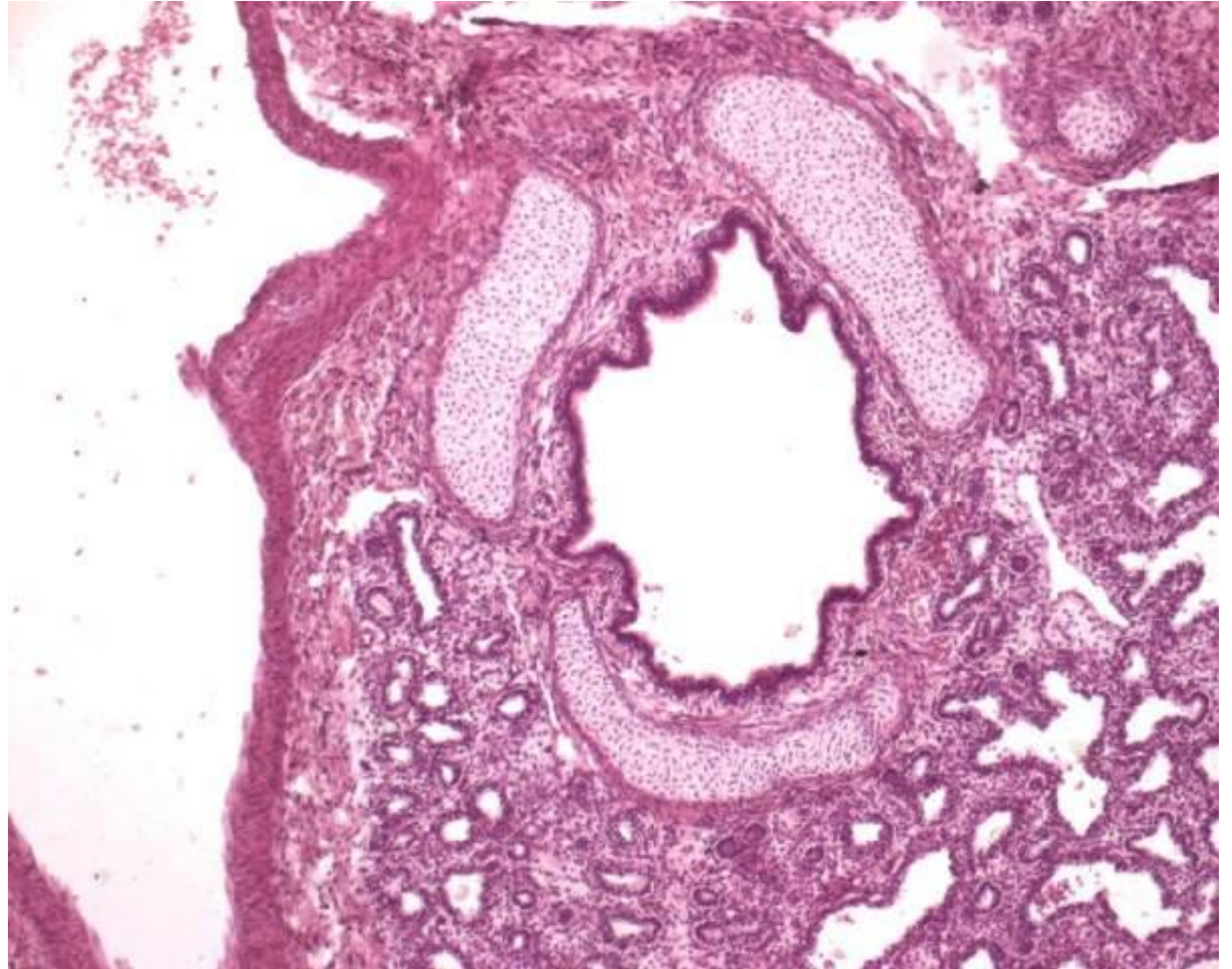
Maturation of the lungs



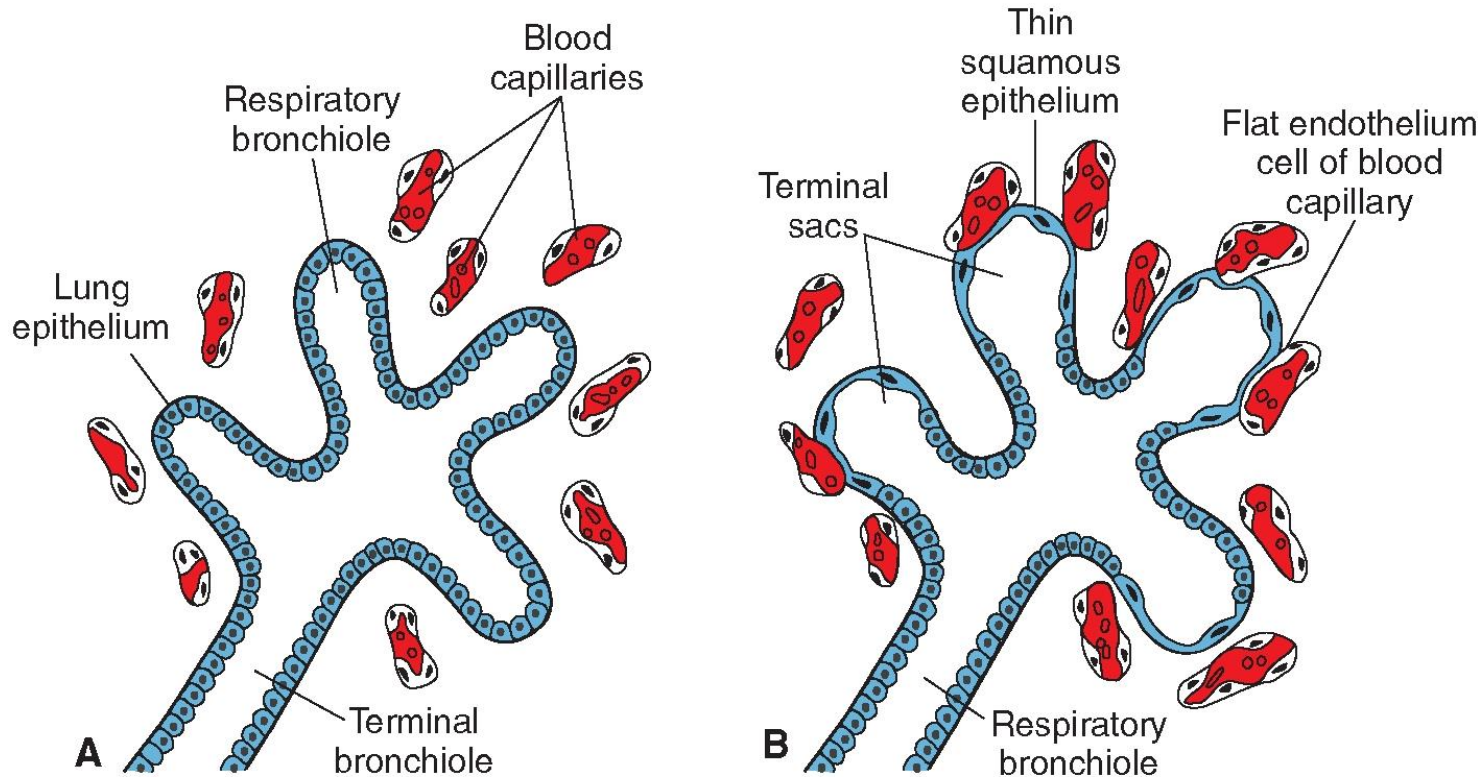
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Canalicular period

- 16 - 26 weeks
- respiratory bronchioles with cuboidal cells
- alveolar ducts



Maturation of the lungs



Canalicular period

- 16 - 26 weeks
- respiratory bronchioles with cuboidal cells
- alveolar ducts

Terminal sac period

- 26 weeks to birth
- terminal sacs (primitive alveoli) with flattened cells
- close contact with capillaries

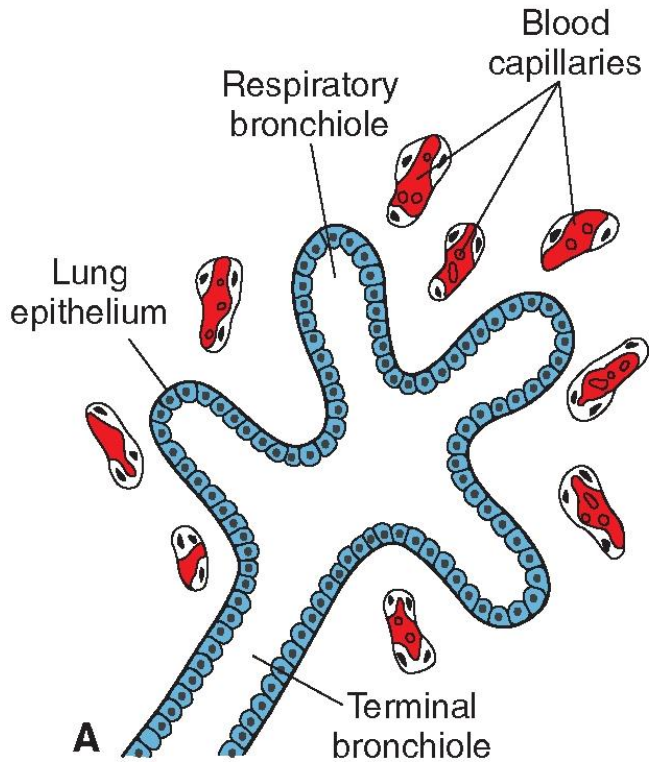
Type I pneumocytes

- Form the blood-air barrier

Type II pneumocytes

- Produce **surfactant** at the end of 6th month

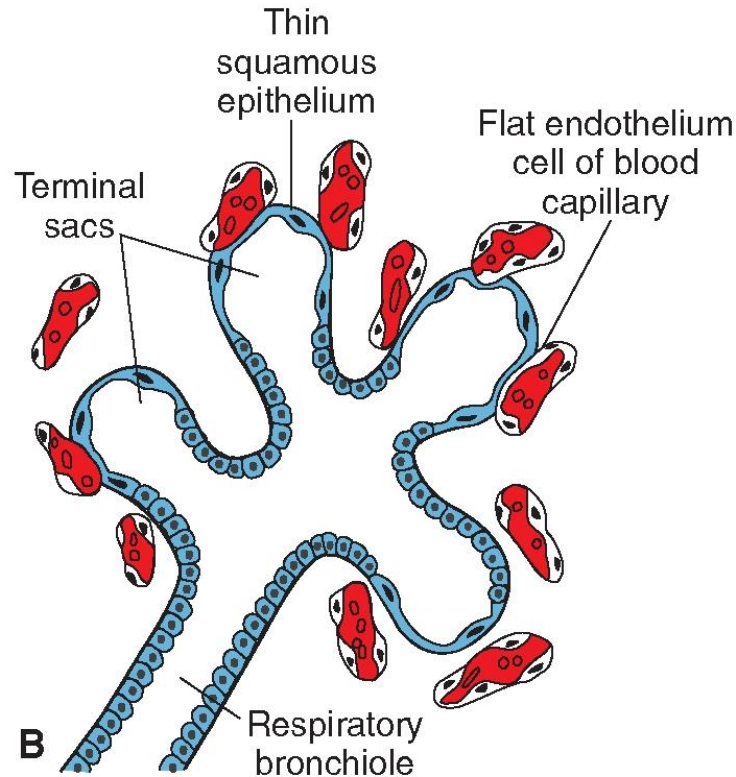
Maturation of the lungs



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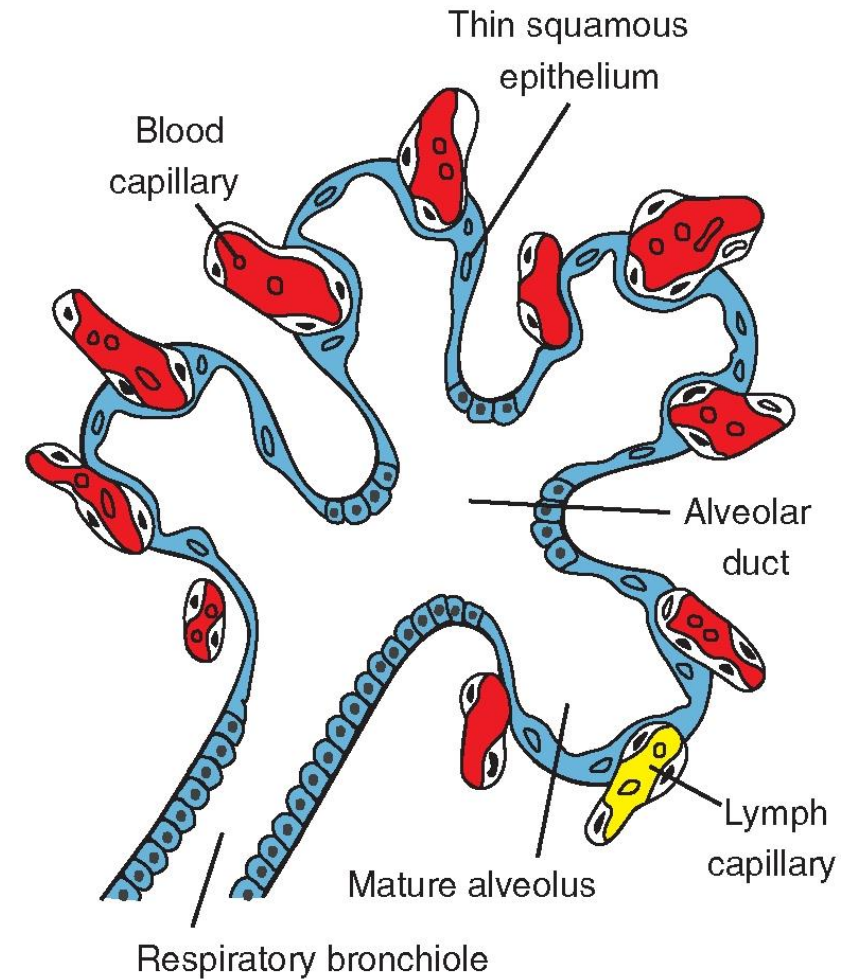
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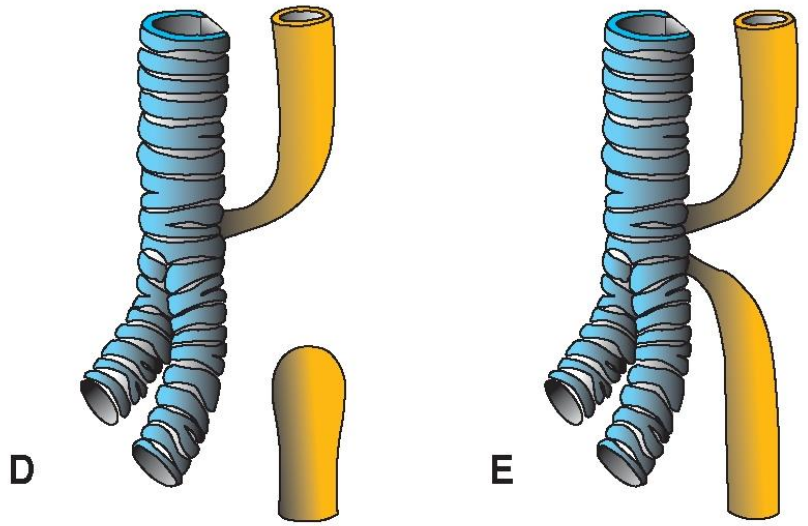
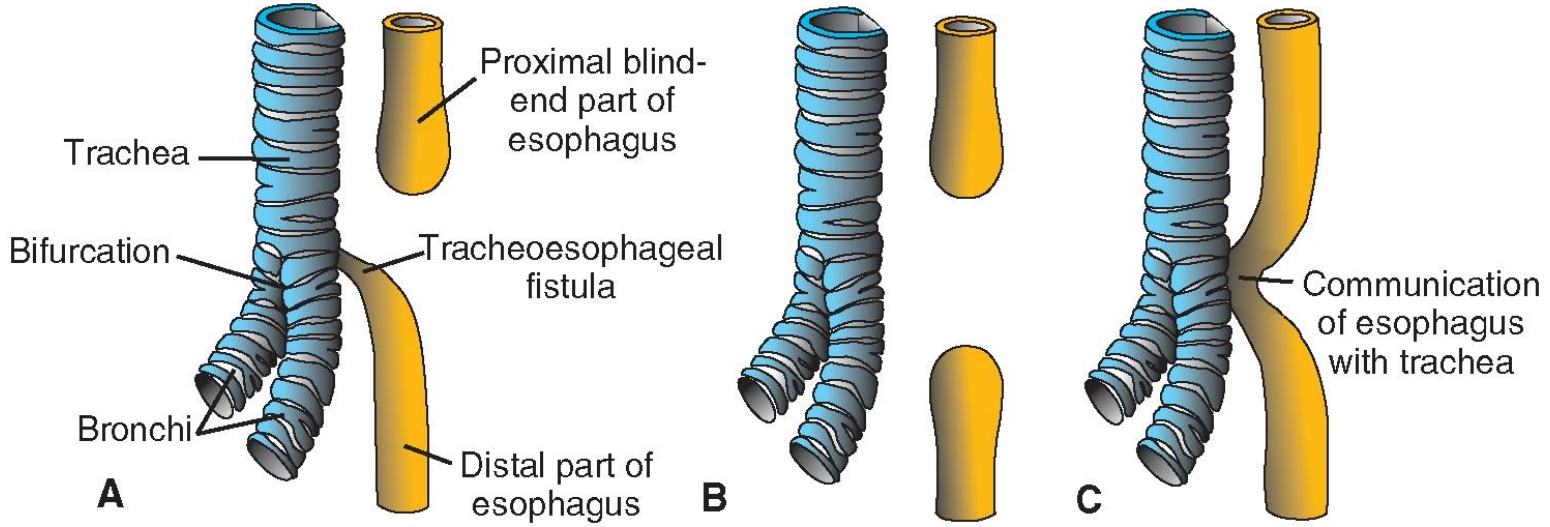


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Alveolar period

- 32 weeks
- Thin alveolocapillary membrane

Respiratory system abnormalities



Thank you for your attention!

