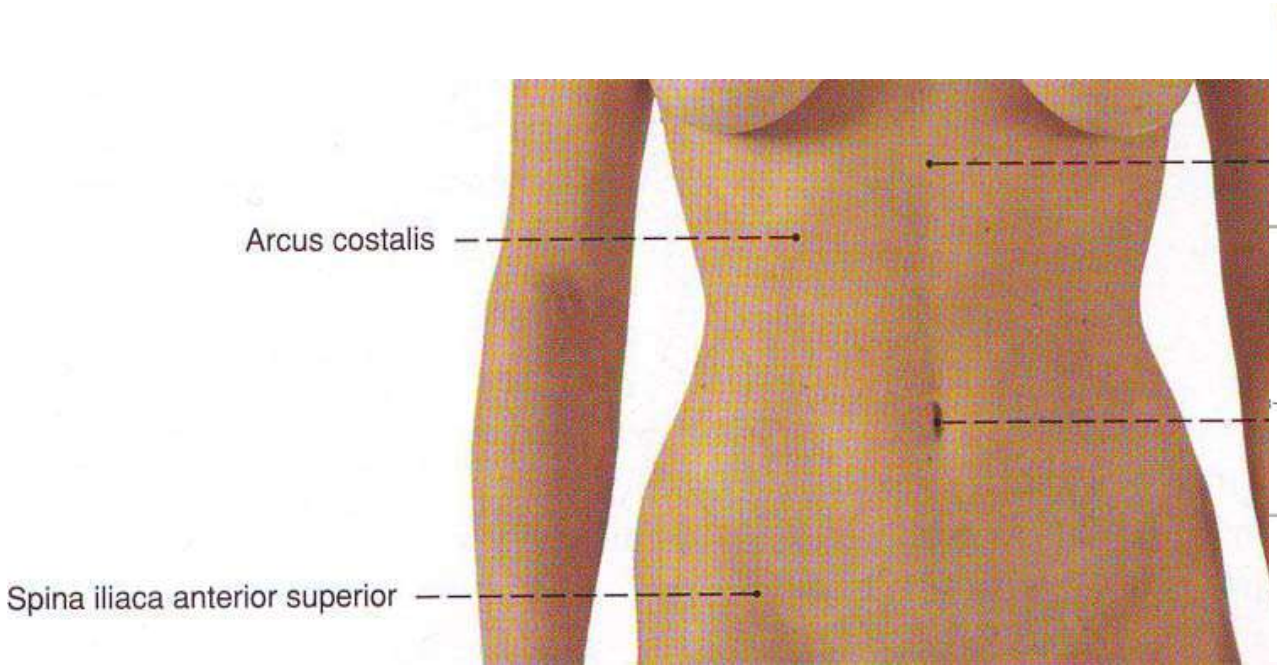
Topographic anatomy of the abdomen

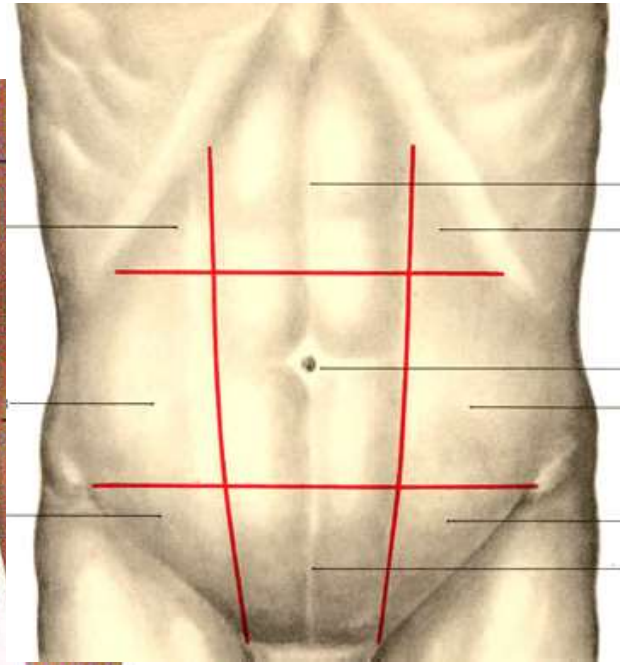
1. Abdominal regions
2. Anterolateral abdominal wall
3. Inguinal canal
4. Peritoneal cavity – upper section
5. Peritoneal cavity – lower section

Overview: regions and planes

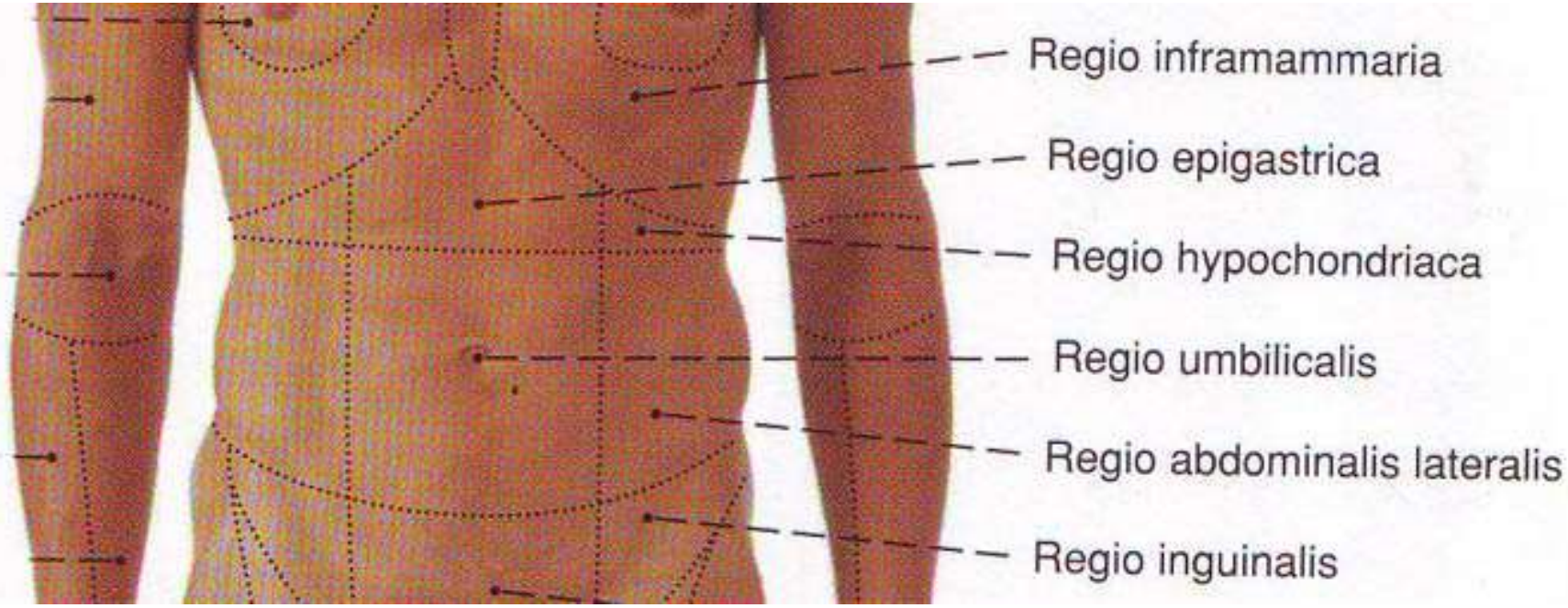
- *linea bicostalis*
- *linea bispinalis*

- *epigastrium*
- *mesogastrium*
- *hypogastrium*

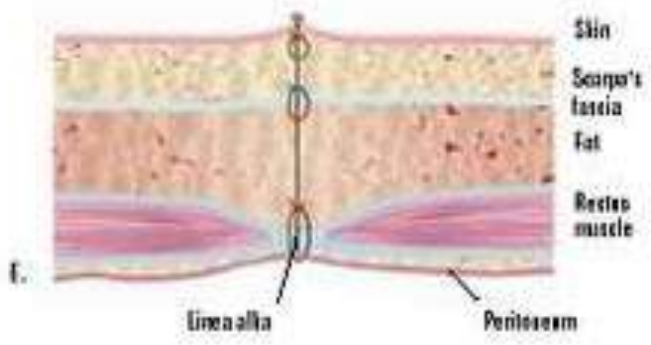




Abdominal regions, *regiones abdominis*



Anterolateral abdominal wall: layers



Skin and subcutaneous tissue
Superficial fascia

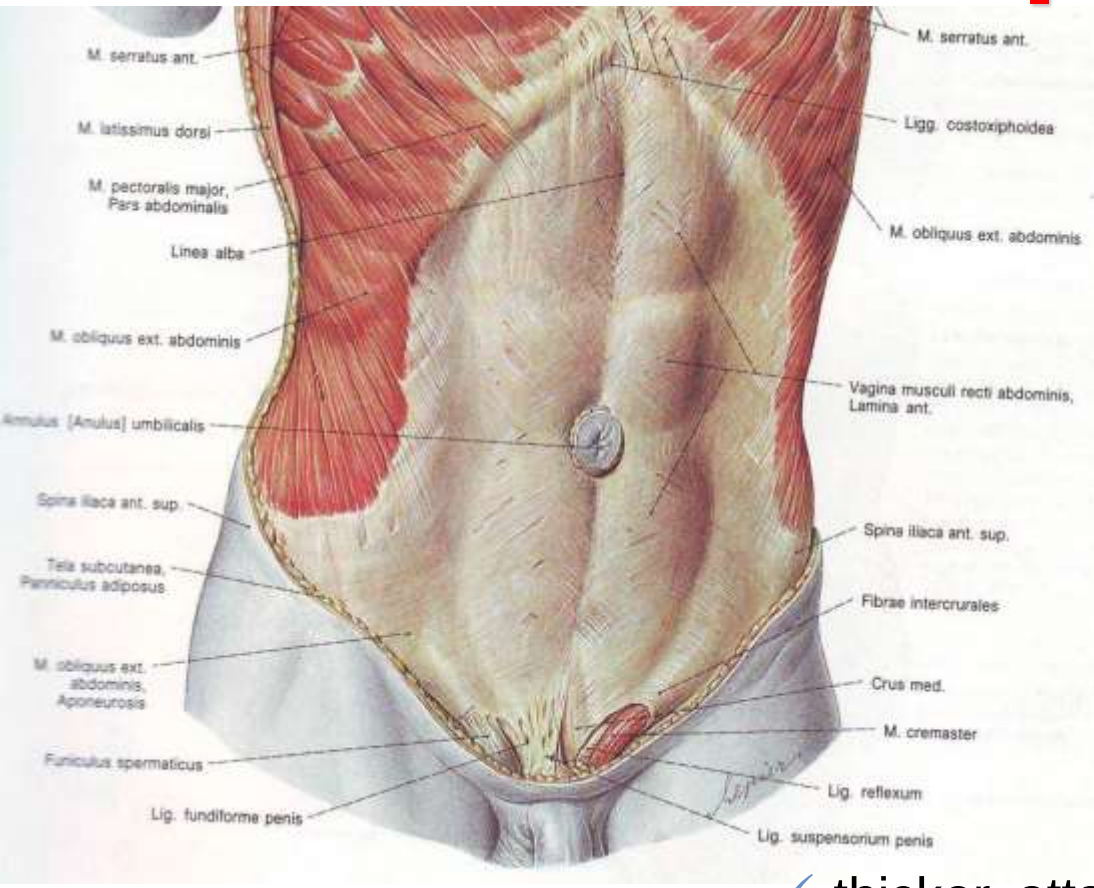
Muscles and their aponeuroses

Deep fascia

Extraperiotoneal fat

Parietal peritoneum

Superficial (investing) fascia, *fascia investiens abdominis*



- **superficial** fatty layer – ***Camper* fascia**
  - ✓ passes into the femoral region, without an attachment to the inguinal fold
- **intermediate** (membranous layer) – ***Scarpa* fascia**
- **deep** layer *(lamina secundaria fasciae superficialis)* – ***Thompson* fascia**
  - ✓ thicker, attached to the inguinal fold – abscesses in the anterolateral abdominal wall

Neurovascular plexuses

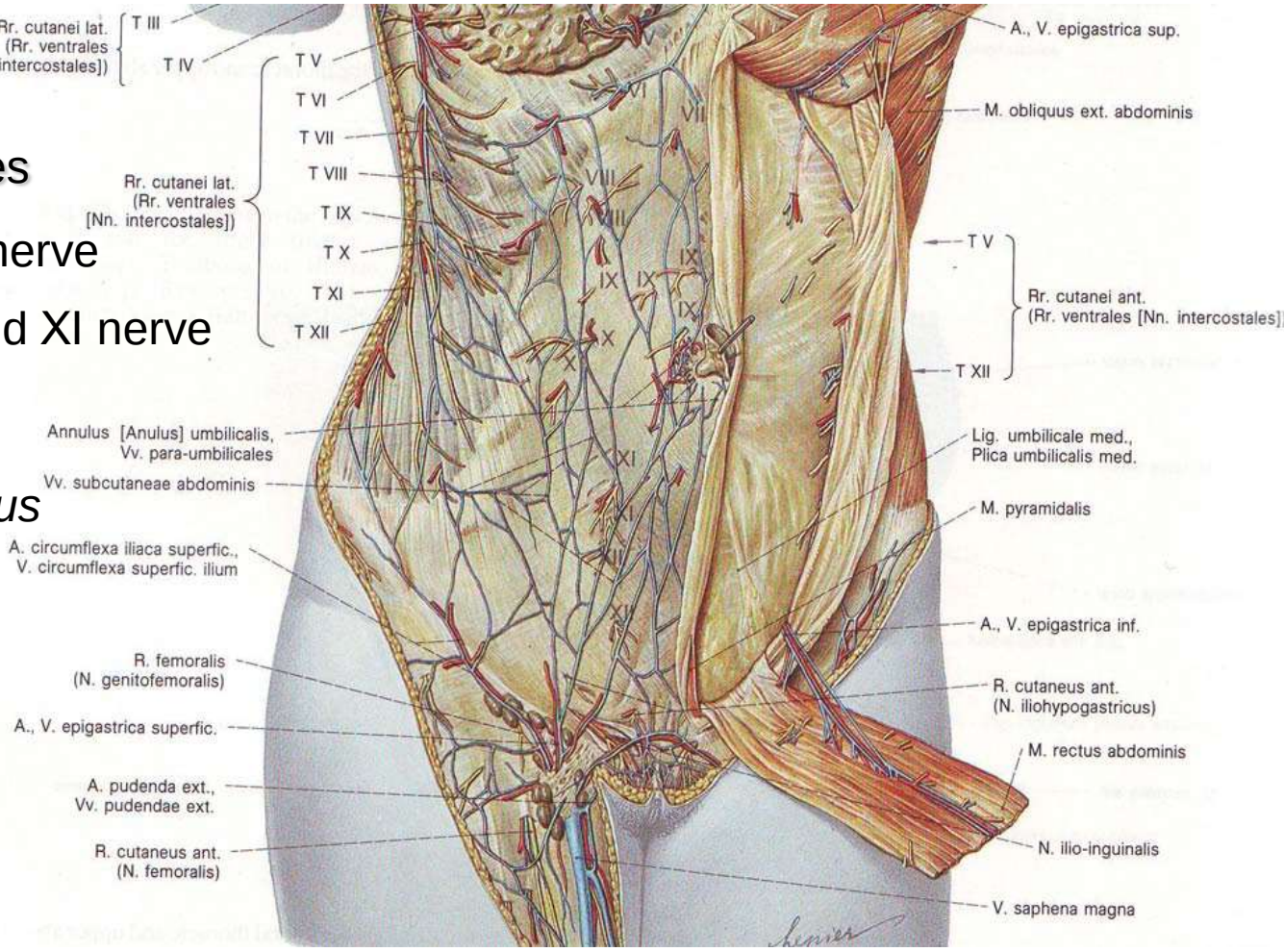
- Innervation:

  VI-XII intercostal nerves

  - ✓epigastrium: VII-IX nerve
  - ✓mesogastrium: X and XI nerve
  - ✓hypogastrium:
    XII nerve
    n. iliohypogastricus
    n. ilioinguinalis

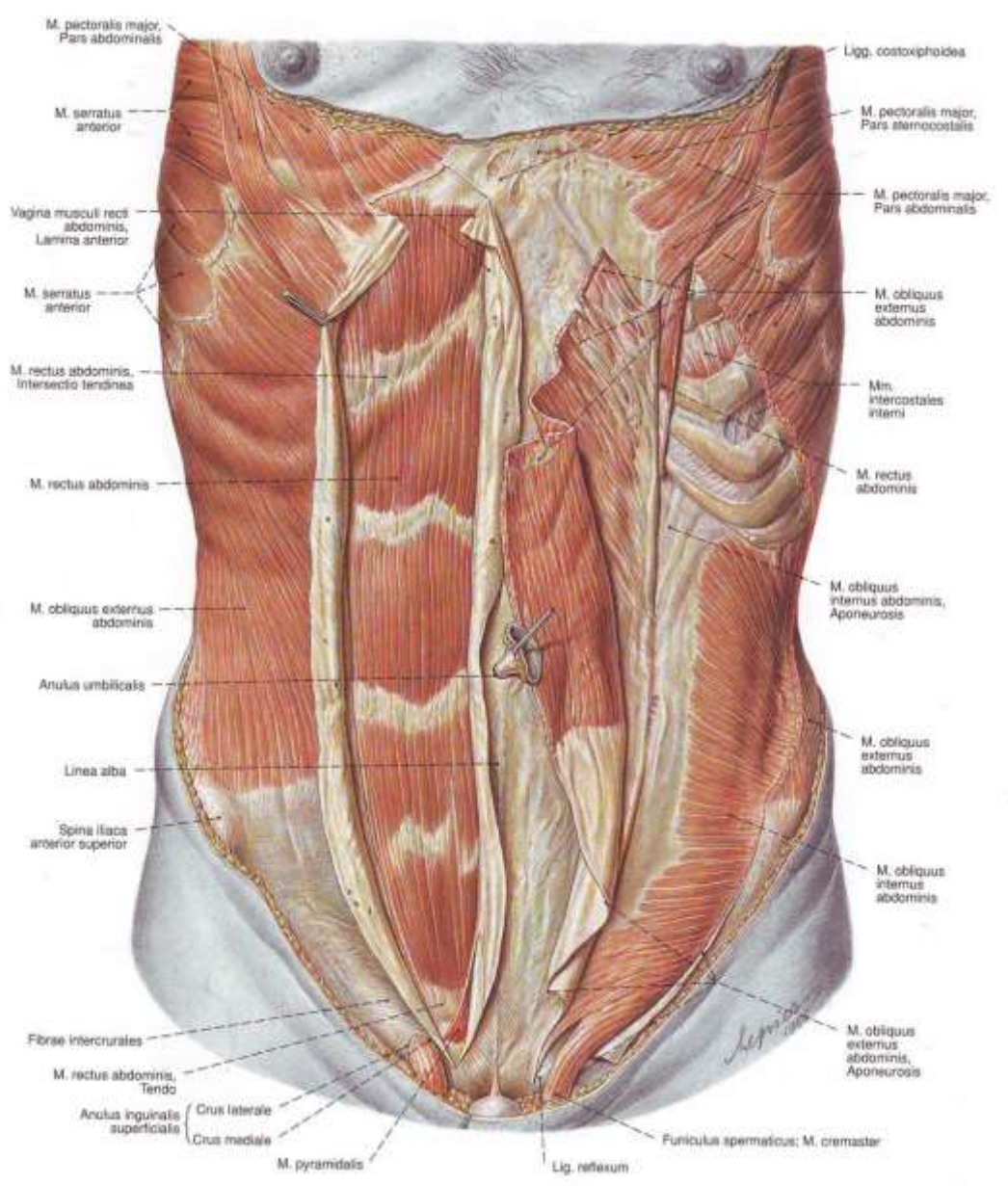
- Anastomoses:

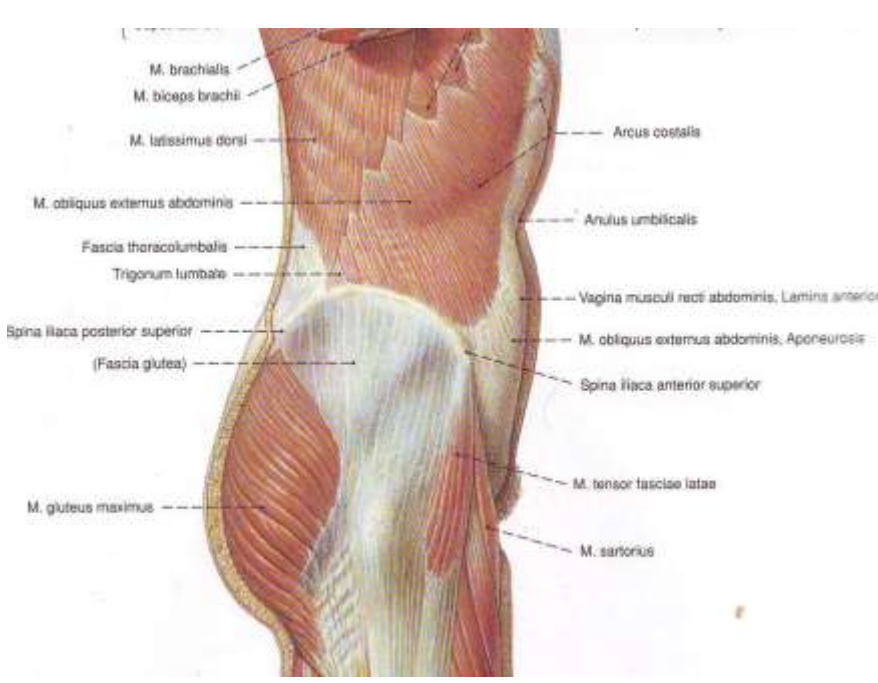
  - ✓cavo-caval
  - ✓portocaval shunts
  - ✓*caput medusae*

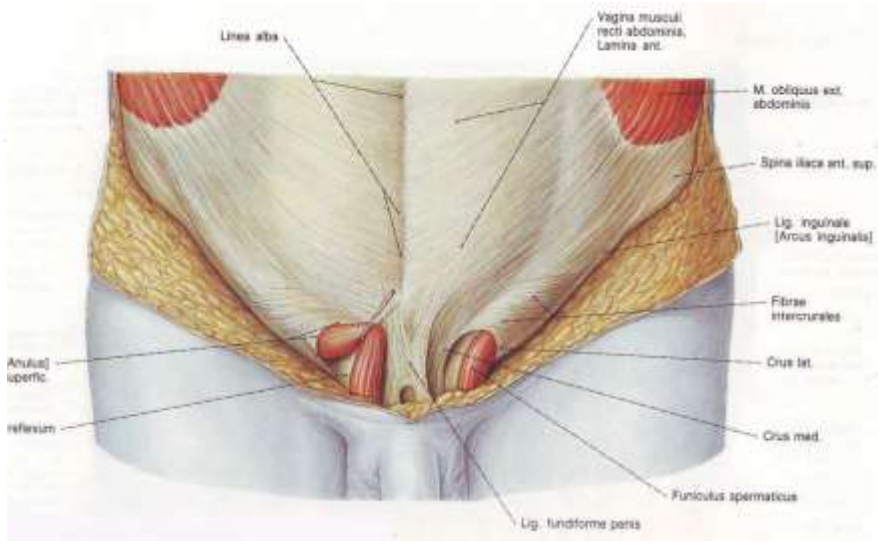


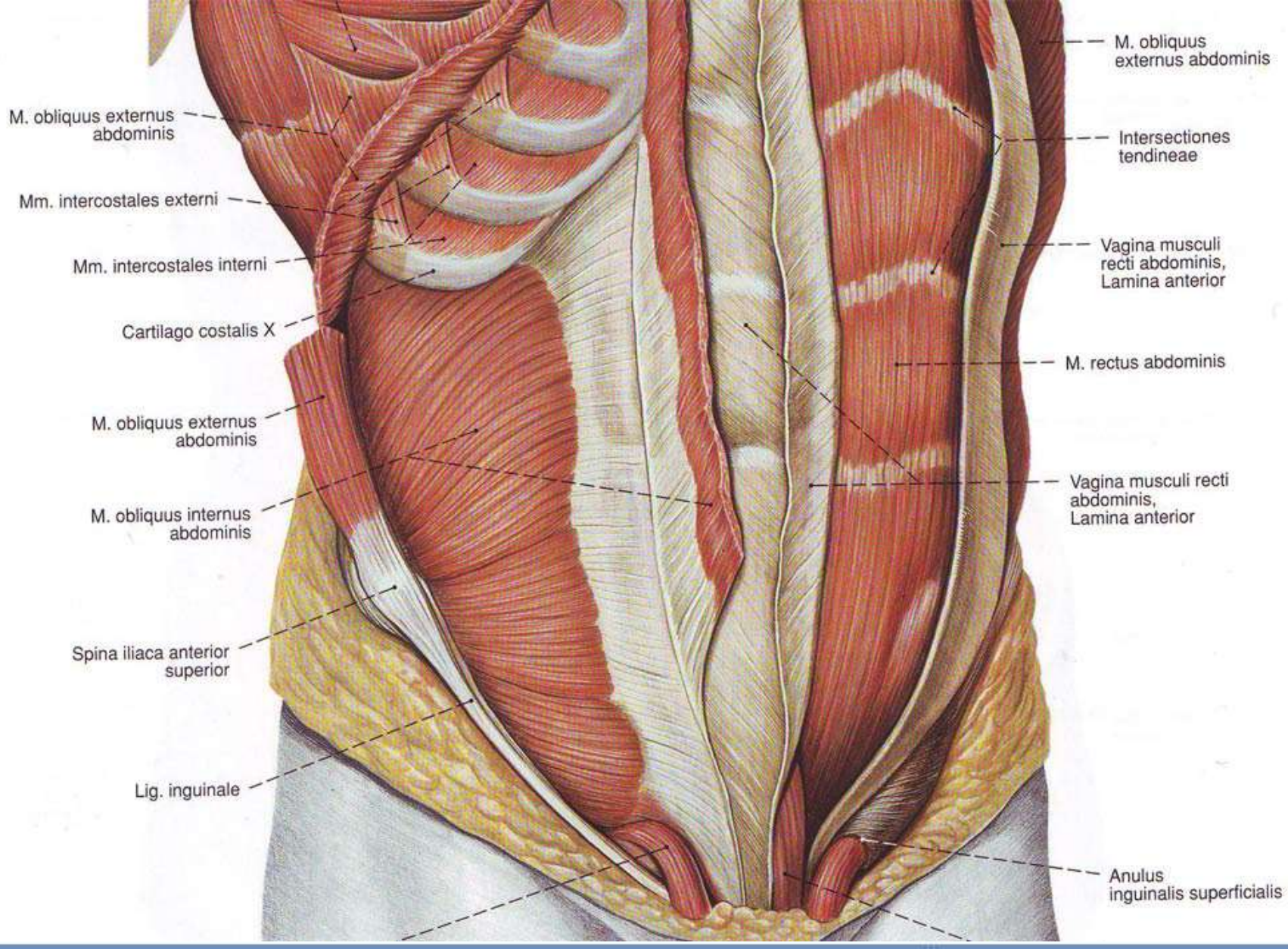
Muscles of the anterolateral abdominal wall

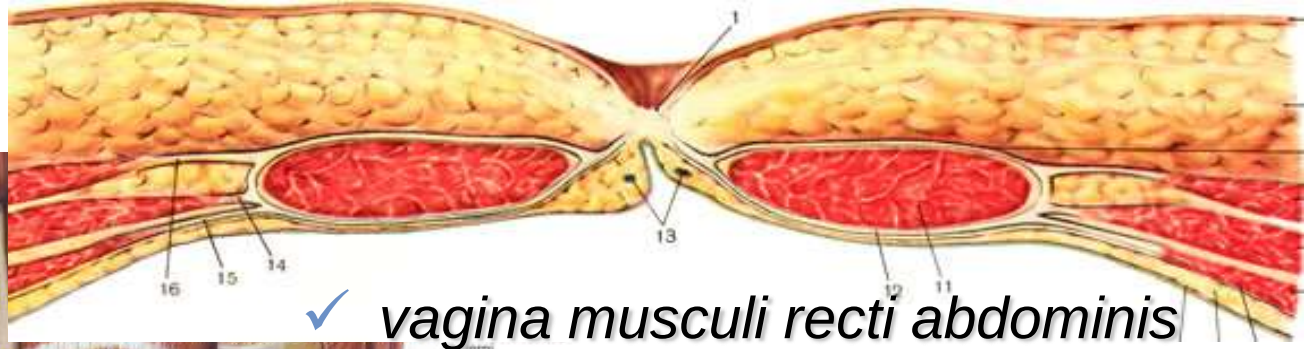
m. obliquus externus abdominis
m. obliquus internus abdominis
m. transversus abdominis
m. rectus abdominalis
m. pyramidalis


M. pectoralis major, Pars abdominalis
M. serratus anterior
Vagina musculi recti abdominis, Lamina anterior
M. serratus anterior
M. rectus abdominis, Intersectio tendinea
M. rectus abdominis
M. obliquus externus abdominis
Anulus umbilicalis
Linea alba
Spina iliaca anterior superior
Fibrae intercrurales
M. rectus abdominis, Tendo
Anulus inguinalis superficialis
Crus laterale
Crus mediale
M. pyramidalis
Lig. reflexum
Funiculus spermaticus; M. cremaster
M. obliquus externus abdominis, Aponeurosis
M. obliquus internus abdominis
M. obliquus externus abdominis
Mm. intercostales interni
M. pectoralis major, Pars sternocostalis
Ligg. costoxiphoidea

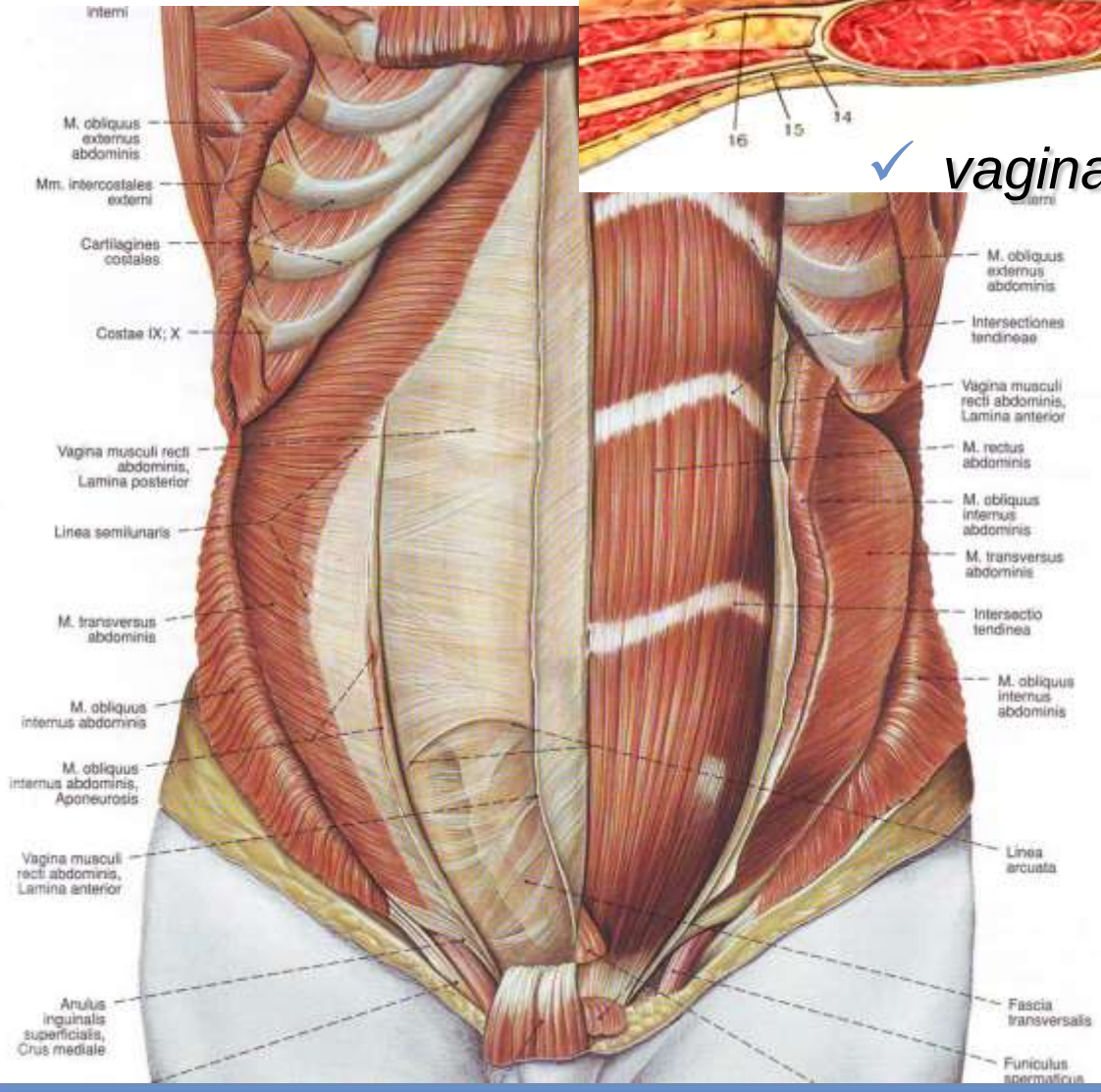

M. brachialis
M. biceps brachii
M. latissimus dorsi
M. obliquus externus abdominis
Fascia thoracolumbalis
Trigonum lumbale
Spina iliaca posterior superior
(Fascia glutea)
M. gluteus maximus
Arcus costalis
Anulus umbilicalis
Vagina musculi recti abdominis, Lamina anterior
M. obliquus externus abdominis, Aponeurosis
Spina iliaca anterior superior
M. tensor fasciae latae
M. sartorius


Linea alba
Vagina musculi recti abdominis, Lamina ant.
M. obliquus ext. abdominis
Spina iliaca ant. sup.
Lig. inguinale [Arcus inguinalis]
Fibrae intercrurales
Crus lat.
Crus med.
Funiculus spermaticus
Lig. fundiforme penis


M. obliquus externus abdominis
Intersectiones tendineae
M. obliquus externus abdominis
Mm. intercostales externi
Vagina musculi recti abdominis, Lamina anterior
Mm. intercostales interni
Cartilago costalis X
M. rectus abdominis
M. obliquus externus abdominis
Vagina musculi recti abdominis, Lamina anterior
M. obliquus internus abdominis
Spina iliaca anterior superior
Lig. inguinale
Anulus inguinalis superficialis

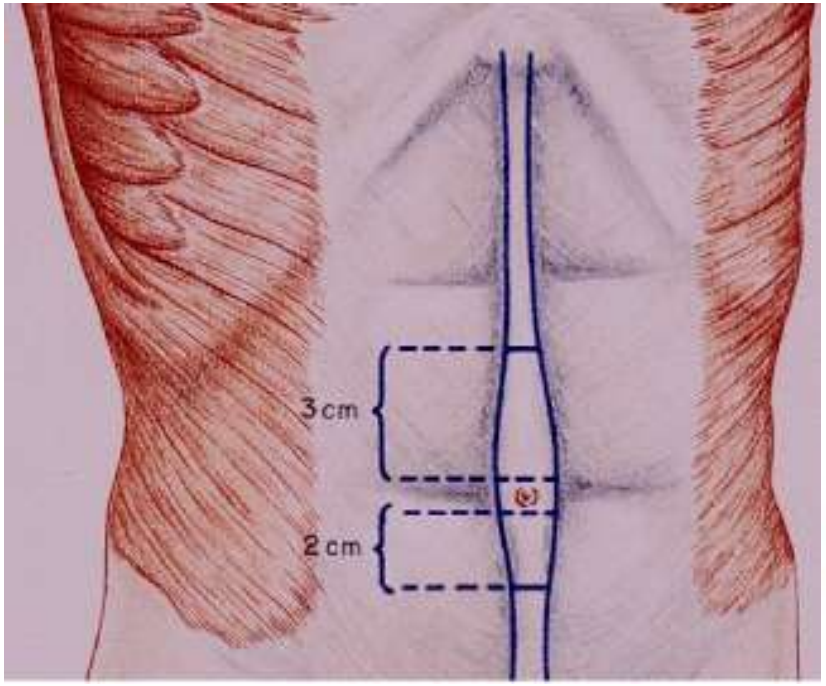


- ✓ *vagina musculi recti abdominis* (rectus sheath)

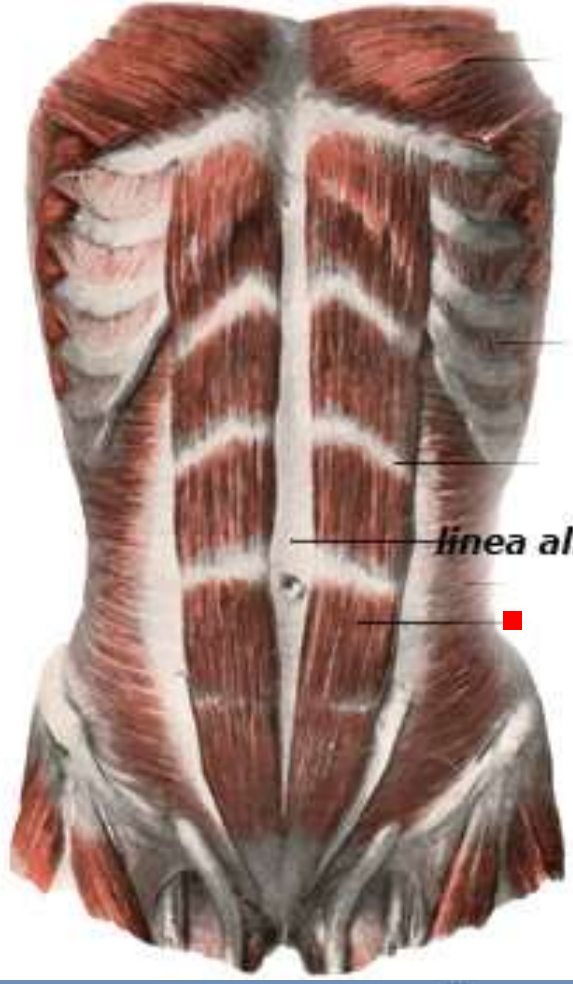


The white line, *linea alba*
The navel, *umbilicus*

- width:
  - ✓ *pr. xiphoideus* – 5-8 mm
  - ✓ above navel – 15 mm
  - ✓ umbilicus – 20-25 mm
  - ✓ below navel – 2-3 mm

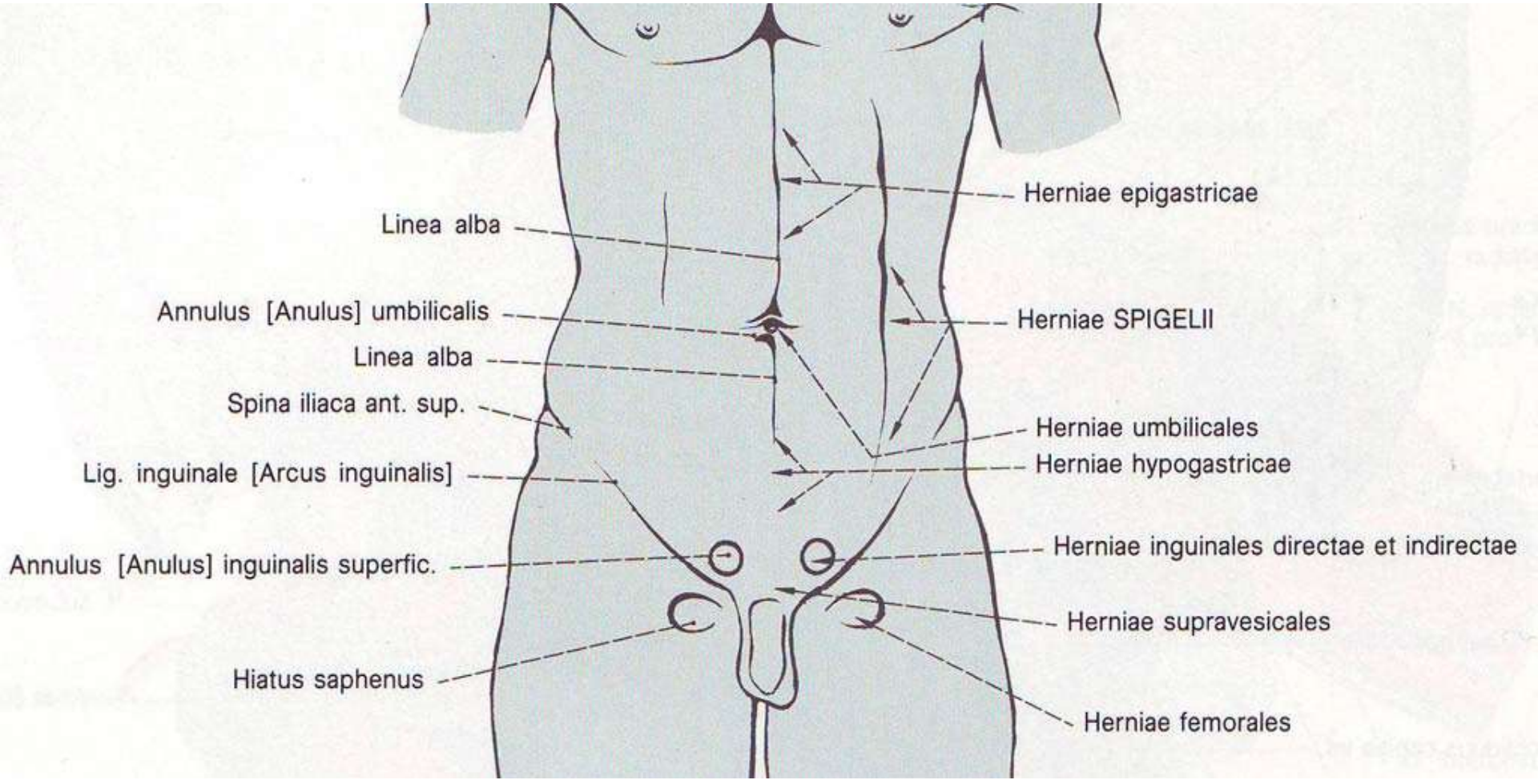


- level: *discus intervertebralis* L_3-L_4

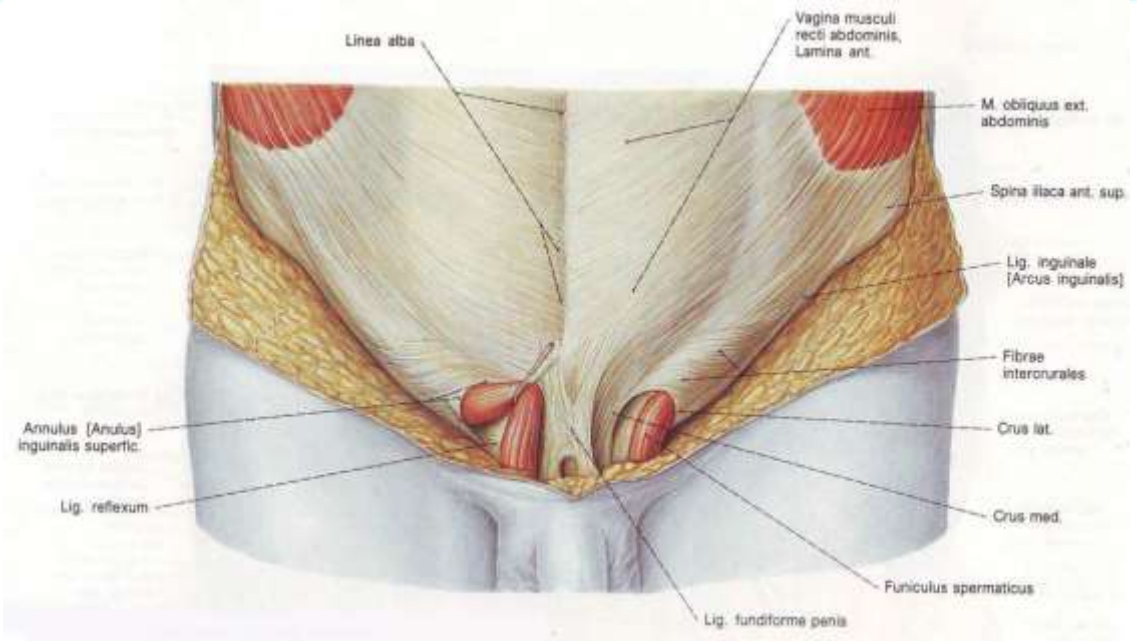


- layers:
  - ✓ skin
  - ✓ scar tissue
  - ✓ umbilical fascia
  - ✓ parietal peritoneum

Sites of abdominal hernia formation



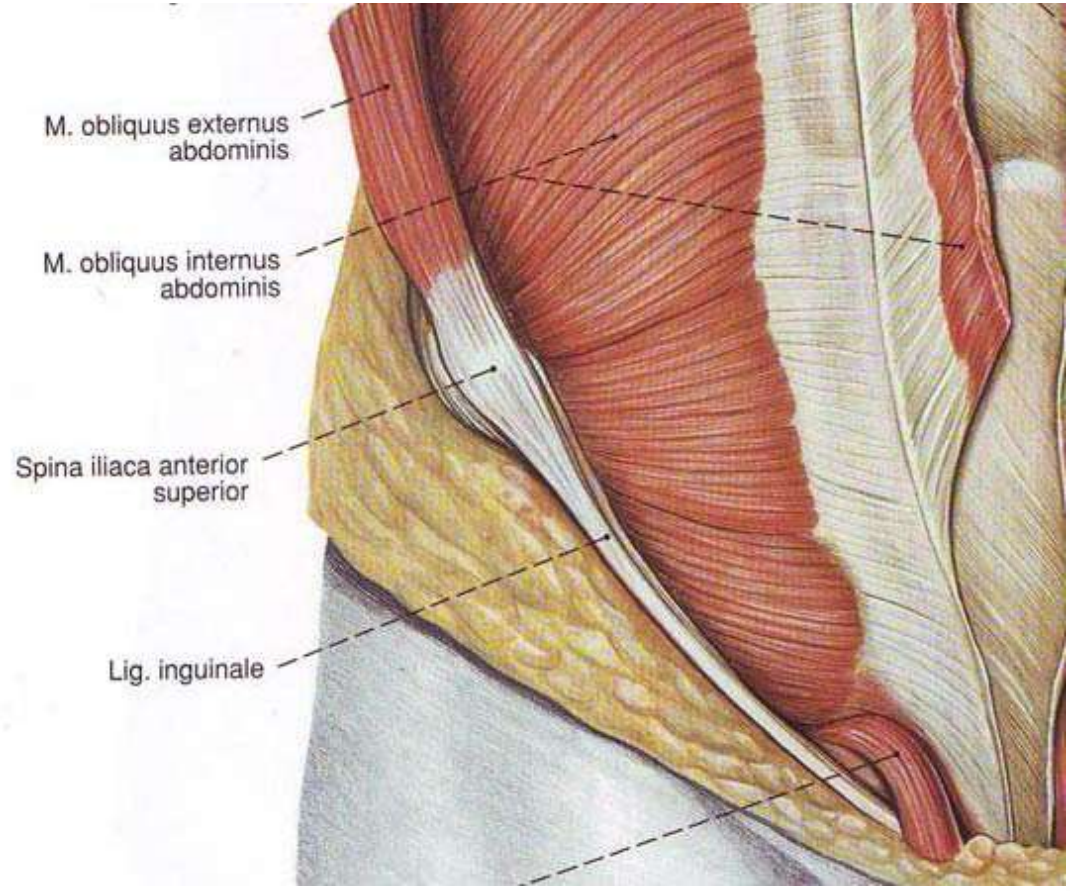
The inguinal canal, *Canalis inguinalis*

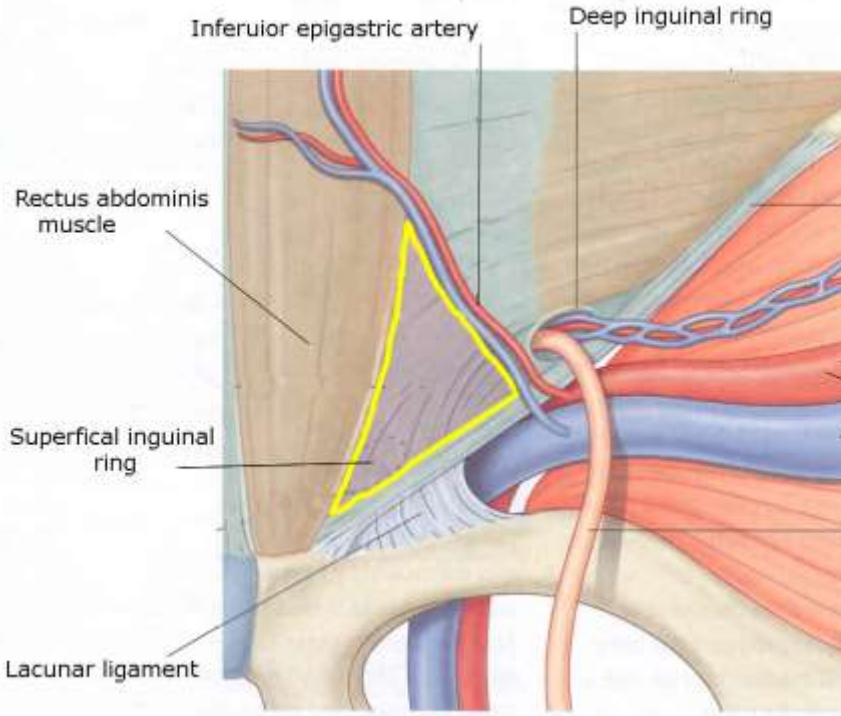


Inguinal canal: location

- above the inguinal (Poupart's) ligament
- in the inguinal (Hesselbach's) triangle

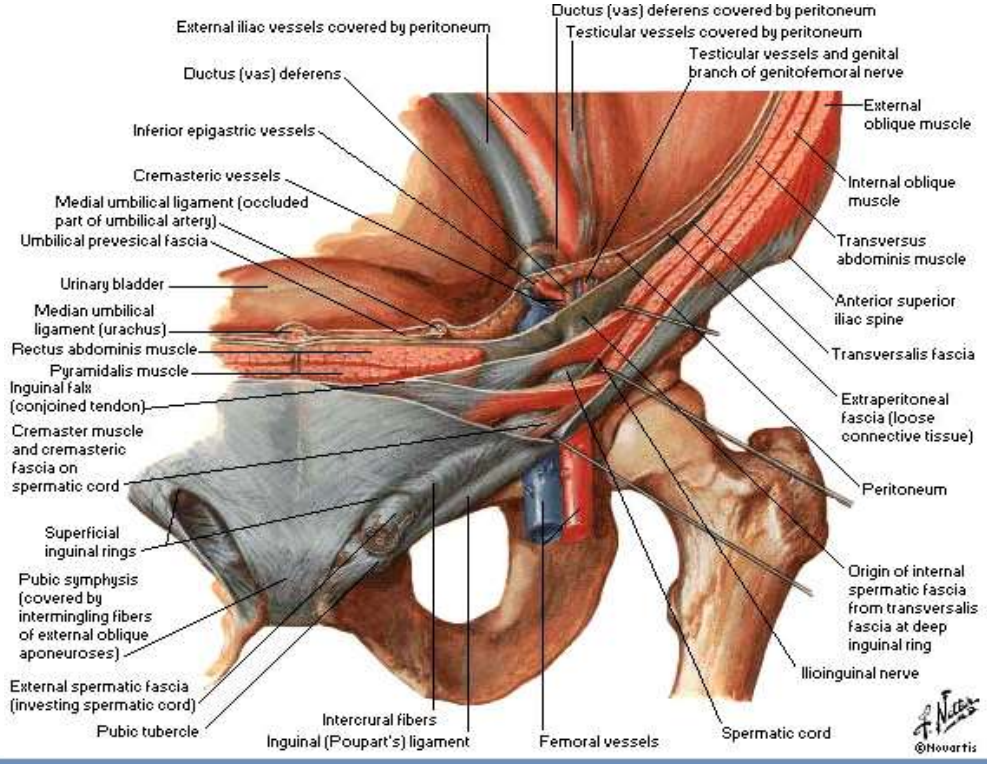
- length: 4-5 cm
- diameter:
  - ✓ ♂ - ~ 1 cm
  - ✓ ♀ - 0.5 cm



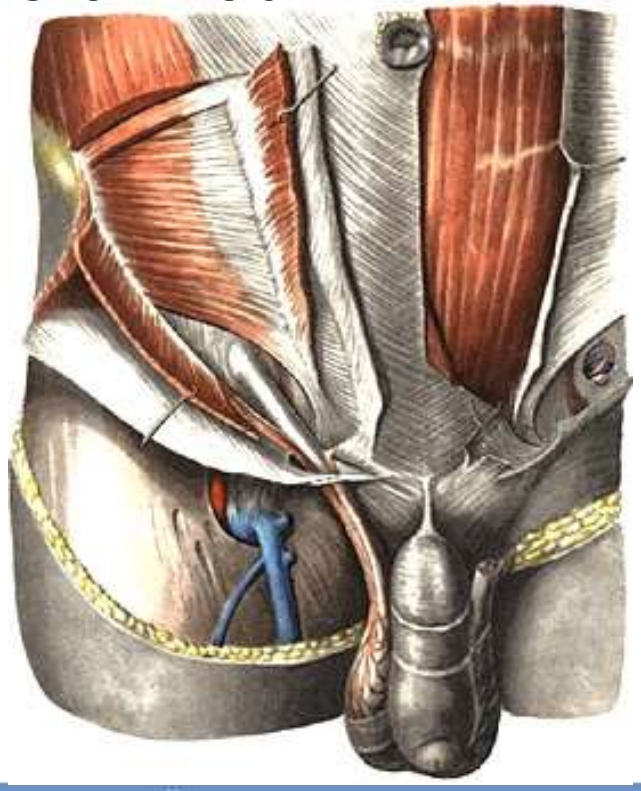


Inguinal canal: openings

- superficial (external) inguinal ring, *anulus inguinalis superficialis:*
  - ✓ medial side of the anterolateral wall
  - ✓ shape: oval or triangular
  - ✓ width 1-1.2 cm; height 2.5 cm

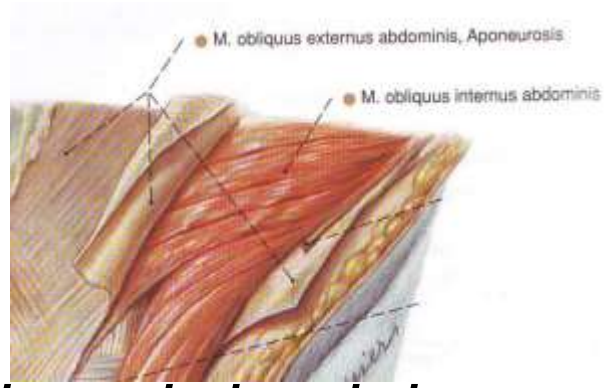


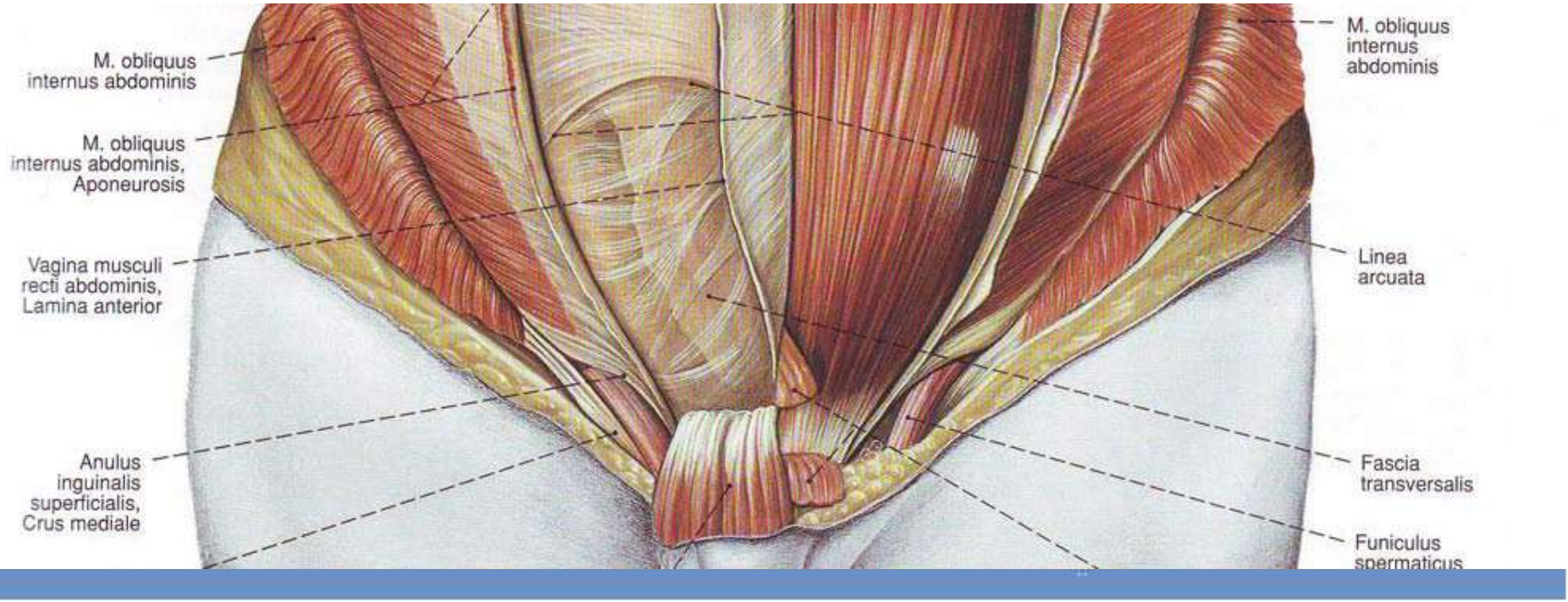
- deep (internal) inguinal ring, *anulus inguinalis profundus:*
  - ✓ 5 cm superior and lateral
  - ✓ shape: vertical cleft
  - ✓ size: 1-1.5 cm



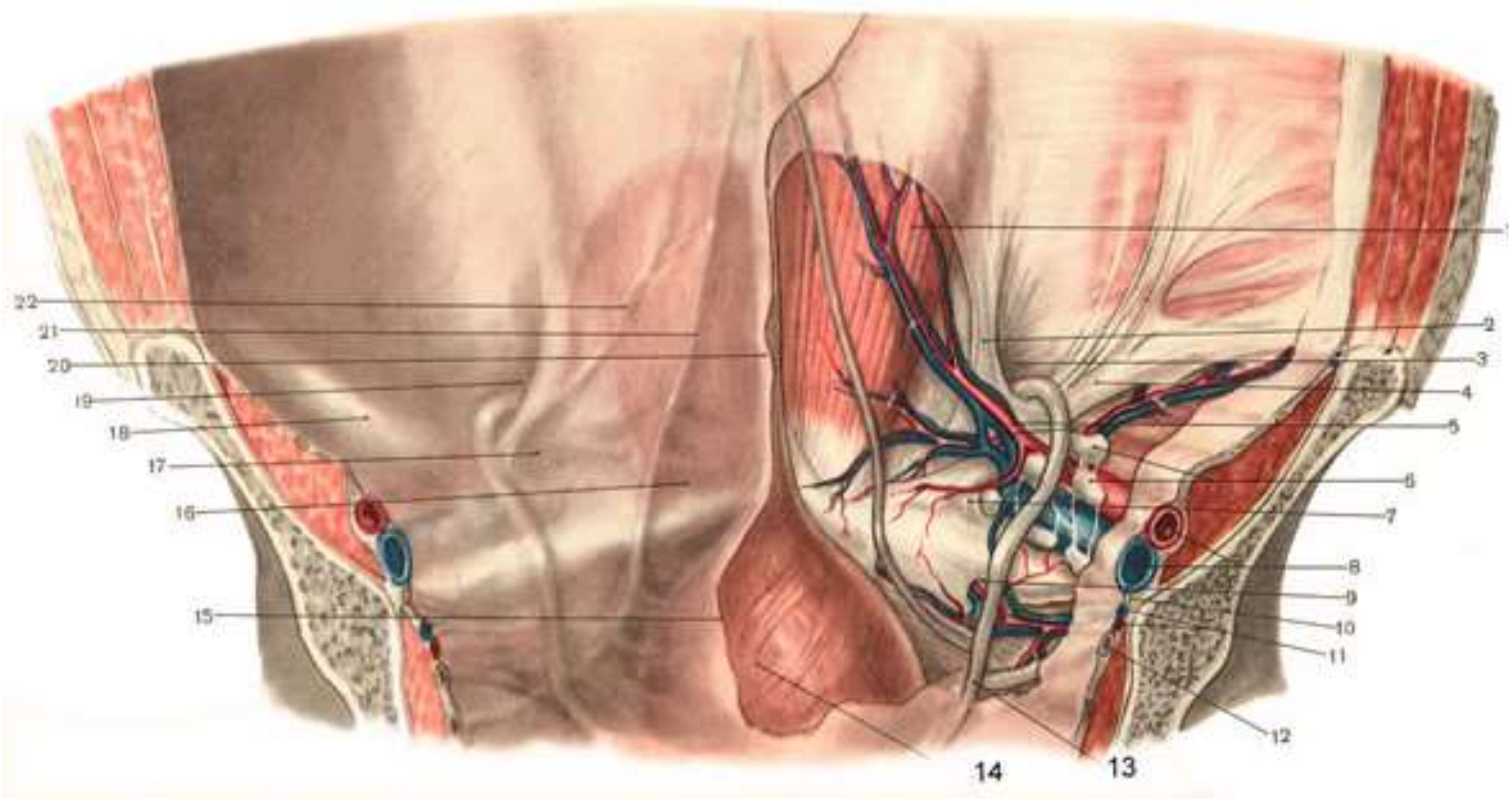
Inguinal canal: walls

- anterior: *m.obliquus ext. abdominis*
- inferior: *lig. inguinale*
- posterior: *fascia transversalis*
- superior: lower margin of *m. obliqus int. abdominis*
  m. transversus abdominis



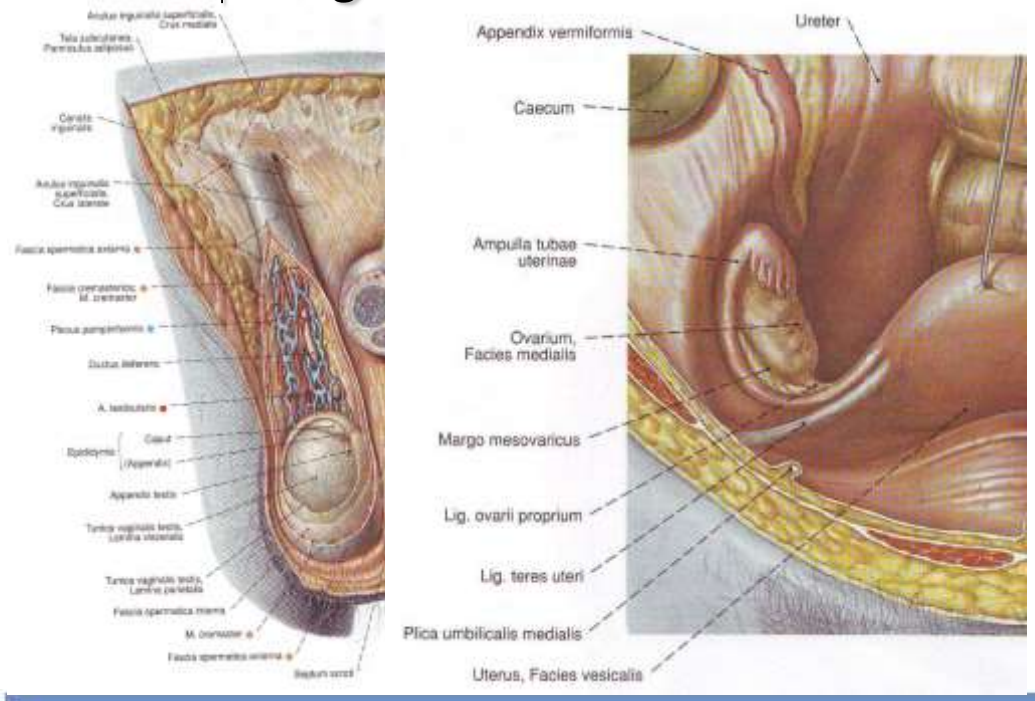


The parietal peritoneum

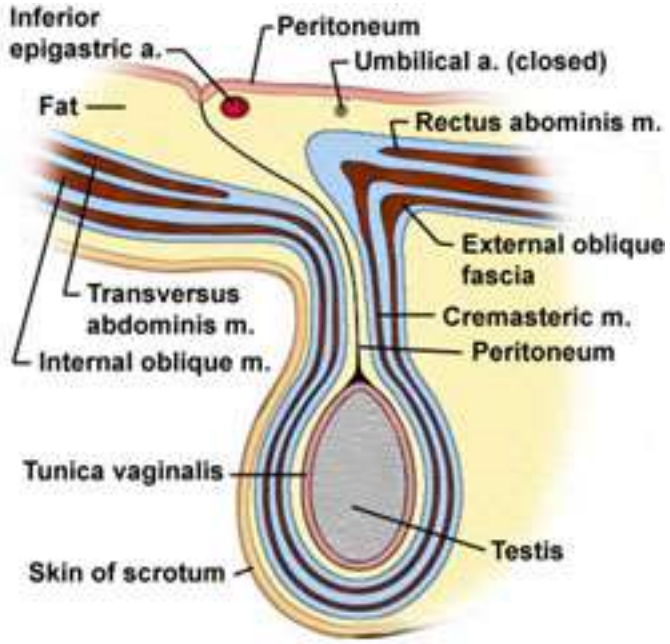


Inguinal canal: content

- content:
  - ✓ ♂ + ♀ - *n. ilioinguinalis, r. genitalis n. genitofemoralis*
  - ✓ ♂ - spermatic cord (funiculus spermaticus),
  - ✓ ♀ - *lig. teres uteri*

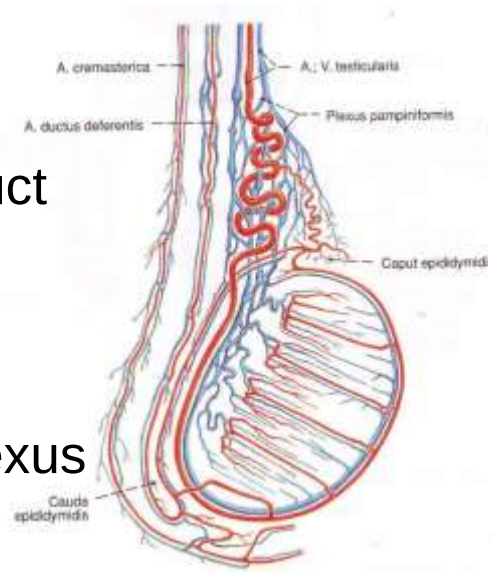


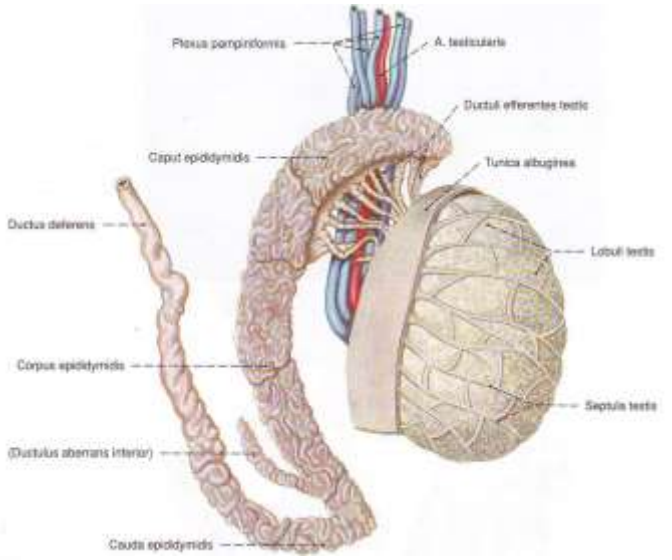
- coverings:
  - ✓ internal spermatic fascia
  - ✓ cremasteric fascia
  - ✓ cremaster muscle
  - ✓ external spermatic fascia

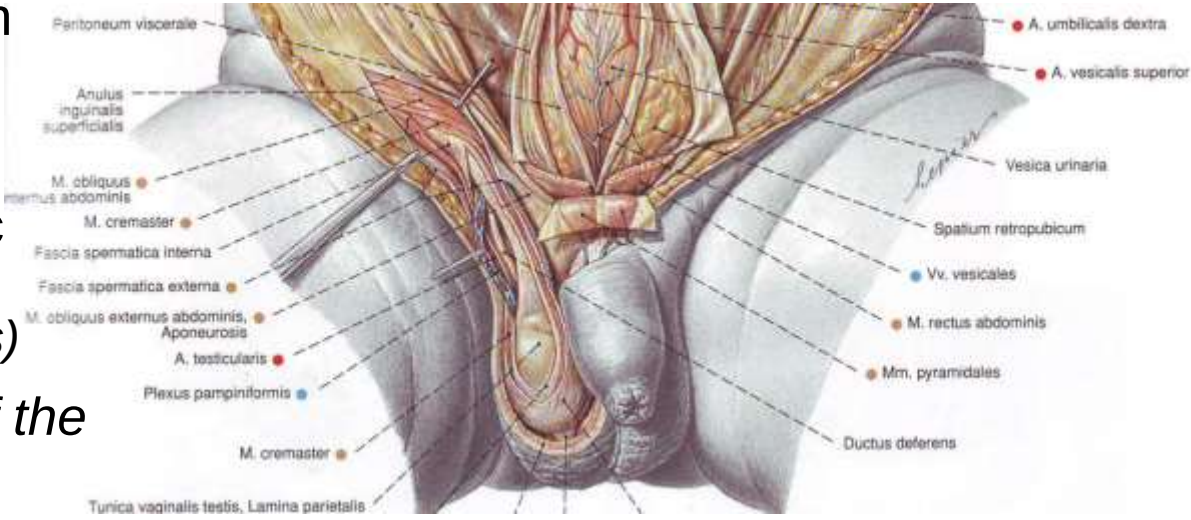


Funiculus spermaticus: content

- *ductus deferens*
- arterial blood vessels:
  - ✓ artery of the deferent duct
  - ✓ cremasteric artery
  - ✓ testicular artery
- venous vessels
  - ✓ pampiniform venous plexus
- lymphatic vessels:
  - ✓ along the testicular vein to lumbar lymph nodes
- nerve plexuses:
  - ✓ sensory and autonomic nerve fibers *(plexus testicularis et differentialis)*
- *lig. vaginale* – *vestige of the processus vaginalis*

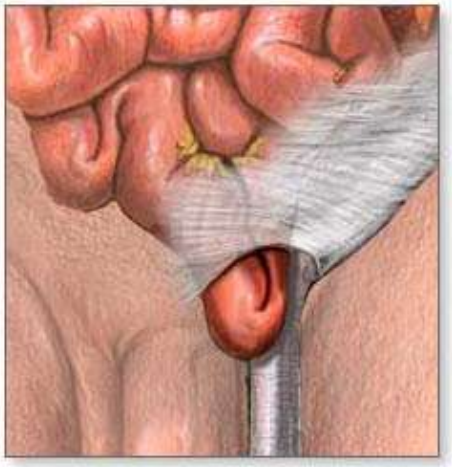


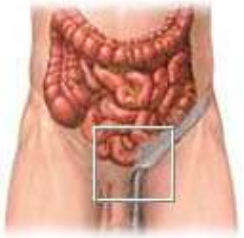


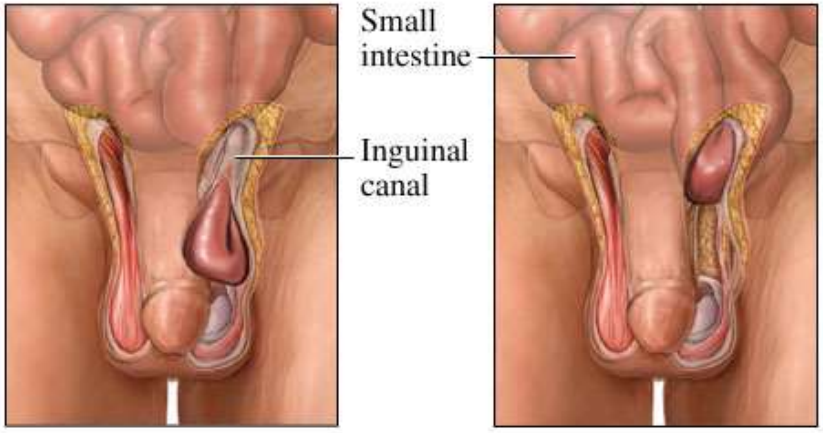


Clinical significance

- Inguinal hernias:
  - ✓ congenital (indirect)
  - ✓ acquired (direct)





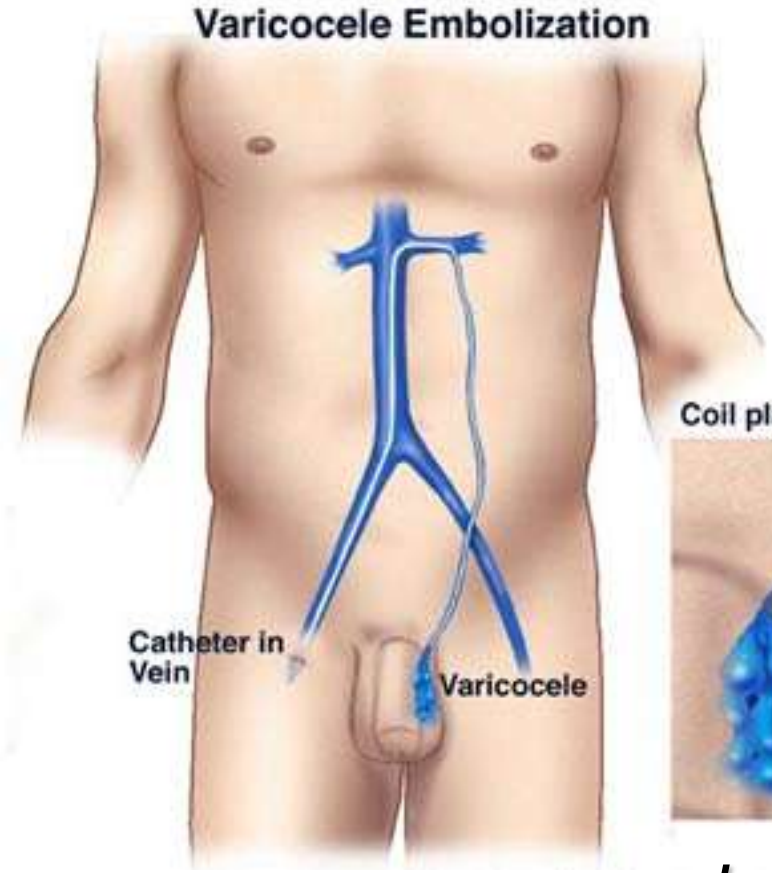


Indirect inguinal hernia

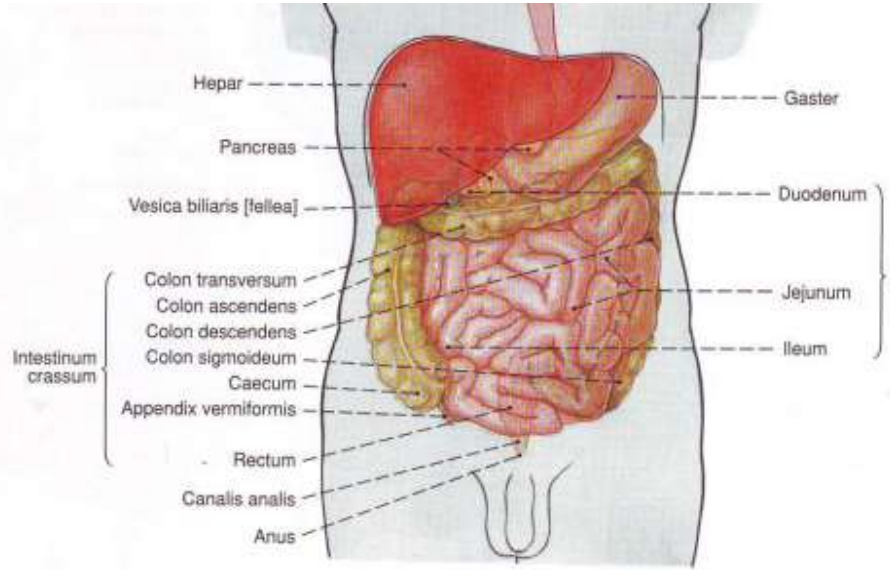
Direct inguinal hernia

Clinical significance

- *varicocele*



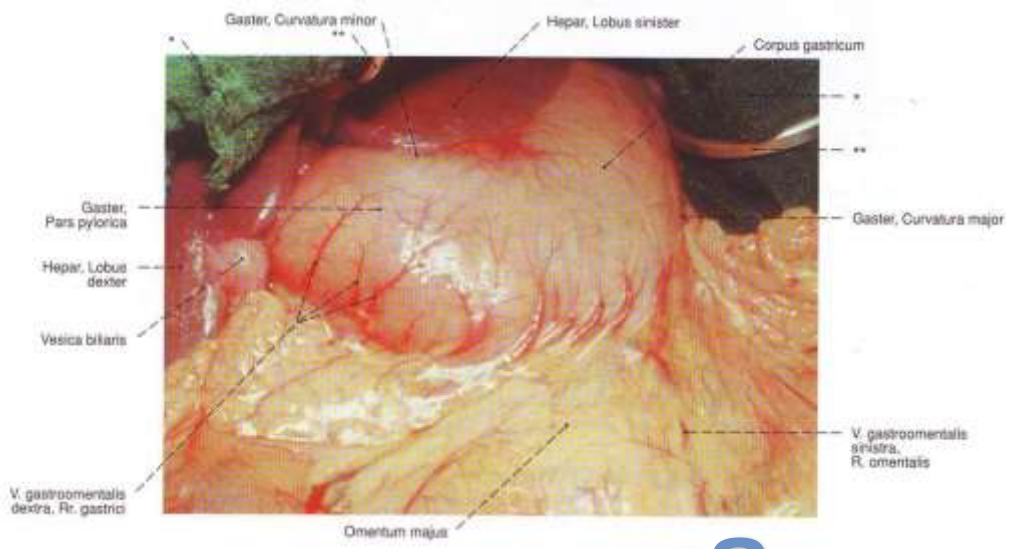
- *descensus testis*



ABDOMINAL CAVITY: PERITONEAL CAVITY

Superior section (supracolic compartment)

- Peritoneum, *peritoneum* and Peritoneal formations
- Skeletotopy and syntopy of the organs and neurovascular bundles

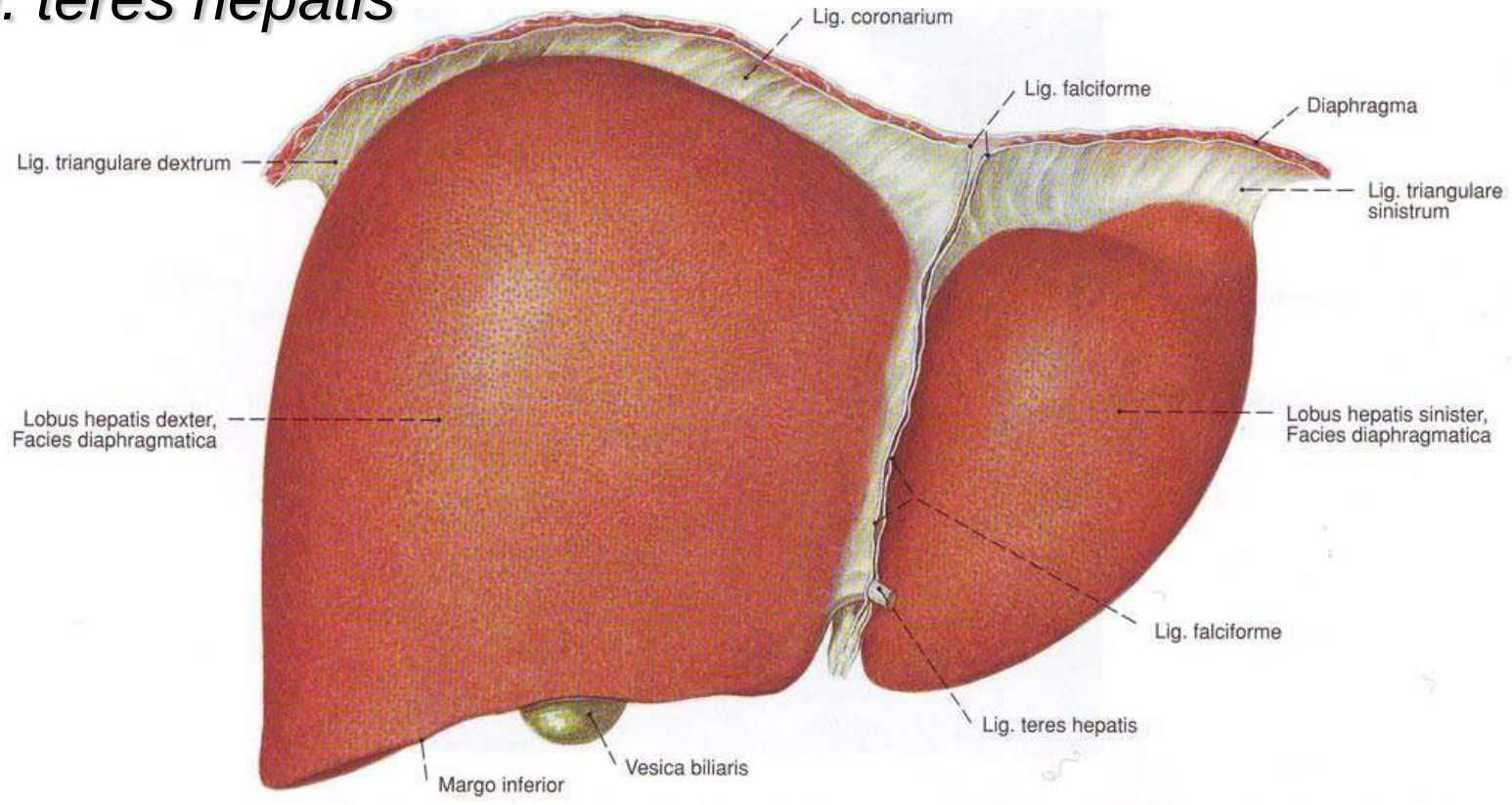


Supracolic compartment: peritoneal formations

- peritoneal ligaments
- peritoneal spaces (recesses and bursae)

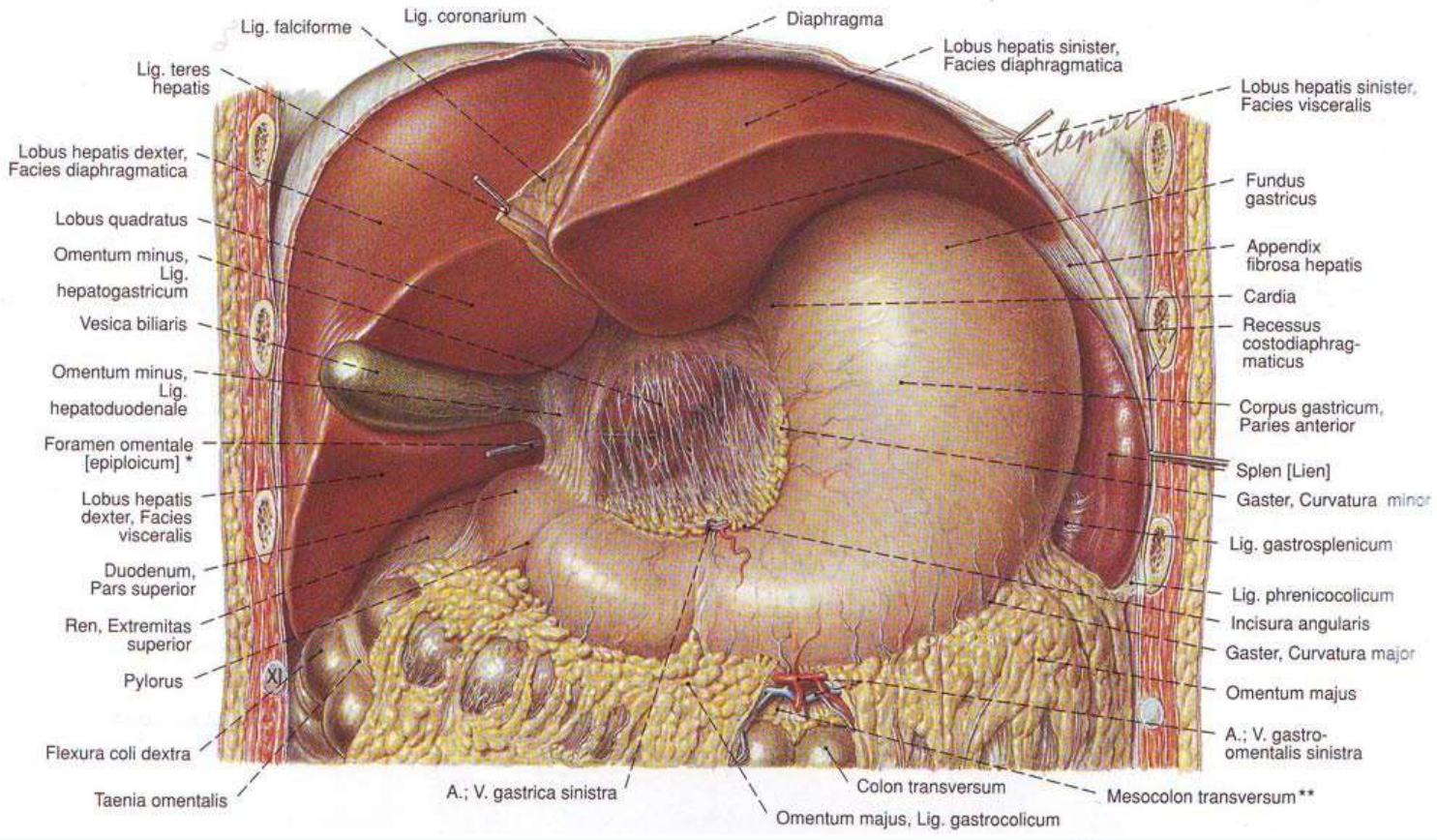
Supracolic compartment: peritoneal formations

- *lig. coronarium hepatis ⇨ ligg. triangularia*
- *lig. falciforme hepatis*
- *lig. teres hepatis*



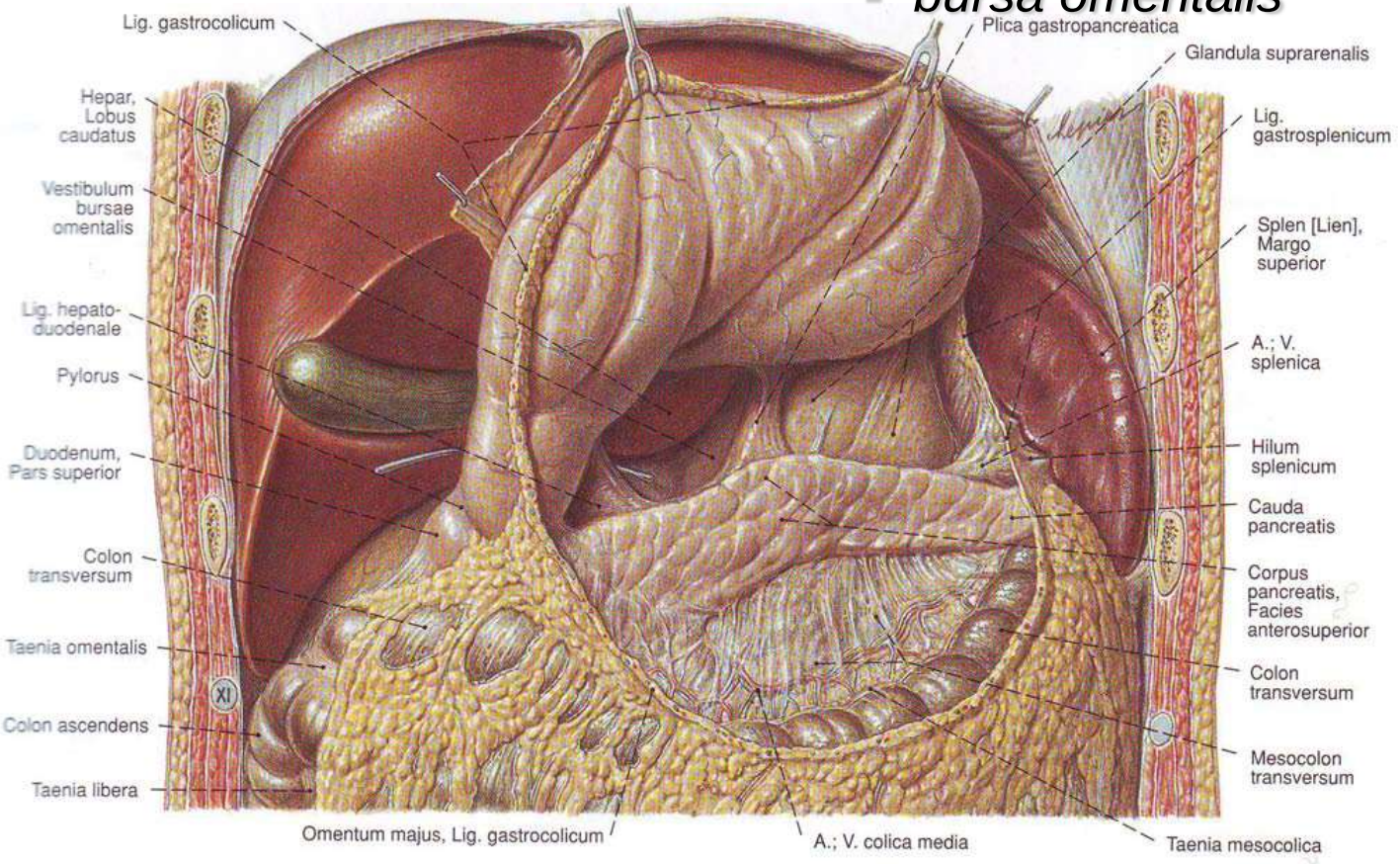
Supracolic compartment: peritoneal formations

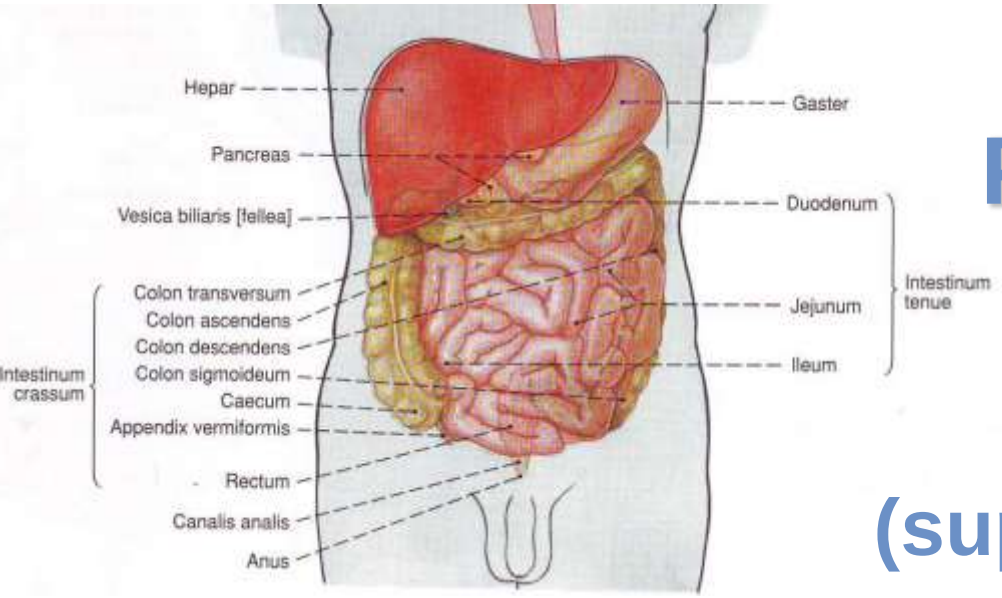
- *omentum minus:*
  - ✓ *lig. hepatogastricum* – *aa. et vv. gastricae, trunci vagales,* lymph nodes and lymphatic vessels
  - ✓ *lig. hepatoduodenale* – *ductus cysticus et hepaticus comm., a. hepatica propria, v. portae*



Supracolic compartment: peritoneal formations

- *omentum majus:*
  - ✓ *lig. gastrophrenicum*
  - ✓ *lig. gastrocolicum*
- *pediculus lienis:*
  - ✓ *lig. gastrolienale*
  - ✓ *lig. phrenicolienale (lig. lienorenale)*
- *bursa hepatica (recessus subphrenicus dexter)*
- *bursa pregastrica (recessus subphrenicus sinister)*
- *bursa omentalis*





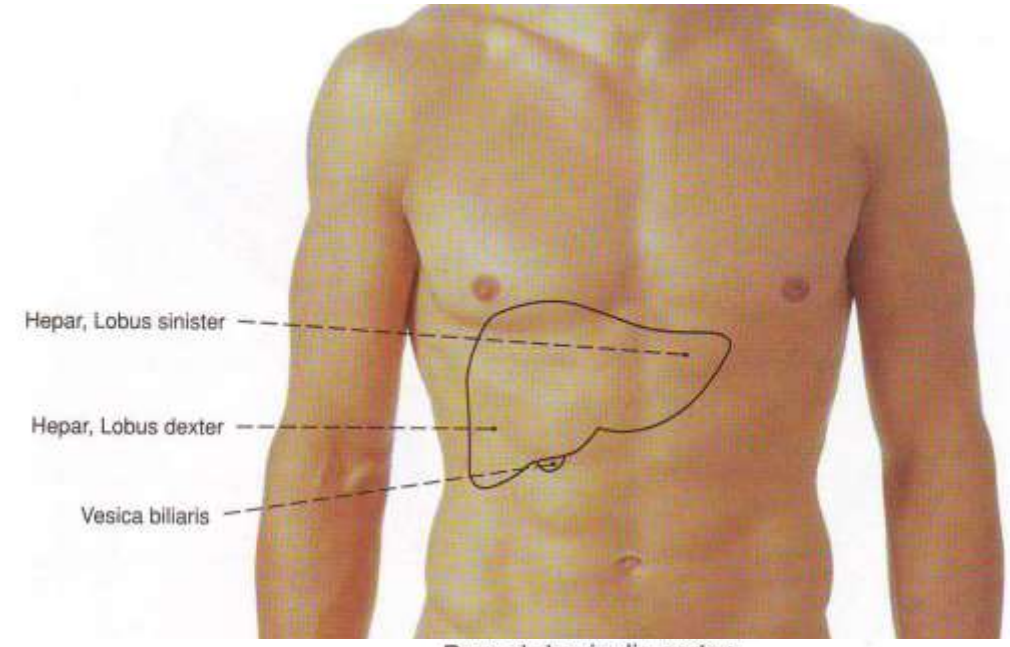
Peritoneal cavity:

Superior section

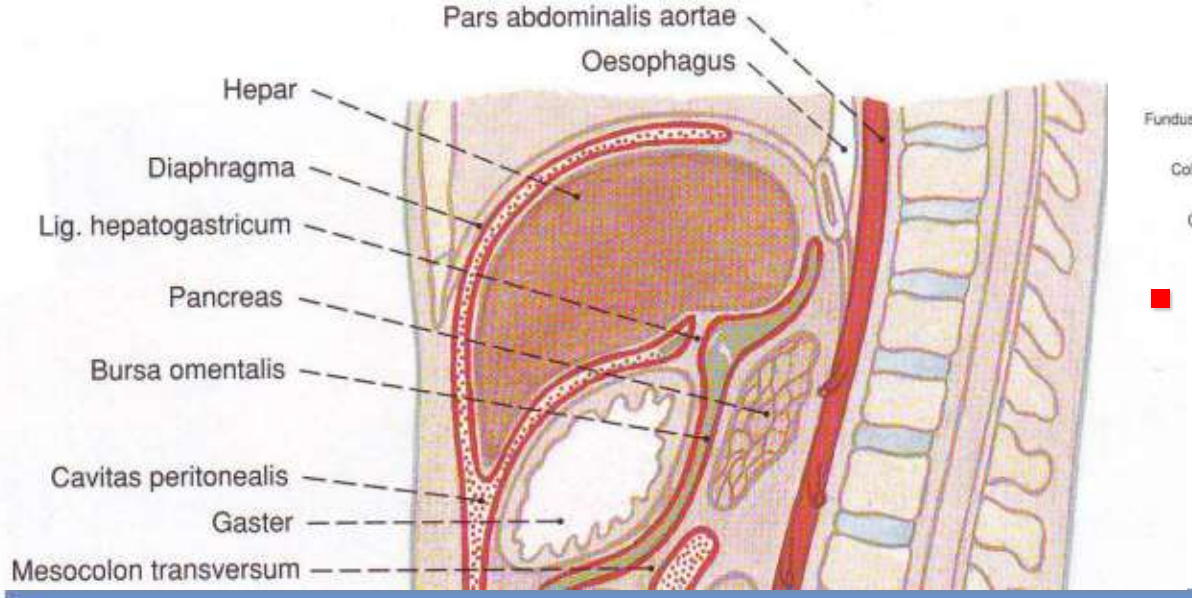
(supracolic compartments)

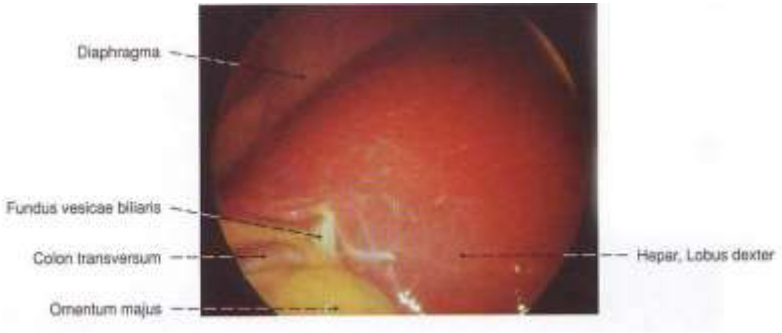
- Peritoneal formations
- Skeletotopy and syntopy of the organs and neurovascular bundles

The liver and gallbladder



- skeletotopy:
  - ✓ superior border – the right dome of the diaphragm
  - ✓ inferior border – anterior margin

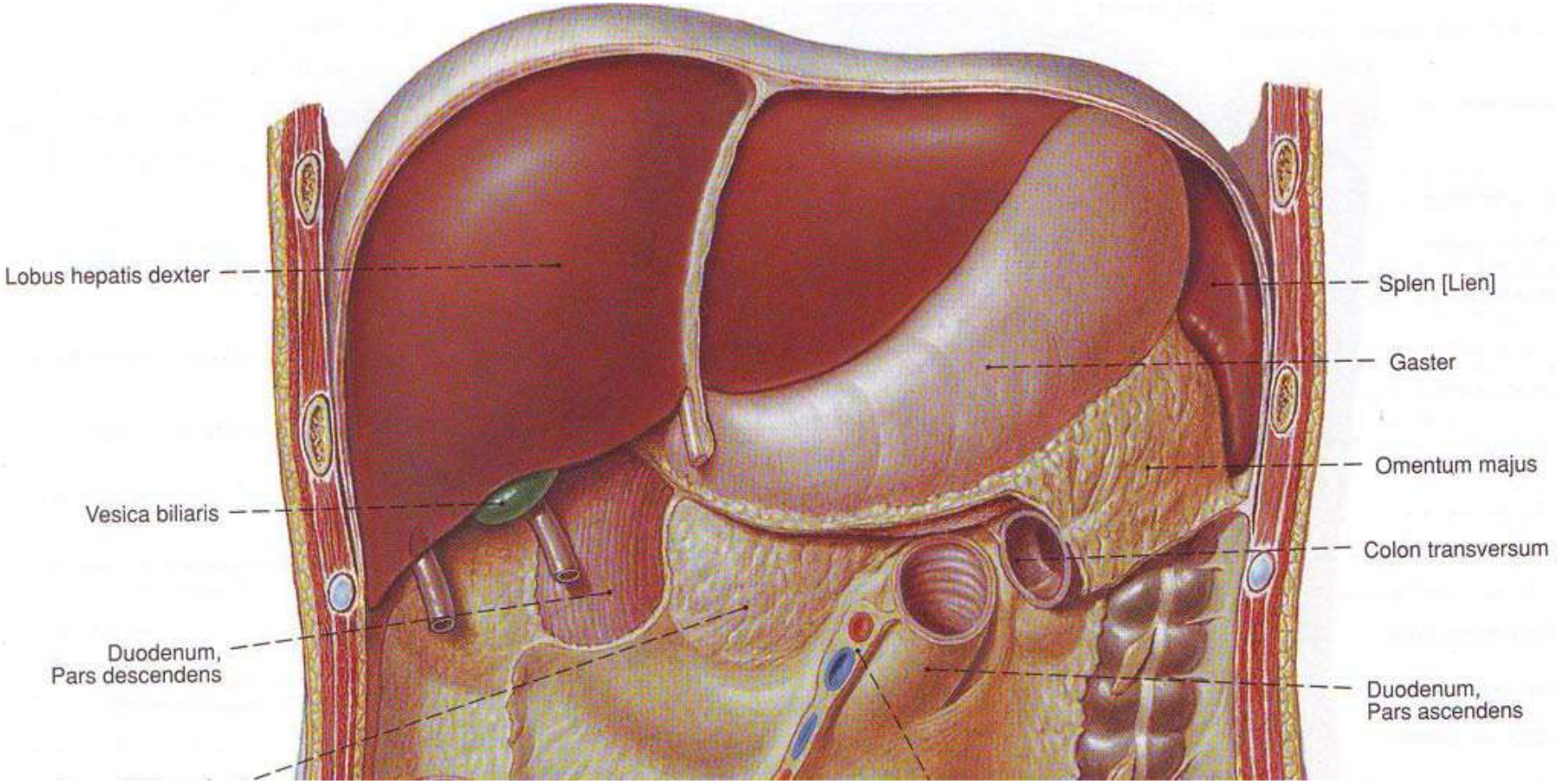




- syntopy:
  - ✓ intraperitoneally
  - ✓ mesoperitoneally *(area nuda, pars affixa)*

Clinical significance

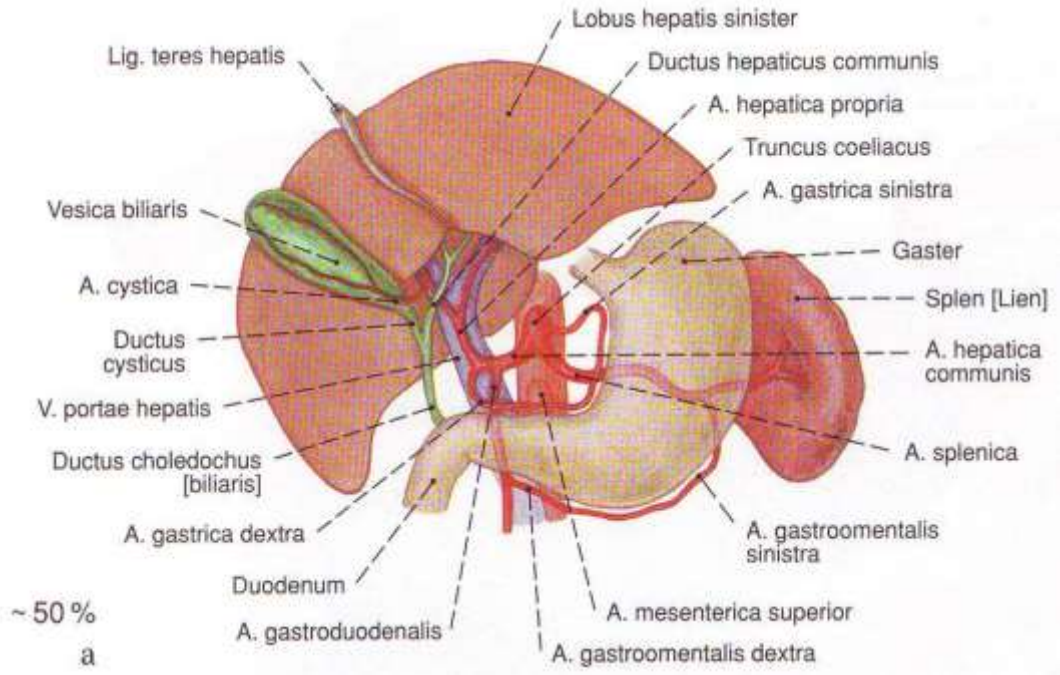
The liver and gallbladder

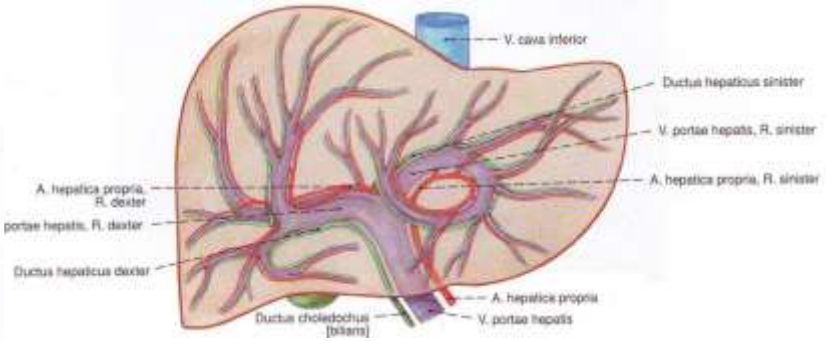


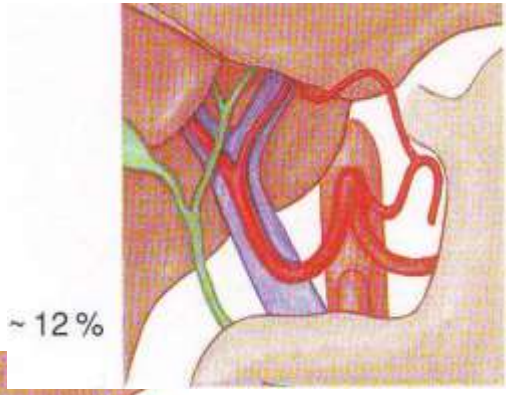
- upper (liver) area
- lower (gastric) area

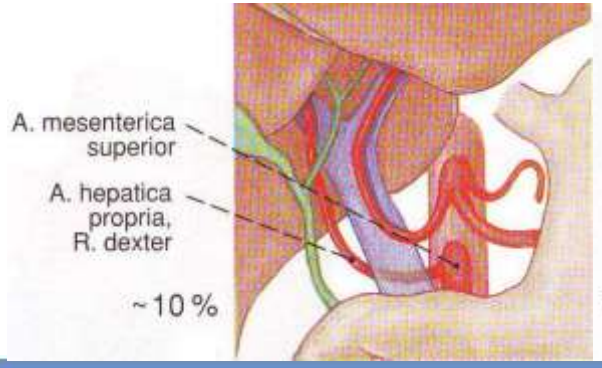
- *fundus vesicae felleae* – 9th rib

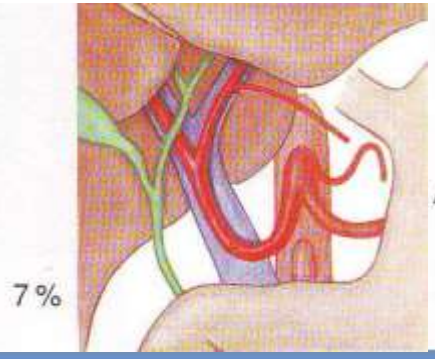
The liver and gallbladder: blood vessels

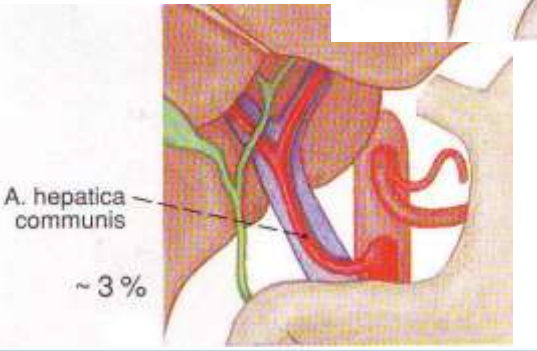






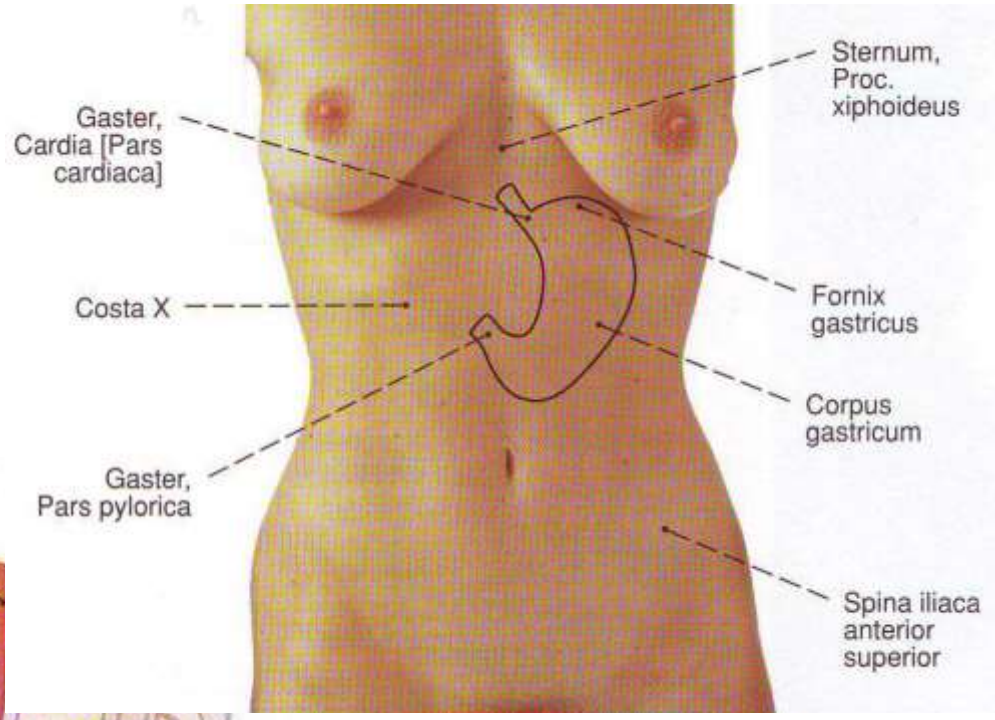


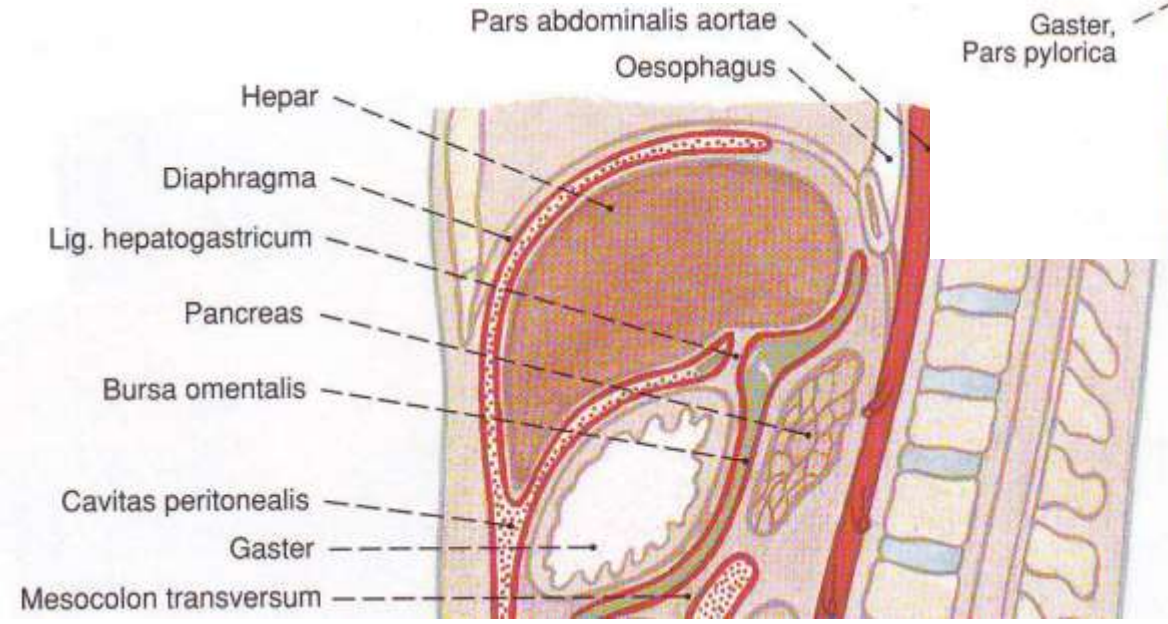




The stomach, *ventriculus*

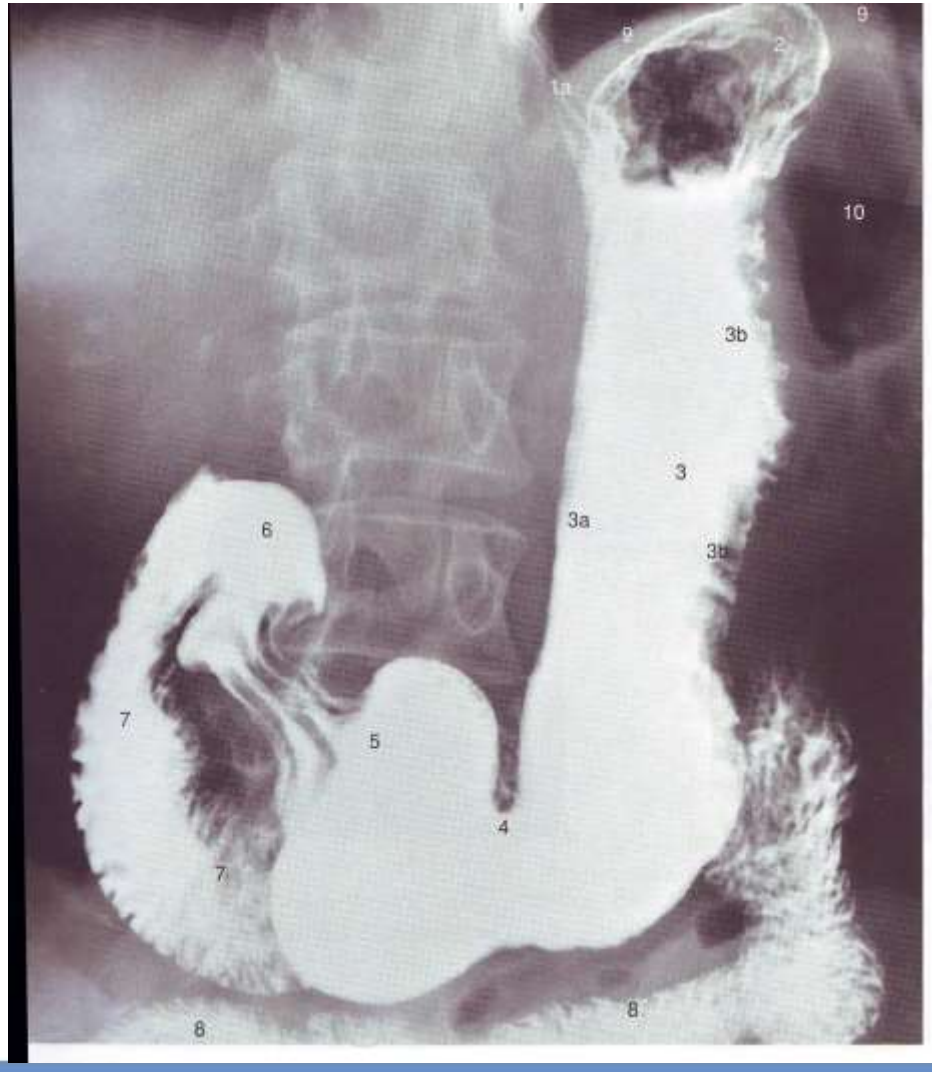
- skeletotopy:
  - ✓ cardia – Th_{10} (cartilage of the 7^{th} left rib)
  - ✓ pylorus – L_1





- syntopy: intraperitoneally
  - ✓ gastric chamber
  - ✓ gastric area (Traube's space)

Abdominal X-ray

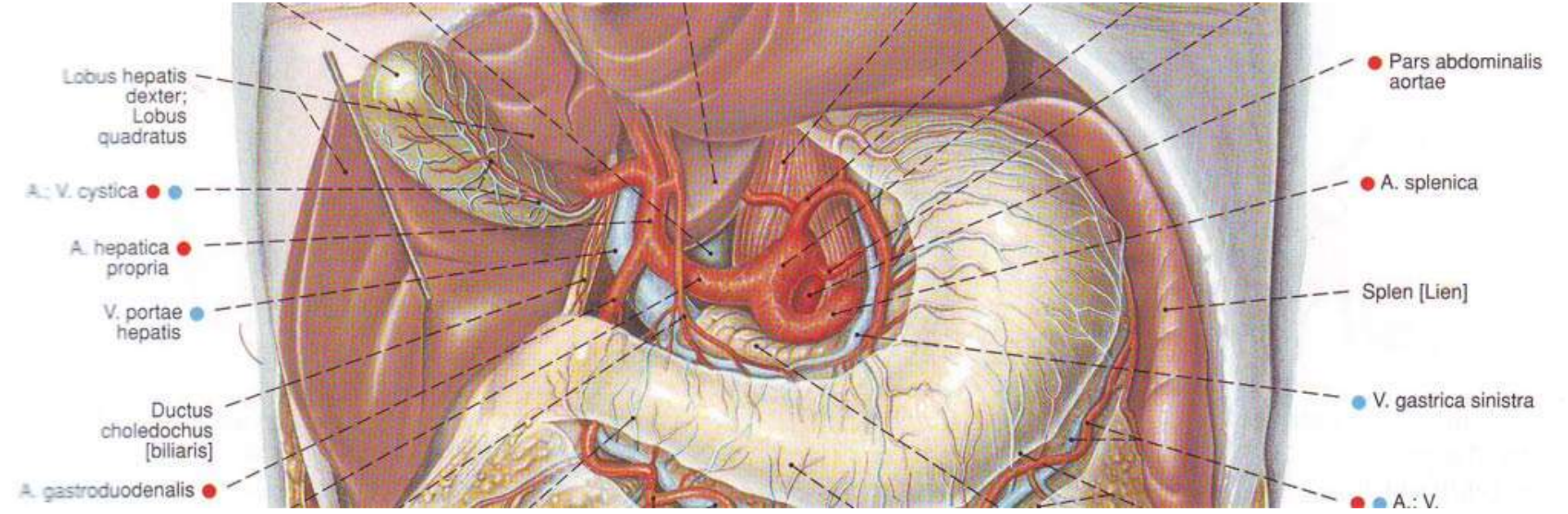


- *Saccus digestorius:*
  - ✓*fornix gastricus*
  - ✓*corpus gastricum*
  - ✓*sinus ventriculi*
- *Canalis egestorius:*
  - ✓*pars pylorica*
  - ✓*pylorus*

1 = Oesophagus mit Kontrastbrei. Am Übergang (1a) in den Fundus gastricus sind die Rinnen zwischen den Falten als dunkle Streifen sichtbar.
2 = Fundus gastricus mit Luftblase
3 = Corpus gastricum
3a = Curvatura minor
3b = Curvatura major. In der Begrenzung der letzteren werden Aussparungen entsprechend dem Relief der Schleimhautfalten sichtbar.
4 = peristaltische Einschnürung an der Incisura angularis
5 = Pars pylorica vor der Weitergabe einer Portion Mageninhalts
6 = Ampulla duodeni
7 = Pars descendens duodeni mit Plicae circulares
8 = Jejunum
9 = linke Zwerchfellkuppel
10 = Flexura coli sinistra (luftgefüllt)

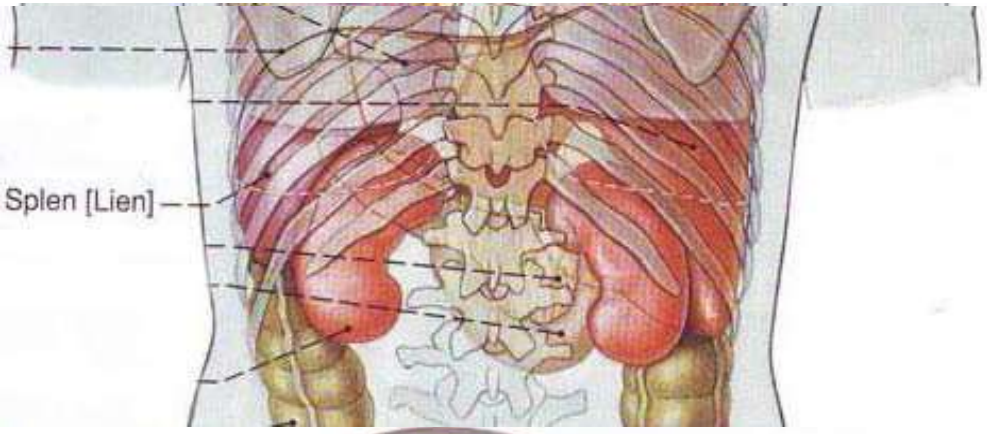
The stomach: blood vessels

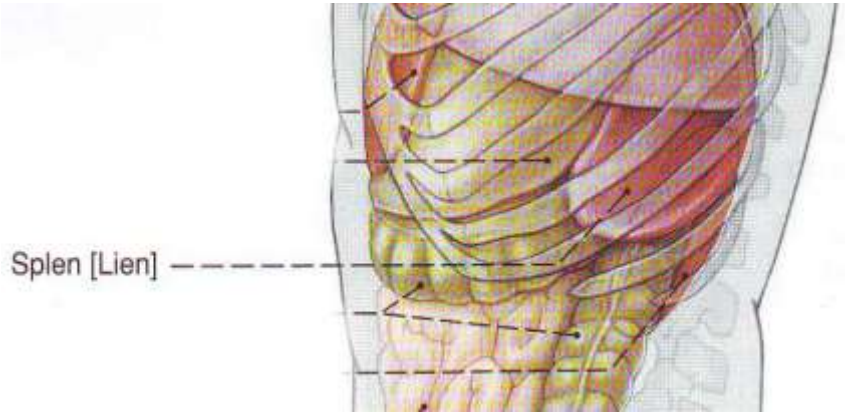
- lesser curvature:
  - ✓ *aa. et vv. gastricae (dextri et sinistri)*
  - ✓ *nodi lymphatici gastrici dextri*
- greater curvature:
  - ✓ *aa. et vv. gastroepiploicae (dextri et sinistri)*
  - ✓ *nodi lymphatici gastroepiploicae*

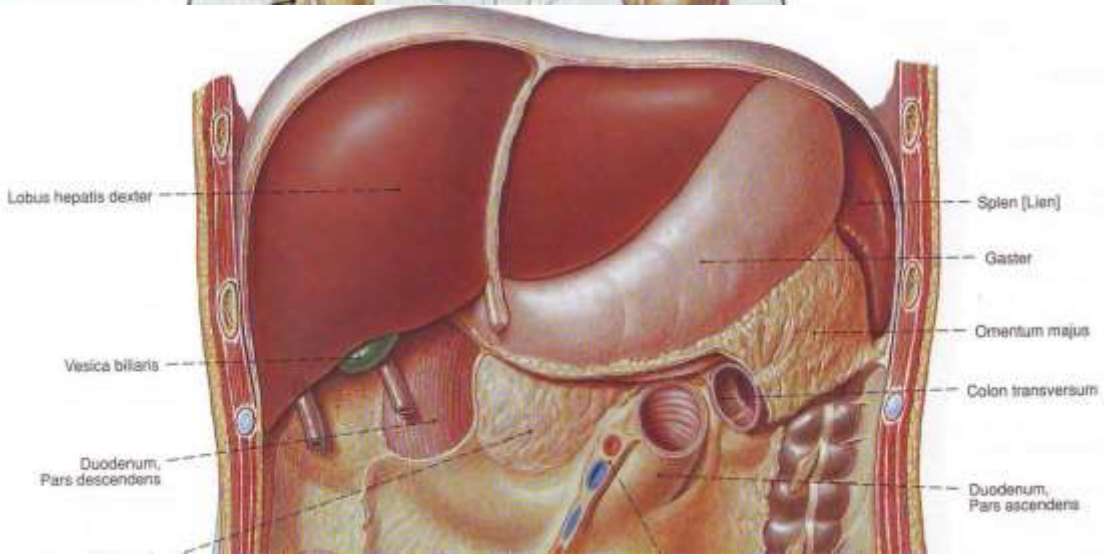


The spleen, *lien*

- Skeletotopy – left hypochondrium:
  - ✓ thoracic wall – between 9th and 11th ribs
  - ✓ longitudinal axis – along the 10th rib



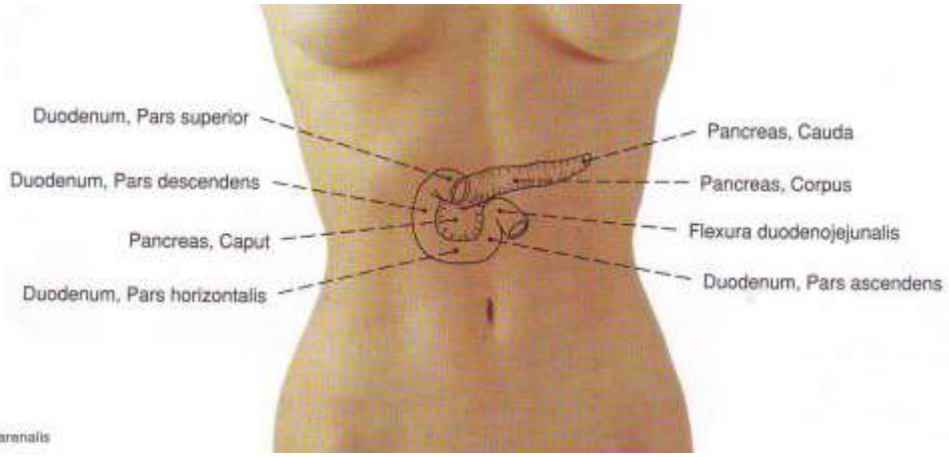


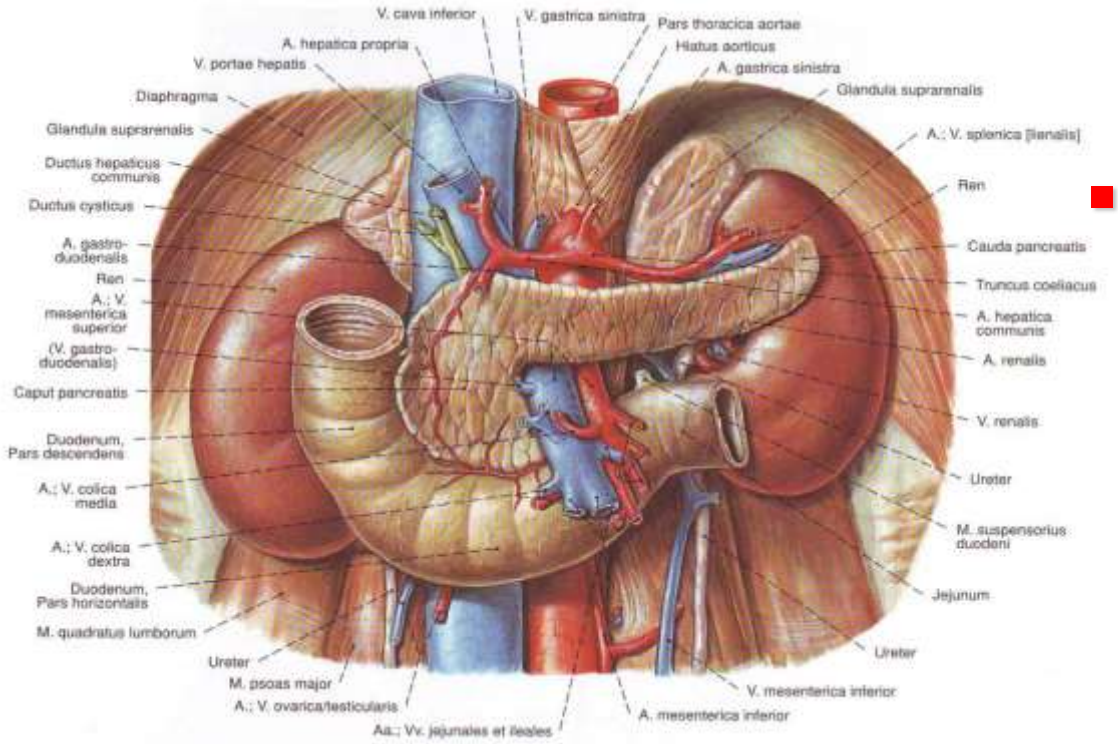


- syntopy – intraperitoneally
  - ✓ *lig. gastrolienale*
  - ✓ *lig. phrenicolienale*
  - ✓ *lig. phrenicocolicum*

The pancreas and duodenum

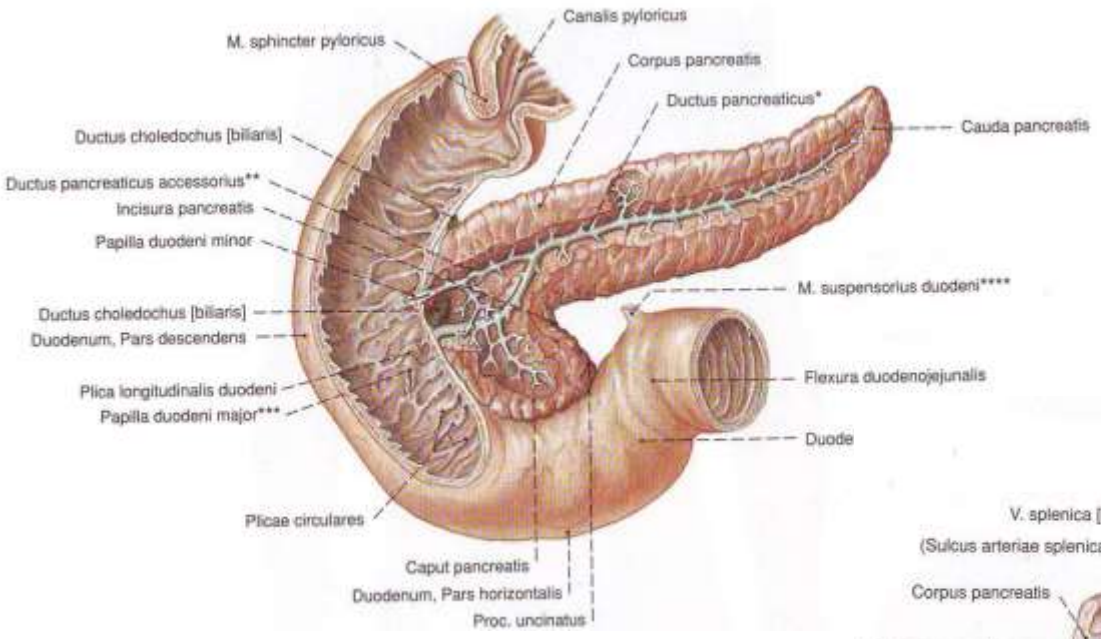
- skeletotopy:
  - ✓ head – L_2
  - ✓ body – L_1
  - ✓ tail – Th_{12}

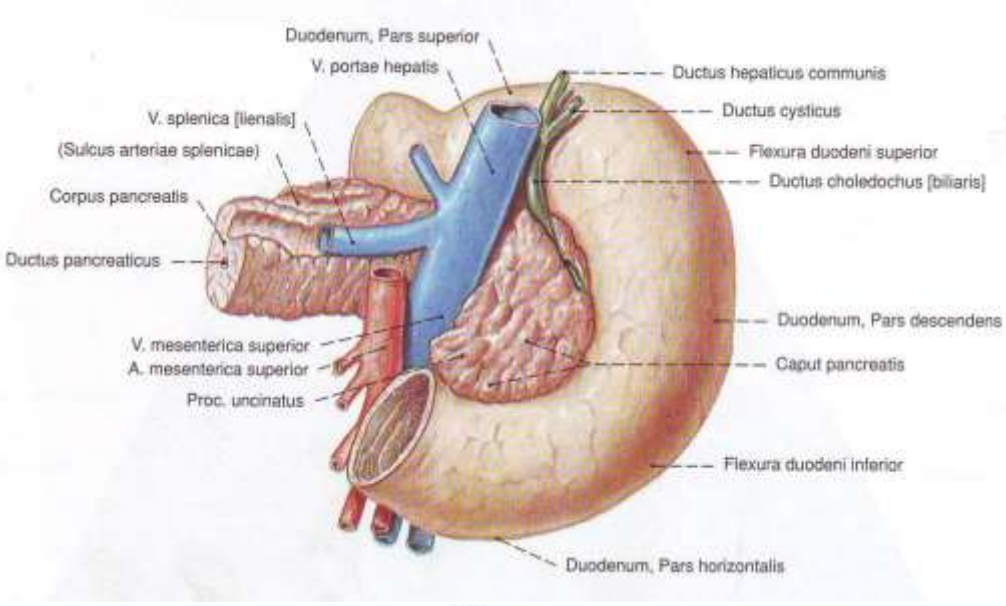




- syntopy:
  - ✓ intraperitoneally:
    pars superior duodeni, cauda pancreatis
  - ✓ retroperitoneally:
    rest parts of the duodenum

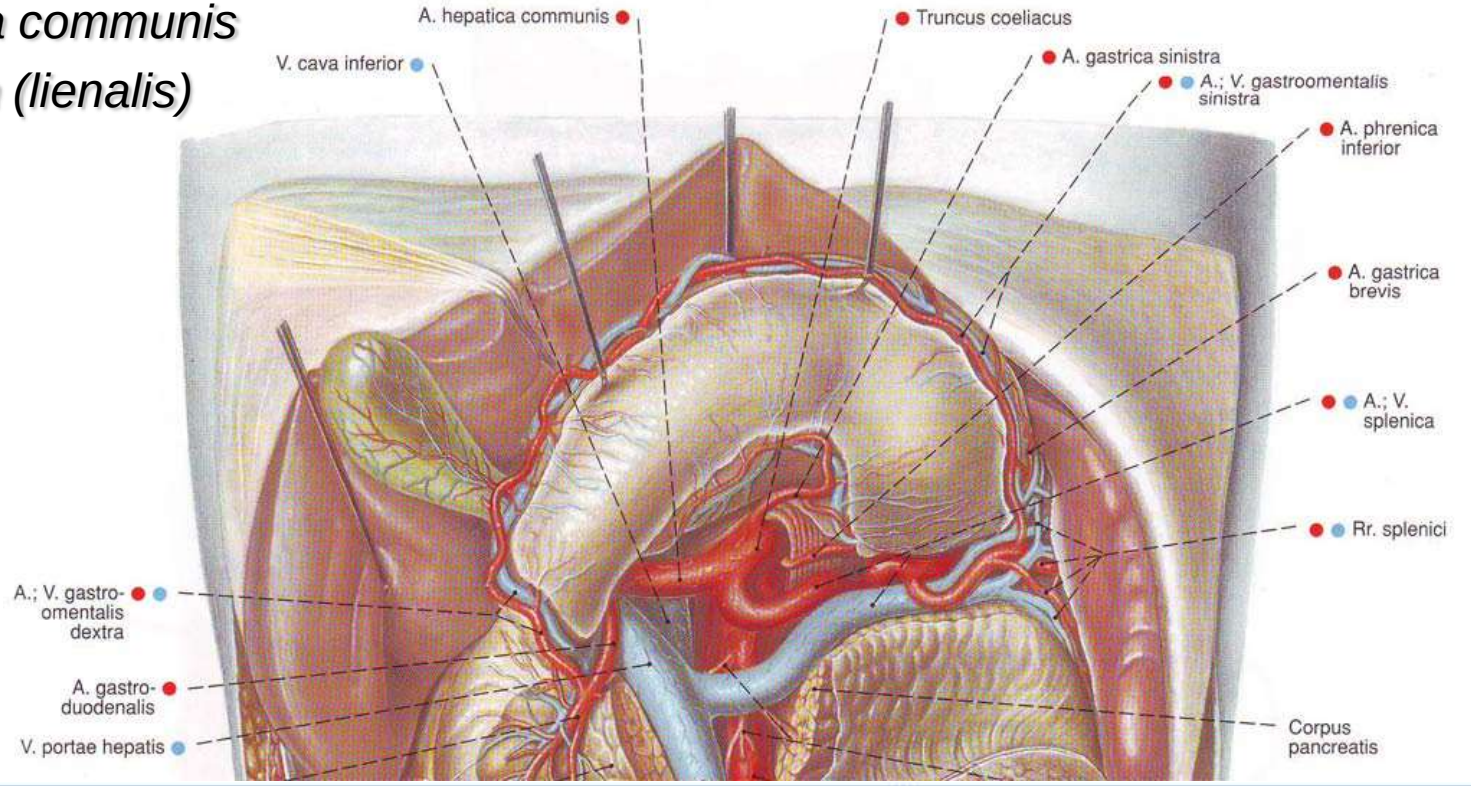
The pancreas and duodenum: blood vessels



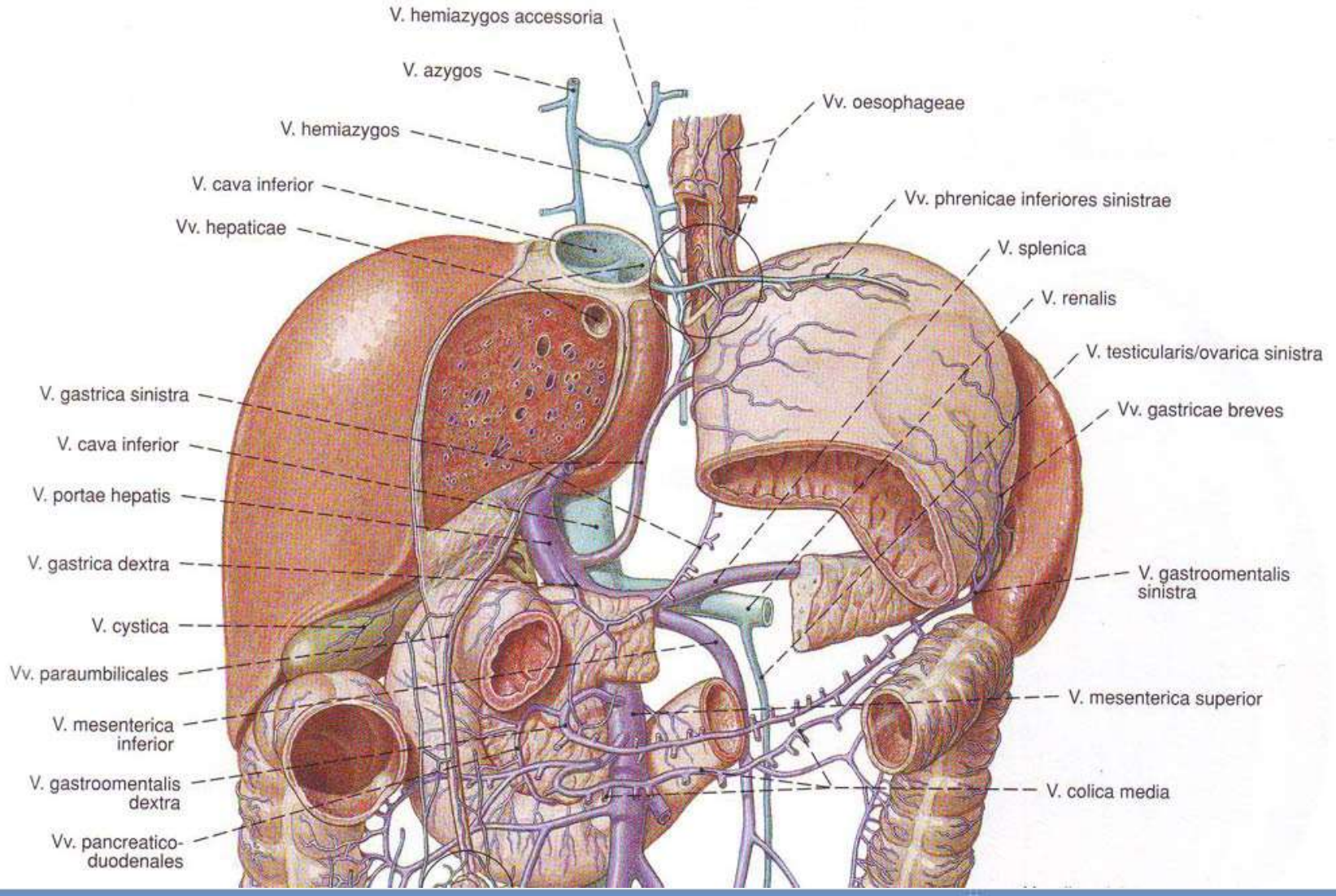


The celiac trunk, *truncus celiacus*

- at the level of the 12th thoracic vertebra – Th12
- length 1-2 cm
- above the pancreatic body it branches off into:
  - ✓ *a. gastrica sinistra*
  - ✓ *a. hepatica communis*
  - ✓ *a. splenica (lienalis)*

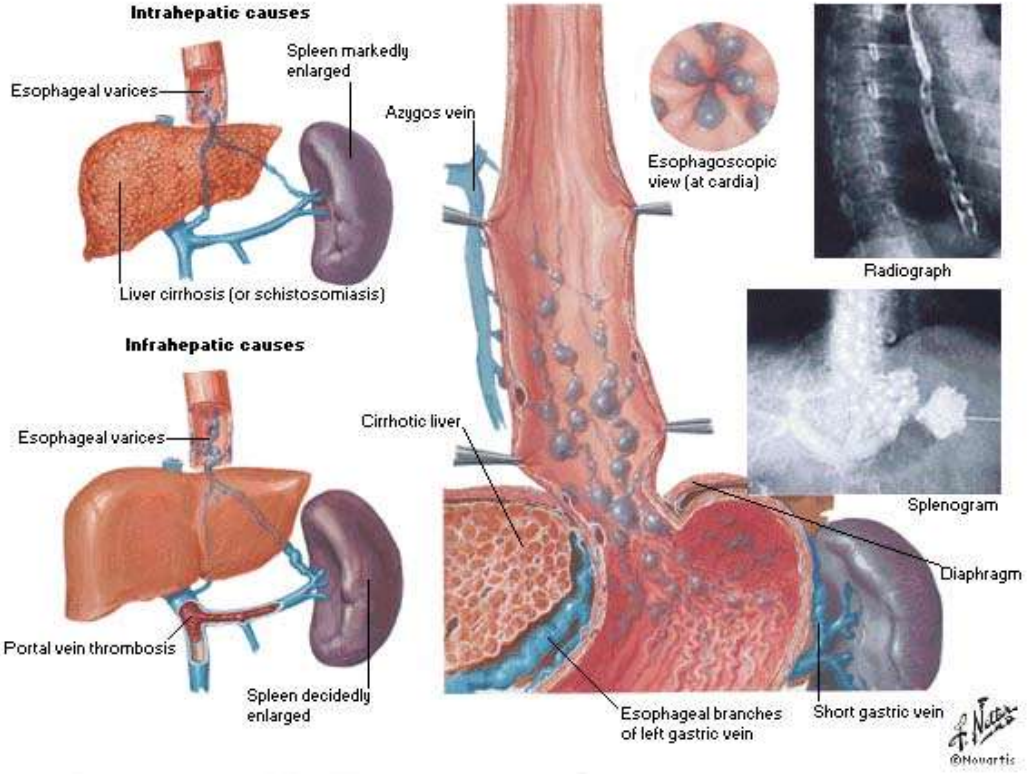


The hepatic portal vein, *vena portae*

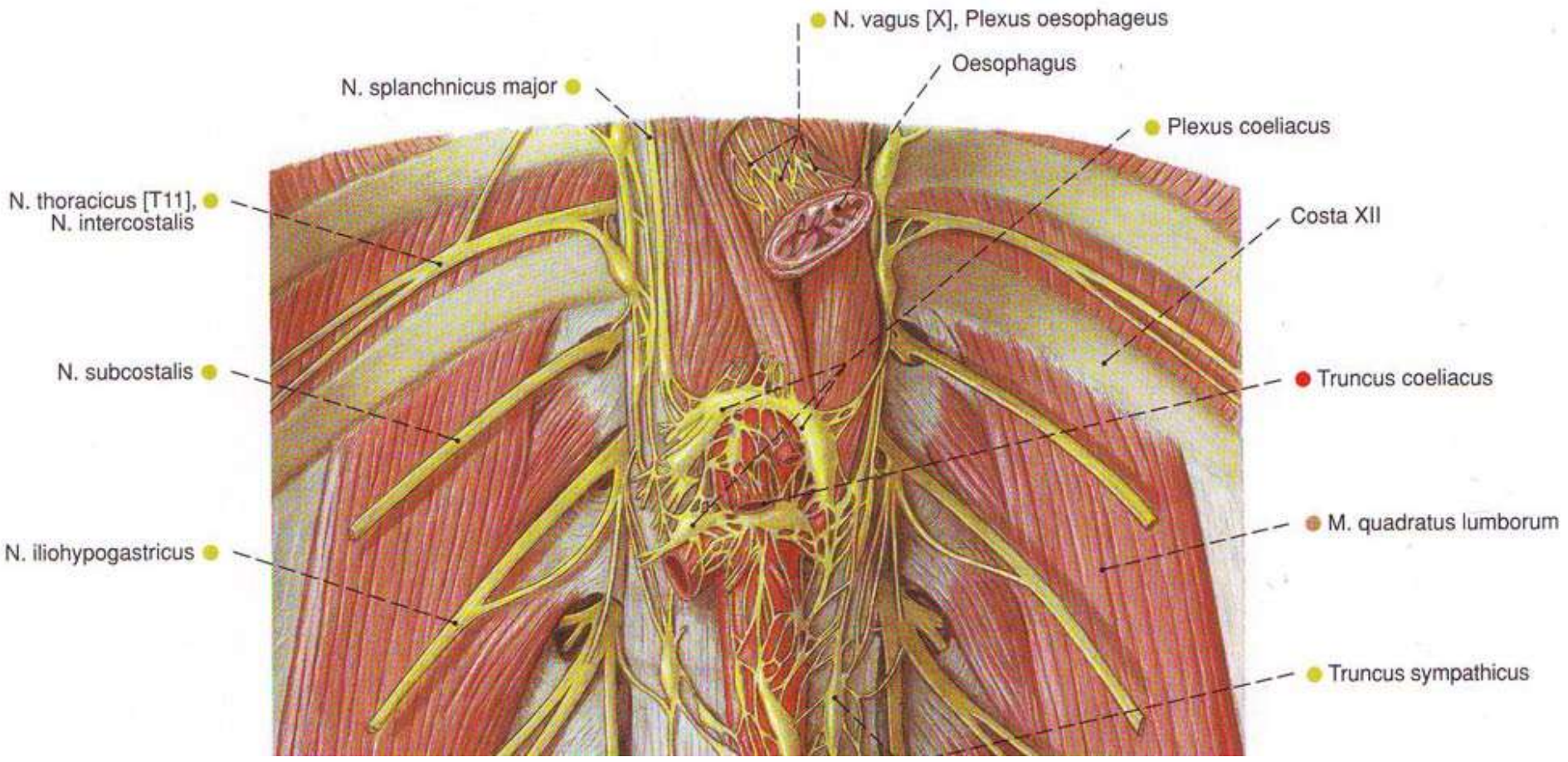


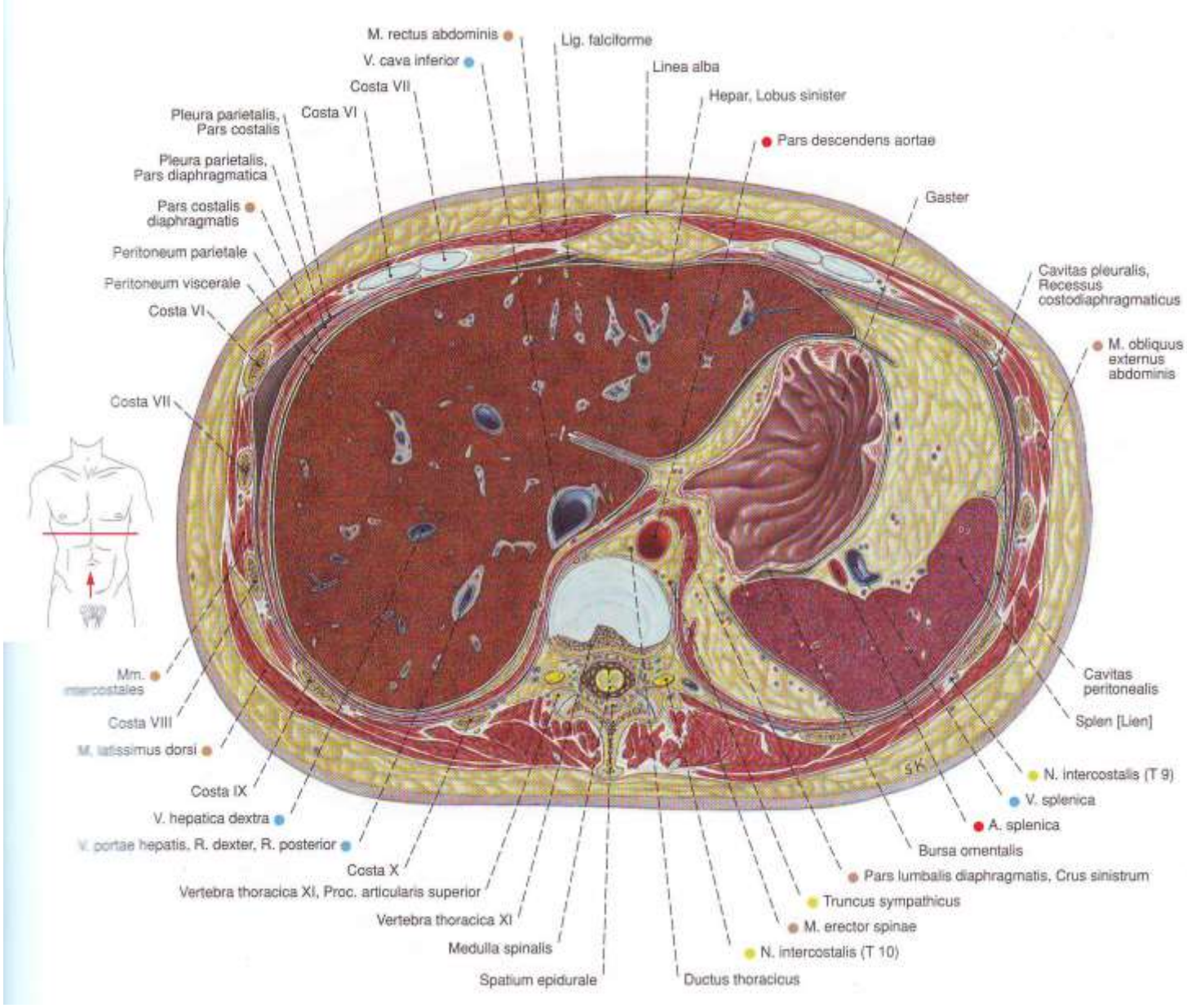
Clinical significance

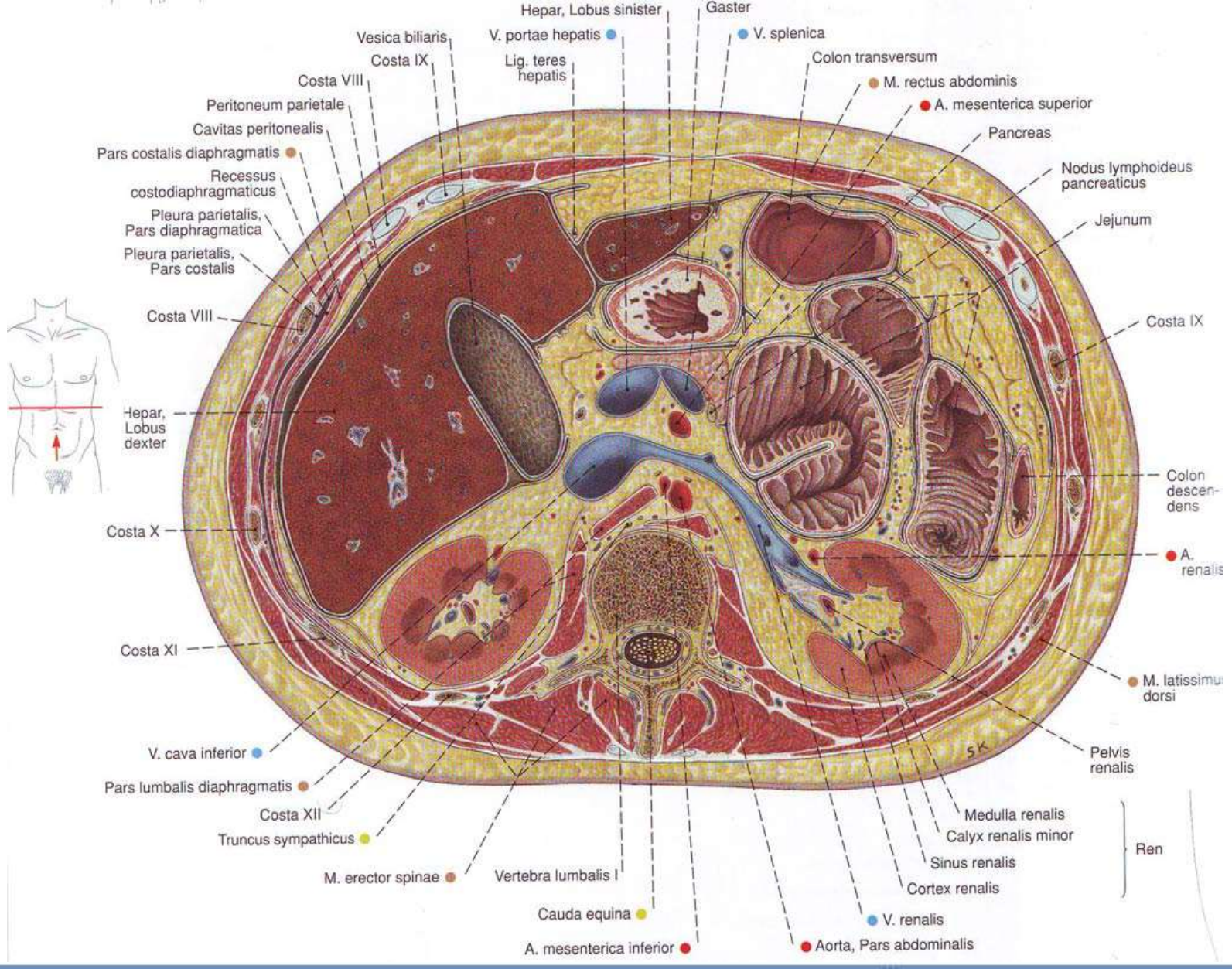
- when normal blood flow to the liver is blocked by a clot or scar tissue in the liver:
  - ✓ esophageal varices
  - ✓ *caput medusae*

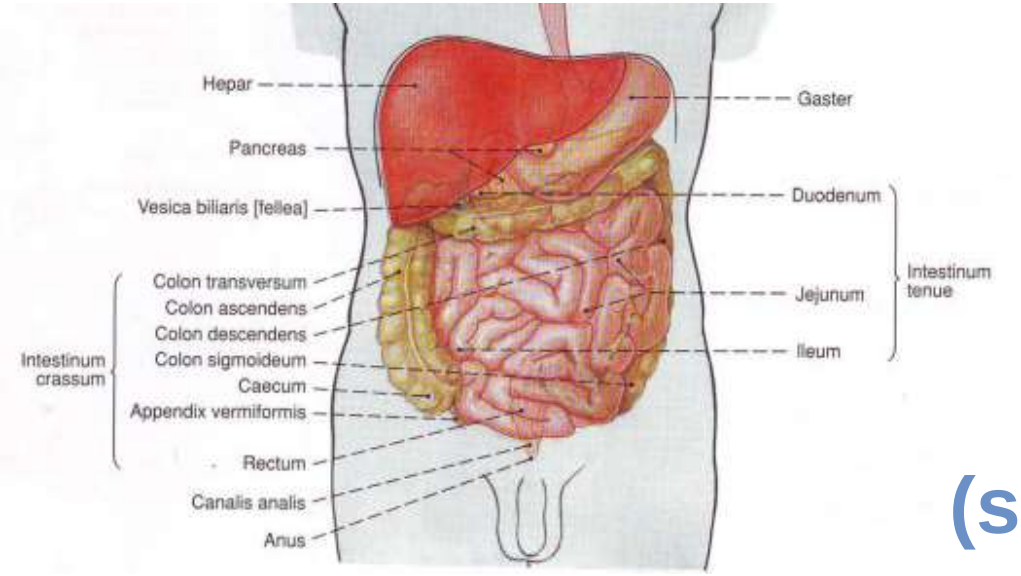


Nerve formations: *trunci vagales, plexus celiacus*




M. rectus abdominis
Lig. falciforme
V. cava inferior
Linea alba
Costa VII
Hepar, Lobus sinister
Pleura parietalis, Pars costalis
Costa VI
Pars descendens aortae
Pleura parietalis, Pars diaphragmatica
Gaster
Pars costalis diaphragmatis
Peritoneum parietale
Cavitas pleuralis, Recessus costodiaphragmaticus
Peritoneum viscerale
M. obliquus externus abdominis
Costa VI
Costa VII
Mm. intercostales
Cavitas peritonealis
Costa VIII
Splen [Lien]
M. latissimus dorsi
N. intercostalis (T 9)
Costa IX
V. splenica
V. hepatica dextra
A. splenica
V. portae hepatis, R. dexter, R. posterior
Bursa omentalis
Costa X
Pars lumbalis diaphragmatis, Crus sinistrum
Vertebra thoracica XI, Proc. articularis superior
Truncus sympathicus
Vertebra thoracica XI
M. erector spinae
Medulla spinalis
N. intercostalis (T 10)
Spatium epidurale
Ductus thoracicus


Hepar, Lobus sinister
Gaster
Vesica biliaris
V. portae hepatis
V. splenica
Costa IX
Lig. teres hepatis
Colon transversum
Costa VIII
M. rectus abdominis
Peritoneum parietale
A. mesenterica superior
Cavitas peritonealis
Pancreas
Pars costalis diaphragmatis
Nodus lymphoideus pancreaticus
Recessus costodiaphragmaticus
Jejunum
Pleura parietalis, Pars diaphragmatica
Pleura parietalis, Pars costalis
Costa VIII
Costa IX
Hepar, Lobus dexter
Colon descendens
Costa X
A. renalis
Costa XI
M. latissimus dorsi
V. cava inferior
Pelvis renalis
Pars lumbalis diaphragmatis
Costa XII
Medulla renalis
Truncus sympathicus
Calyx renalis minor
Ren
Sinus renalis
M. erector spinae
Vertebra lumbalis I
Cortex renalis
Cauda equina
V. renalis
A. mesenterica inferior
Aorta, Pars abdominalis



PERITONEAL CAVITY:

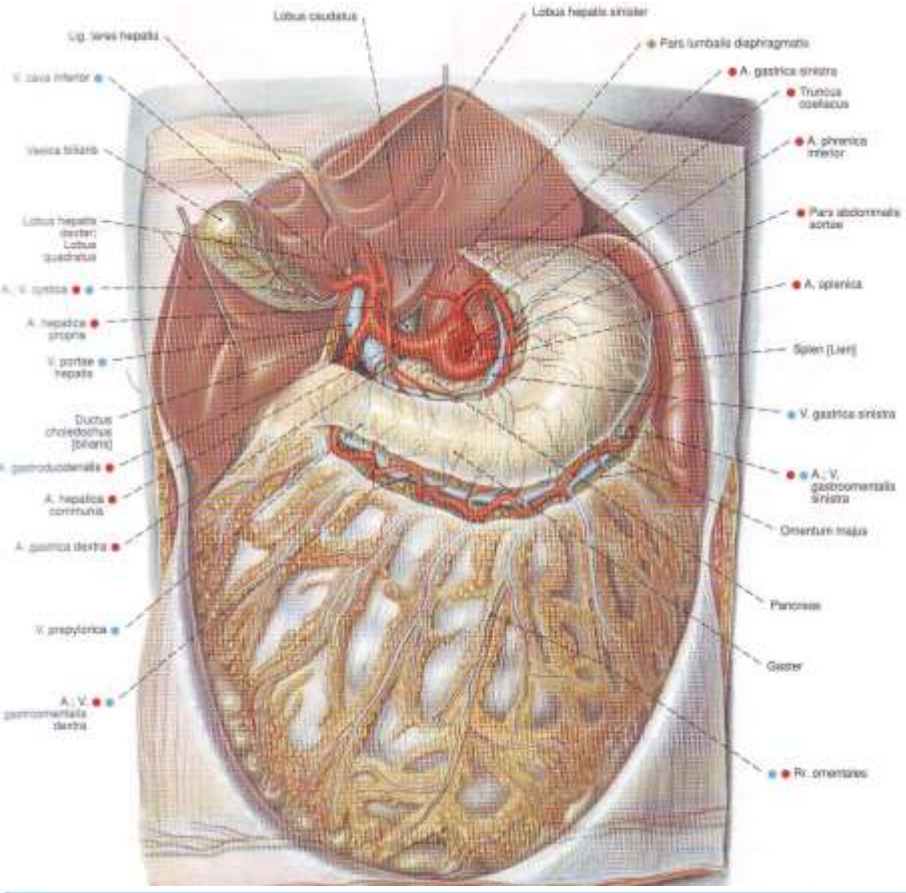
Lower section

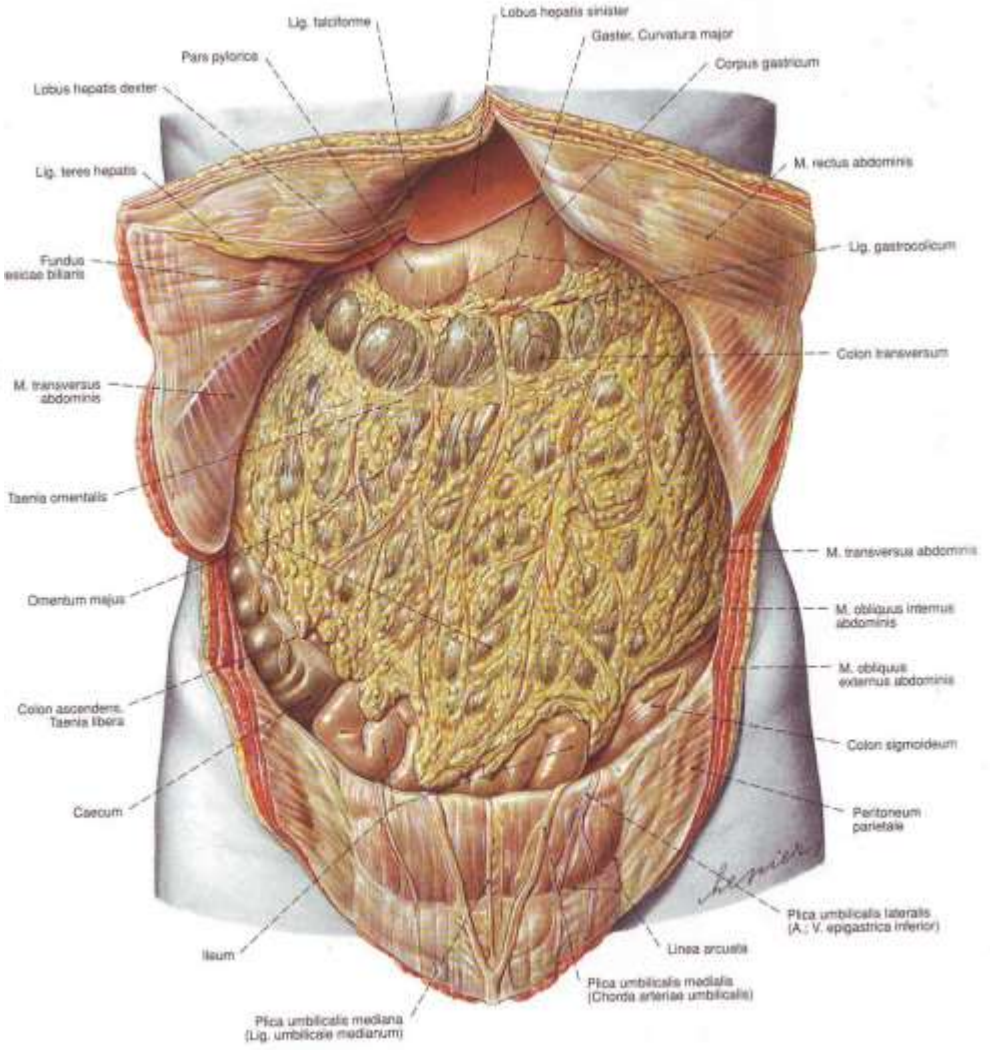
(subcolic compartment)

- Peritoneal formations
- Skeletotopy and syntopy of the organs and neurovascular bundles

Lower section: peritoneal formations

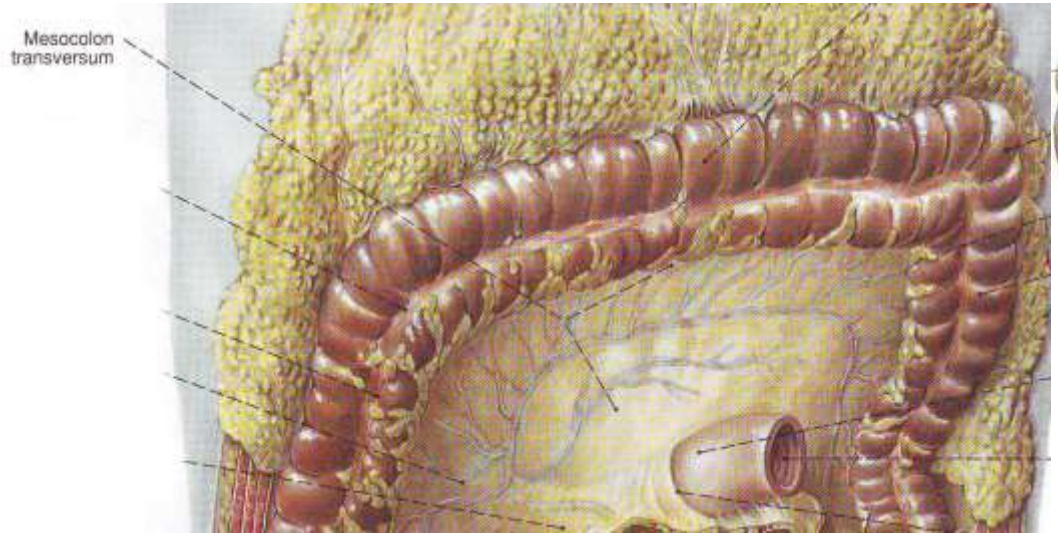
- *omentum majus*





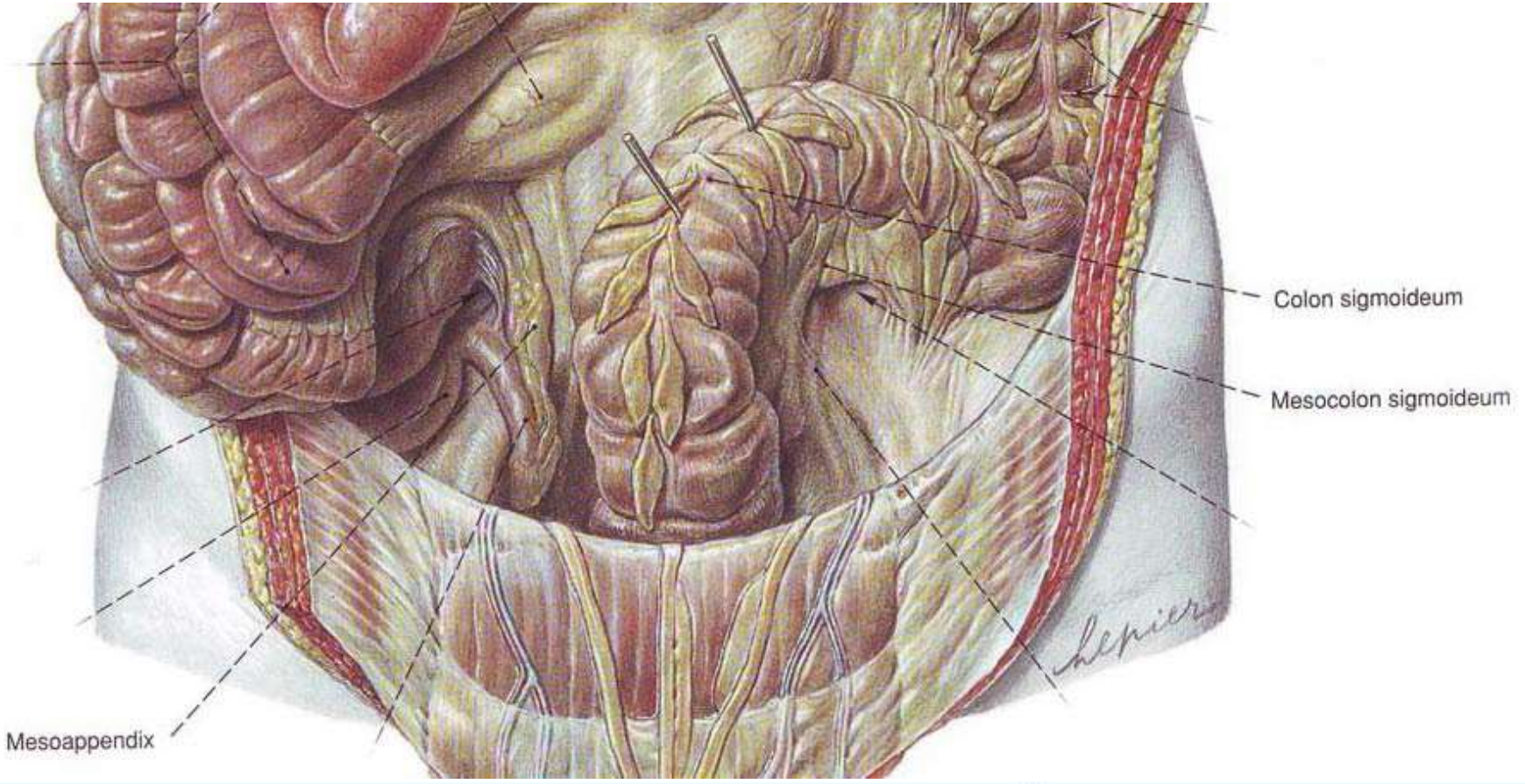
Lower section: peritoneal formations

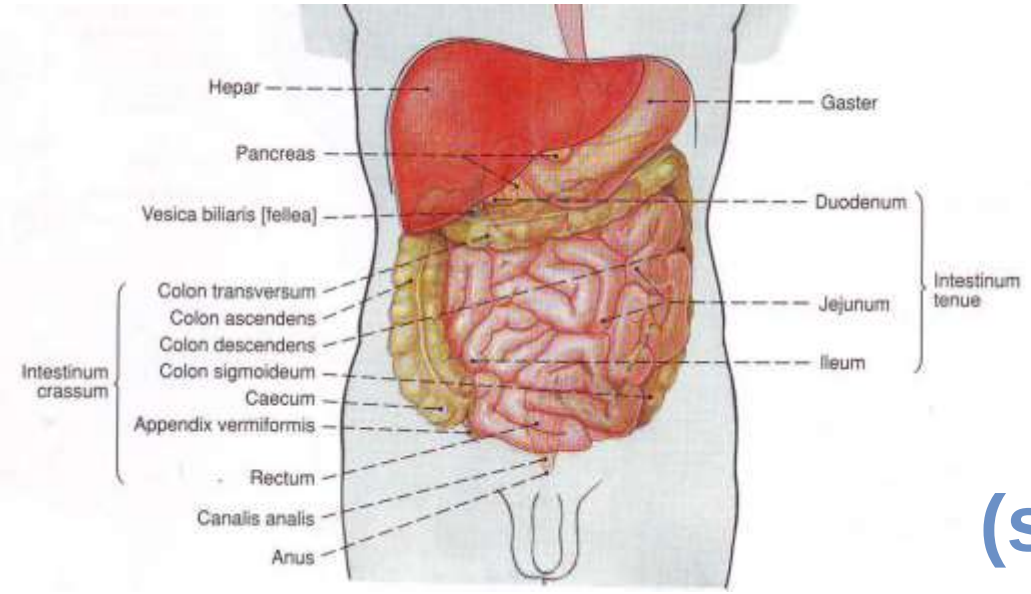
- *mesenterium*
- *mesocolon transversum*



Lower section: peritoneal formations

- *mesocolon sigmoideum*
- *mesoappendix*





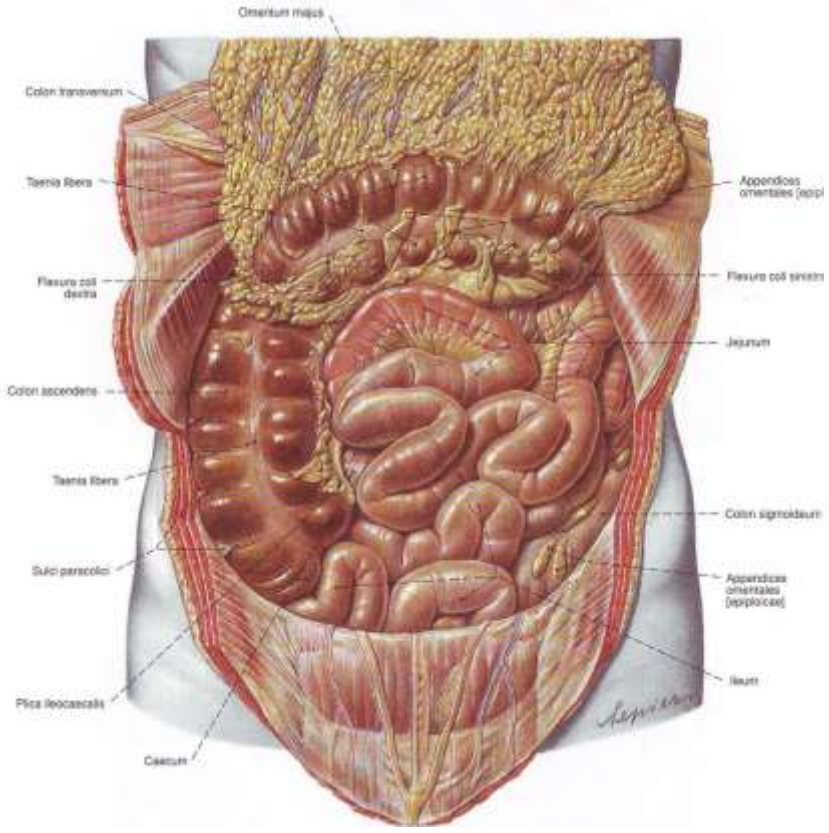
PERITONEAL CAVITY:

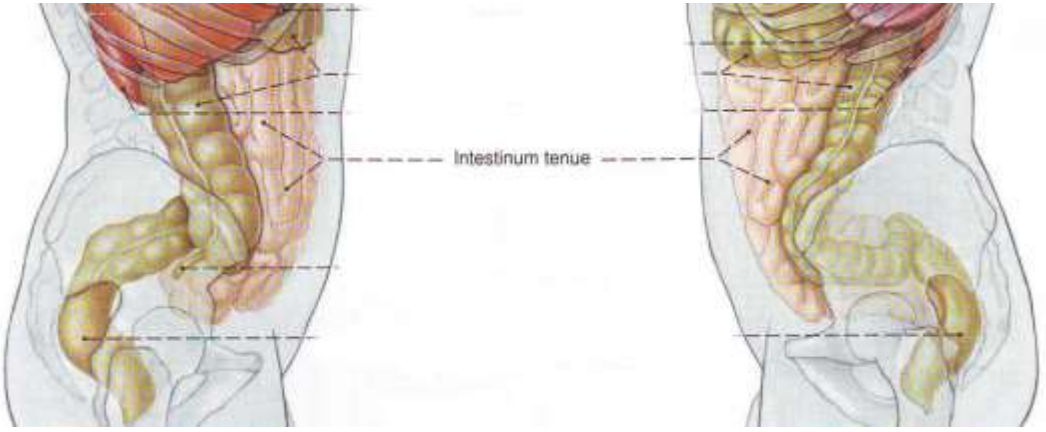
Lower section (subcolic compartment)

- Peritoneal formations
- Skeletotopy and somatotopy of the organs and neurovascular plexuses

Mesenteric small intestine
intestinum tenue mesenteriale

- skeletotopy: L_2-L_4

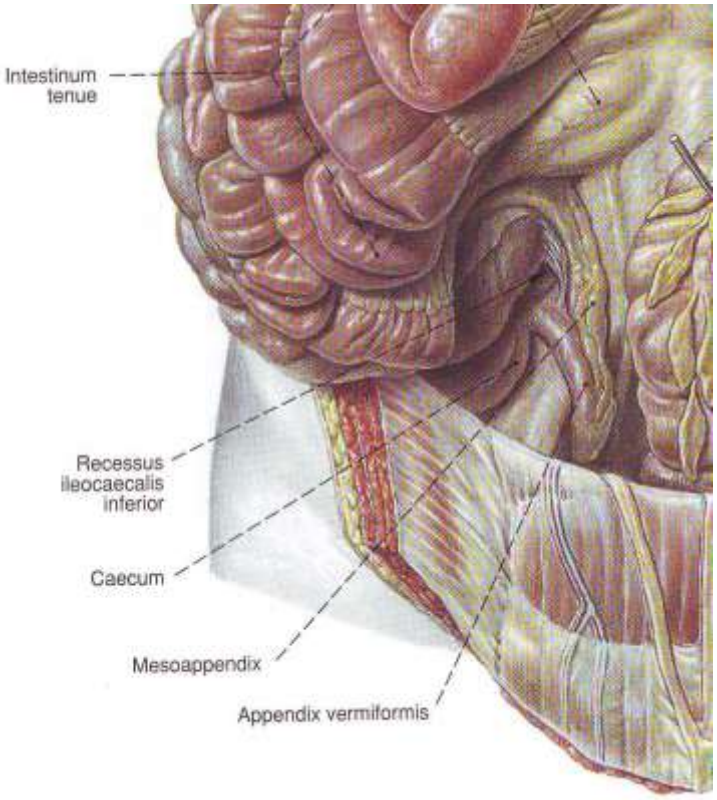


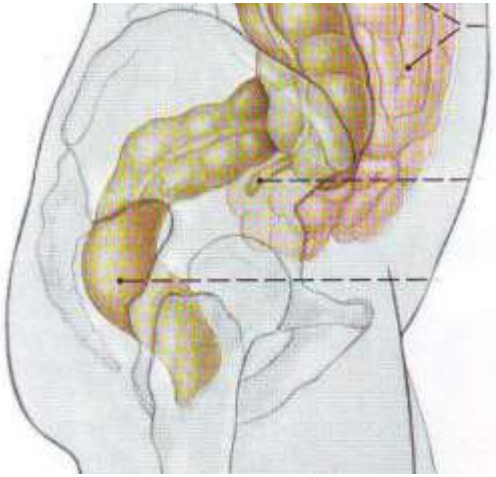


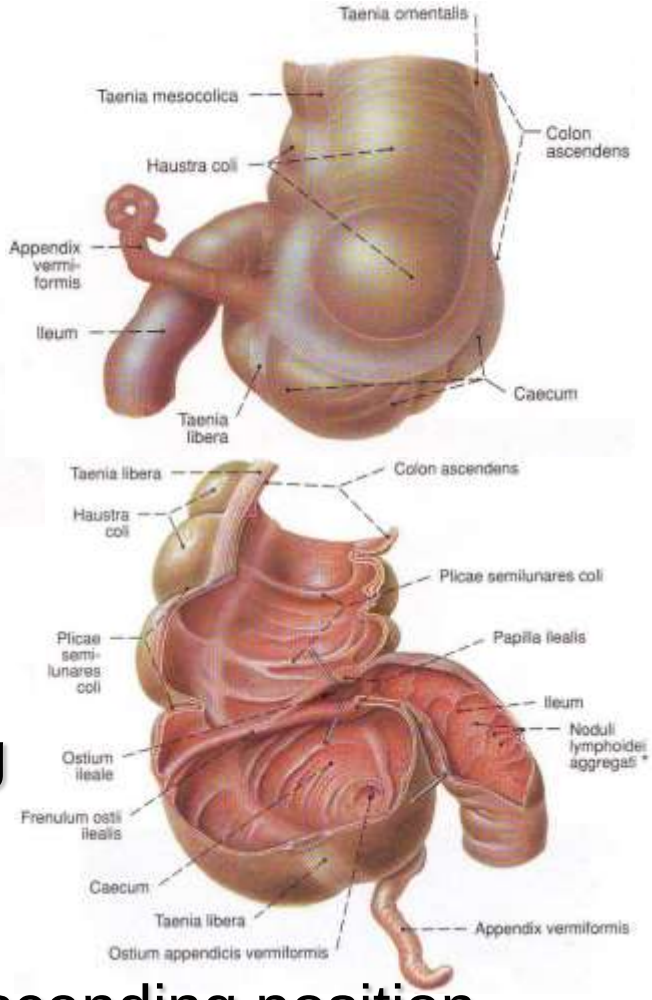
- syntopy: two layers of small bowel loops, intraperitoneally located

The caecum and appendix
cecum, appendix vermiformis

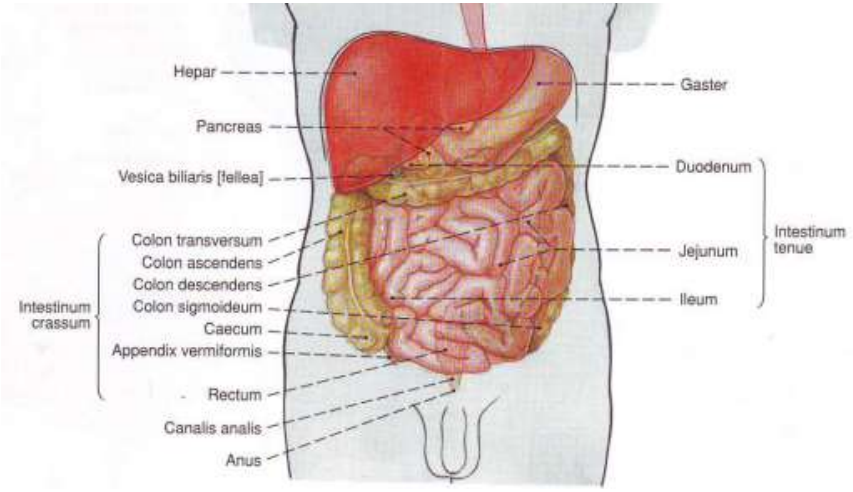
- skeletotopy:
  in the right iliac fossa







- syntopy:
  - ✓ descending
  - ✓ medial
  - ✓ lateral and
  - ✓ posterior ascending position



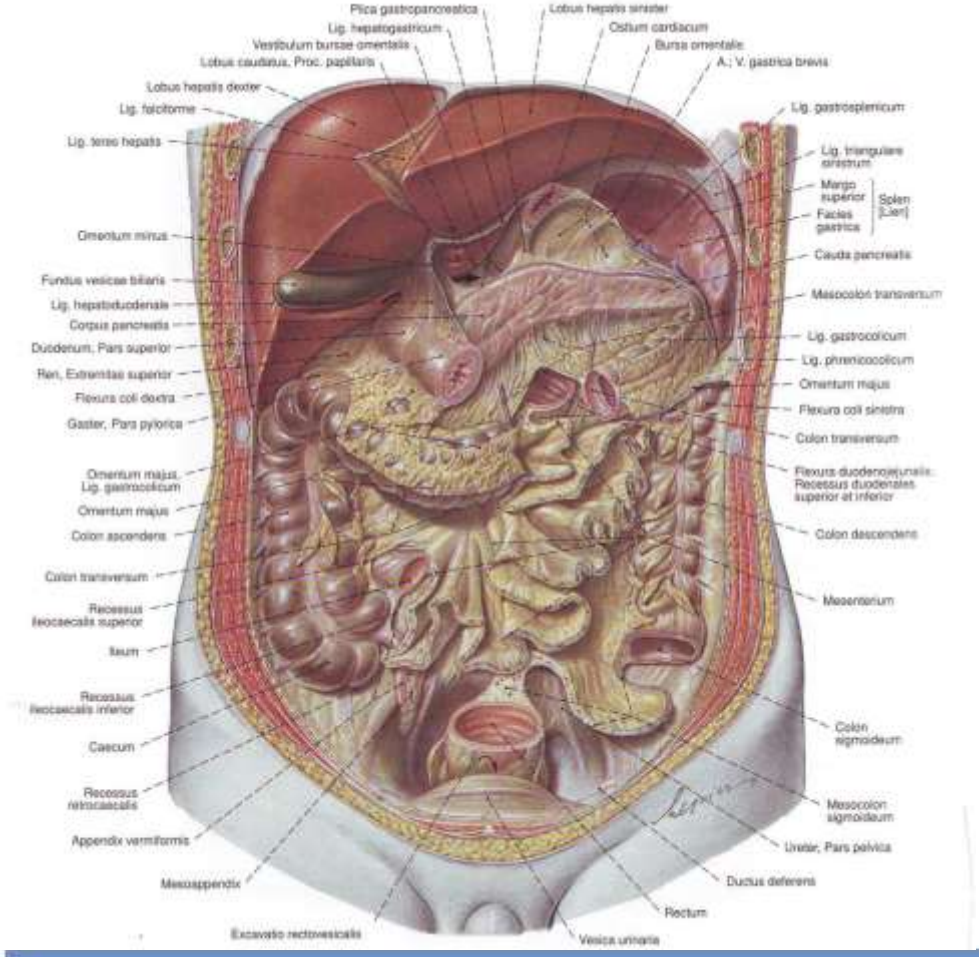
The colon

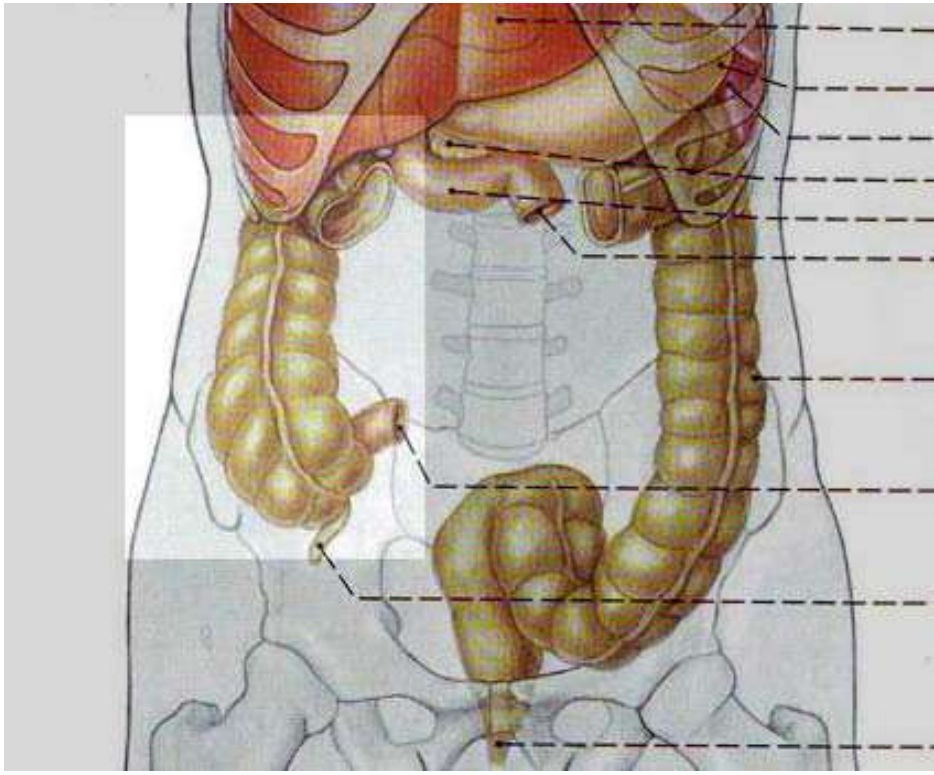
Colon

1. *Colon ascendens*
2. *Colon transversum*
3. *Colon descendens*
4. *Colon sigmoideum*

Colon ascendens

- skeletotopy:
  - ✓ *fossa iliaca dextra*
  - ✓ *canalis lateralis dexter*

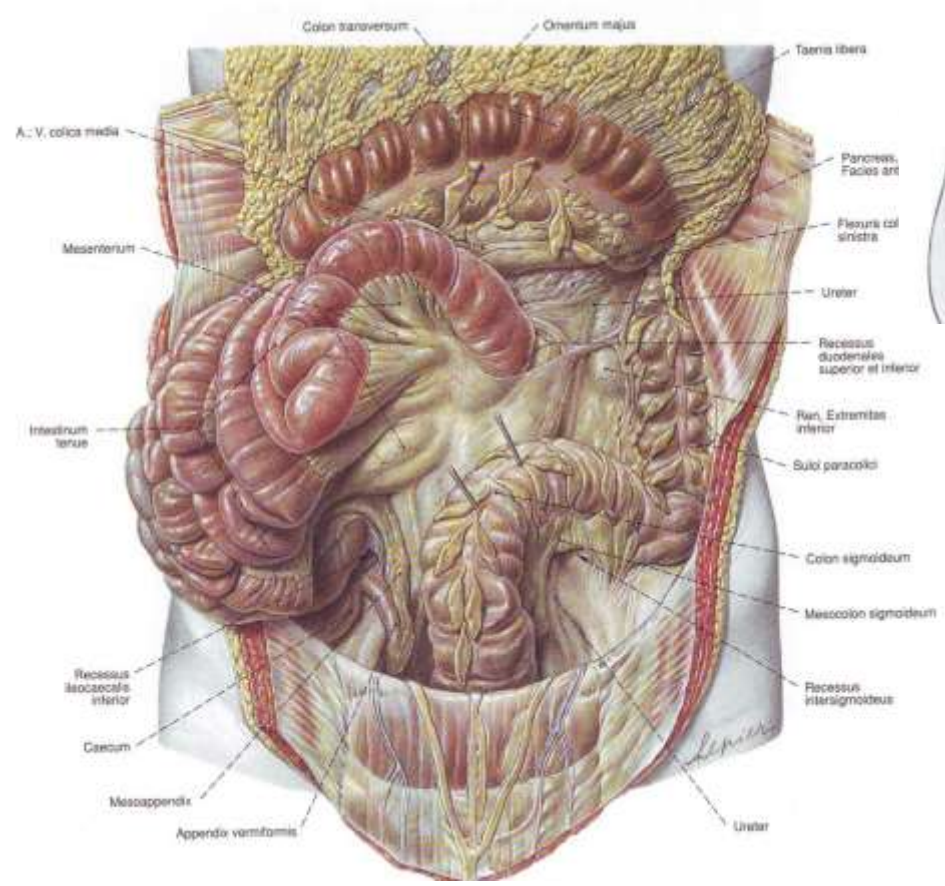


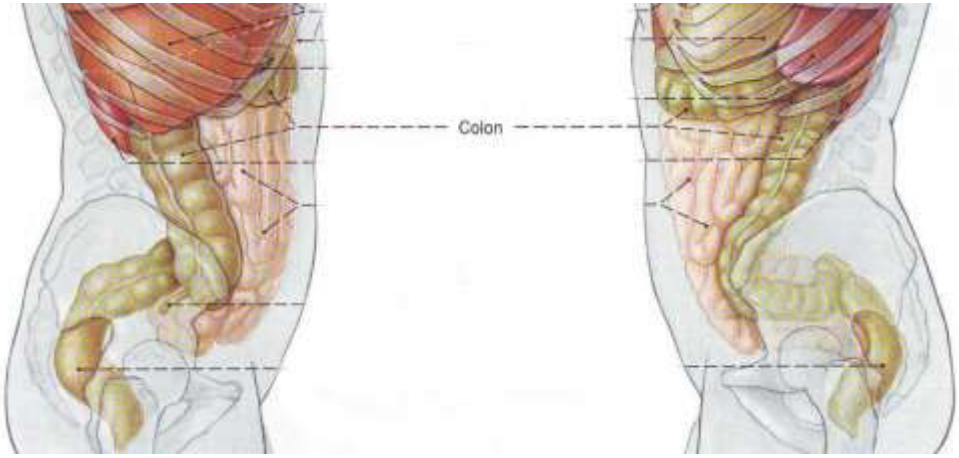


- syntopy:
  - ✓ mesoperitoneally

Colon transversum

- skeletotopy

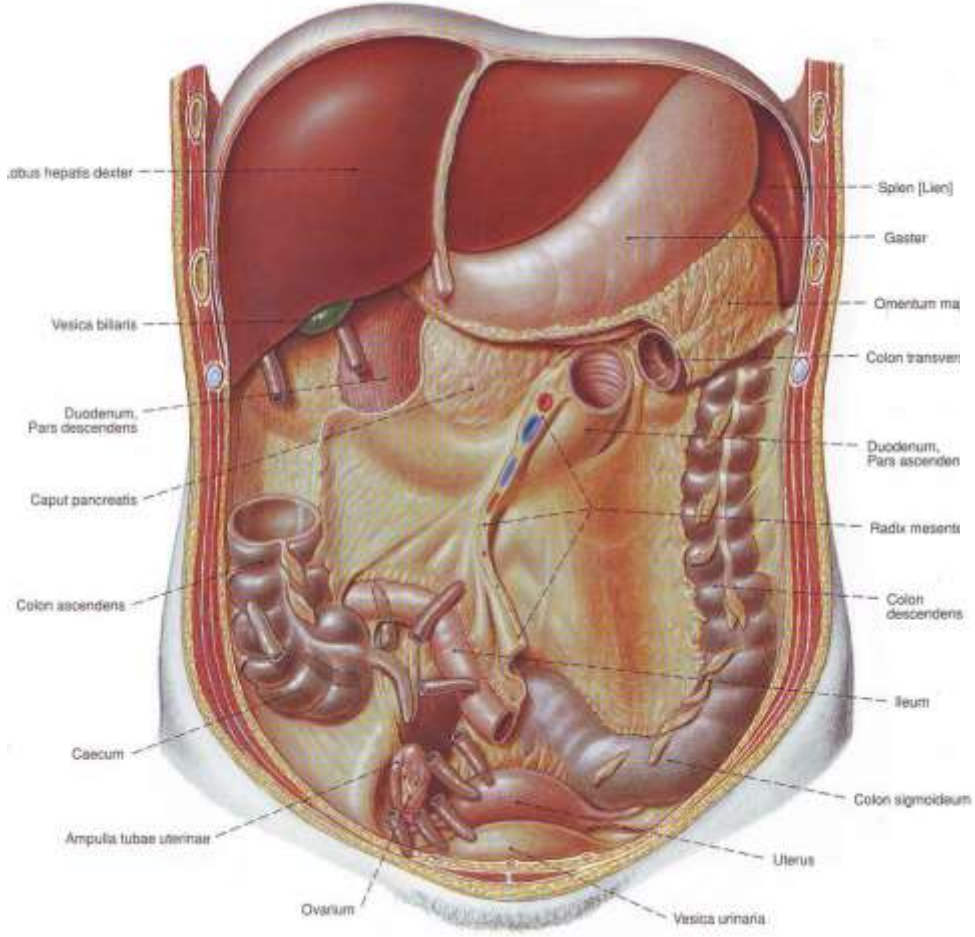


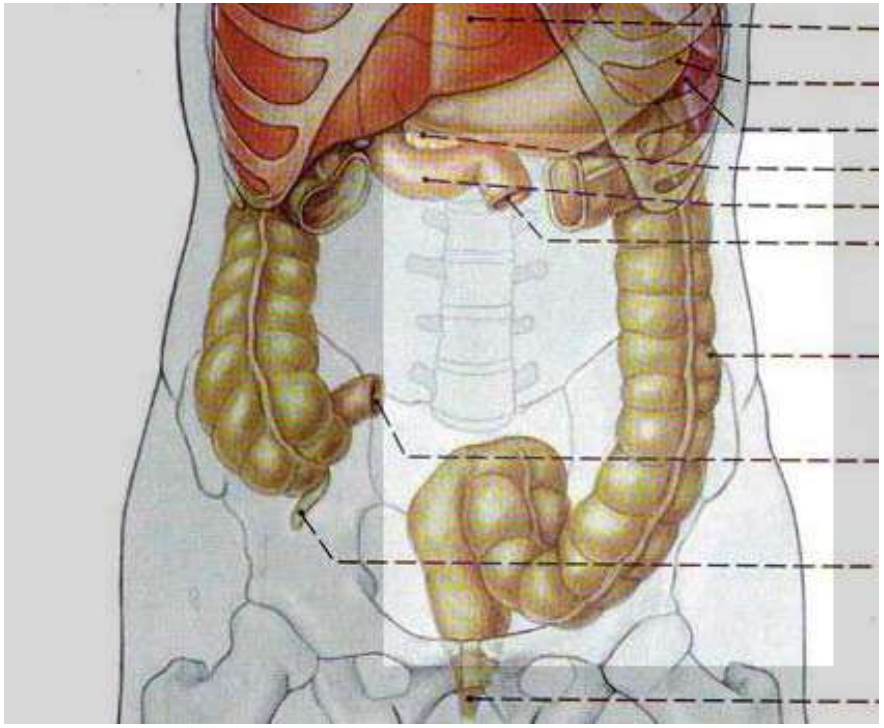


- syntopy:
  - ✓ intraperitoneally
  - ✓ border between the upper and lower abdominal compartment

Colon descendens

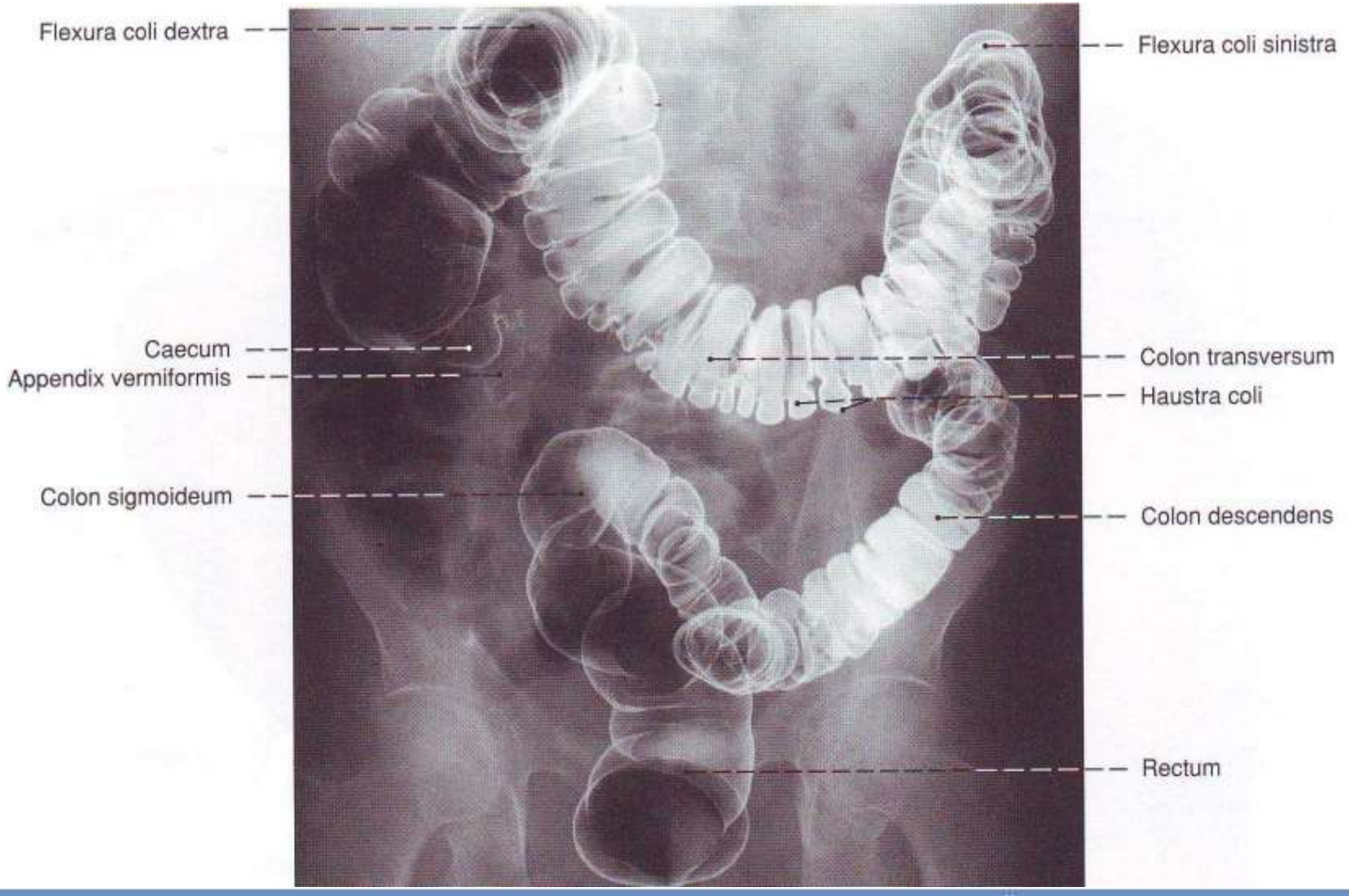
- skeletotopy:
  - ✓ *canalis lateralis sinister*

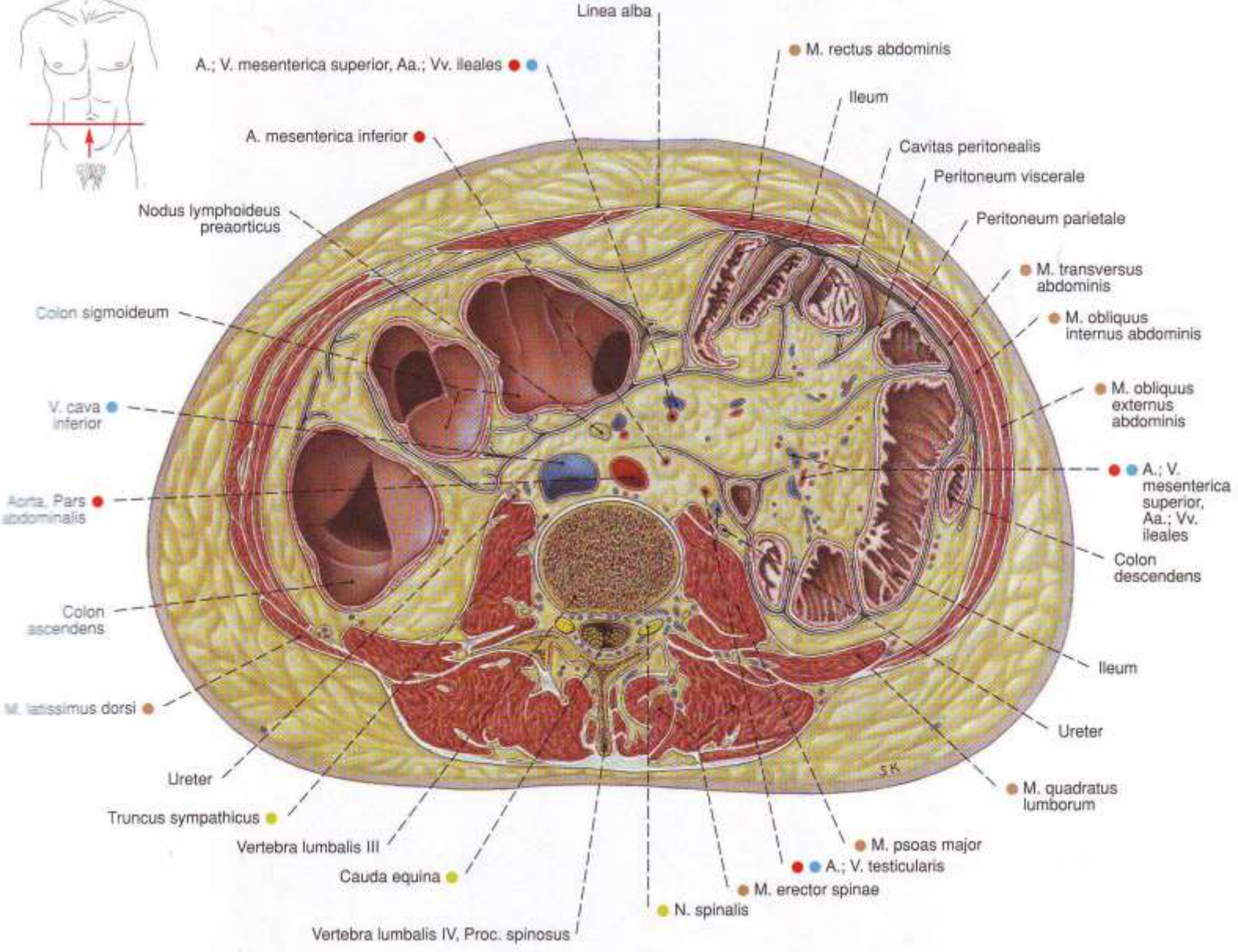




- syntopy:
  - ✓ mesoperitoneally

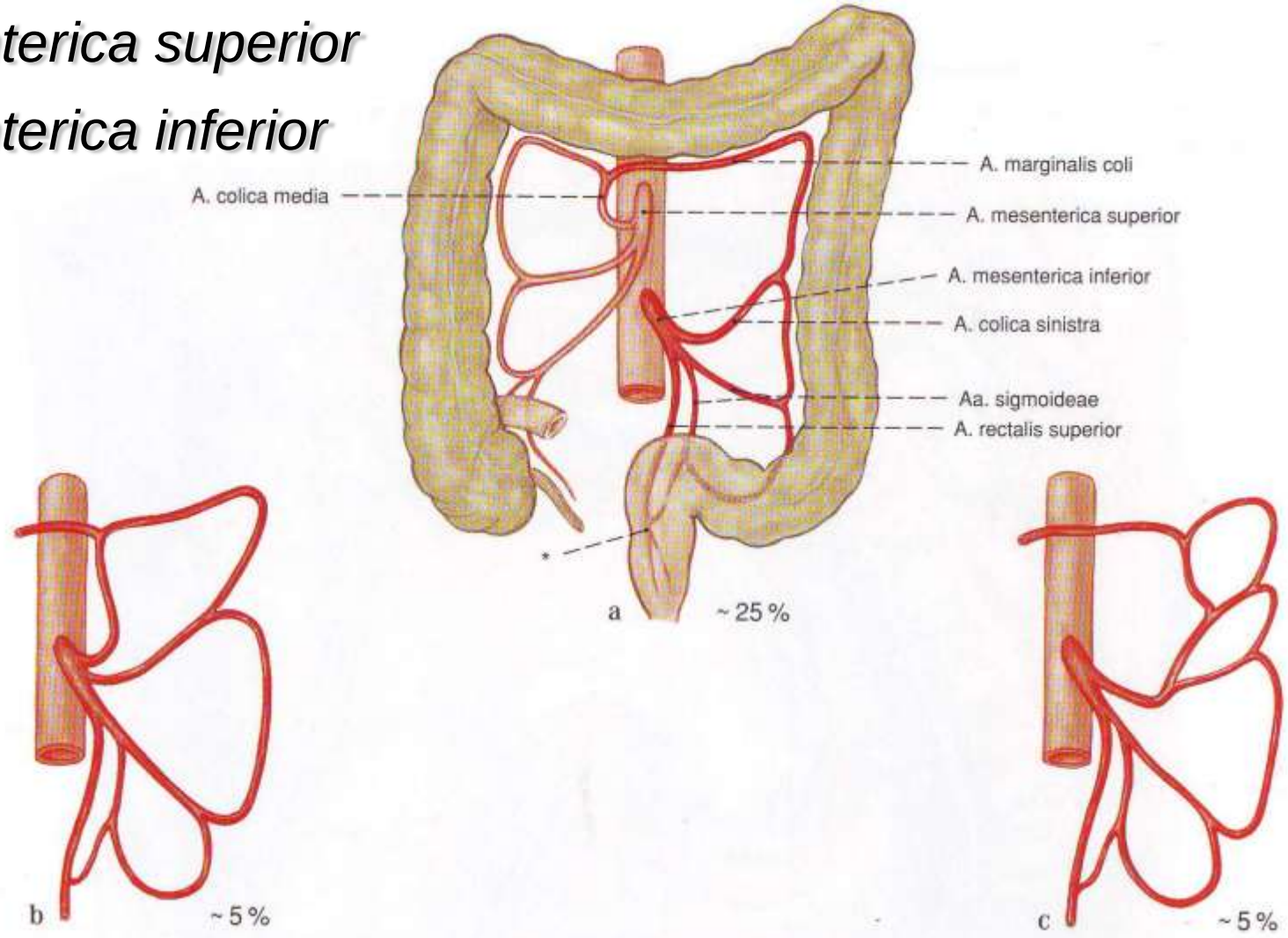
Colon: X-ray


Flexura coli dextra
Flexura coli sinistra
Caecum
Appendix vermiformis
Colon transversum
Haustra coli
Colon sigmoideum
Colon descendens
Rectum

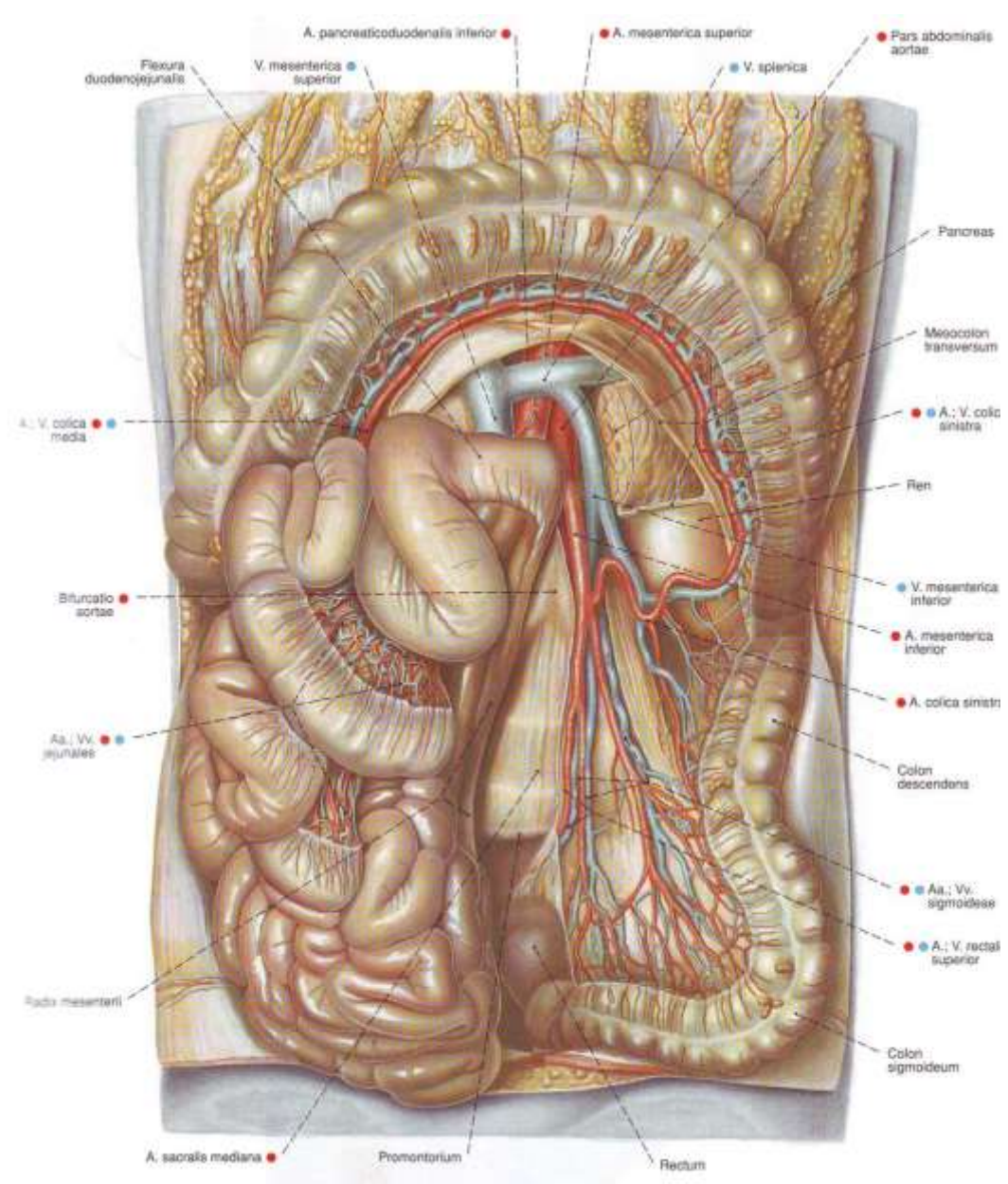

Linea alba
A.; V. mesenterica superior, Aa.; Vv. ileales
M. rectus abdominis
Ileum
A. mesenterica inferior
Cavitas peritonealis
Peritoneum viscerale
Nodus lymphoideus preaorticus
Peritoneum parietale
M. transversus abdominis
Colon sigmoideum
M. obliquus internus abdominis
V. cava inferior
M. obliquus externus abdominis
A.; V. mesenterica superior, Aa.; Vv. ileales
Aorta, Pars abdominalis
Colon descendens
Colon ascendens
Ileum
M. latissimus dorsi
Ureter
Ureter
M. quadratus lumborum
Truncus sympathicus
Vertebra lumbalis III
M. psoas major
A.; V. testicularis
Cauda equina
M. erector spinae
N. spinalis
Vertebra lumbalis IV, Proc. spinosus

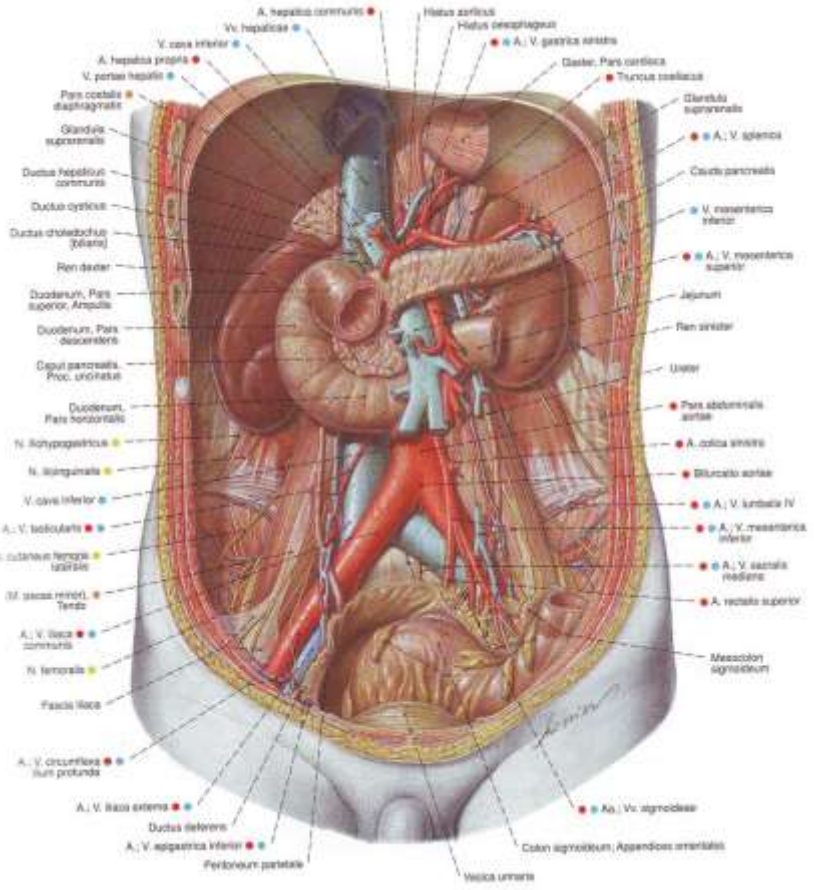
Colon: blood supply

- *a. mesenterica superior*
- *a. mesenterica inferior*

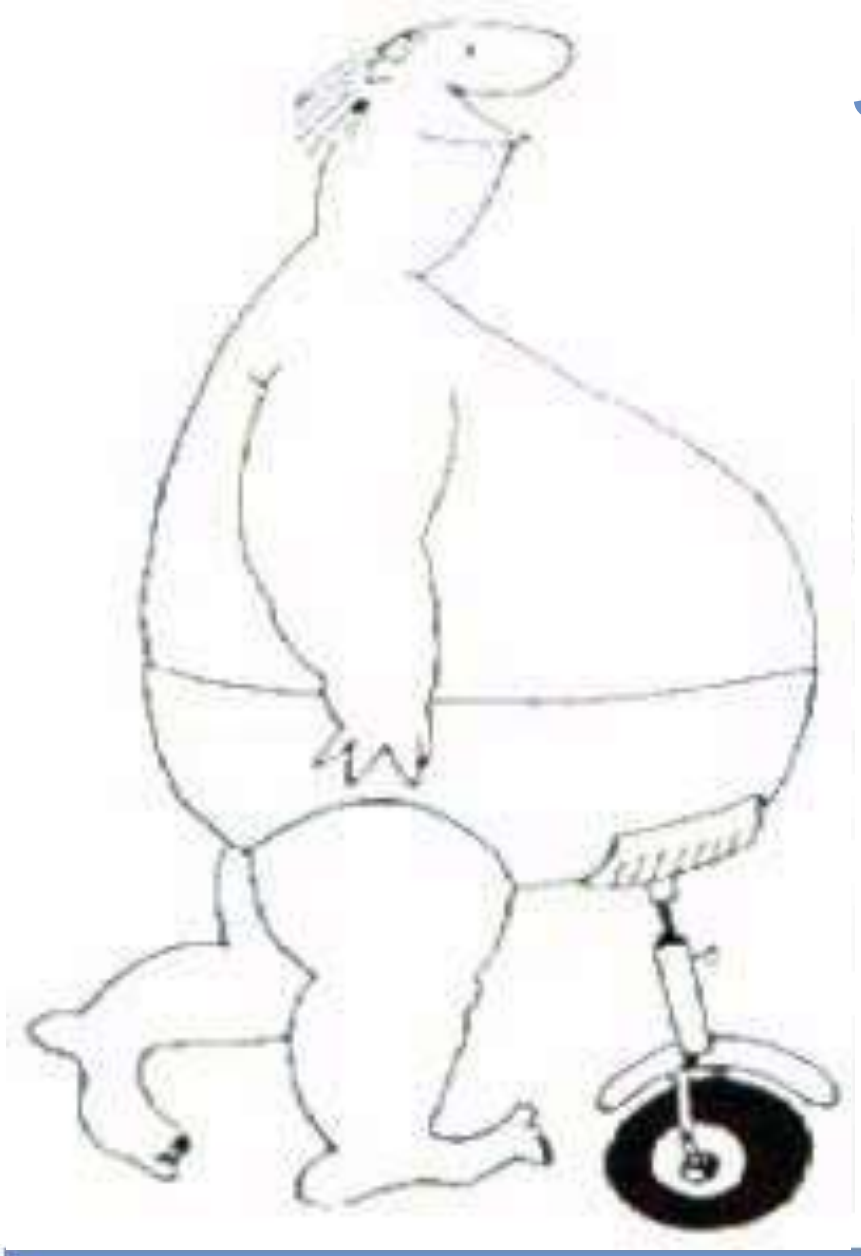


Venous drainage





Sixpack vs. Bierbauch



Thank you …