

# **CLINICAL ANATOMY**

## **ABDOMEN**

Inst. of Anatomy, 1st and 2nd Medical Faculty  
3rd Surgical Clinic, 1st Medical Faculty

# **Surgical anatomy**

## **Approaches to the peritoneal cavity**

**ANTERIOR ABDOMINAL WALL**

# **ABDOMINAL WALLS**

- Superior – diaphragm
- Posterior – m. psoas major, m. quadratus lumborum
- Inferior – pelvic floor (m. levator ani, m. coccygeus)
- Anterior and lateral – oblique muscles and m. rectus abdominis
- Internal surface of muscles – covered by transversal fascia and by peritoneum

## **Abdominal cavity v. peritoneal cavity**

- **Abdominal cavity** = peritoneal cavity + retroperitoneal (praoperitoneal space)

## **Projections of organs**

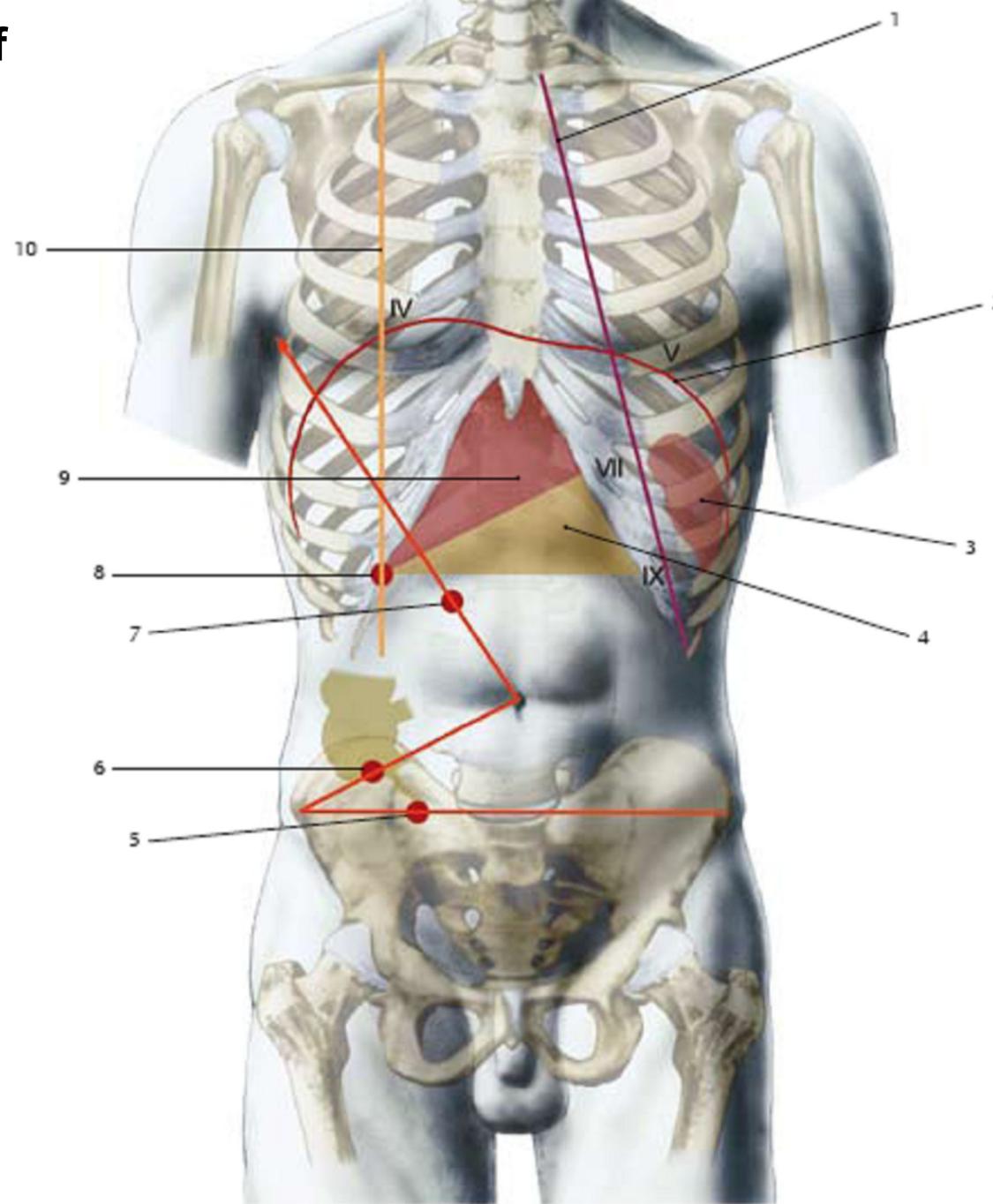
**Points :**

**Murphy**

**Desjardins**

**McBurney**

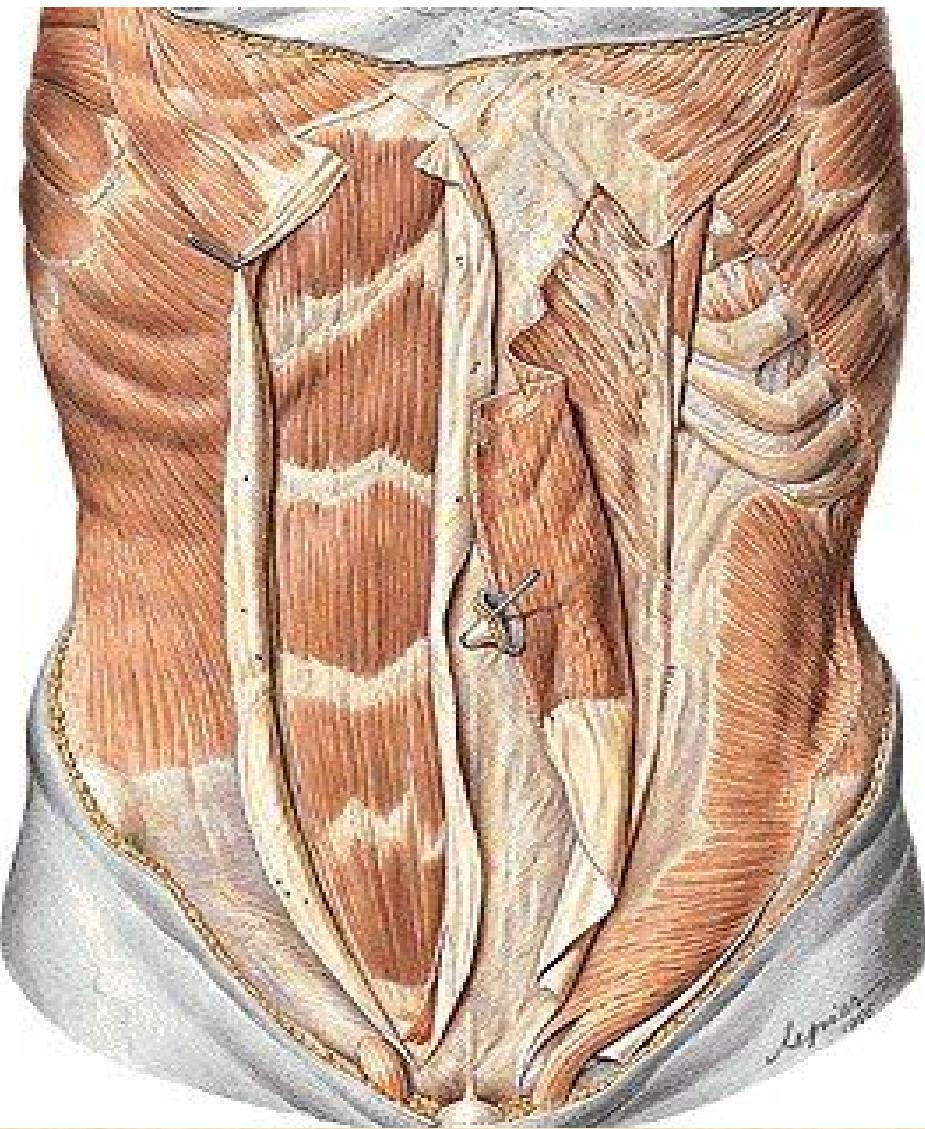
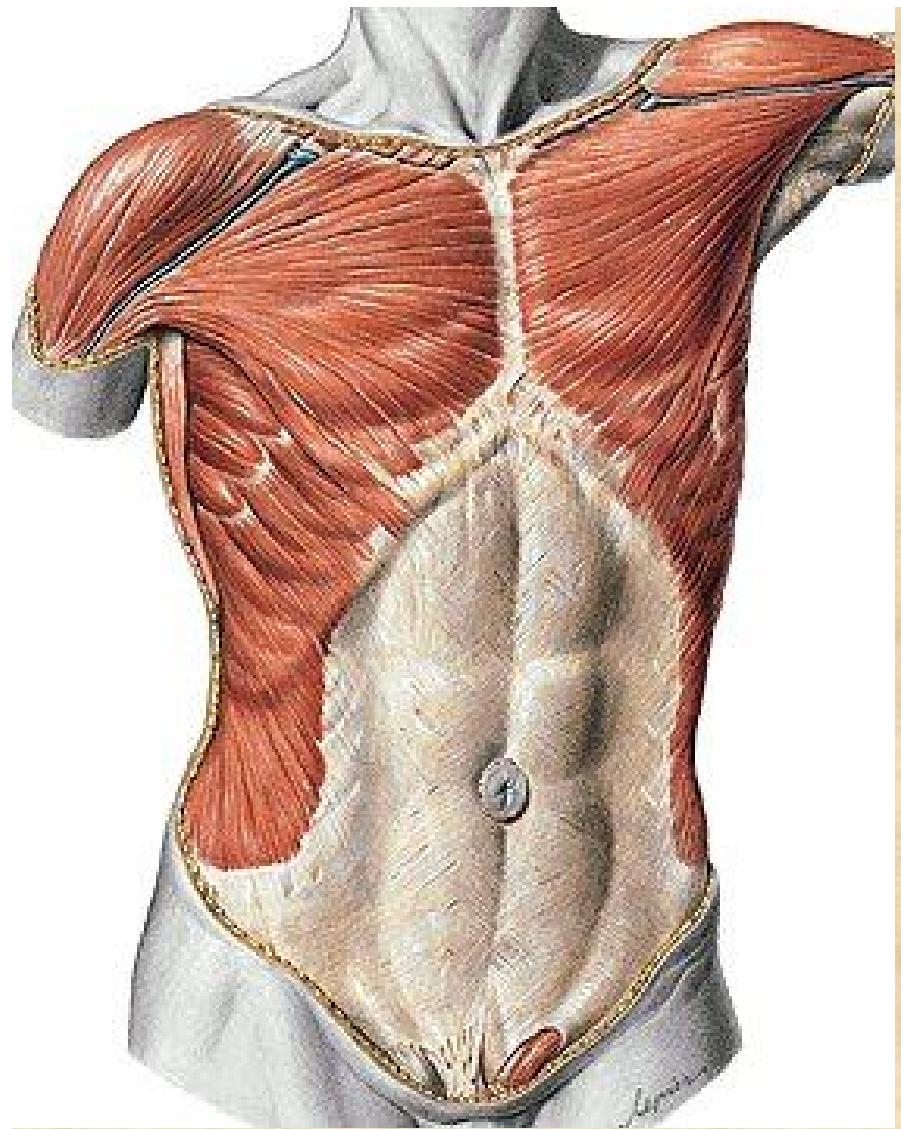
**Lanz**



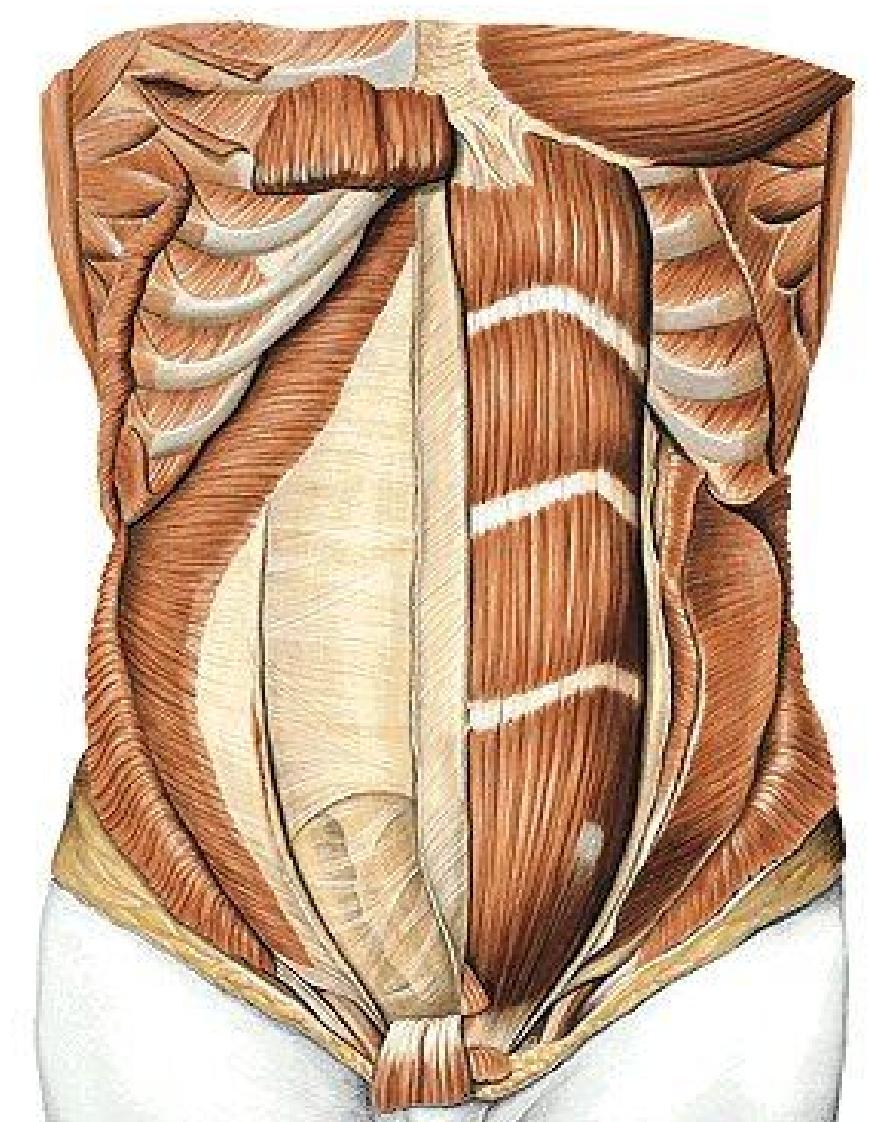
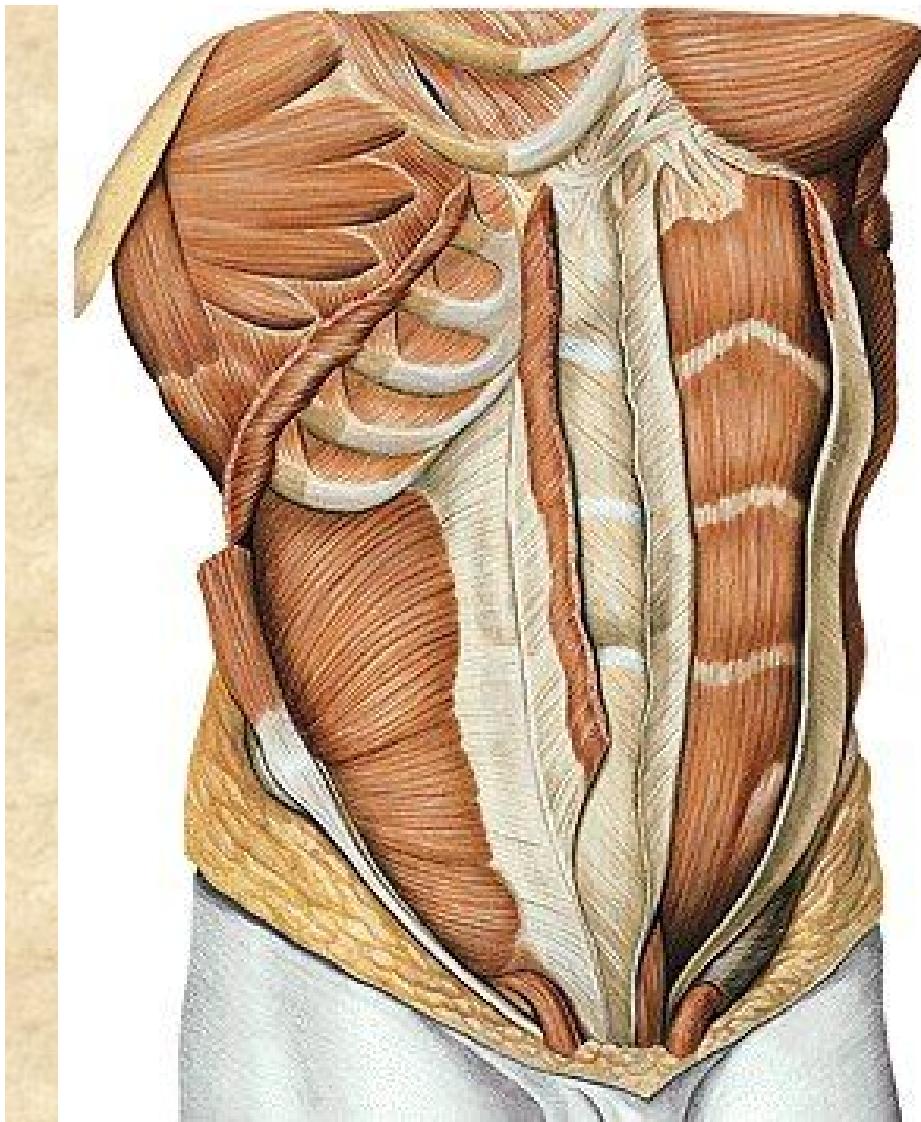
# **ANTERIOR ABDOMINAL WALL**

## **LINEA ALBA**

- Cord of connective tissue
- Extend – sternum (xyphoid process) – symphysis, pubic bones
- Aponeurotic parts of oblique muscles attach to the linea alba at the midline
- One of the surgical approaches to the peritoneal cavity (midline incision)

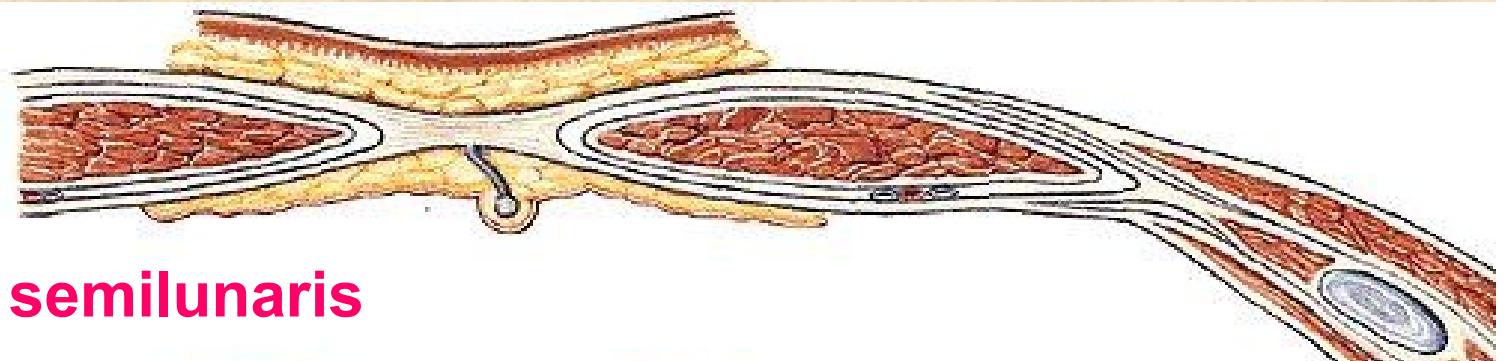


**m. rectus abdominis, vagina mm. recti abdominis  
linea alba, m. obliquus abdominis ext.**

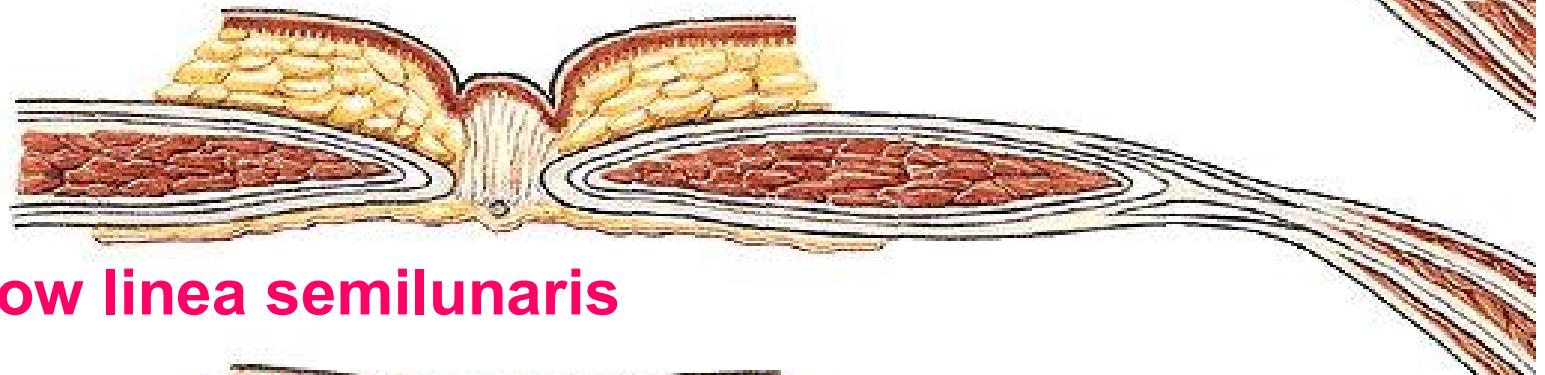


**m. obliquus abdominis internus**  
**m. transversus abdominis, linea semilunaris**

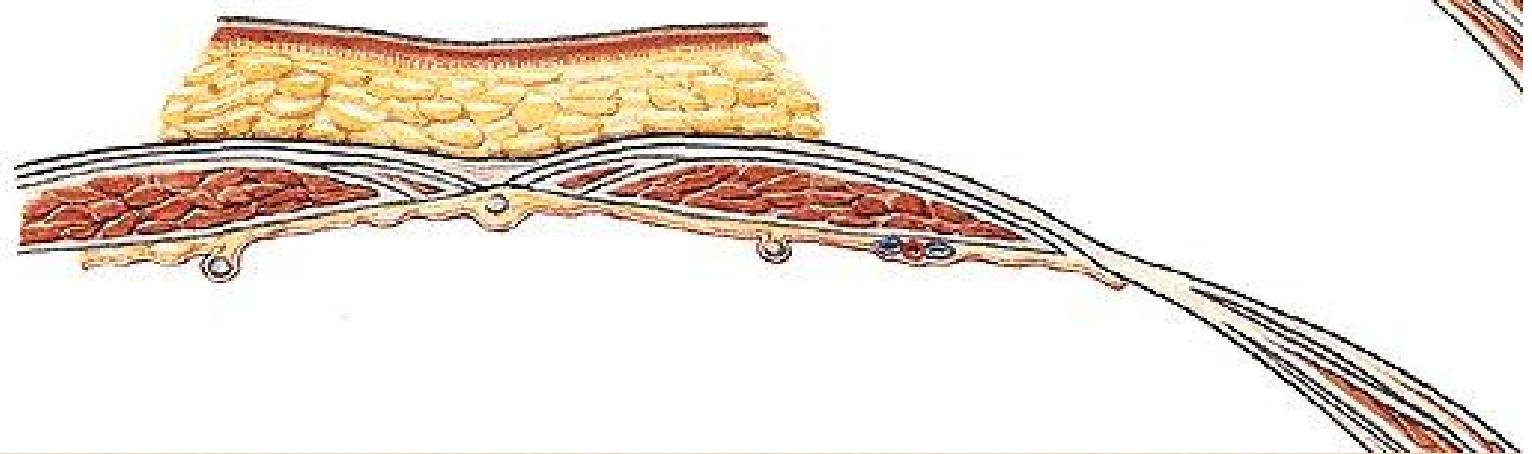
## Structure of the vagina mm. recti abdominis



Above linea semilunaris



Below linea semilunaris



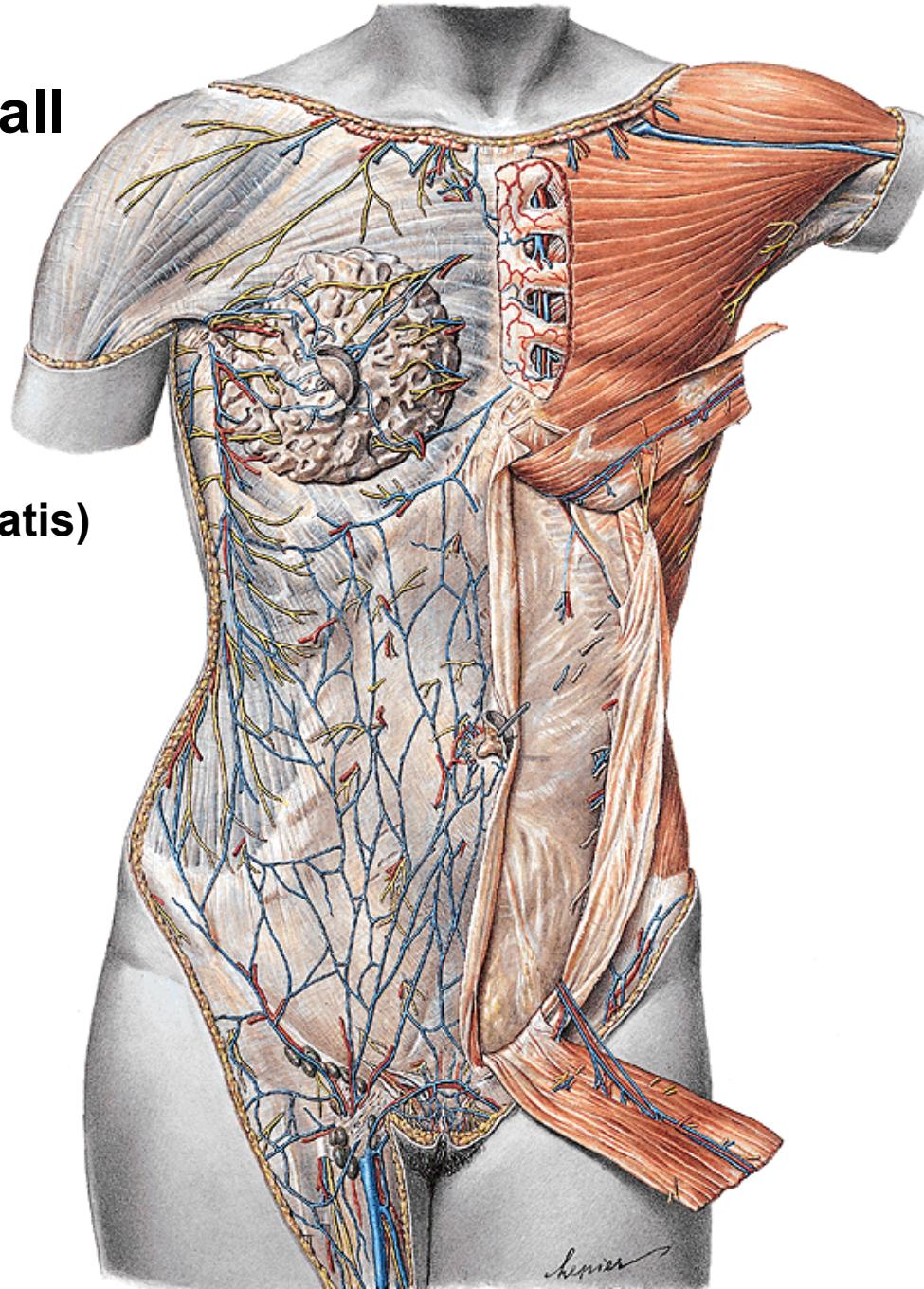
## **Superficial veins of the thoracic and abdominal wall**

v. thoracica lateralis  
v. thoracoepigastrica

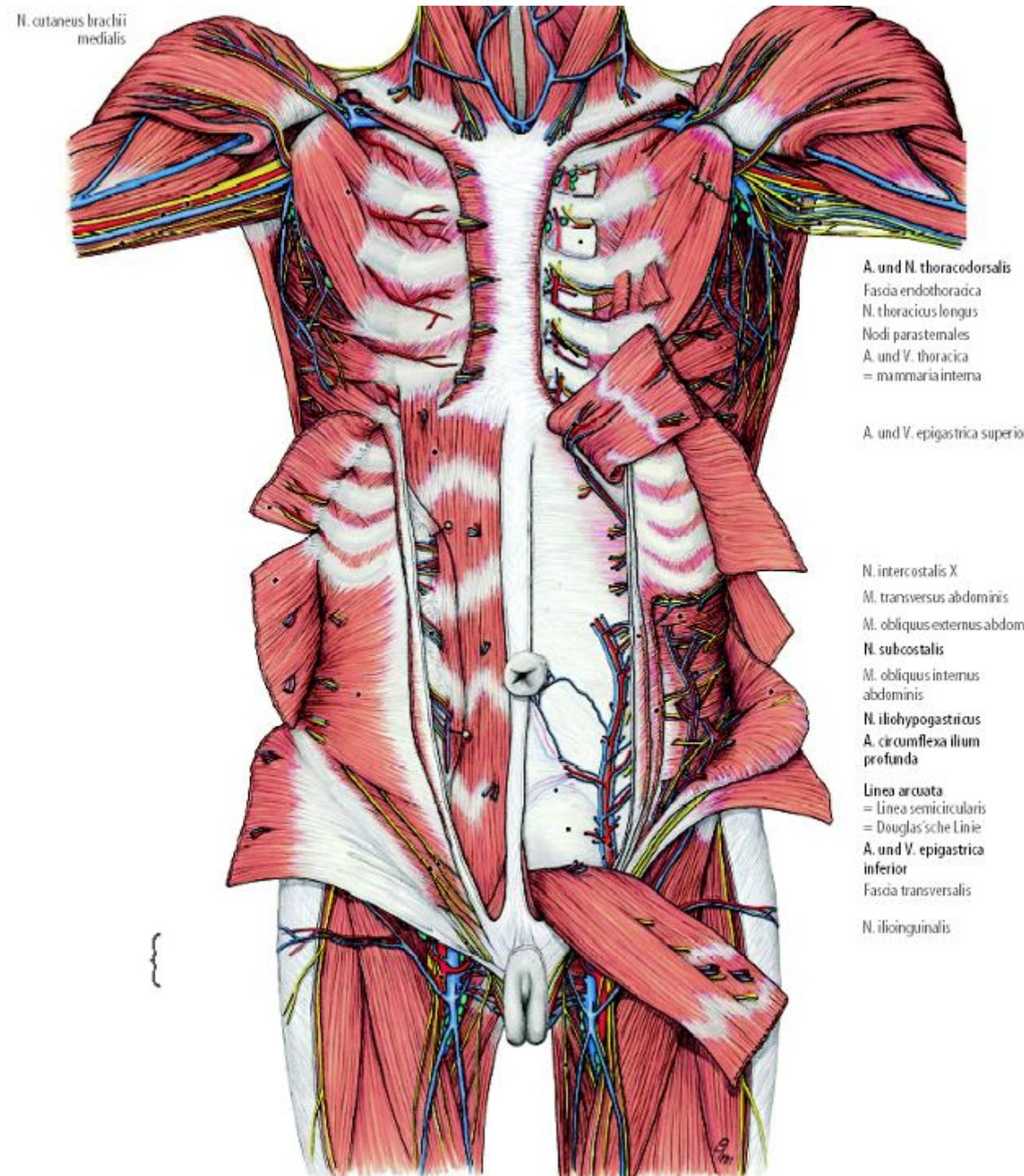
**vv. Paraumbilicales (lig. Teres hepatis)**

v. epigastrica superficialis  
v. circumflexa ilium spfc.

**Cavo-caval anastomosis**  
**Porto-caval anastomosis**  
**(caput medusae)**



**aa. intercostales**  
**a. epigastrica sup.**  
**a. epigastrica inf.**



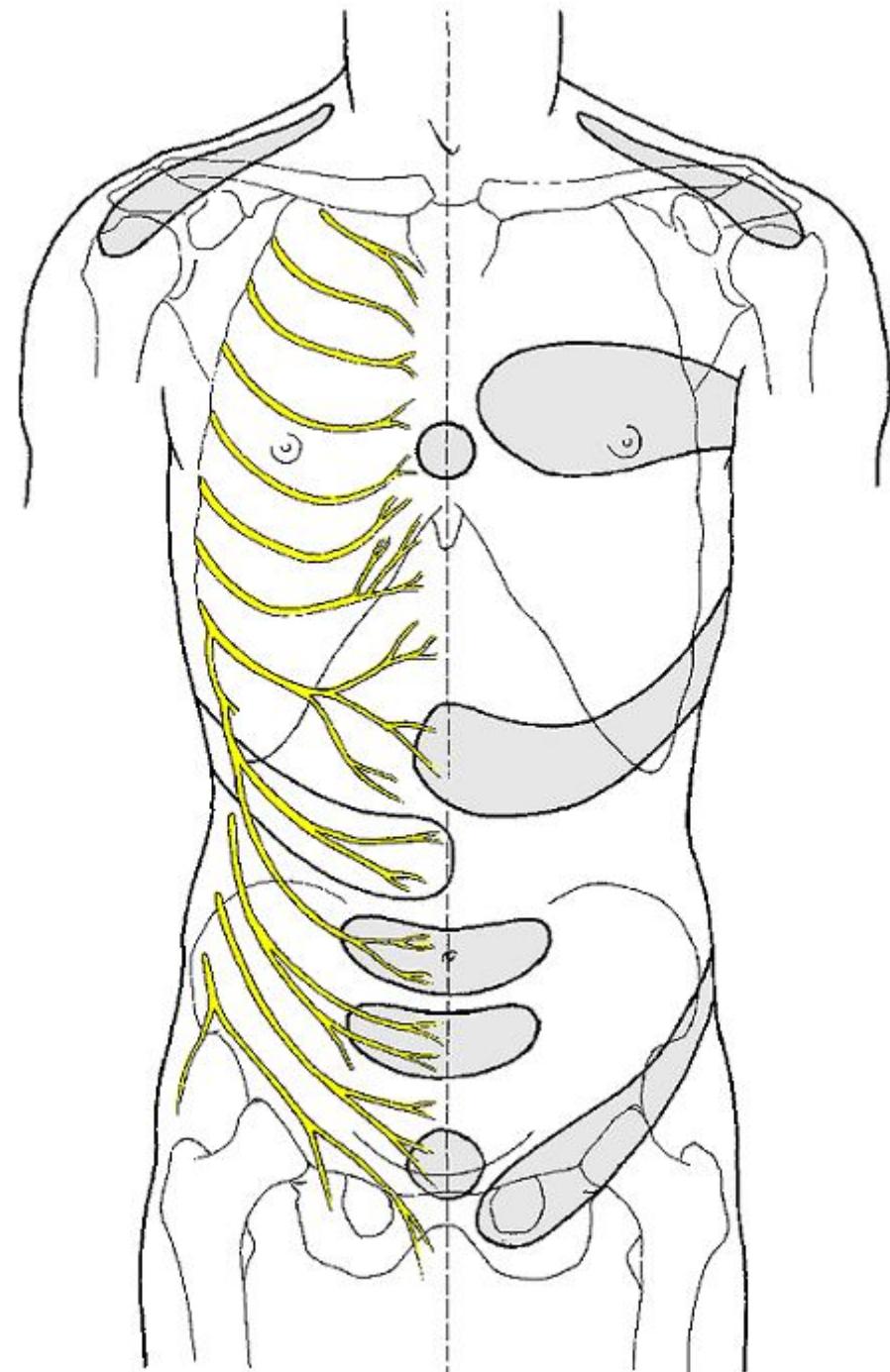
## **Sensory innervation of the anterior abdominal and thoracic wall (skin and peritoneal innervation)**

### **Somatosensory innervation :**

Intercostal nerves  
n. iliohypogastricus  
n. Ilioinguinalis

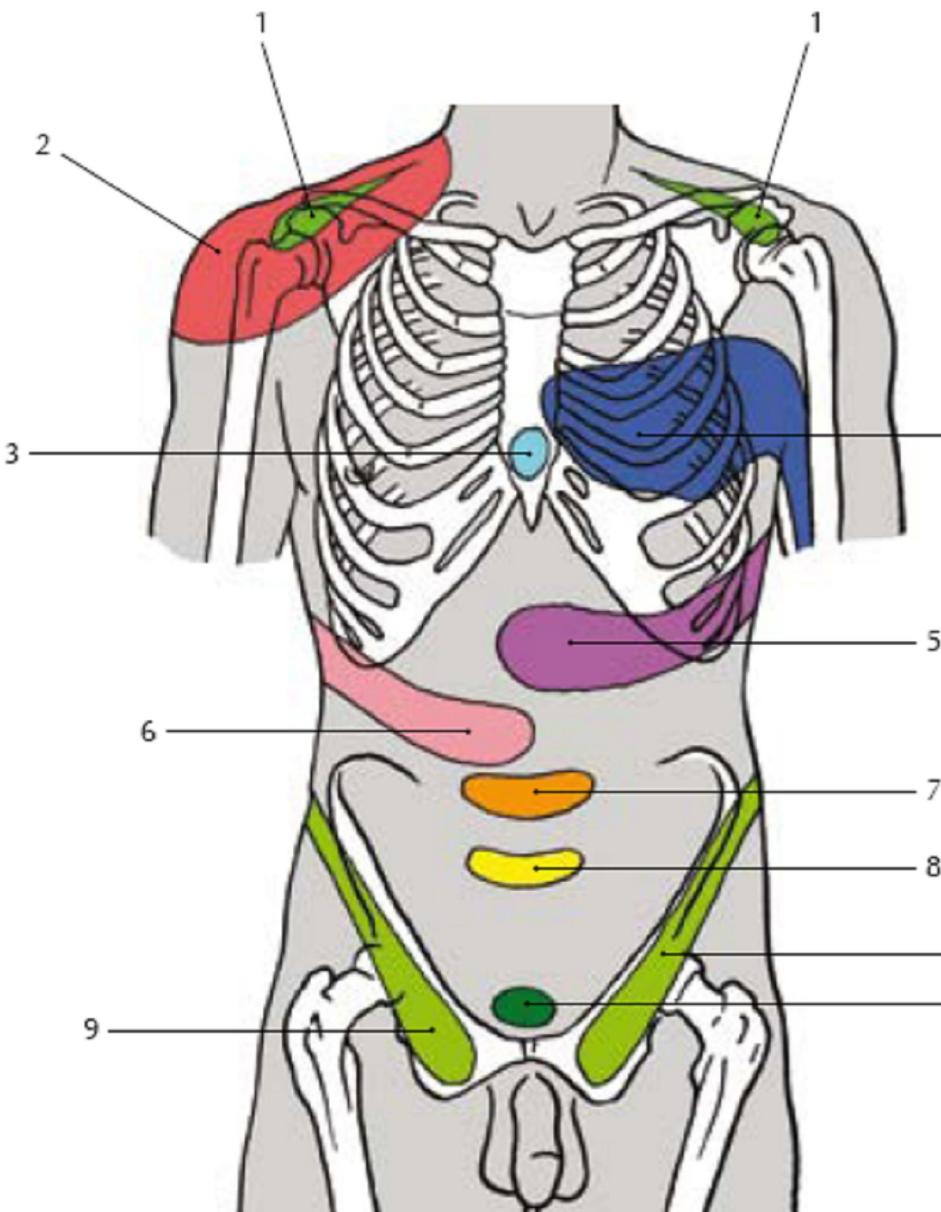
**Somatic pain** : from abdominal wall and parietal peritoneum, sharp and well localized

**Visceral pain** : from viscera, autonomic nerve fibers, distension, muscular contraction, vague, nauseating, poorly localized, tends to be referred



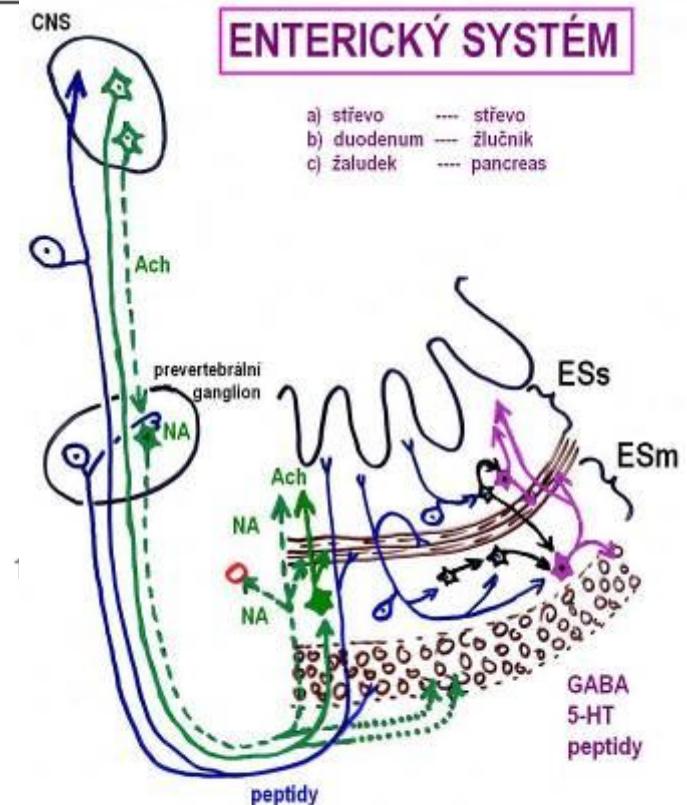
# Referred pain

- Visceral disease- frequently accompanied by pain which is referred to parts of body surface
- In this cutaneous area skin is hyperesthetic, exhibits vasomotor changes and contractions of muscles (*défense musculaire*, resting position)
- This cutenaous zones are termed **Head zones** – roughly coincides with the segmental innervation of the skin



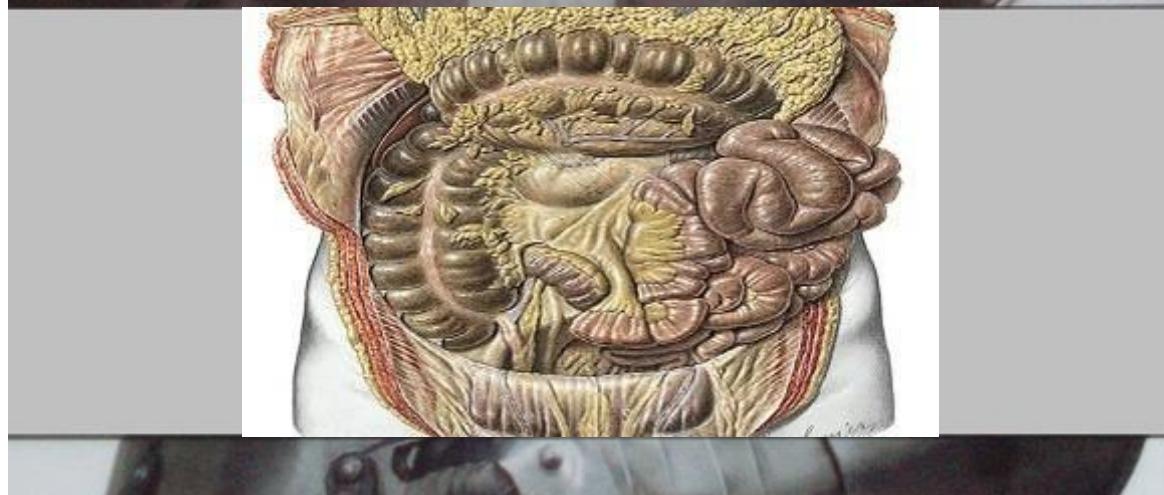
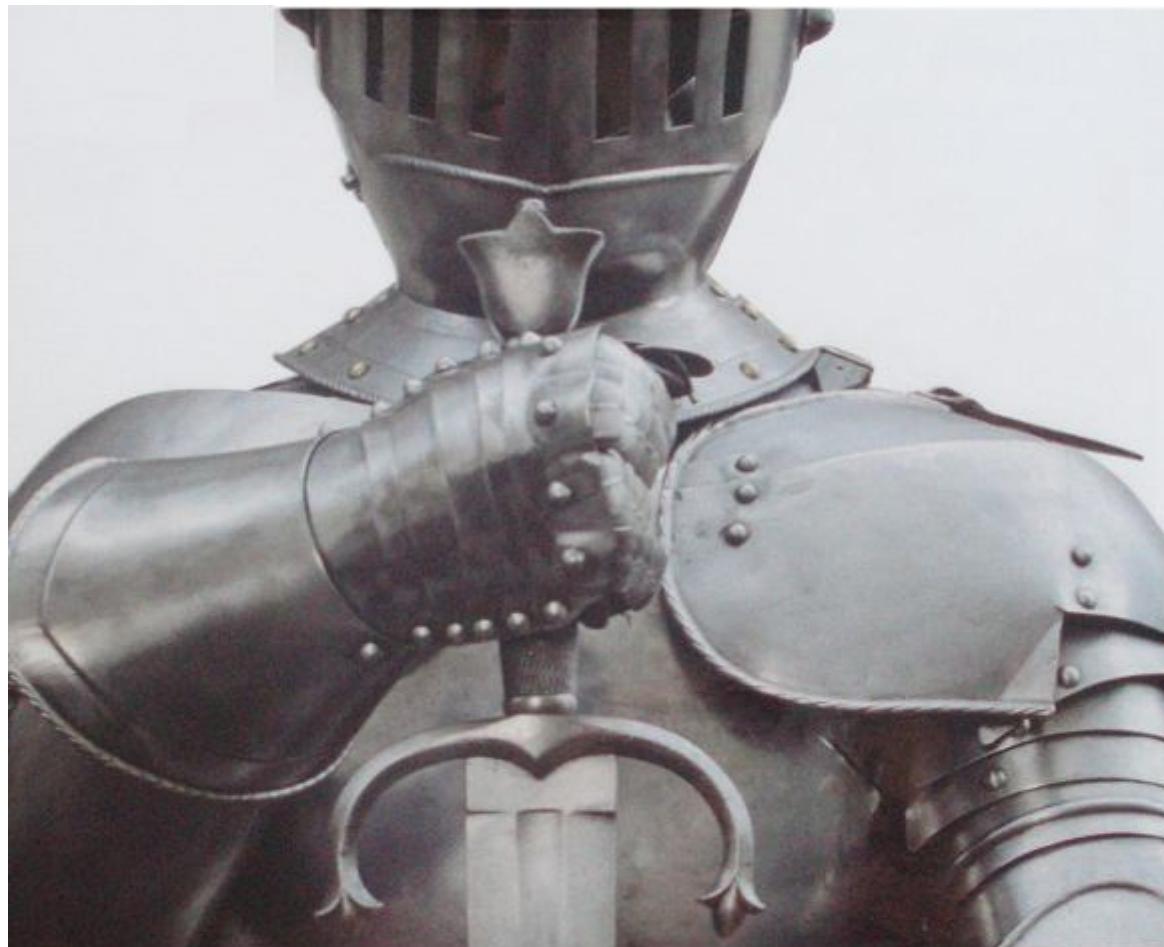
Obr. 15.15. Headovy zóny, kožní projekce z vnitřních orgánů

- 1 – bránice ( $C_4$ )
- 2 – žlučník ( $Th_{5-11}$ )
- 3 – jícen ( $Th_{4-5}$ )
- 4 – srdce ( $Th_{3-4}$ )
- 5 – žaludek ( $Th_6$ )
- 6 – játra a žlučové cesty ( $Th_{6-11}$ )
- 7 – tenké střevo ( $Th_{10}$ )
- 8 – tlusté střevo ( $Th_{11}-L_1$ )
- 9 – ledviny, varle ( $Th_{10}-L_1$ )
- 10 – močový měchýř ( $Th_{11}-L_1$ )



**HEAD ZONES**

ESs = enterický systém submukosní (Meissnerova plteň)  
ESm = enterický systém myenterický (Auerbachova plteň)



**Two reasons  
(indications) for  
opening of  
abdominal cavity**

*Diagnosis  
Treatment*

## **Noninvasive examination:**

Ultrasound examination- sonography

RTG – computer tomography (CT)

Nuclear magnetic resonance (MRI)

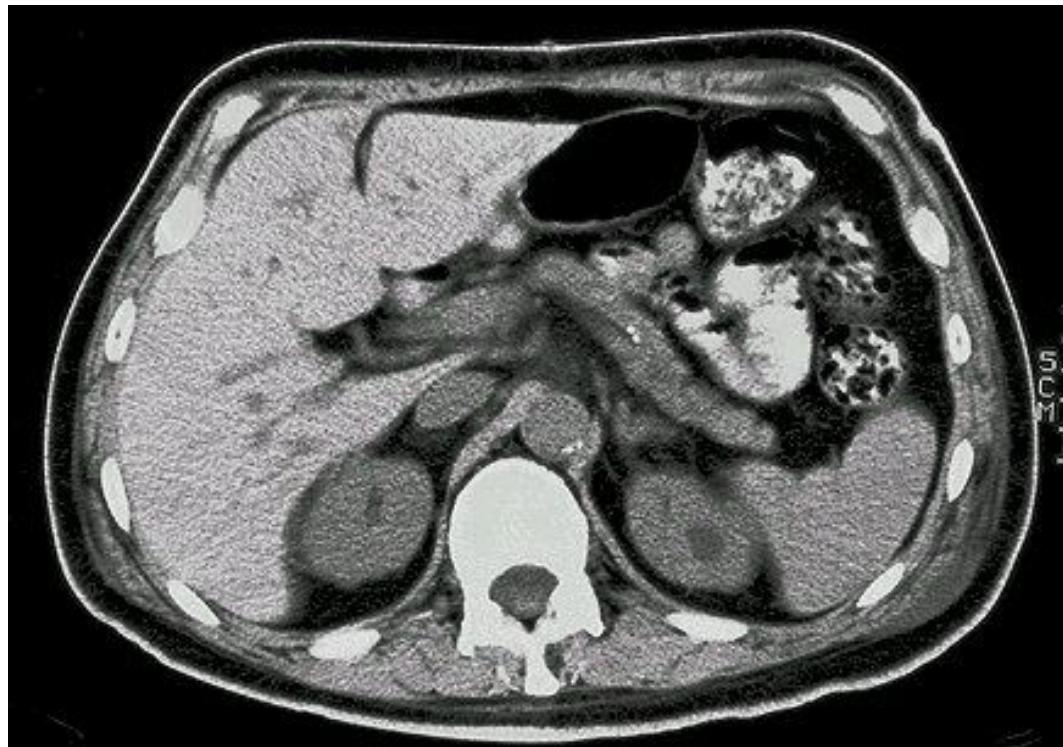
PET/CT (application of isotops)

## **Invasive examination (endoscopy)**

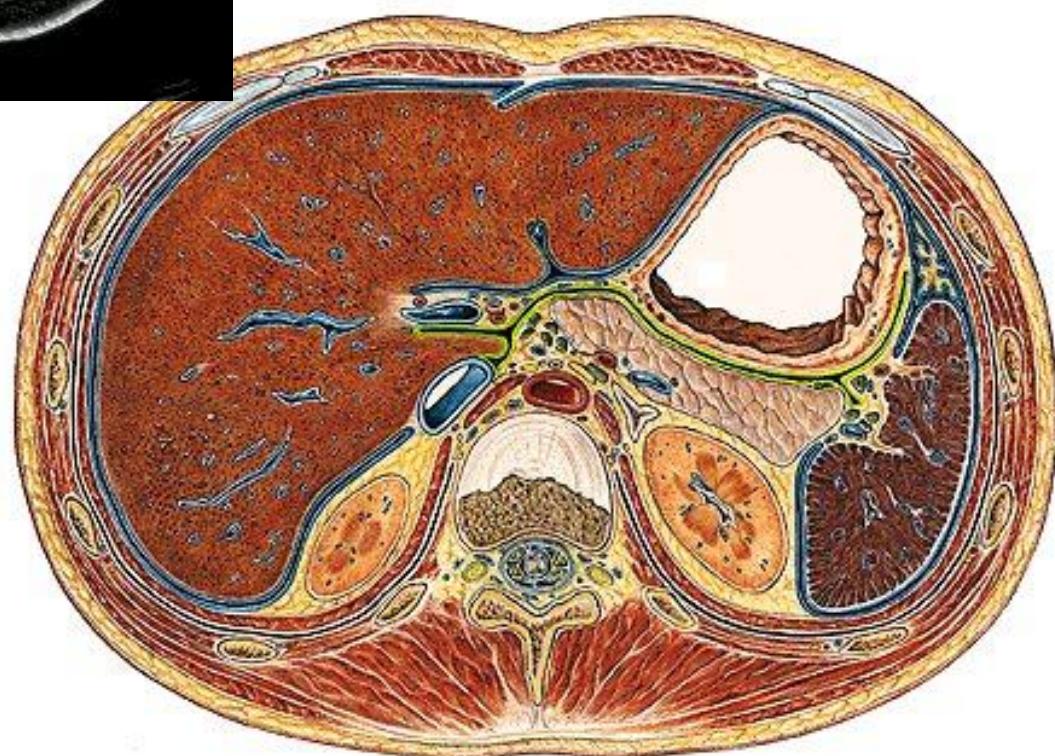
upper endoscopy, coloscopy, enteroscopy,  
enteral camera

Endosonography - combination sono and endoscopy

Exploratory laparotomy



**Diagnostic procedures -**  
**invasive:** sono - puncture,  
**CT - puncture**  
**Endosonography- puncture**



# **Approaches to the peritoneal cavity :**

- **Laparoscopic approaches**
- **Laparotomic approaches (open)**
- Surgeon preference is the determinant of which operation is performed

## Laparoscopy

puncture – Veressi needle

kapnoperitoneum - CO<sub>2</sub>

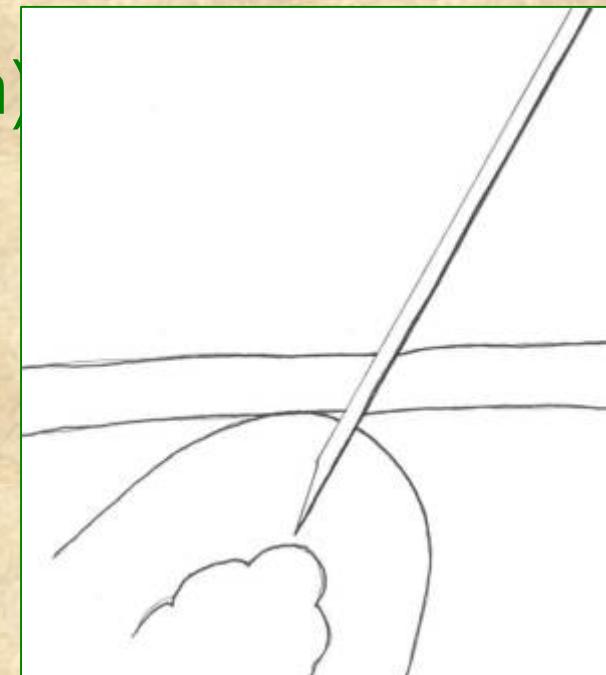
Elevation of the abdominal wall

(never air – danger of air embolism)

## Complications:

Injury of epigastric vessels

Puncture of intestine

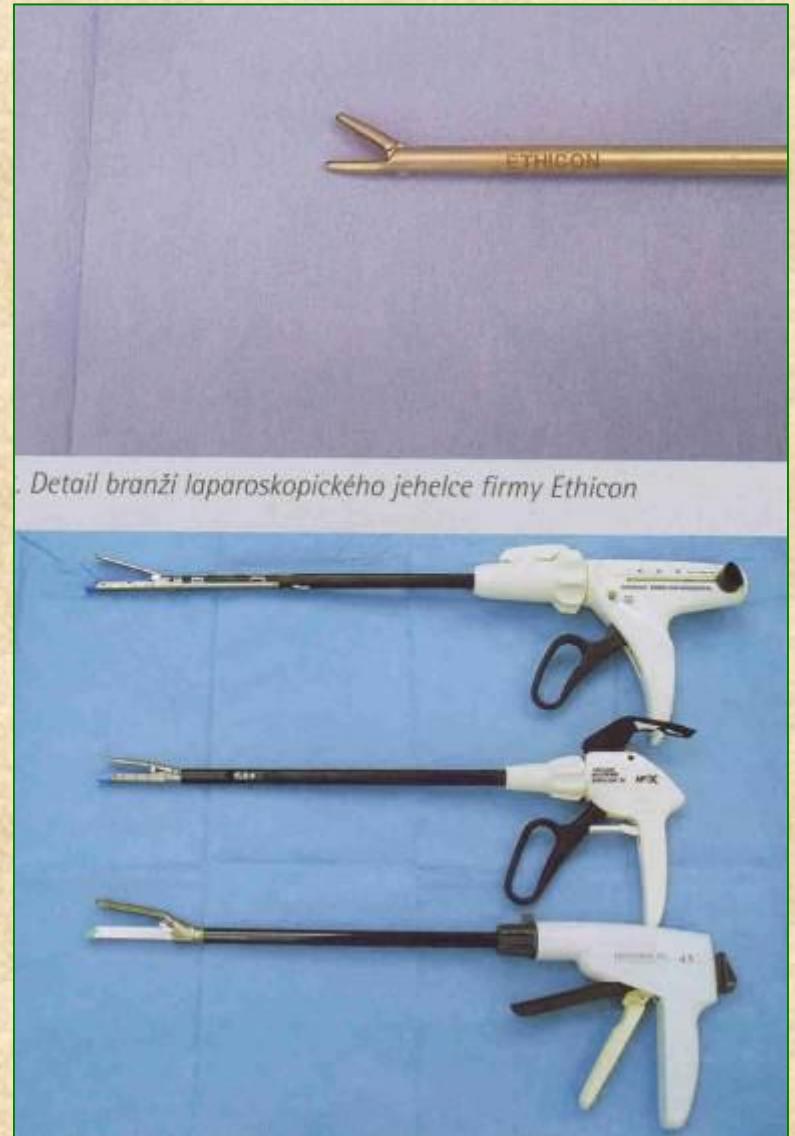




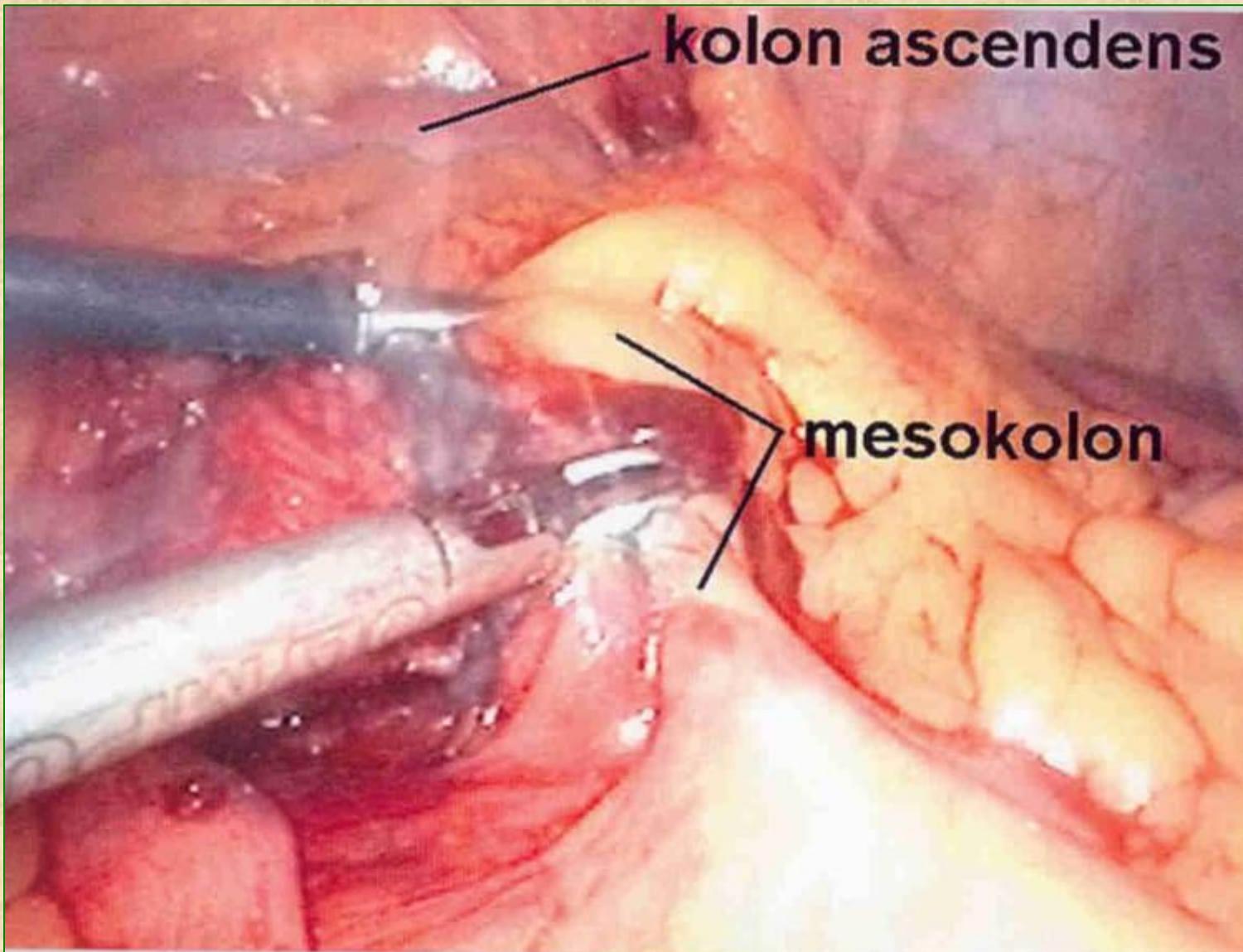
Obr. 3. Laparoskopická věž firmy Wolf



Obr. 4. Laparoskopická věž firmy Olympus



. Detail branži laparoskopického jehelce firmy Ethicon



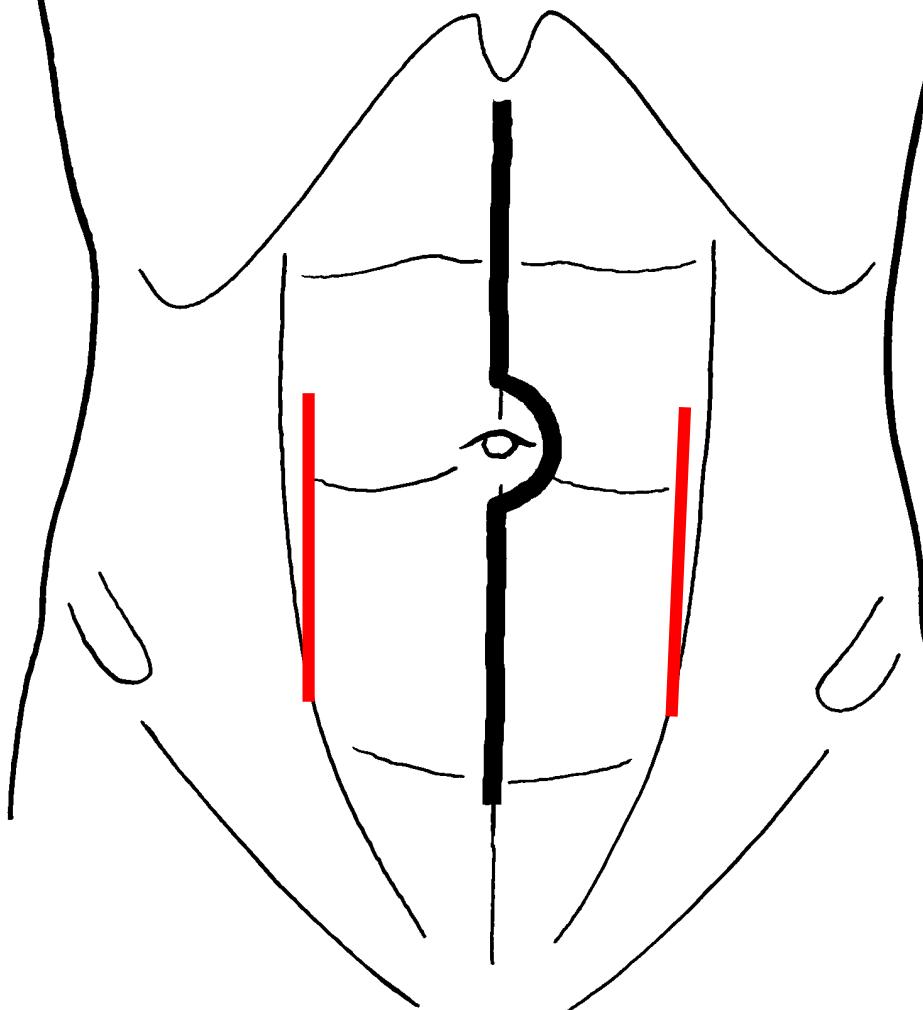
Obr. 40. Protínání mezokola kolon ascendens harmonickým skalpelem

## Why laparoscopy ?

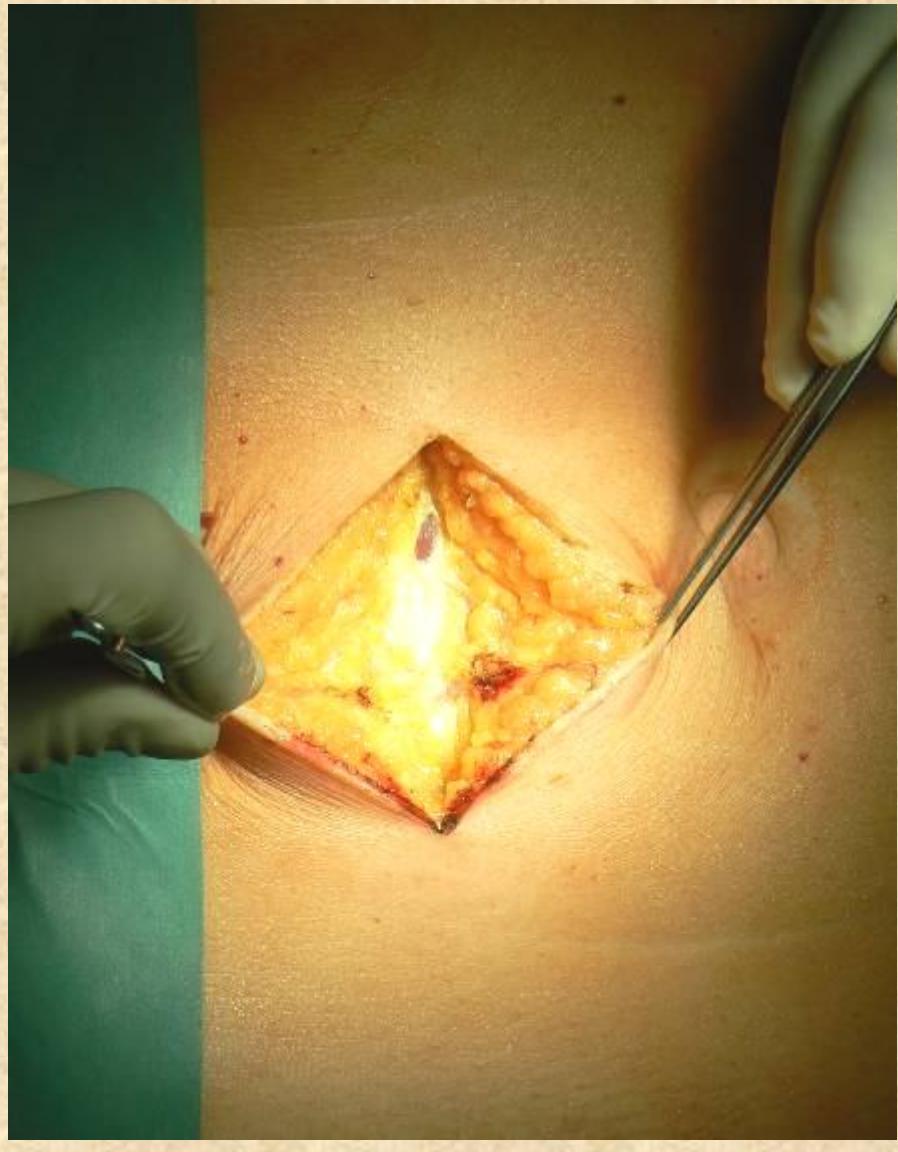
**Short-termed reasons – shorter hospital stay, shorter convalescence, decreased postoperative narcotic use, early restoration of peristaltic movements, better results of pulmonary function tests**

**Long-termed reasons -  
Lesser frequency of abdominal hernias**

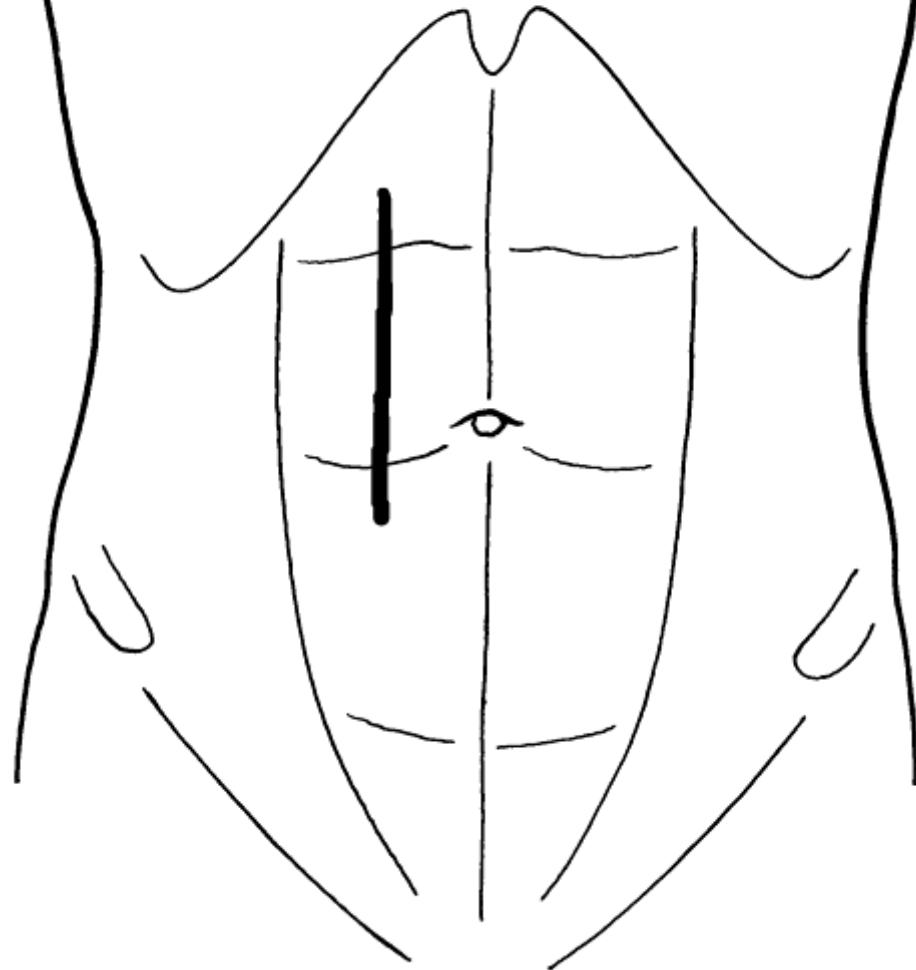
## Middle laparotomy Pararectal incision



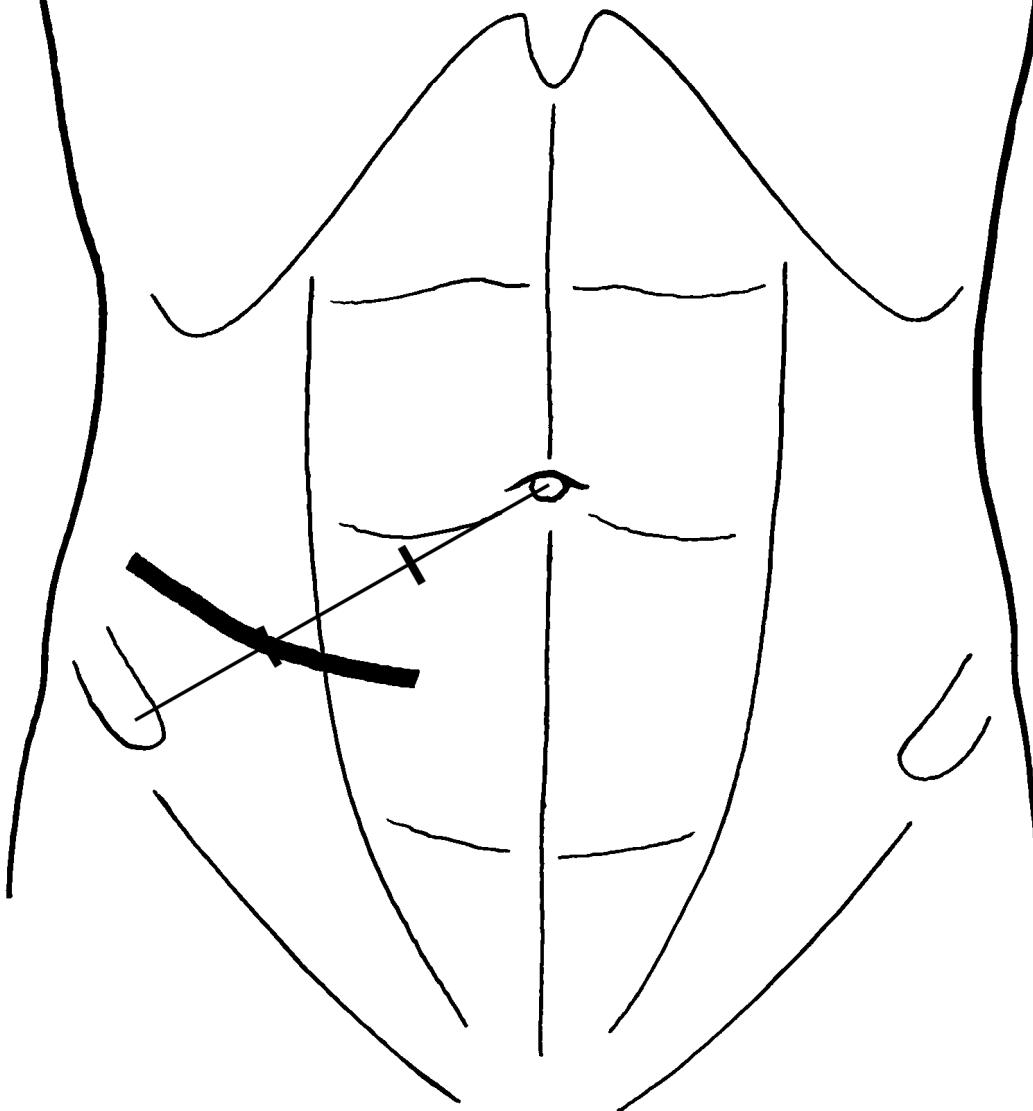
## PARARECTAL INCISION



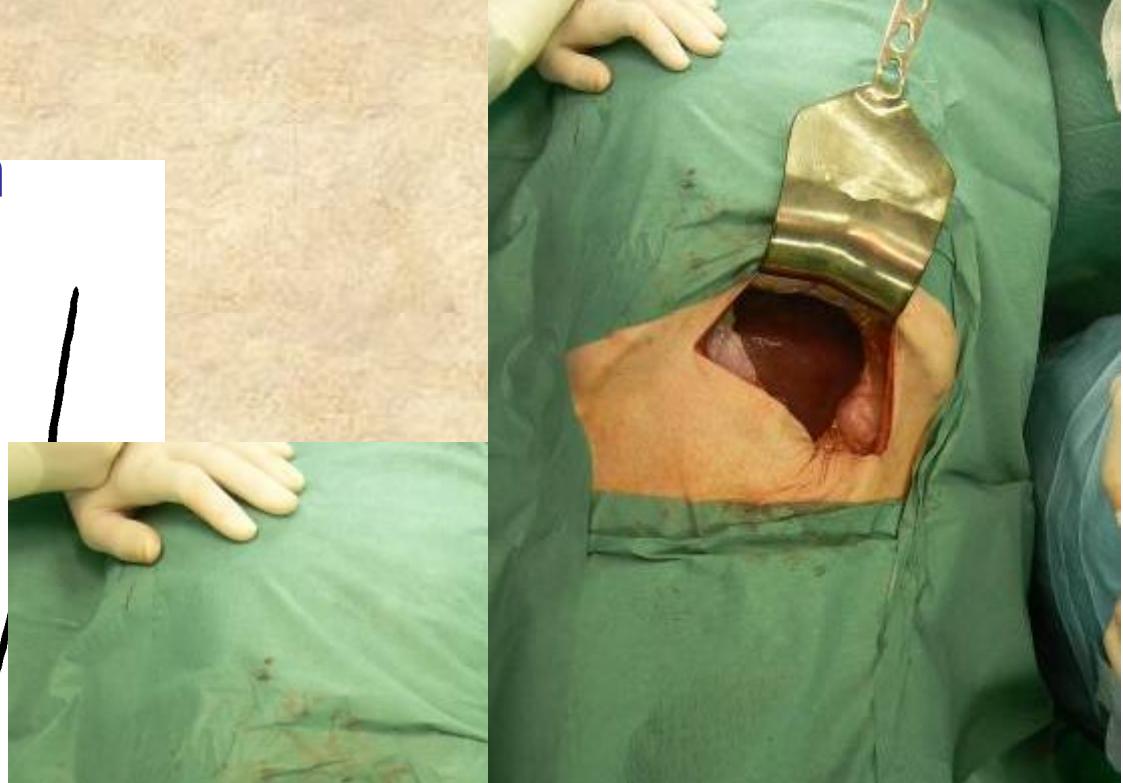
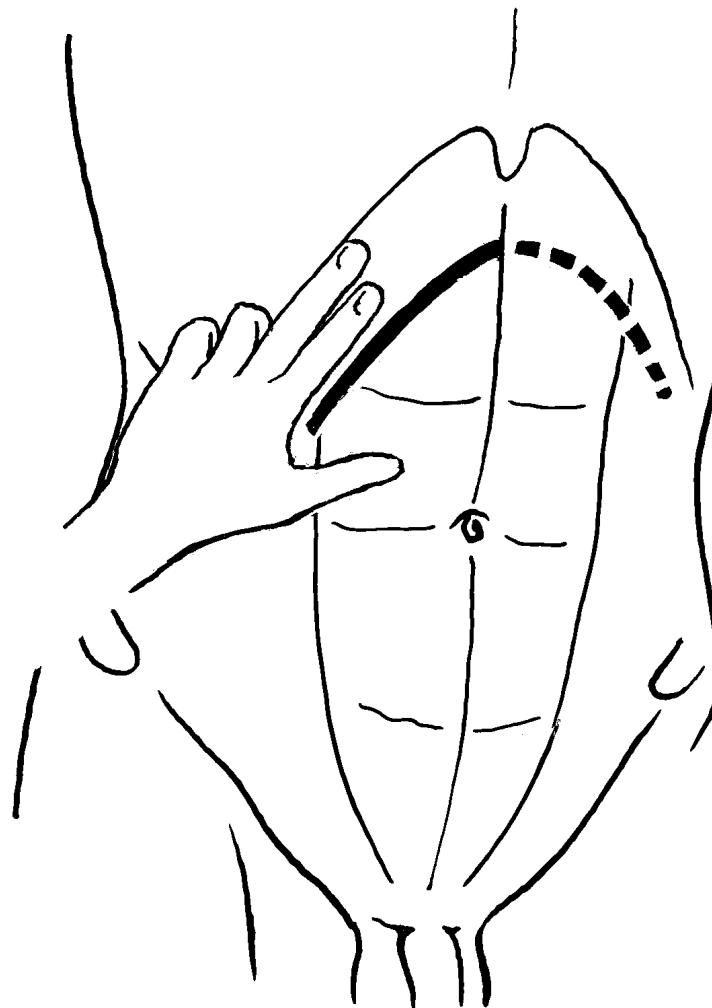
Transrectal  
incision



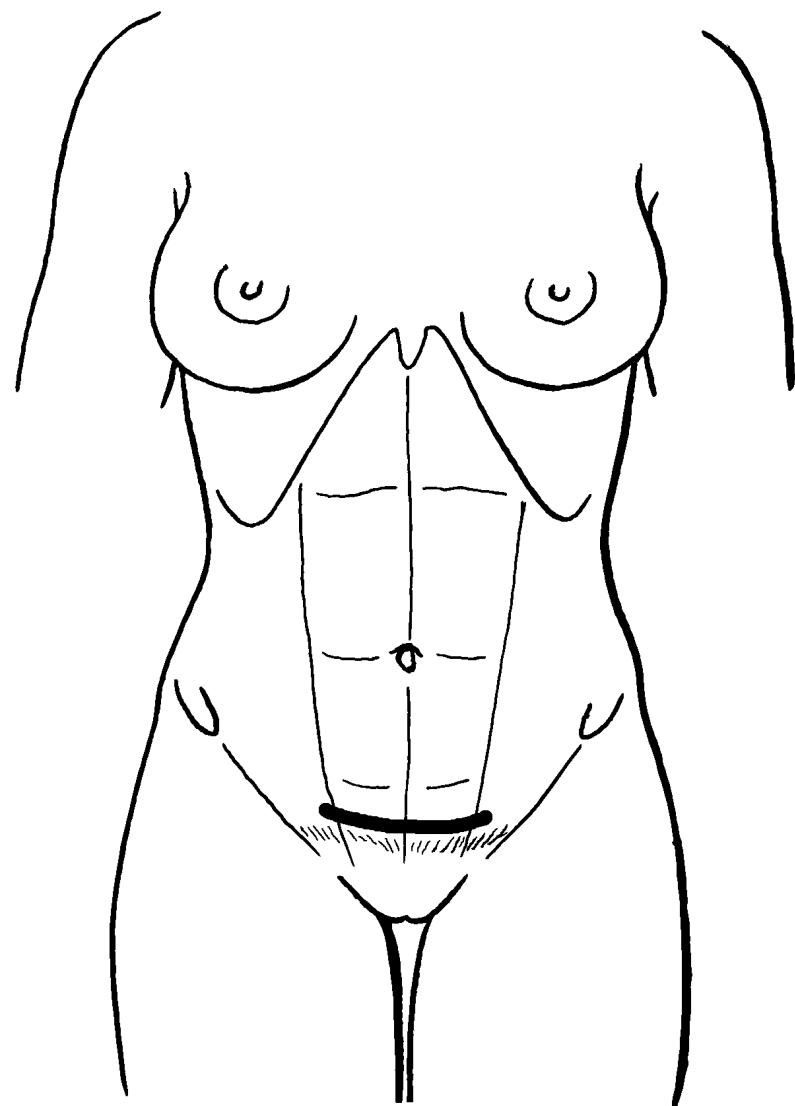
# A transverse right lower quadrant incision Appendectomy

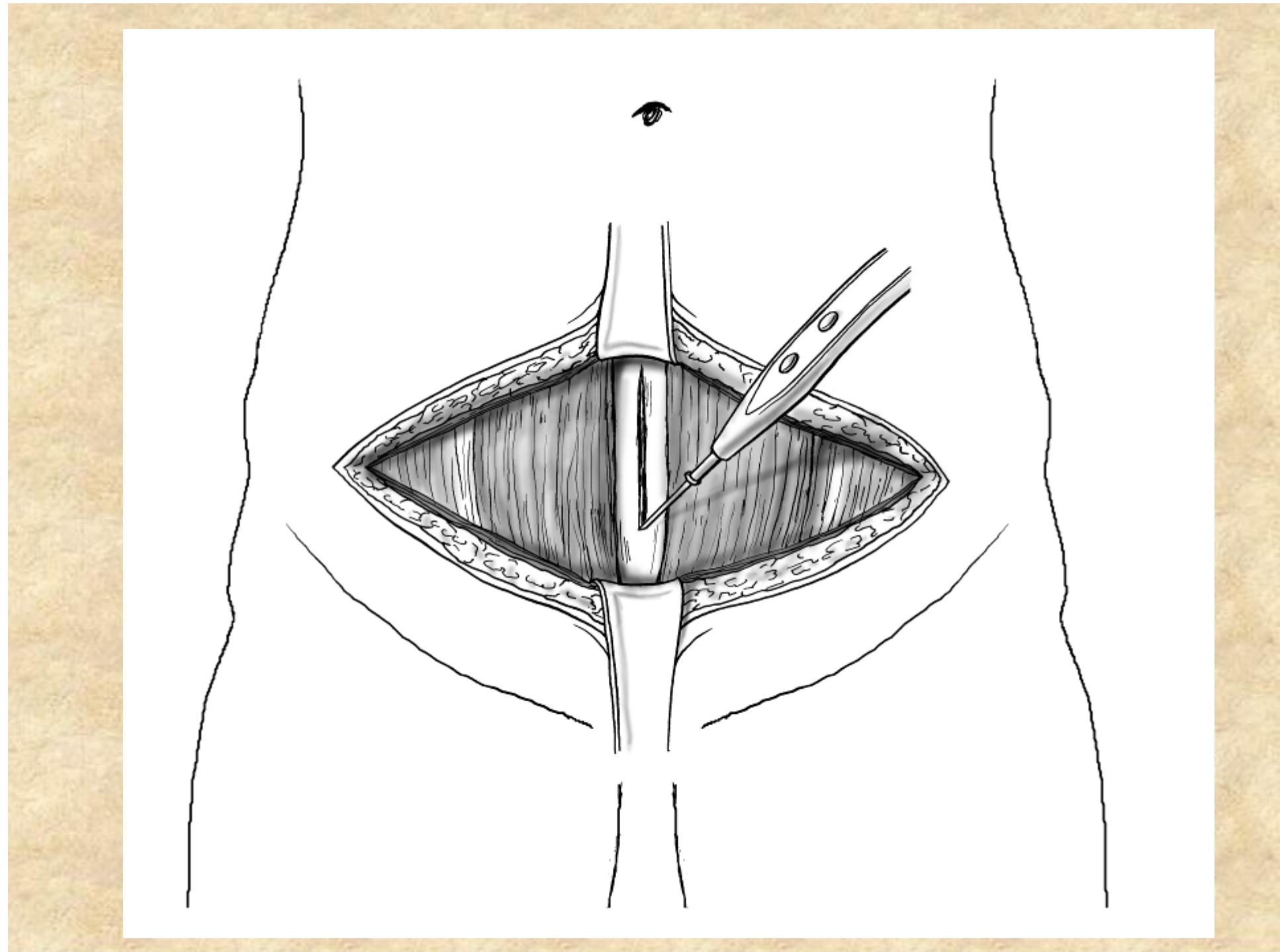


## Subcostal incision

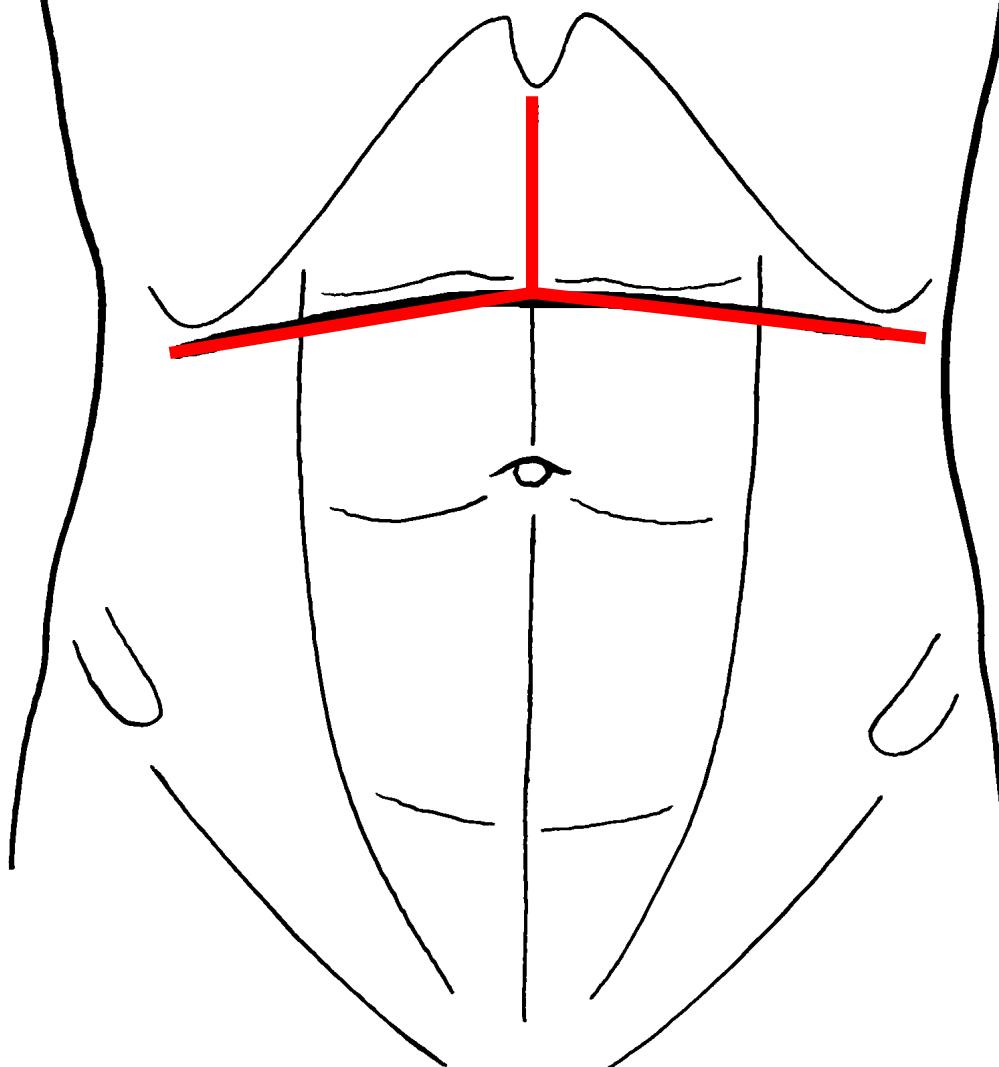


## Pfannenstiel 's incision





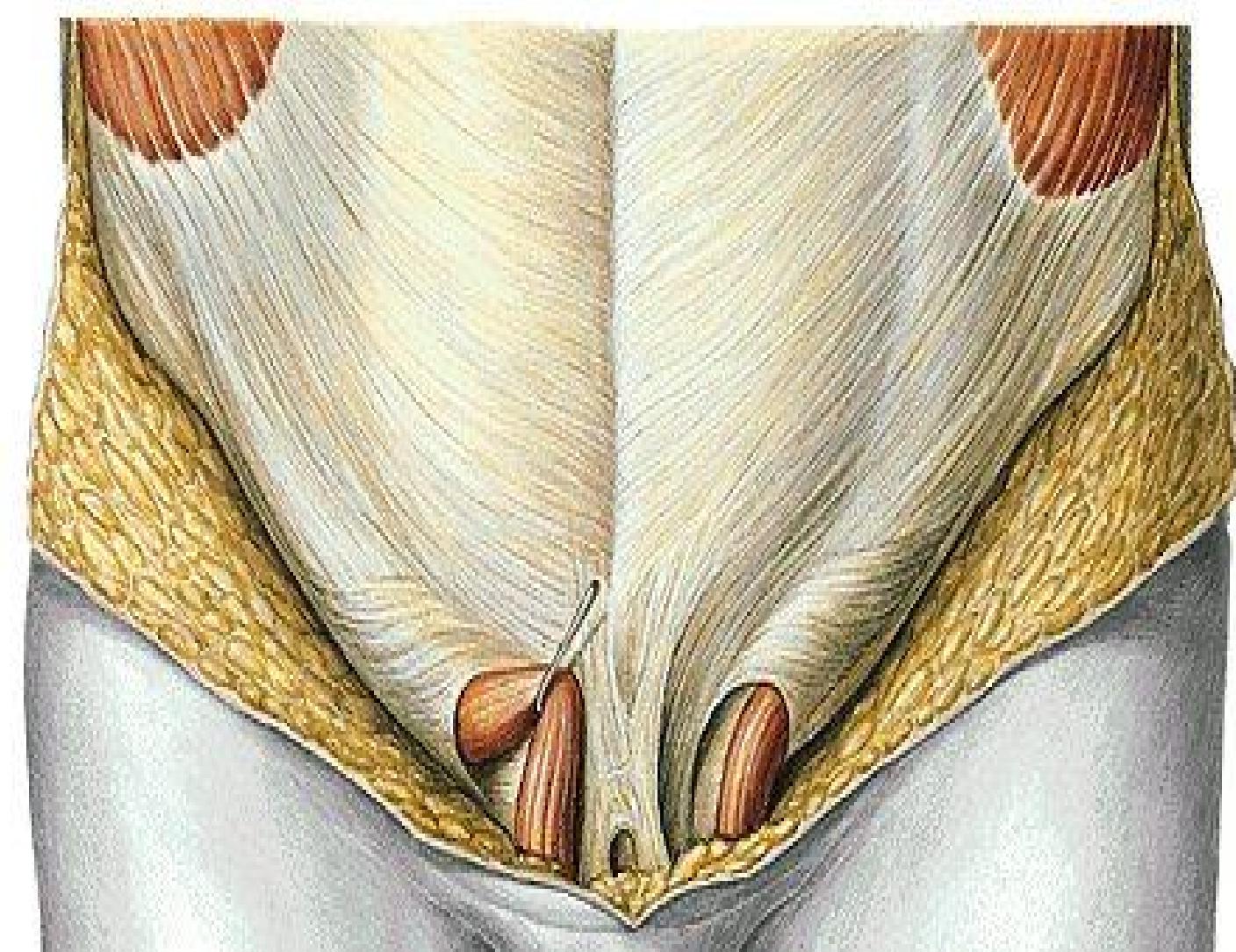
## Mercedes-Benz Stern incision



**Anterior abdominal wall**

**2. Inguinal canal,  
inguinal hernia**

**Direct X indirect**



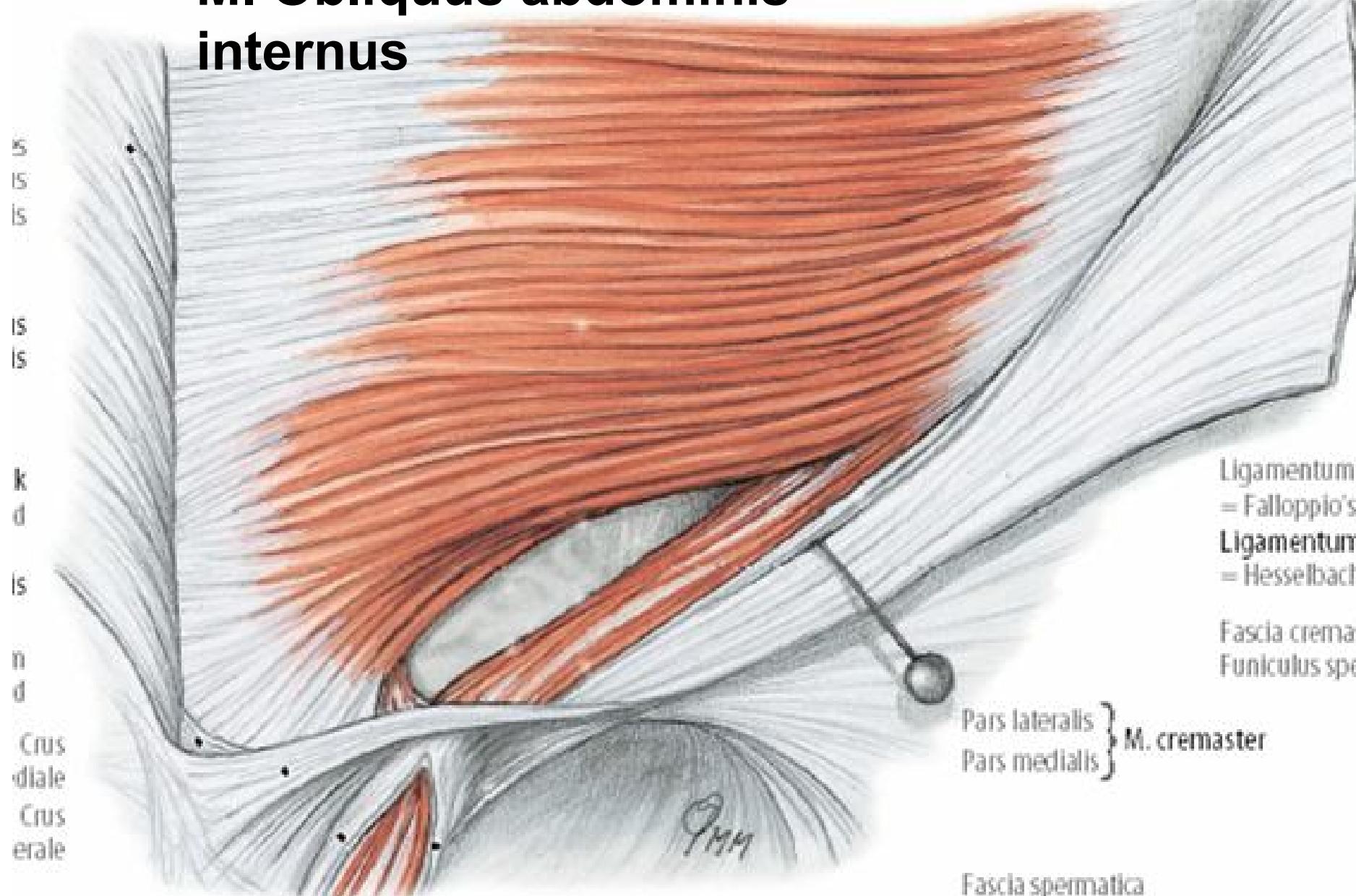
Superficial  
inguinal ring

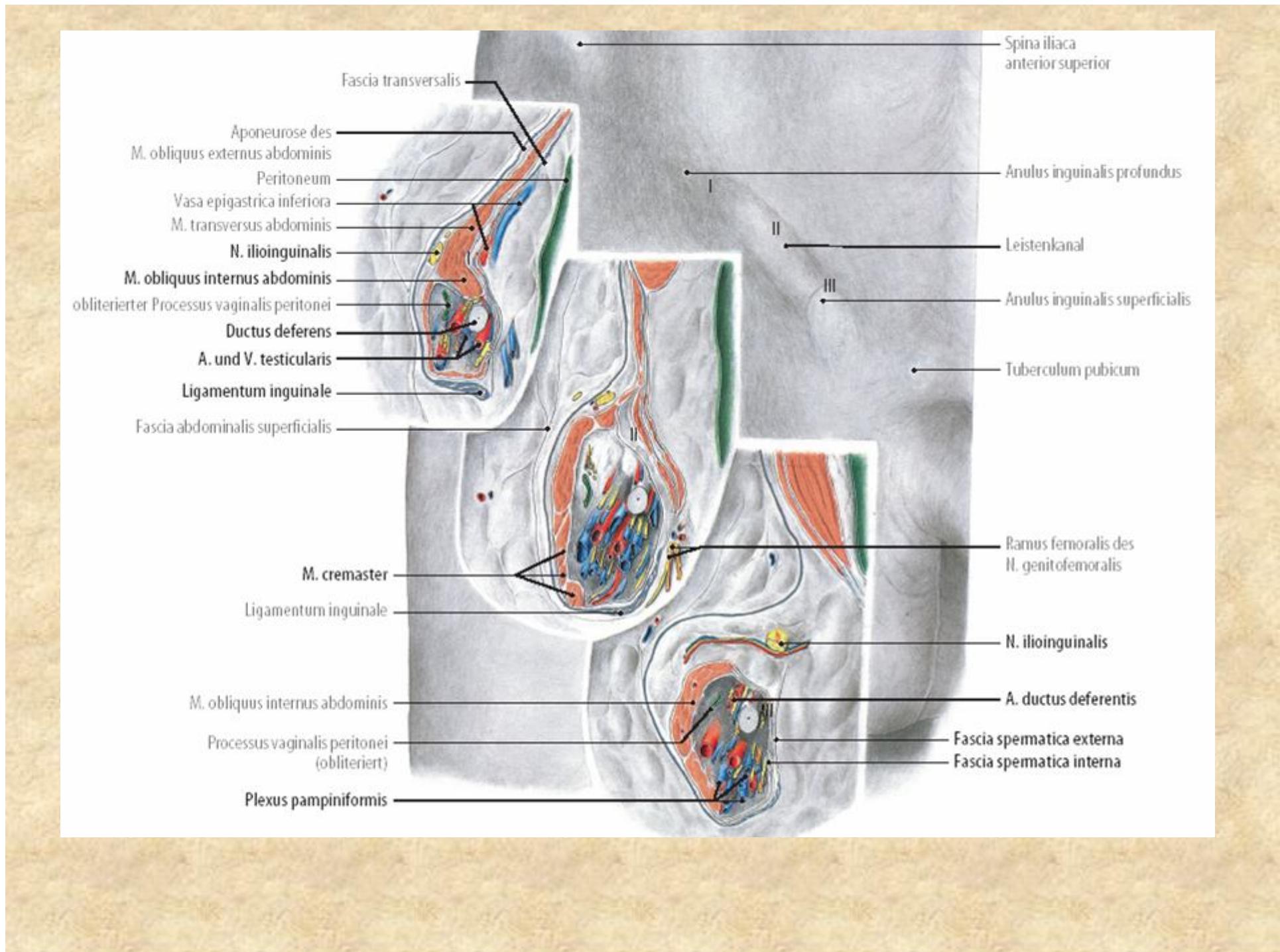
Spermatic  
cord

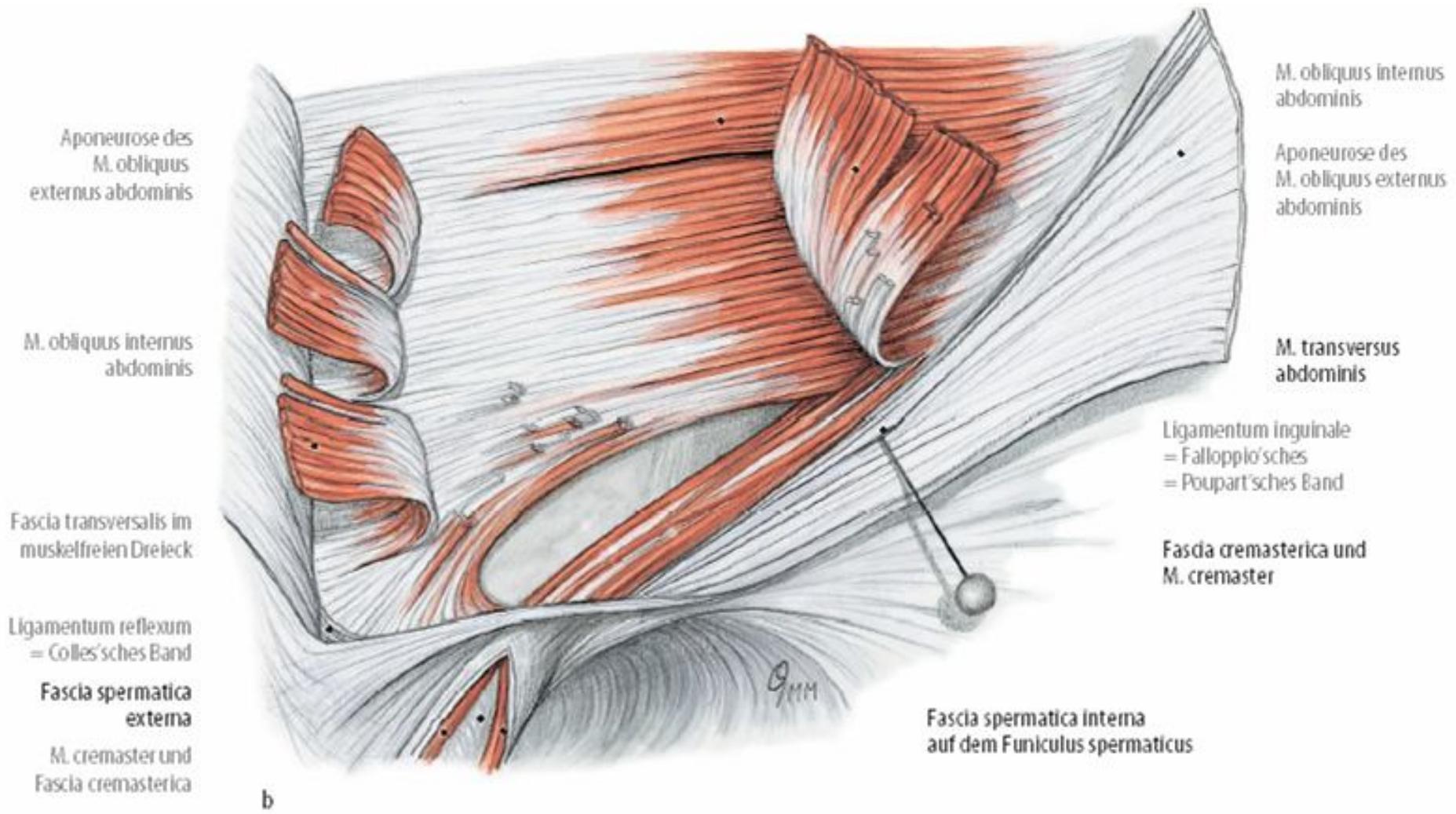
Round  
uterine  
ligament

**Canalis inguinalis**  
**Aponeurosis m. obliqui abdominis externi**

# M. Obliquus abdominis internus

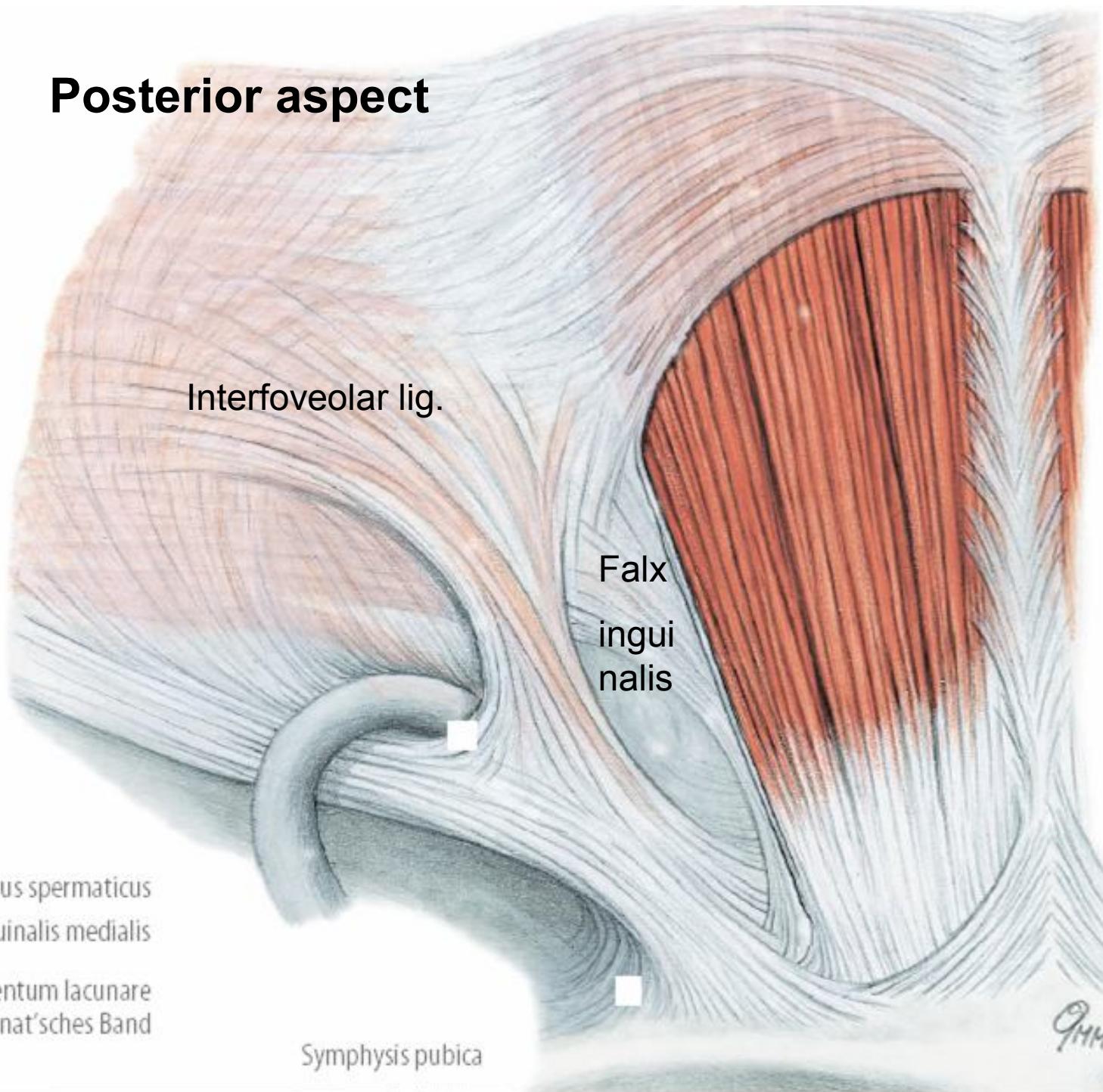






## M. Transversus abdominis

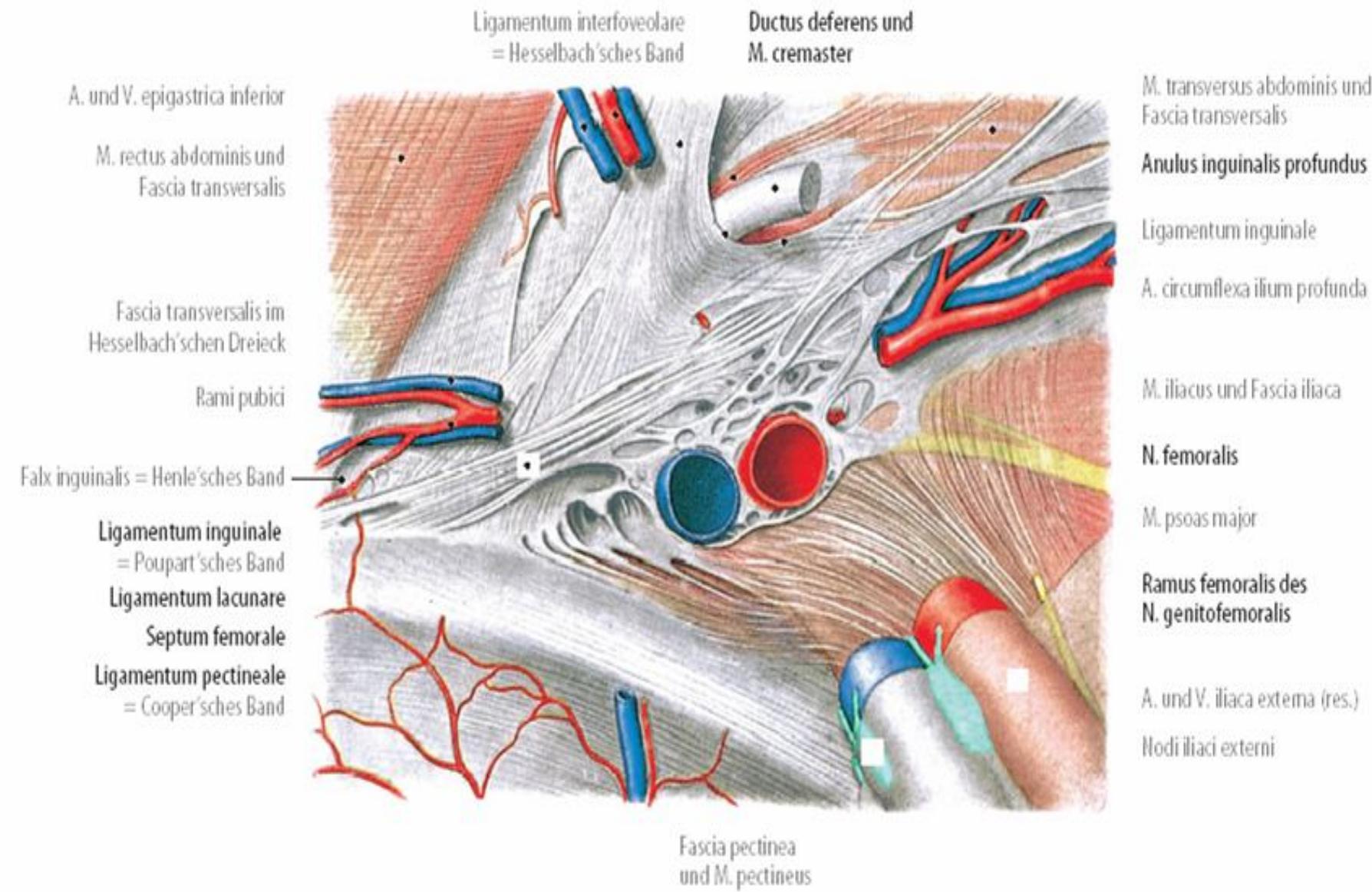
## Posterior aspect



Attenuated  
areas:

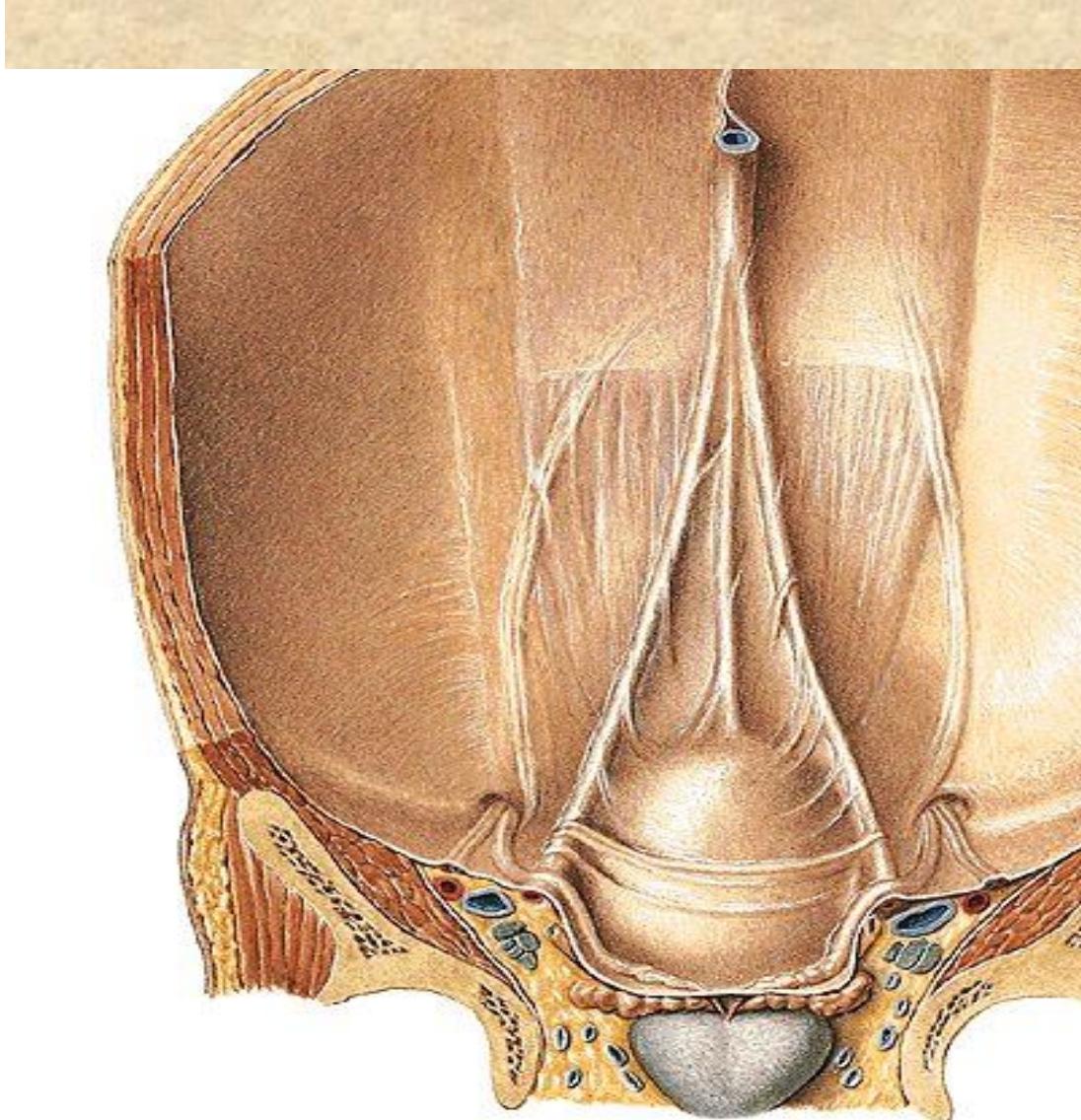
Deep  
inguinal ring

Inguinal  
triangle



# Four walls of the inguinal canal

- Lower –inguinal ligament
- Anterior – aponeurosis of the m. obliquus abdominis externus
- Superior – oblique muscles
- Posterior – transversal fascia + peritoneum



Plica umbilicalis  
mediana (urachus),  
medialis (a.umbilicalis),  
lateralis (vasa  
epigastrica inf.)

Fovea supravesicalis

Fovea inguinalis  
medialis  
(trigonum inguinale)

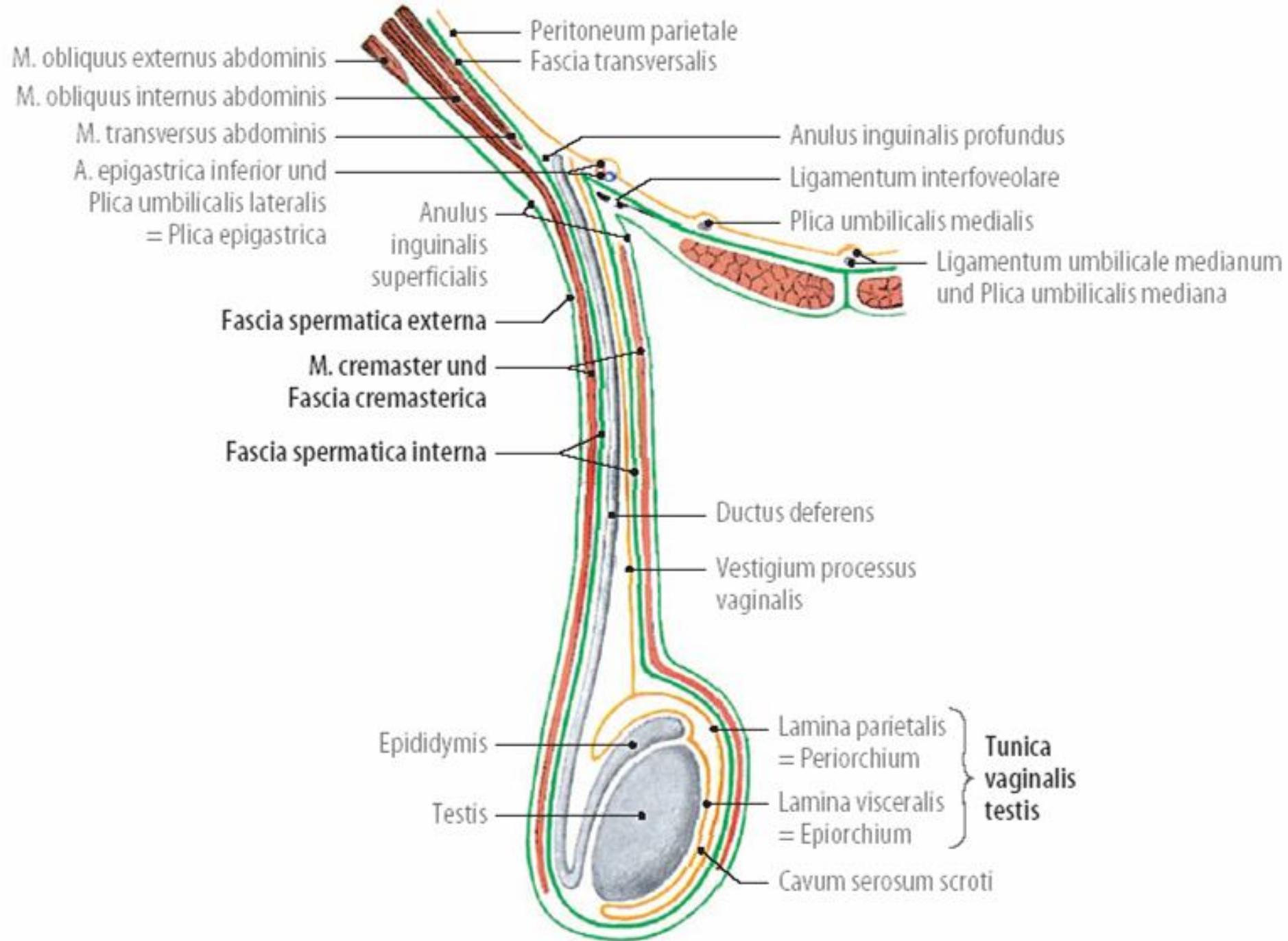
Fovea inguinalis  
lateralis  
(anulus ing. prof.)

**Hernia supravesicalis –  
fovea supravesicalis**

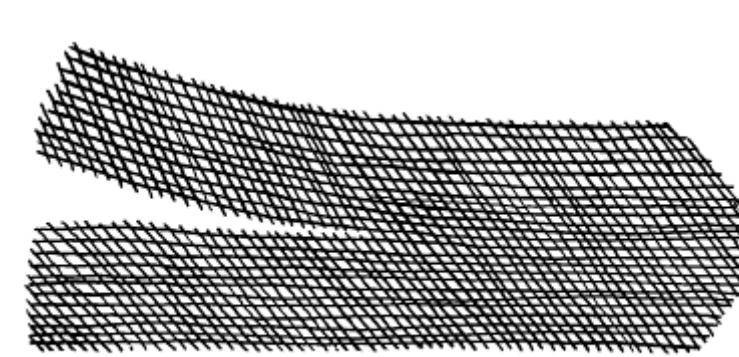
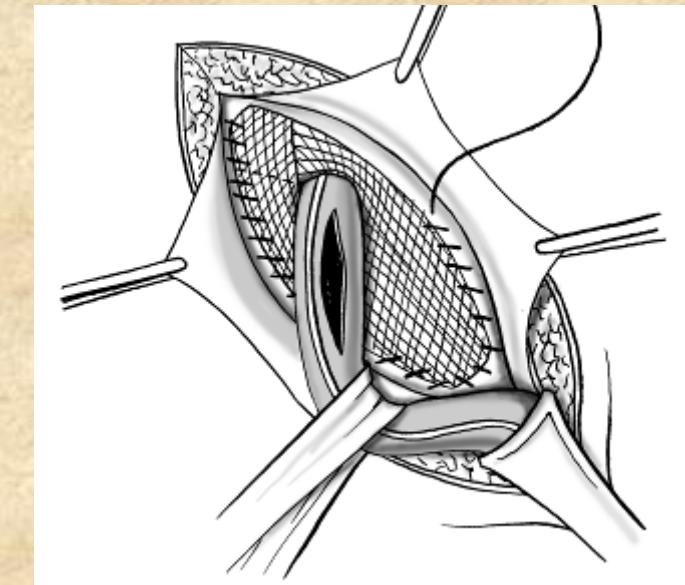
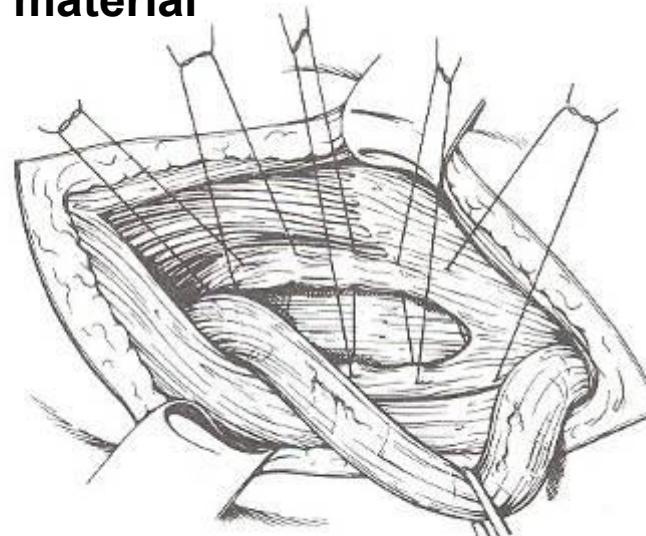
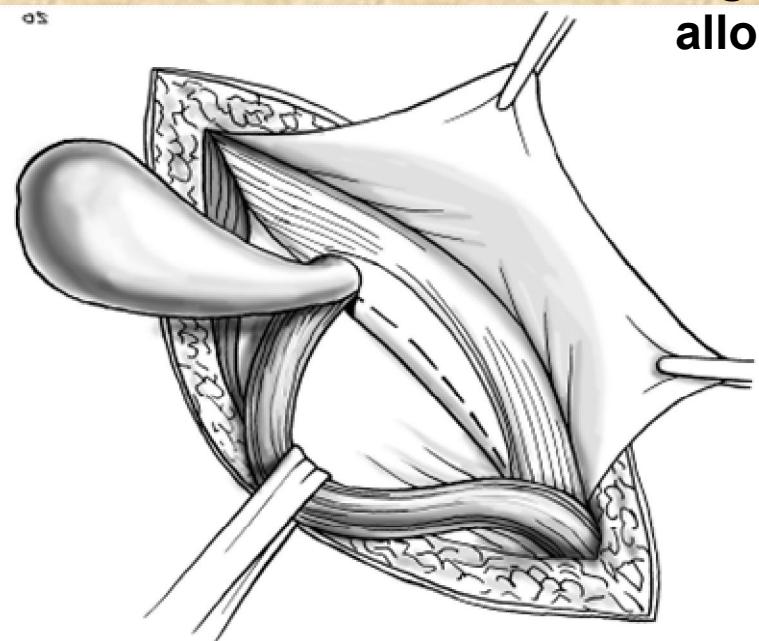
**Hernia inguinalis directa –  
trigonum inguinale – anulus ing. spfc.**

**Hernia inguinalis indirecta –  
anulus ing. prof. – anulus ing. spfc.  
event. Hernia scrotalis**

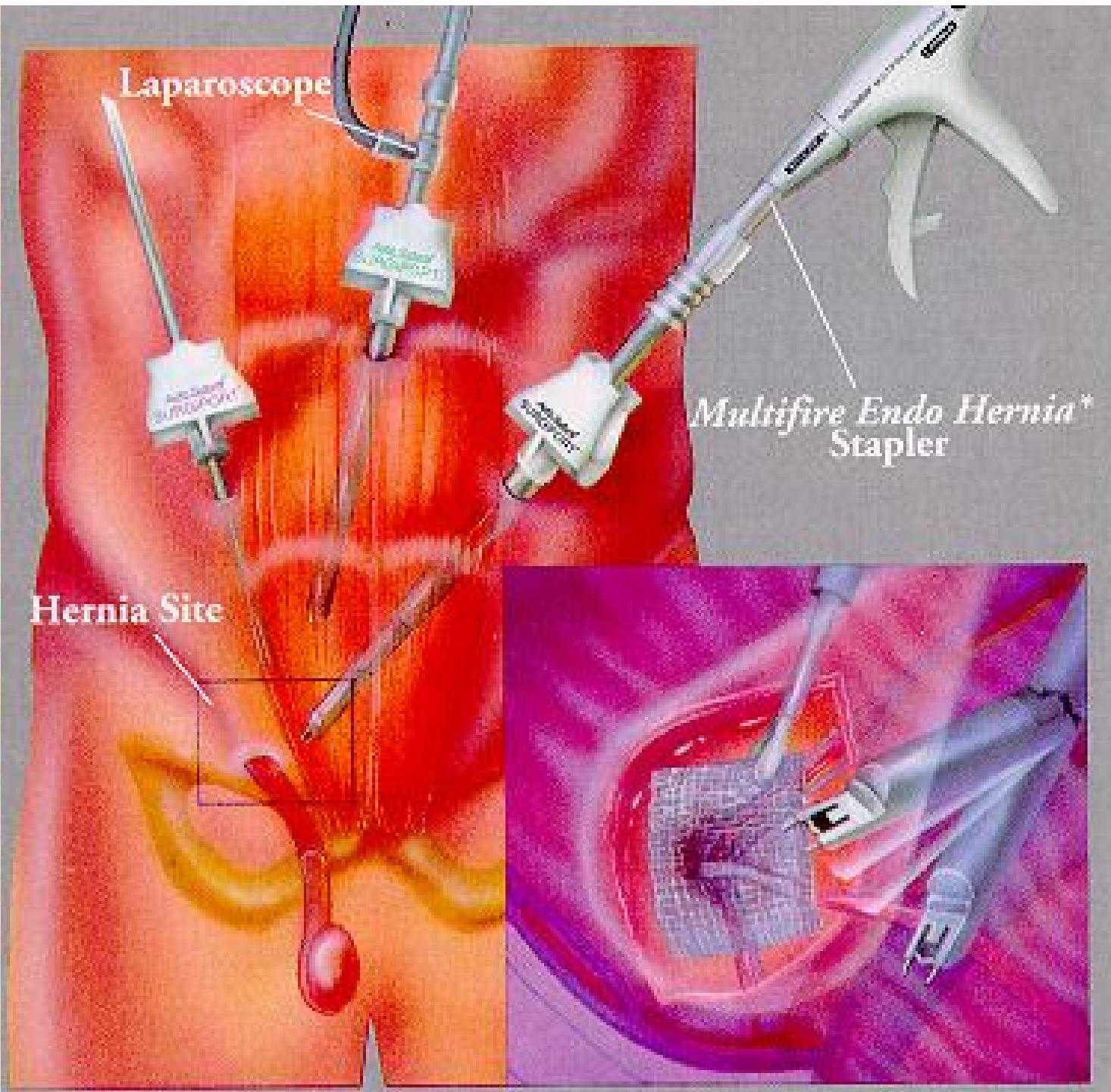
**Hernia femoralis – septum femorale in  
lacuna vasorum- fossa iliopectinea –  
hiatus saphenus**

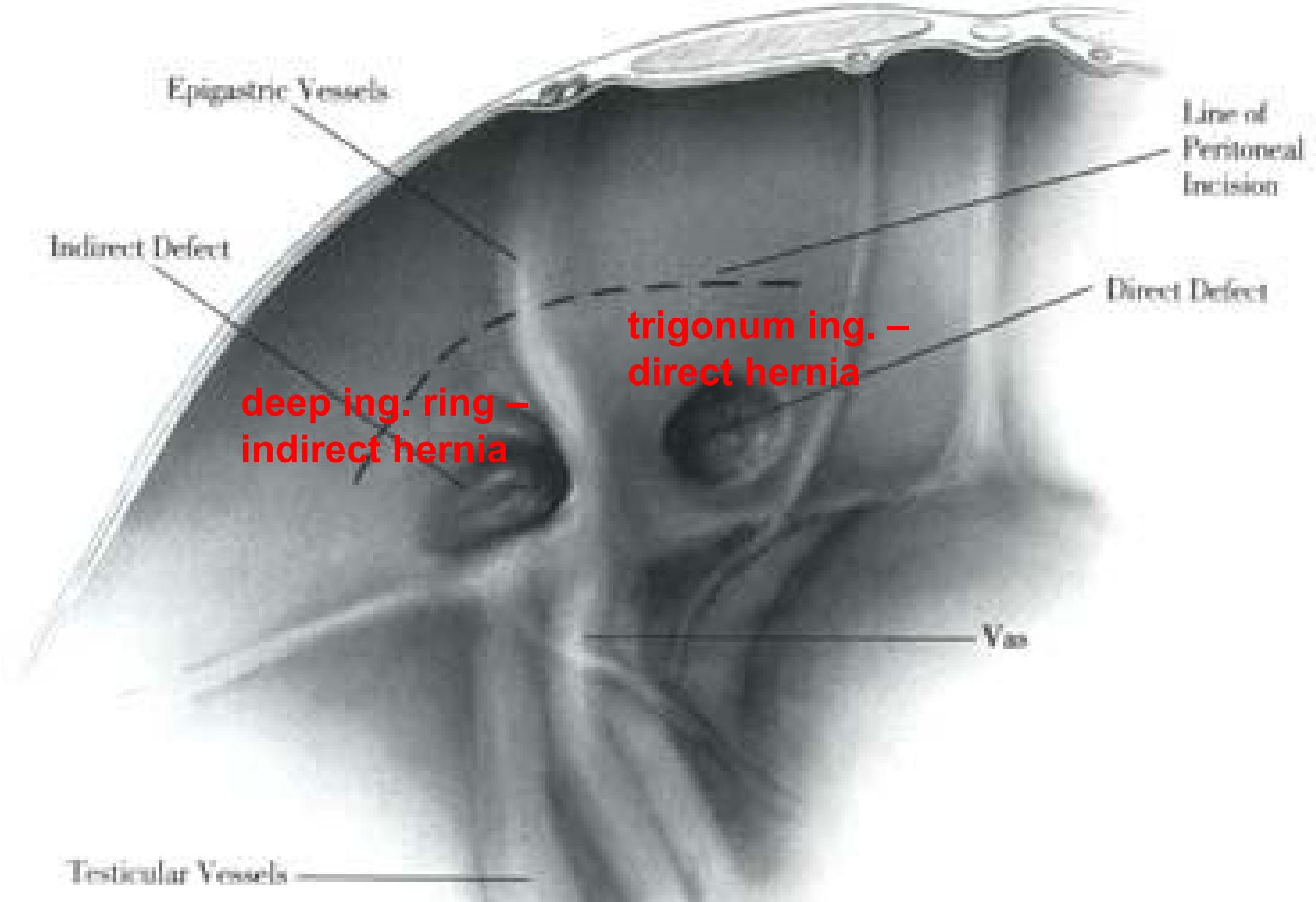


## Inguinal hernia repair – implantation of alloplastic material

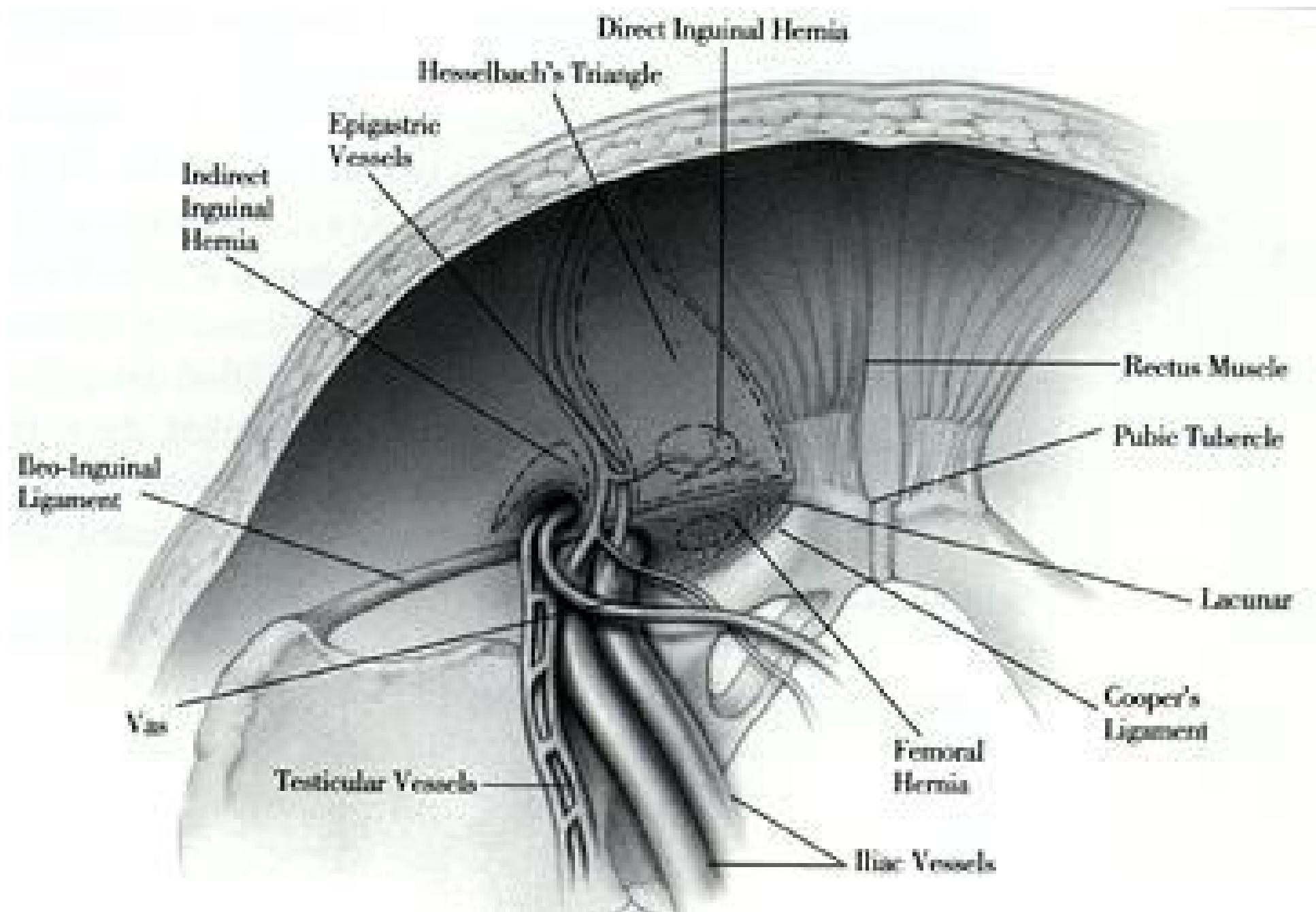


**Open herniotomy with plastic (polypropylene) mesh**

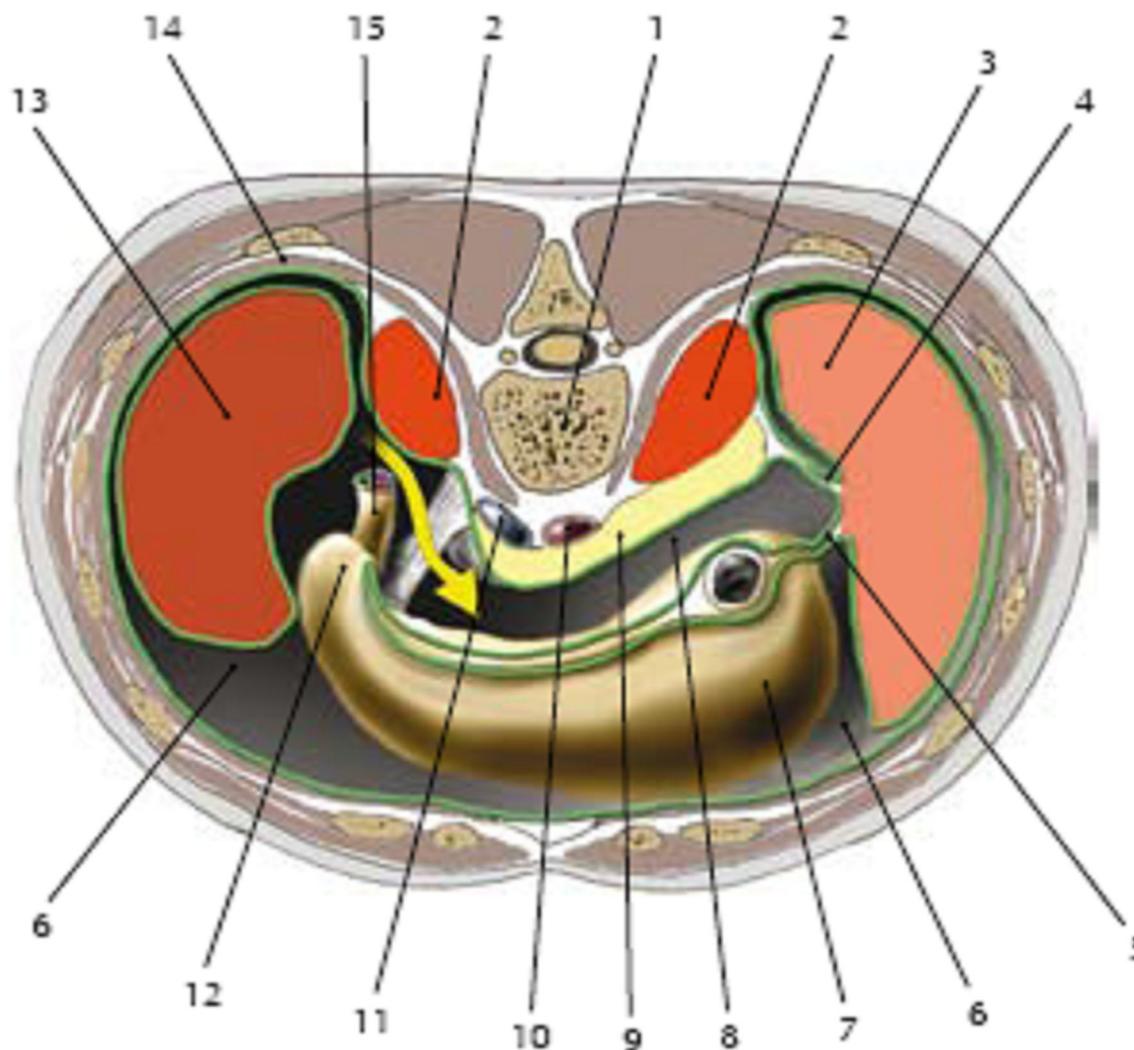




Laparoscopic view



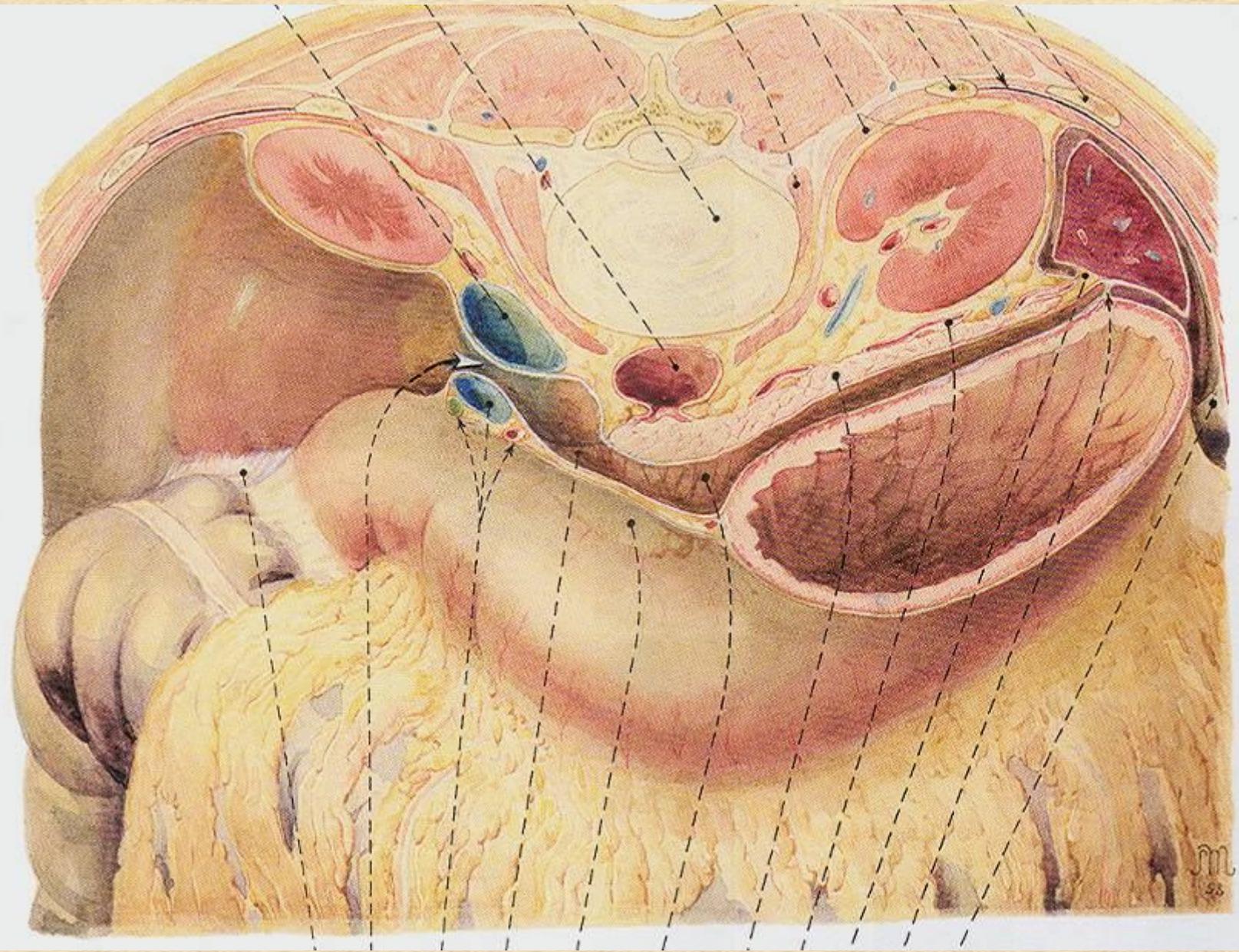
### **3. Supramesocolic part of the peritoneal cavity**

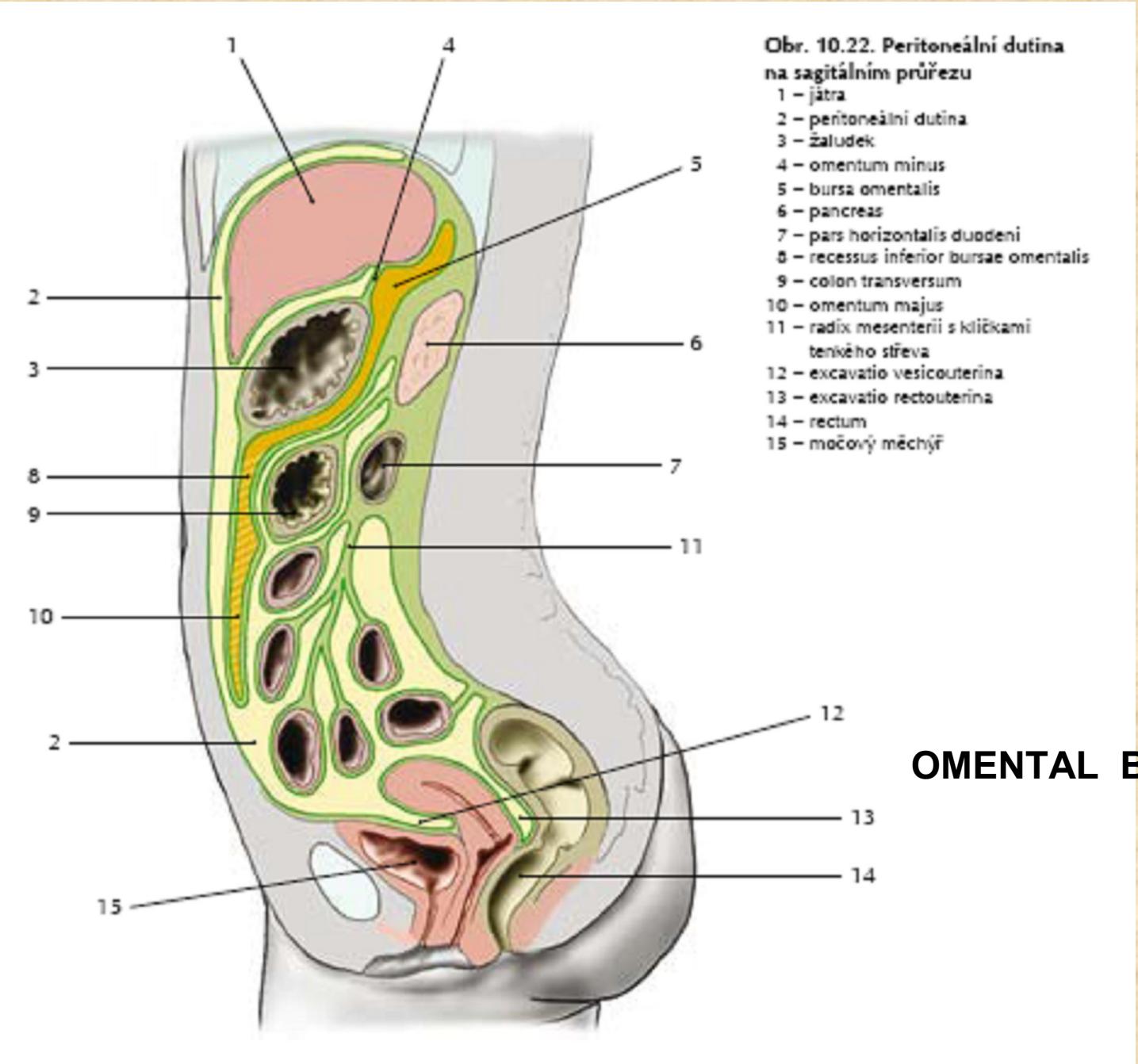


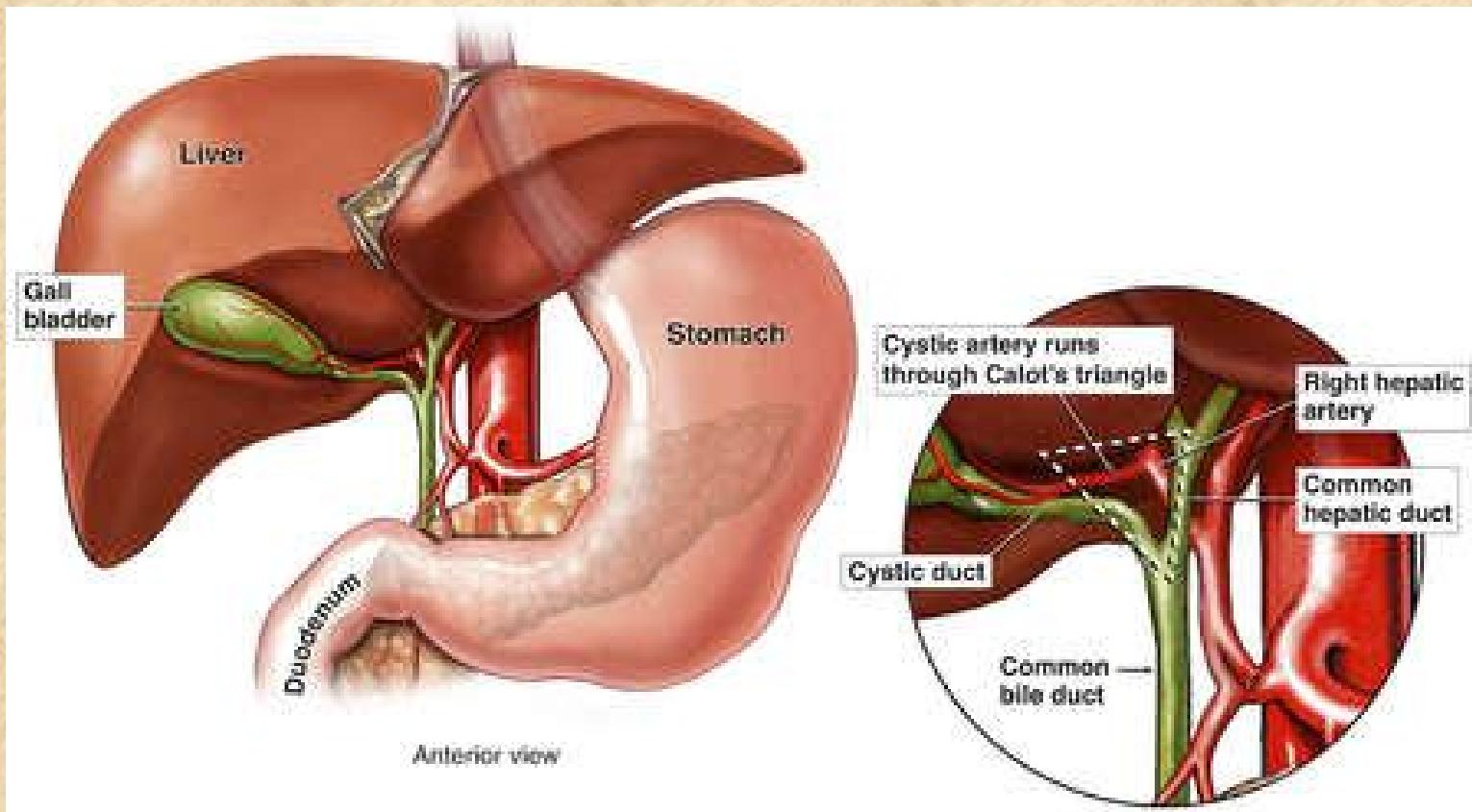
Obr. 10.26. Transverzální řez trupem, orgány dutiny břišní a bursa omentalis, šipka znázorňuje vstup do bursy, foramen epiploicum (schematicky)

- 1 – lumbální obratel
- 2 – pravá a levá ledvina
- 3 – slezina
- 4 – ligamentum pancreaticolienale
- 5 – ligamentum gastricolienale
- 6 – peritoneální dutina
- 7 – žaludek
- 8 – bursa omentalis
- 9 – páncreas
- 10 – aorta
- 11 – v. cava inferior
- 12 – začátek duodena
- 13 – játra
- 14 – bránice
- 15 – ligamentum hepatoduodenale  
obsahující v. portae, a. hepatica  
propria a ductus choledochus

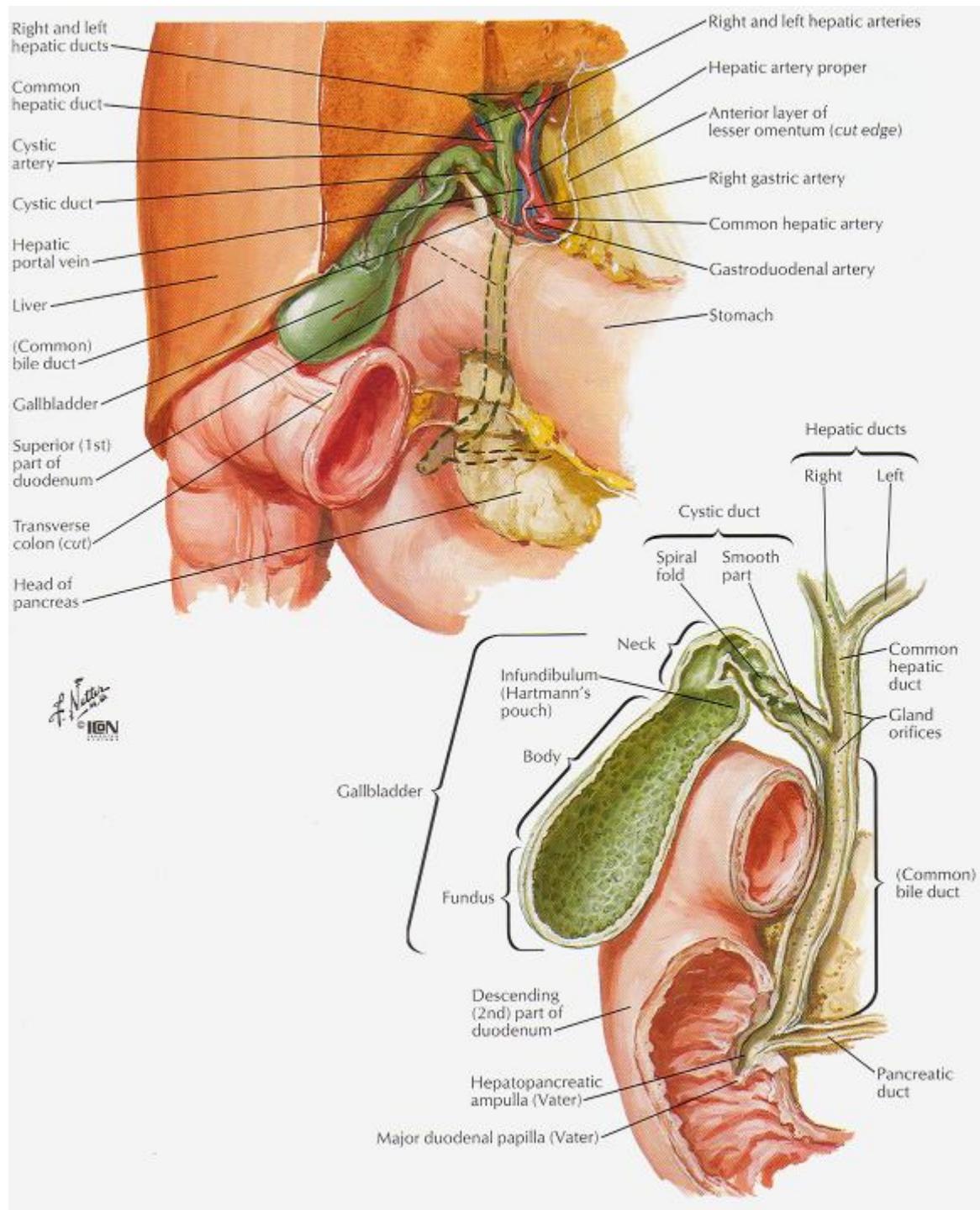
## OMENTAL BURSA (lesser sac) – WALLS



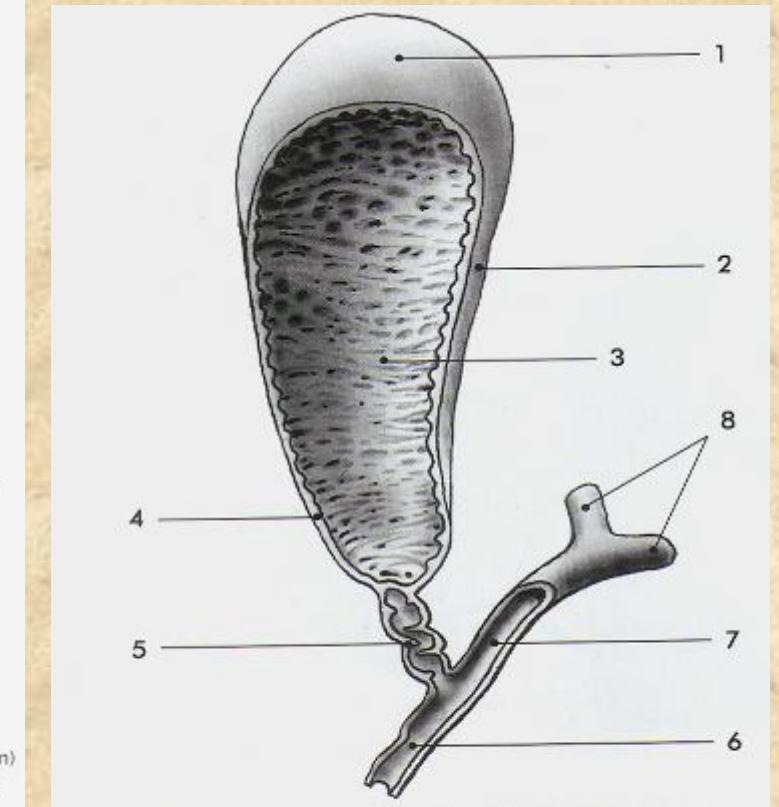




## BILIARY DUCTS

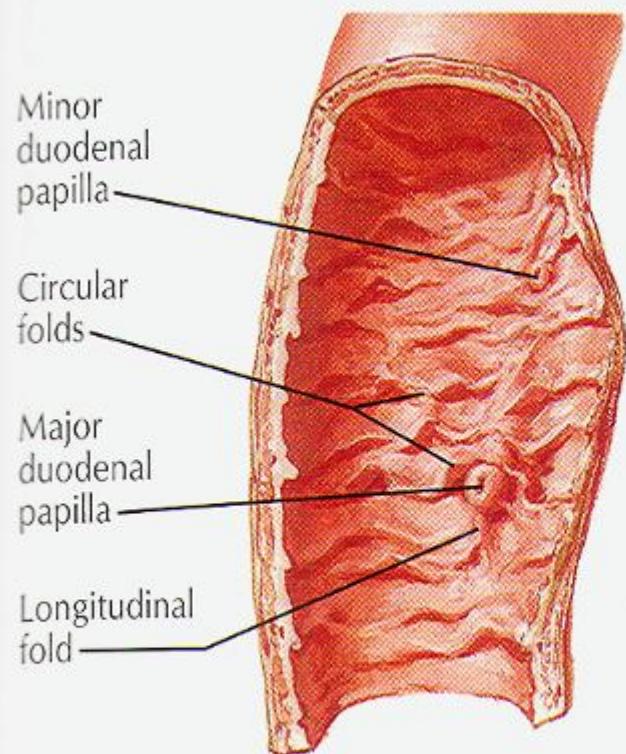


## Extrahep. Biliary ducts

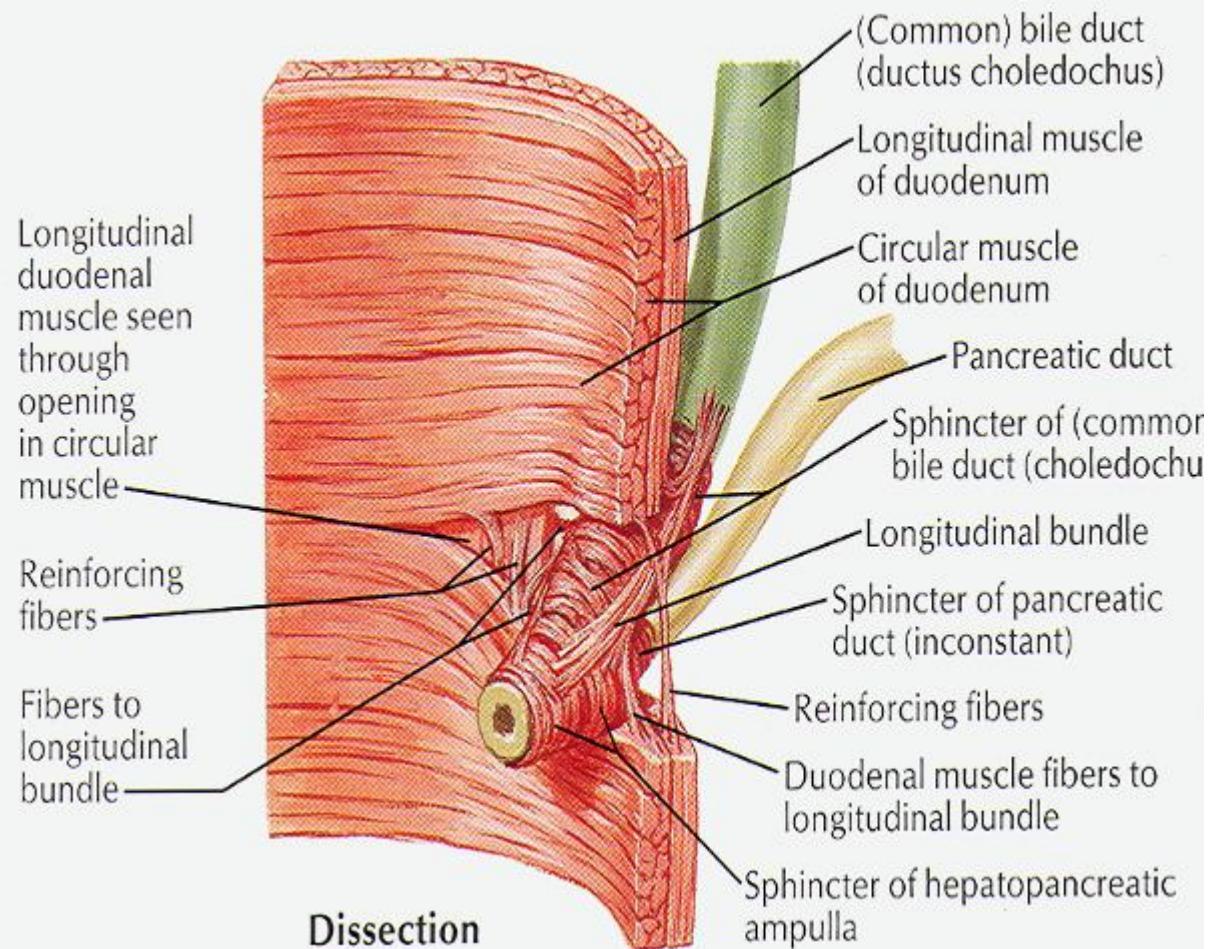


Obr. 5.33. Vesica biliaris a ductus cysticus. 1 – fundus, 2 – corpus, 3 – plicae mucosae, 4 – collum, 5 – ductus cysticus, 6 – ductus choledochus, 7 – ductus hepaticus communis, 8 – ductus hepaticus dx. et sin.

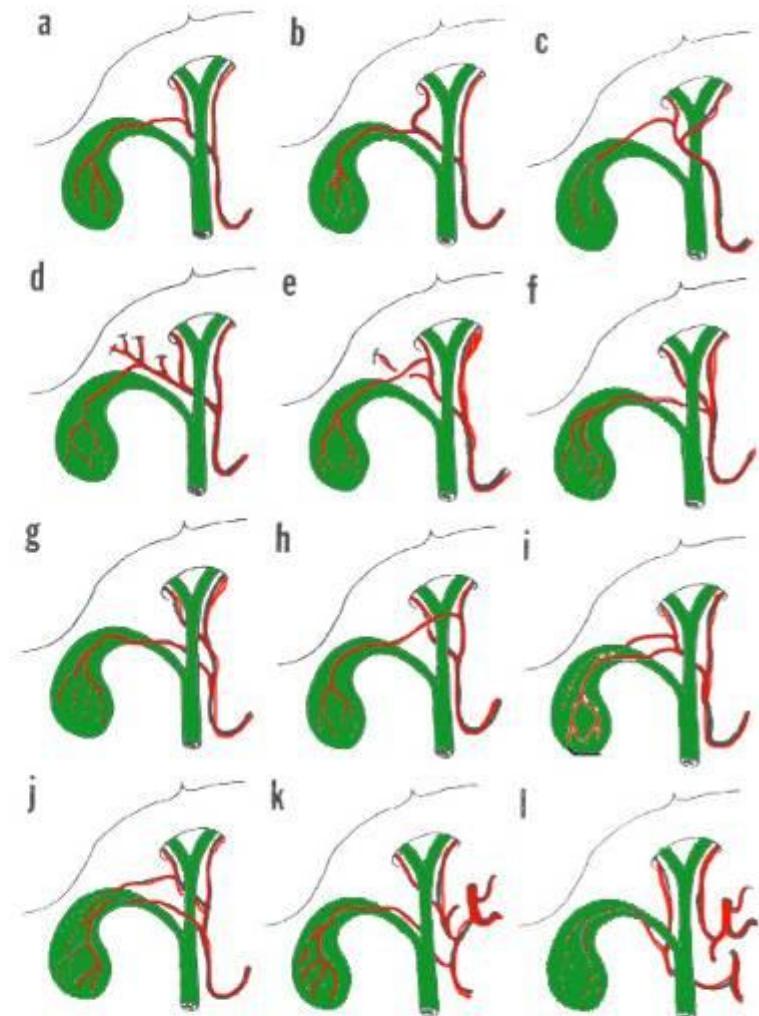
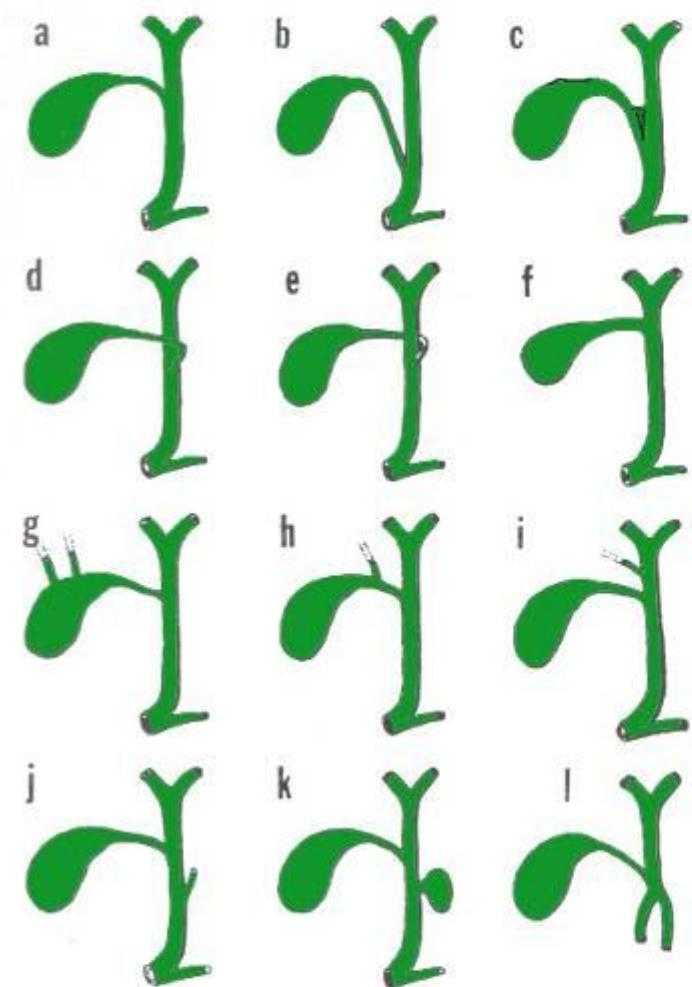
# Papilla Vateri



Interior of descending  
(2nd) part of duodenum



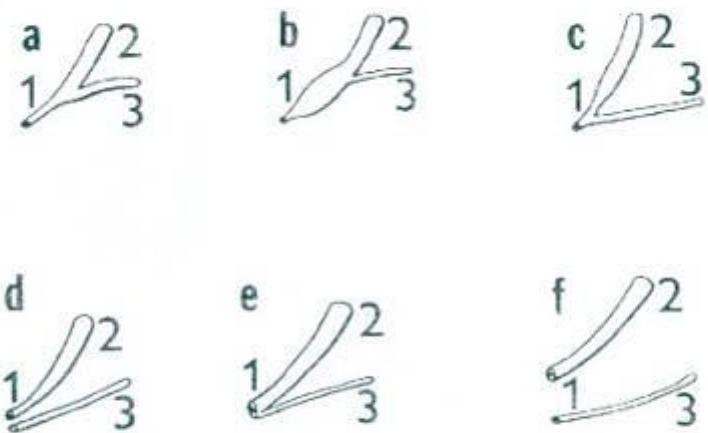
Dissection



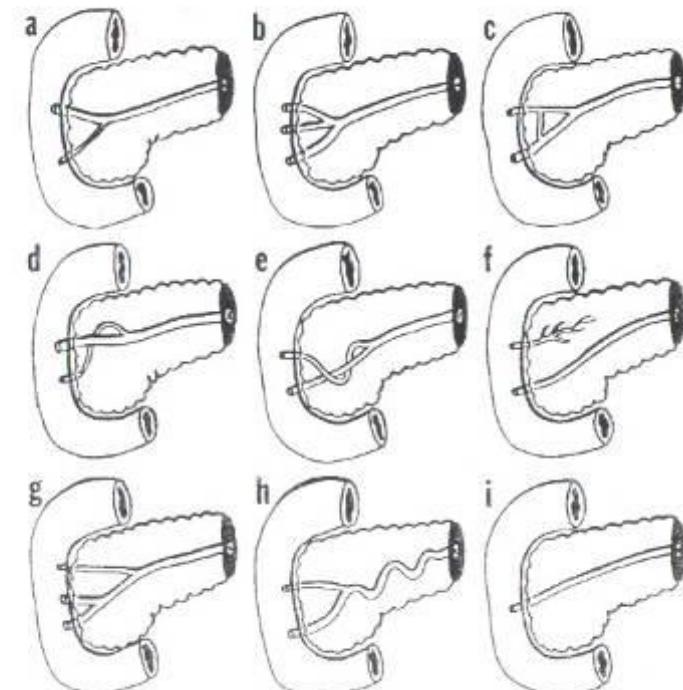
Observe the following:

8.1

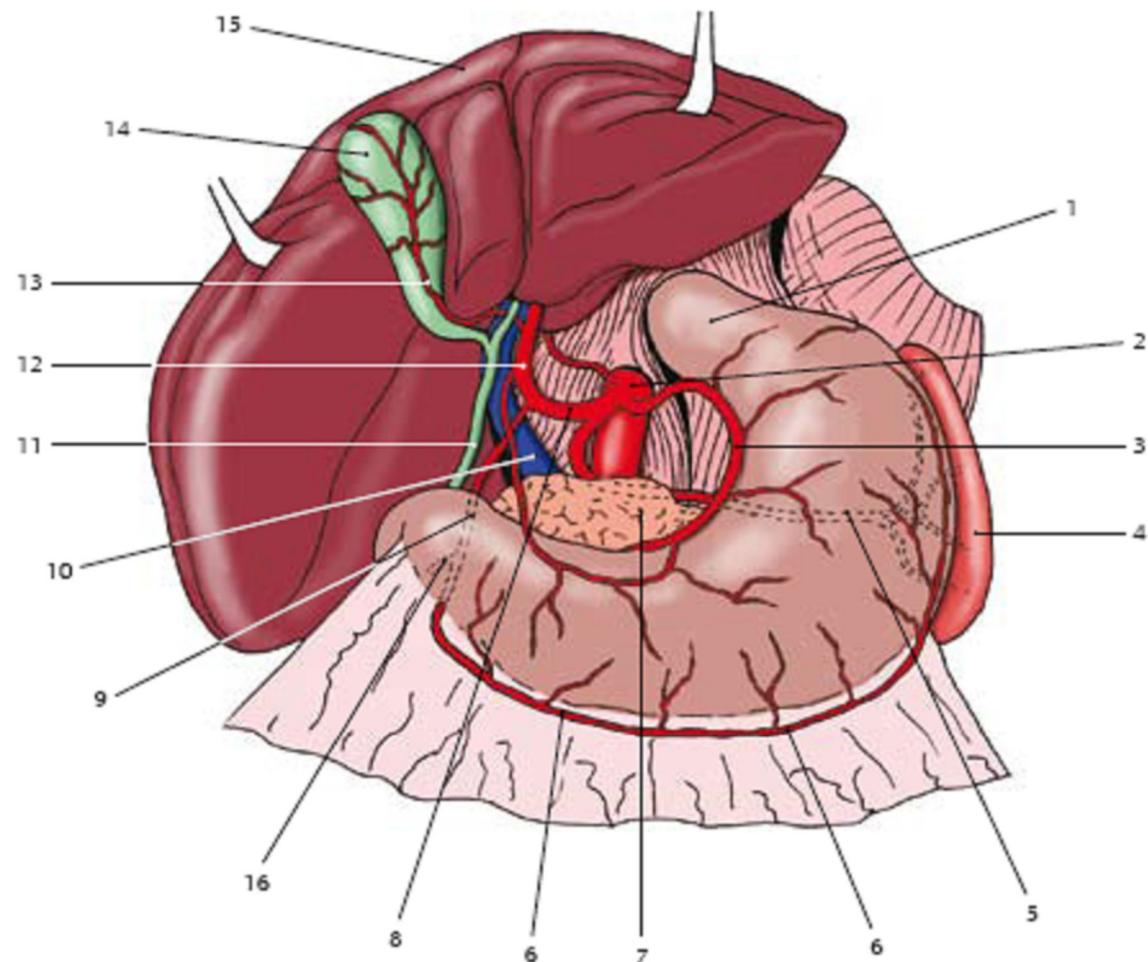
### variability of extrahepatic biliary tree and its blood supply



Obr. 4. Příklady variability vztahů ductus choledochus a ductus pancreaticus: 1 - oblast papillae duodeni major, 2 - ductus choledochus, 3 - ductus pancreaticus. Upraveno podle Čiháka (3)



**variability of choledochal and pancreataic duct opening  
variability of pancreatic ducts**



Obr. 7.7. Truncus coeliacus

2 – truncus coeliacus odstupujici

3 – a. gastrica sin.

4 – stezina

5 – a. lienalis

6 – aa. gastroepiploiceae

8 – a. hepatica communis

9 – a. gastroduodenalis

10 – v. portae

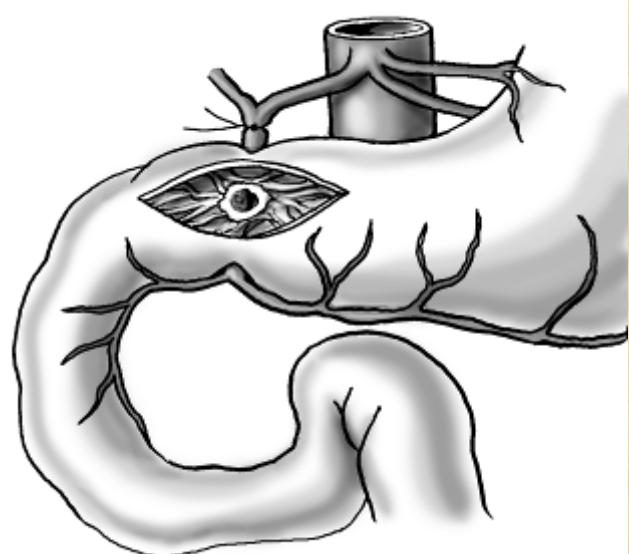
11 – ductus choledochus

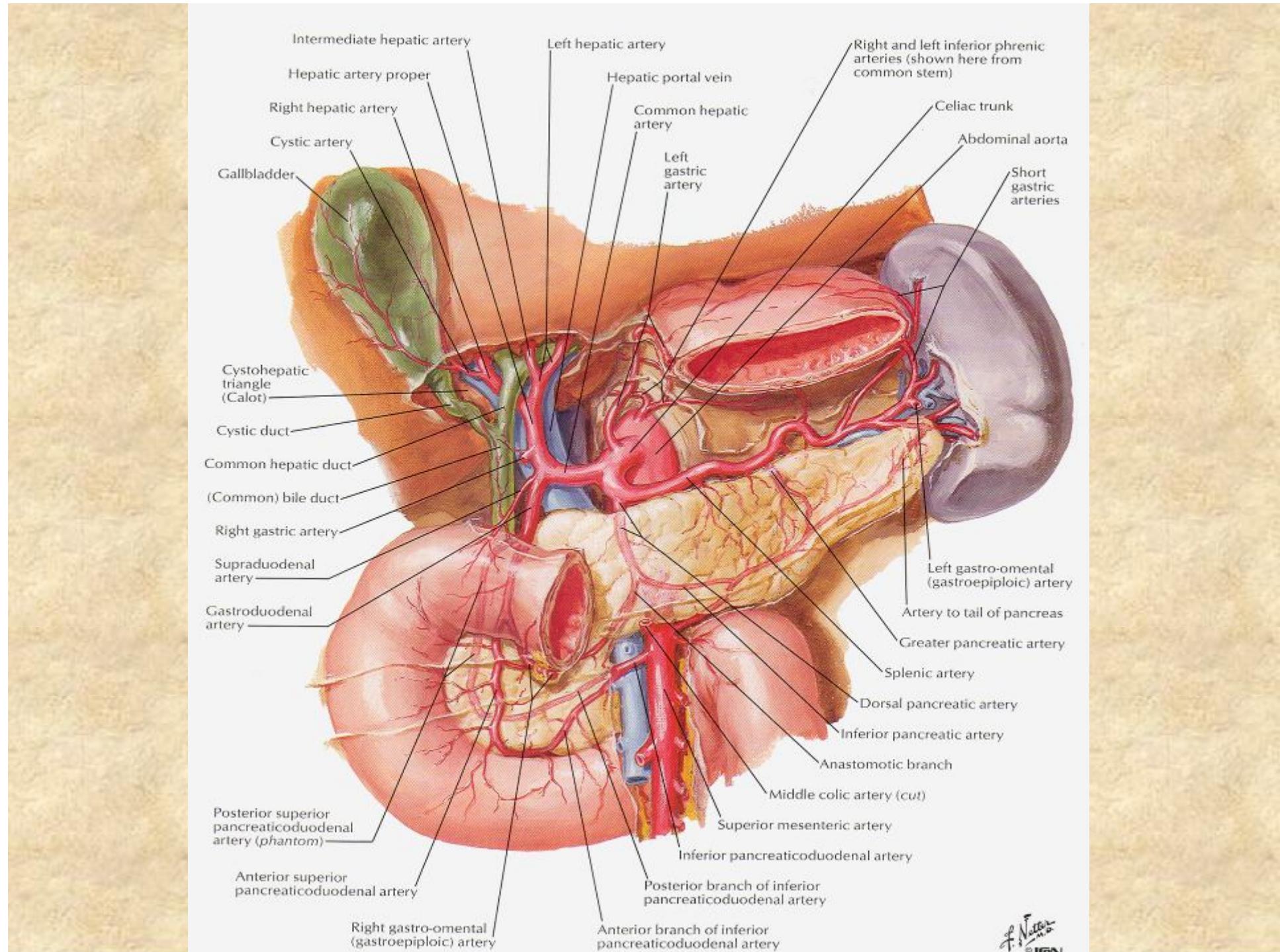
12 – a. hepatica propria

13 – a. cystica

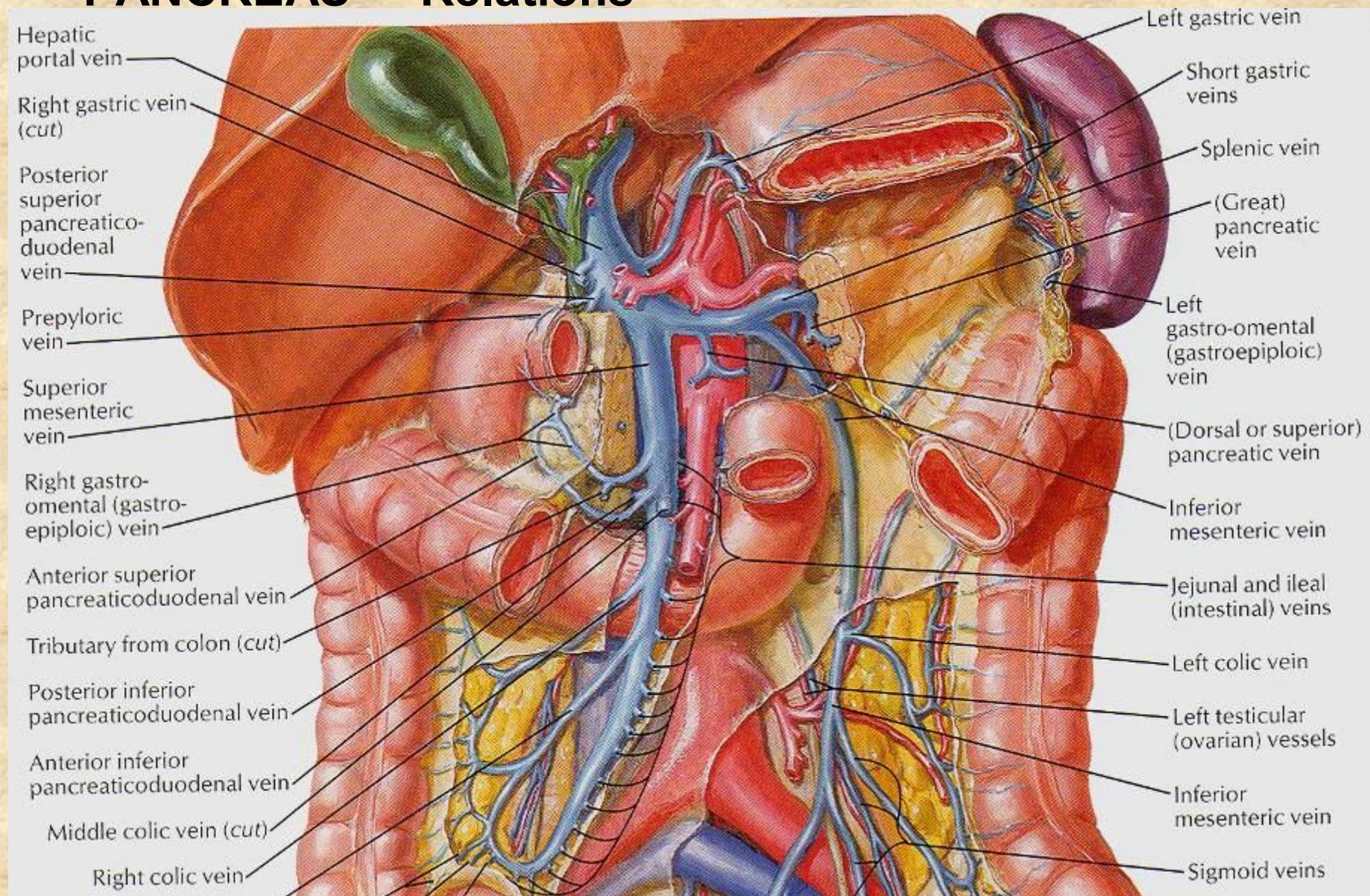
15 – ja

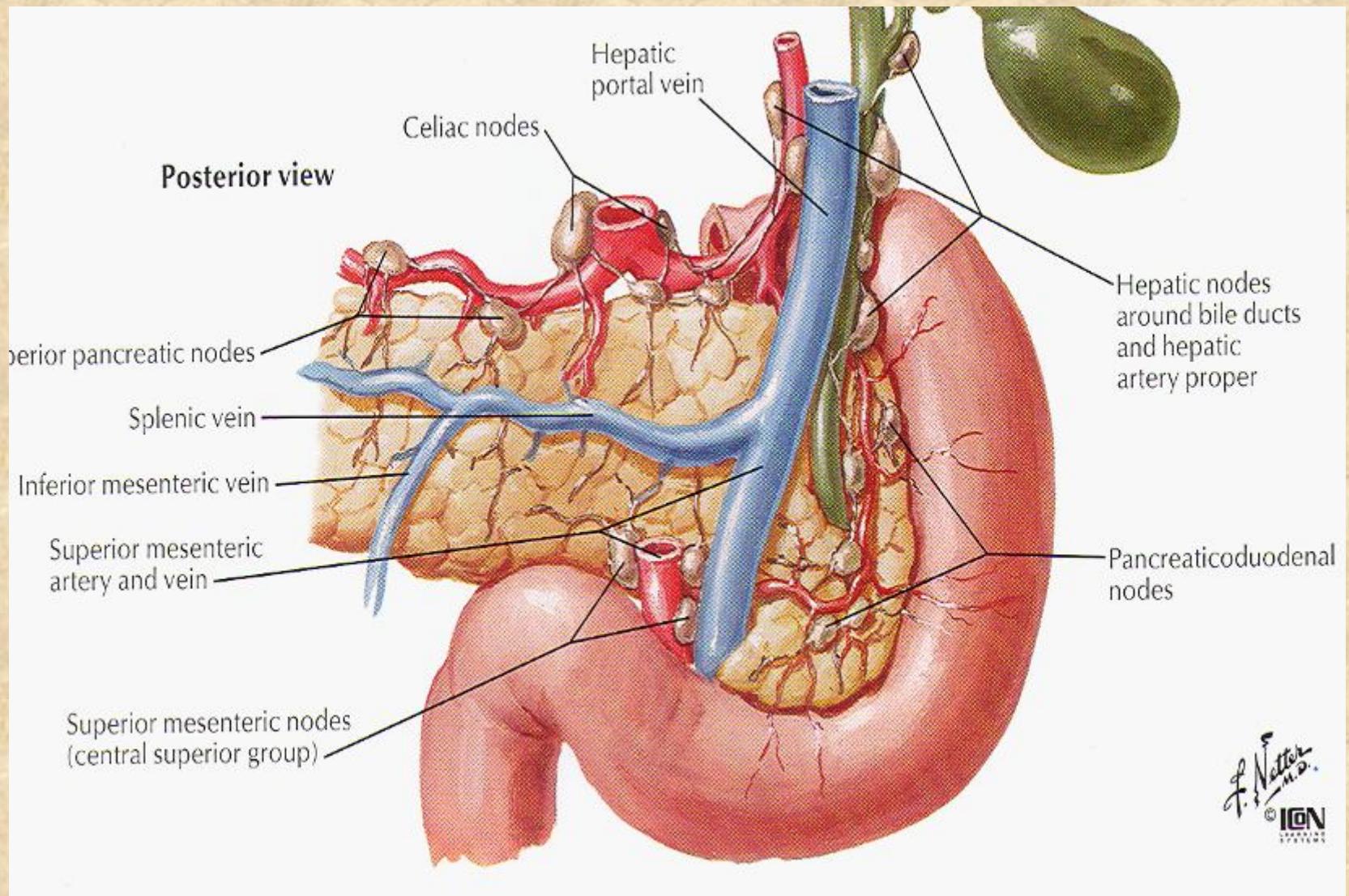
16 – a. pancreaticoduodenalis s.



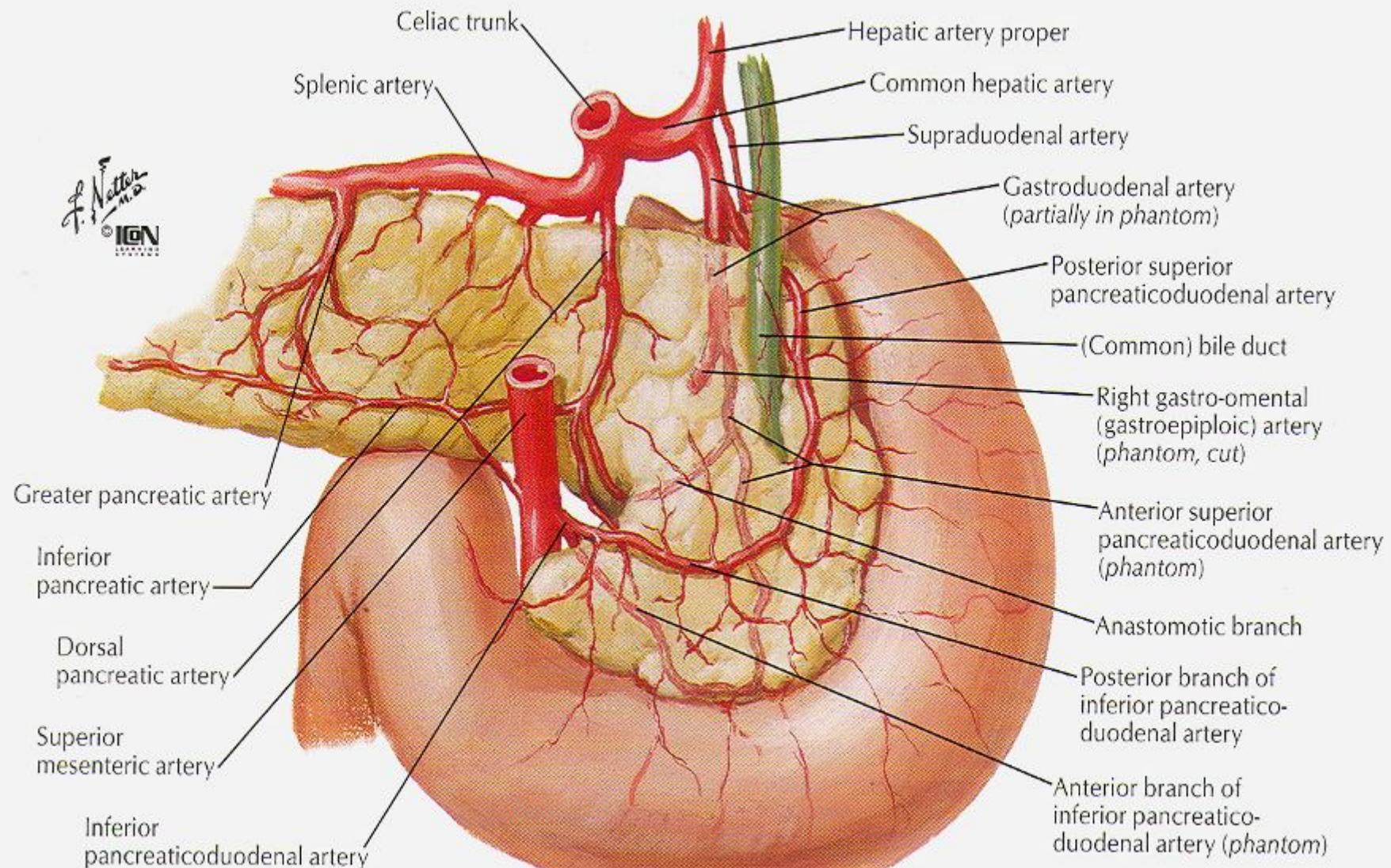


# PANCREAS - Relations



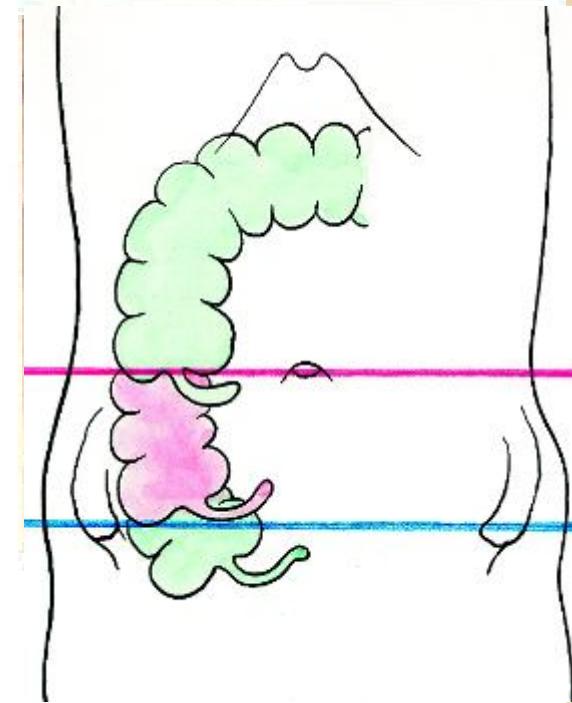
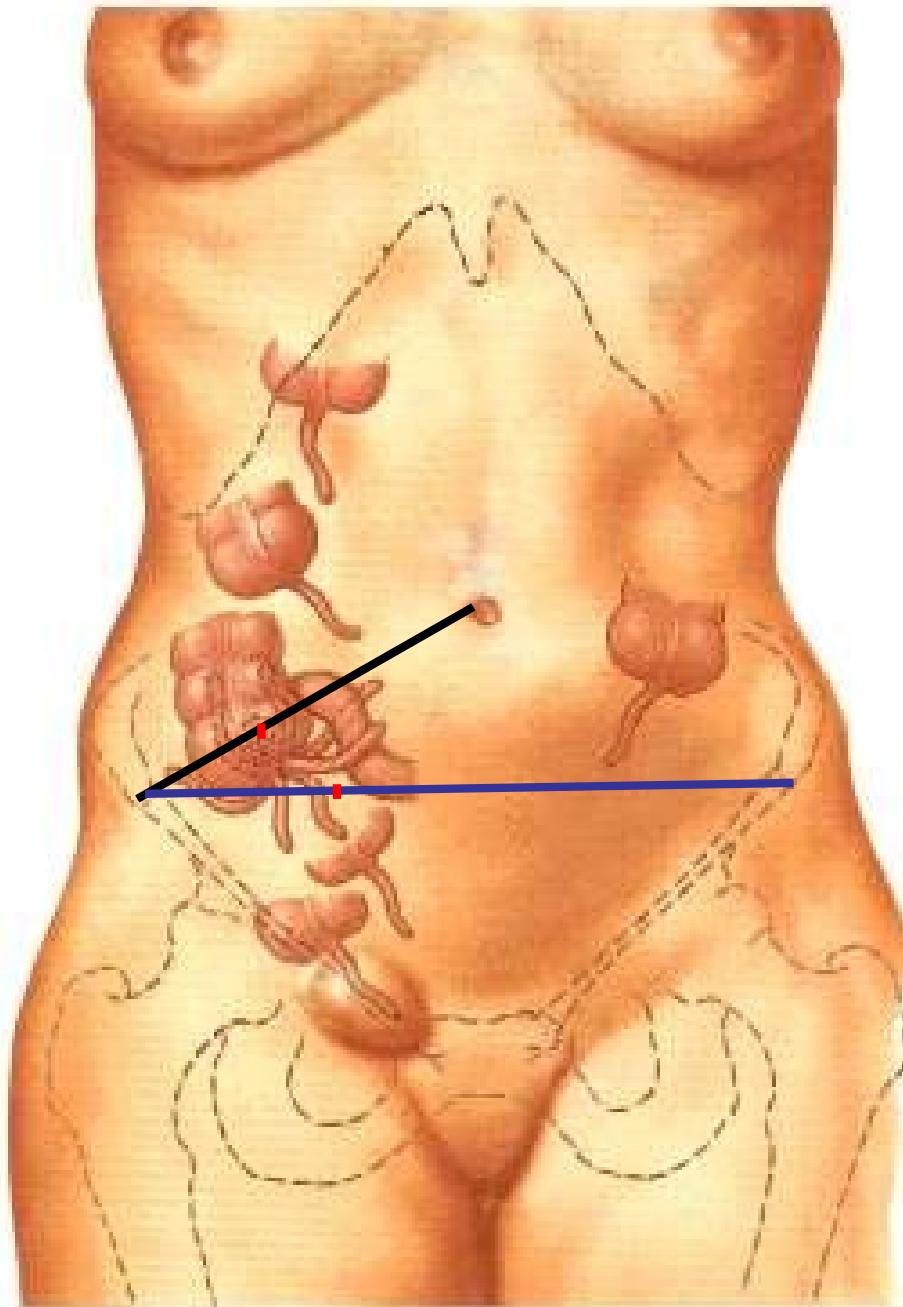


*J. Nette*  
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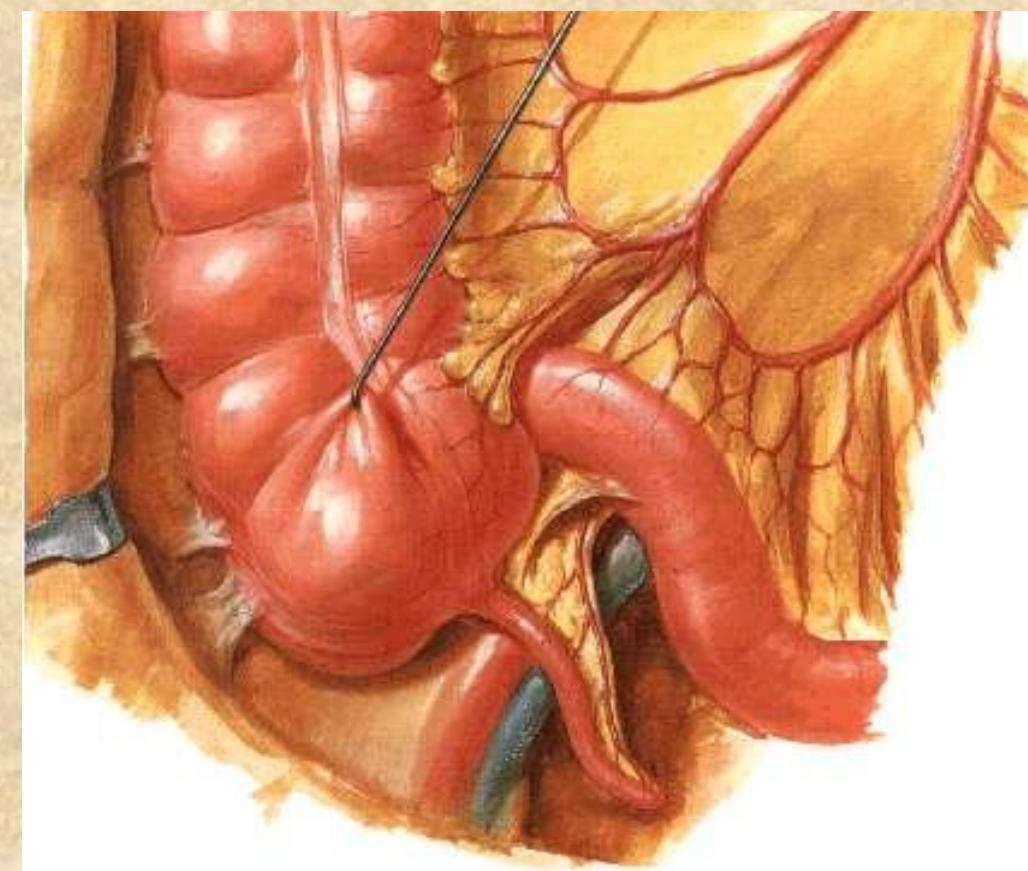
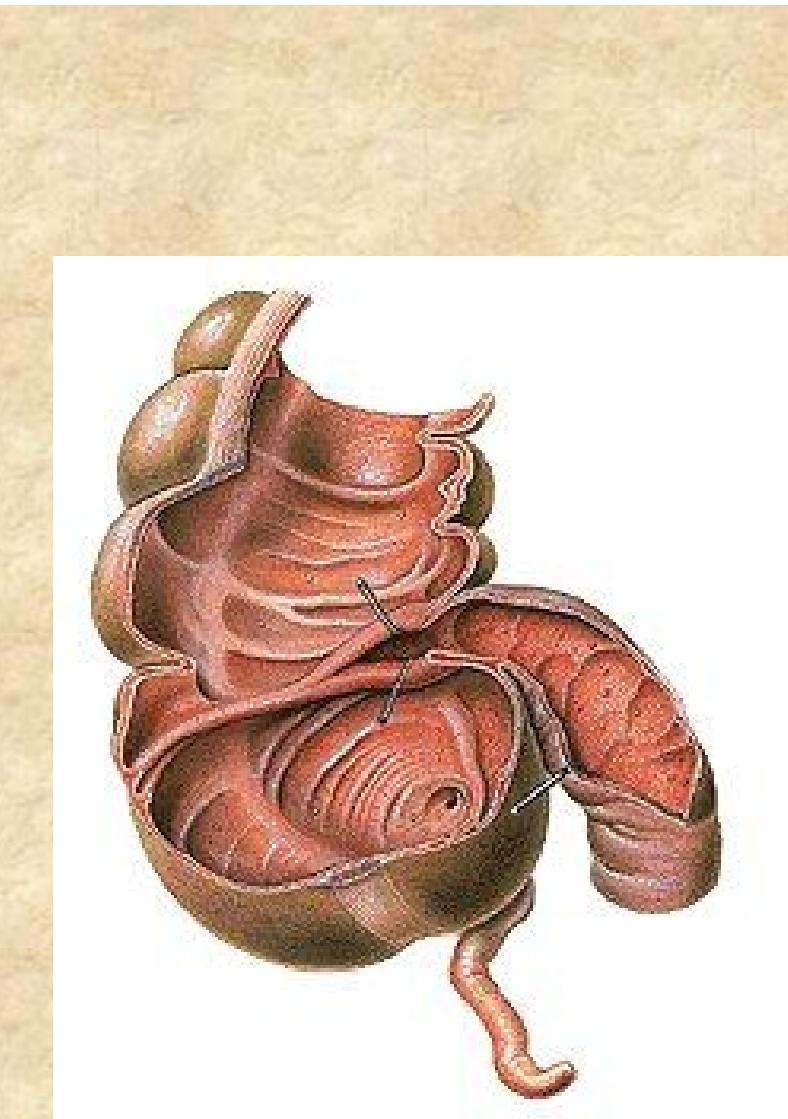
Posterior view

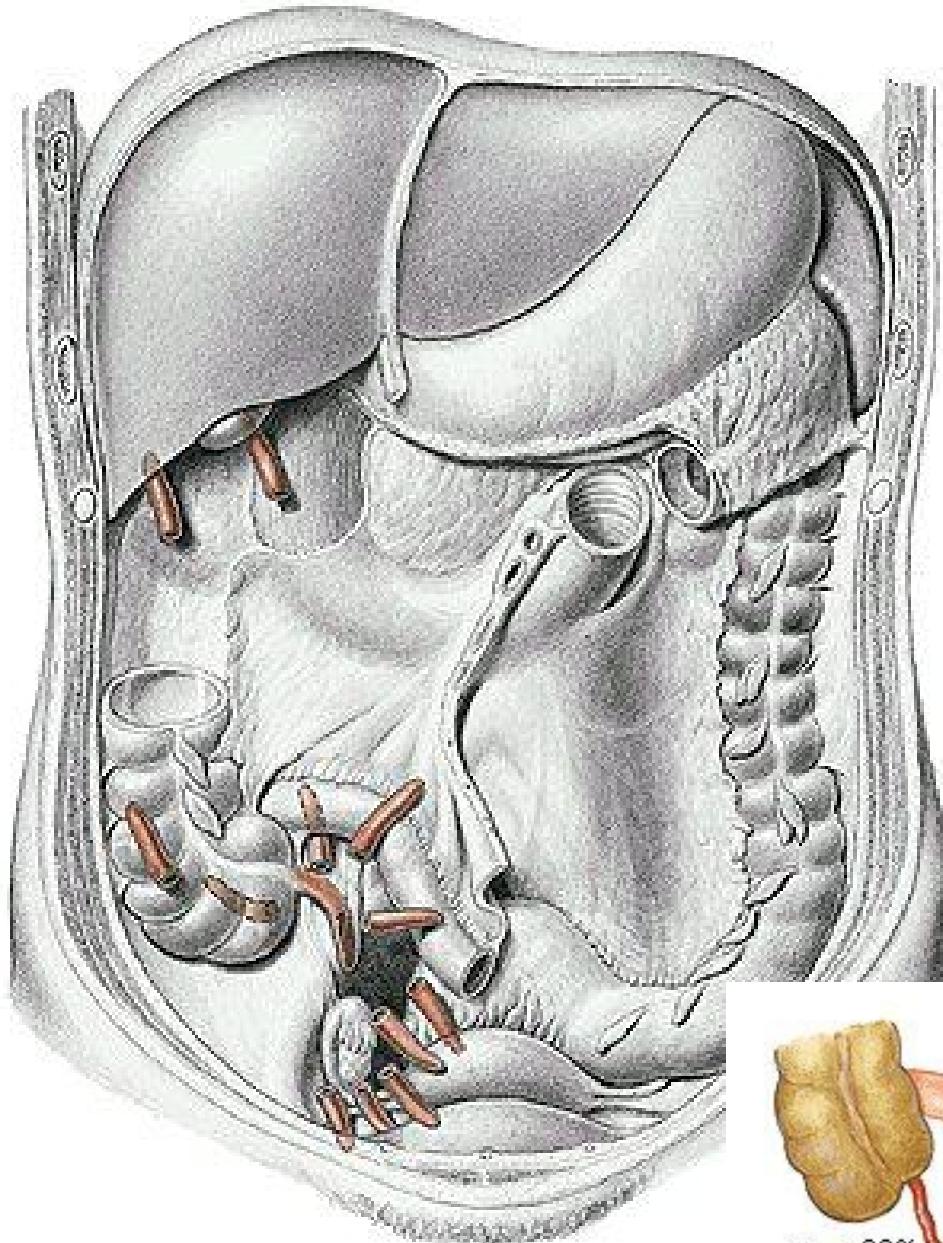
## **4. Appendix vermiformis and appendicitis**



**Lanz's point**  
**Bispinal linea**

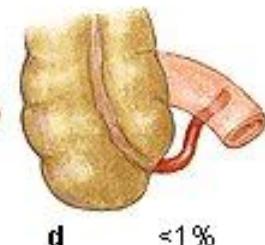
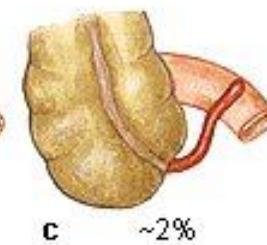
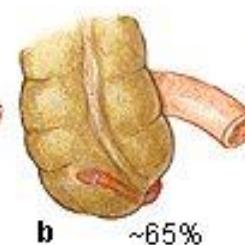
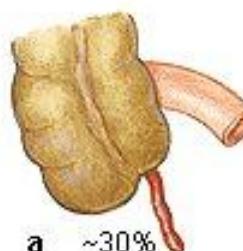
**Mc Burney's point**  
**Monro linea**

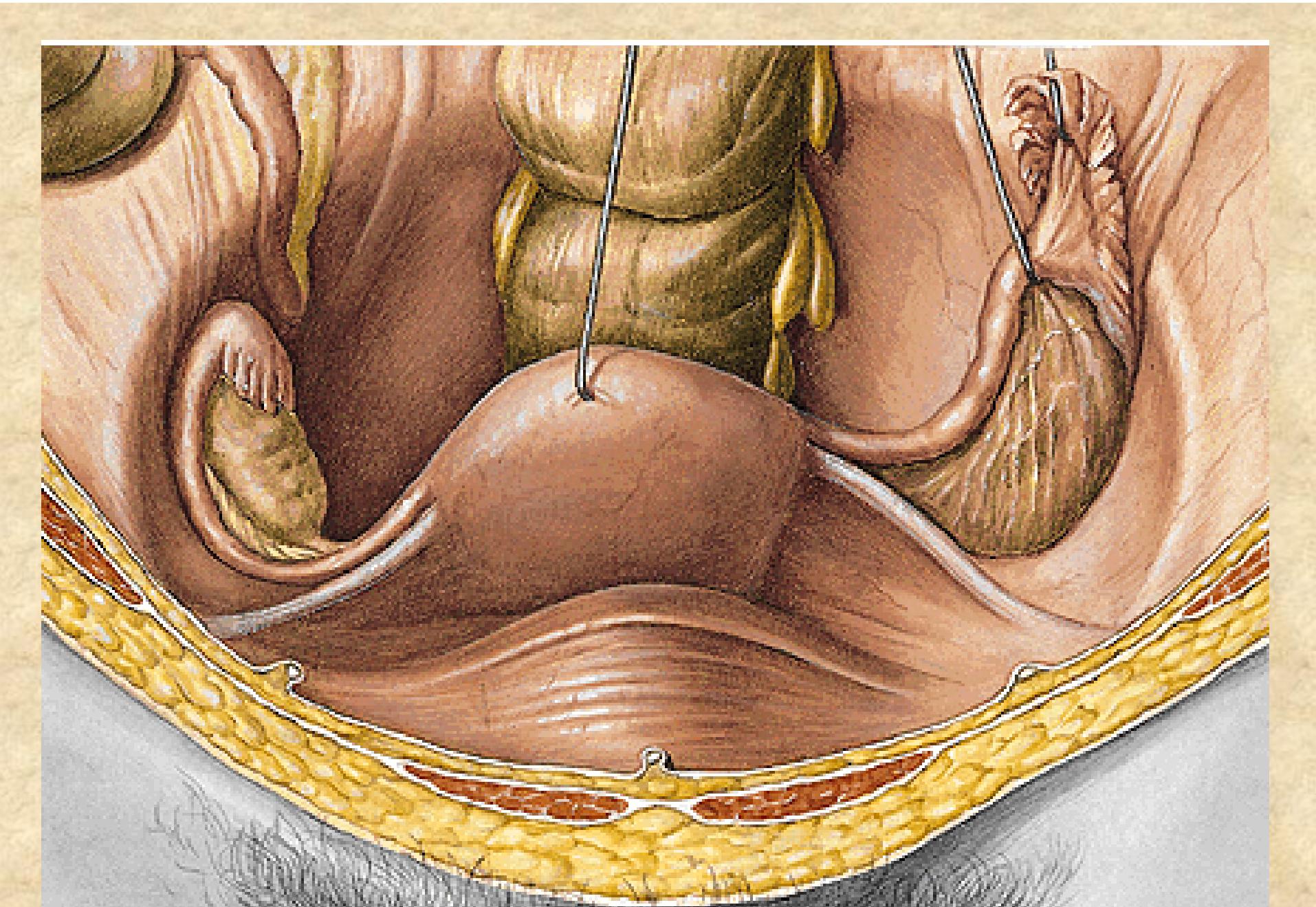




## Positio:

- praecaecal
- laterocaecal
- ileocaecal
- retrocaecal
- subcaecal
- pelvic





**Lig. appendico-ovaricum**

## **THE ACUTE ABDOMEN :**

Clinical syndrome, characterized by the sudden onset of intense **abdominal pain** and associated signs(shock, **vomiting**, changes in **gastrointestinal peristaltic activity**, **fever**)

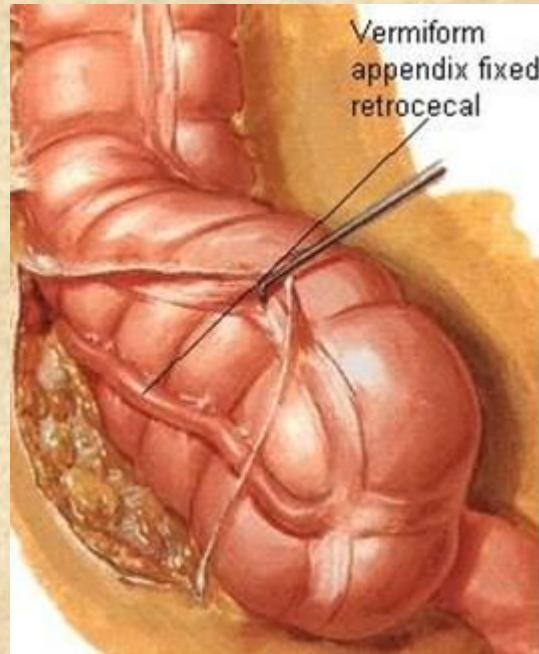
Onset is spontaneous or follows trauma

# **Non – traumatic acute abdomen: causes**

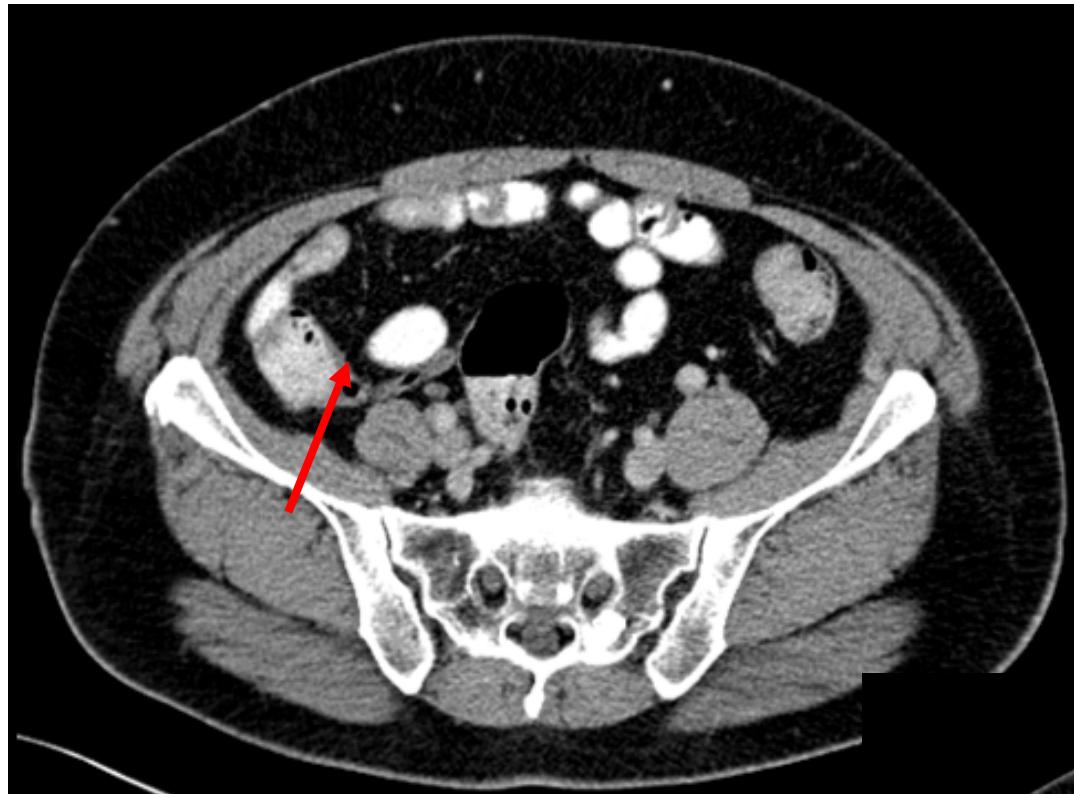
- Inflammatory changes (gastritis, gastroenteritis, pancreatitis, appendicitis)
- Ileus (intestinal blockage)– mechanical (adhesions, tumor, vascular)
- GIT haemorrhage

# **Appendicitis**

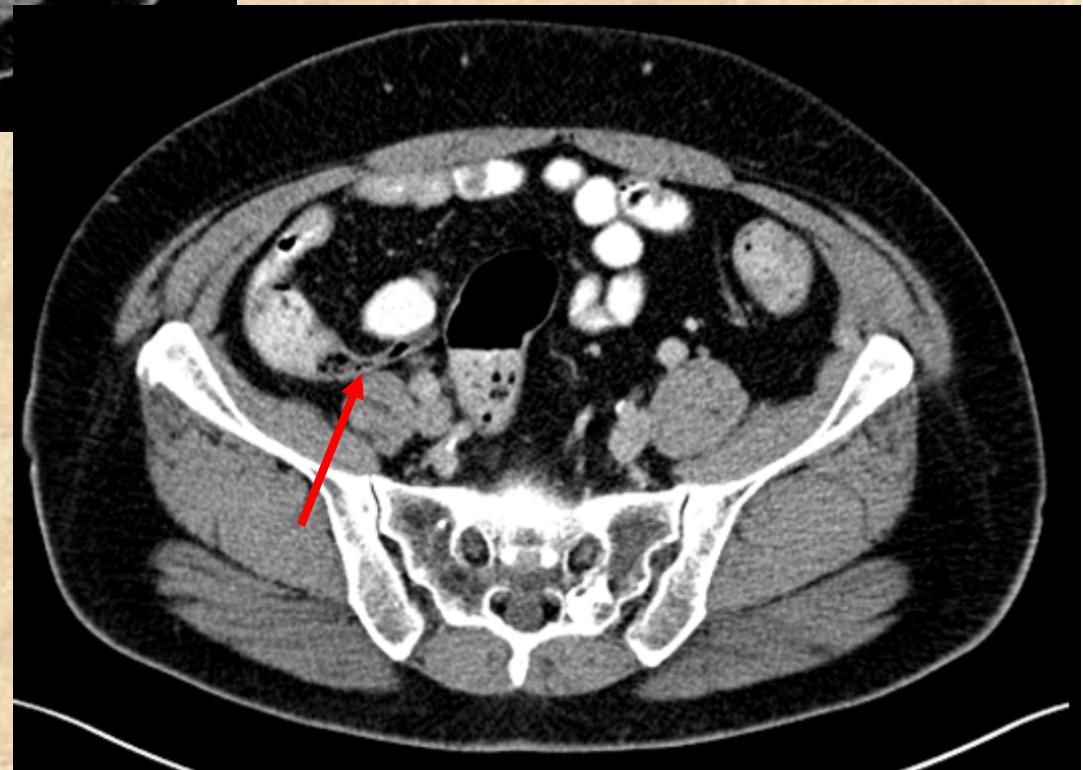
- Patients history
- Clinical examination (abdominal evaluation)
- Laboratory tests (blood tests)
- Rtg, Ultrasound, CT



**Positio retrocaecalis**

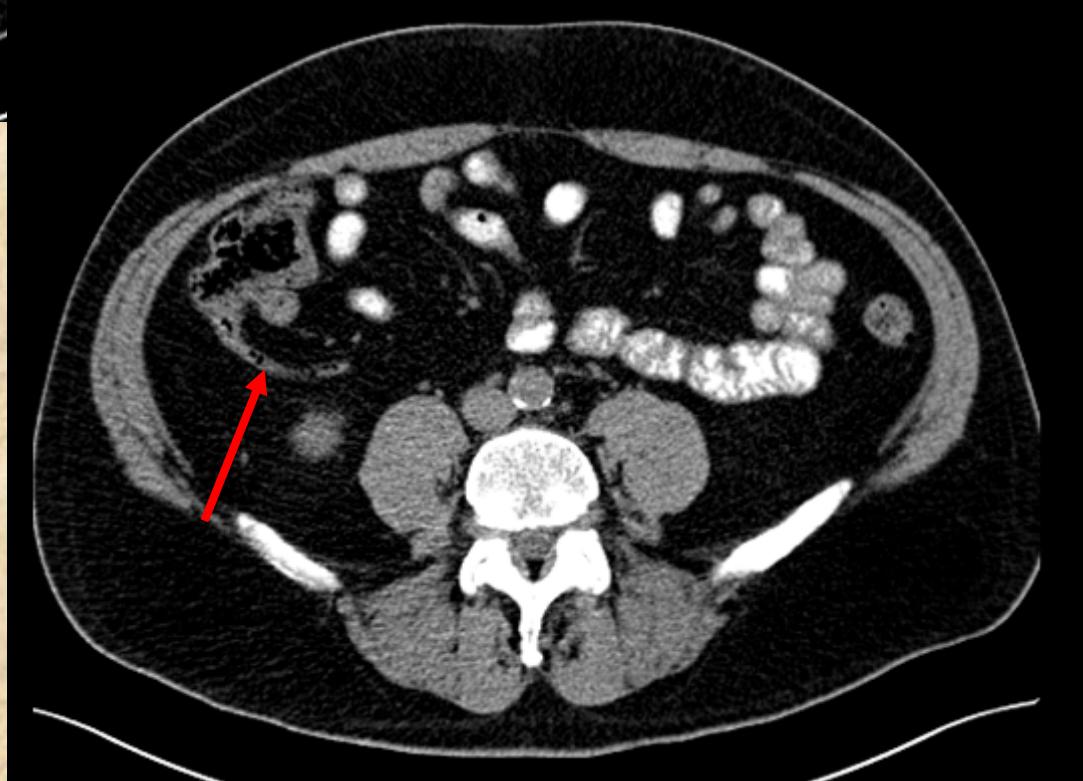


**Positio ileocaecalis**

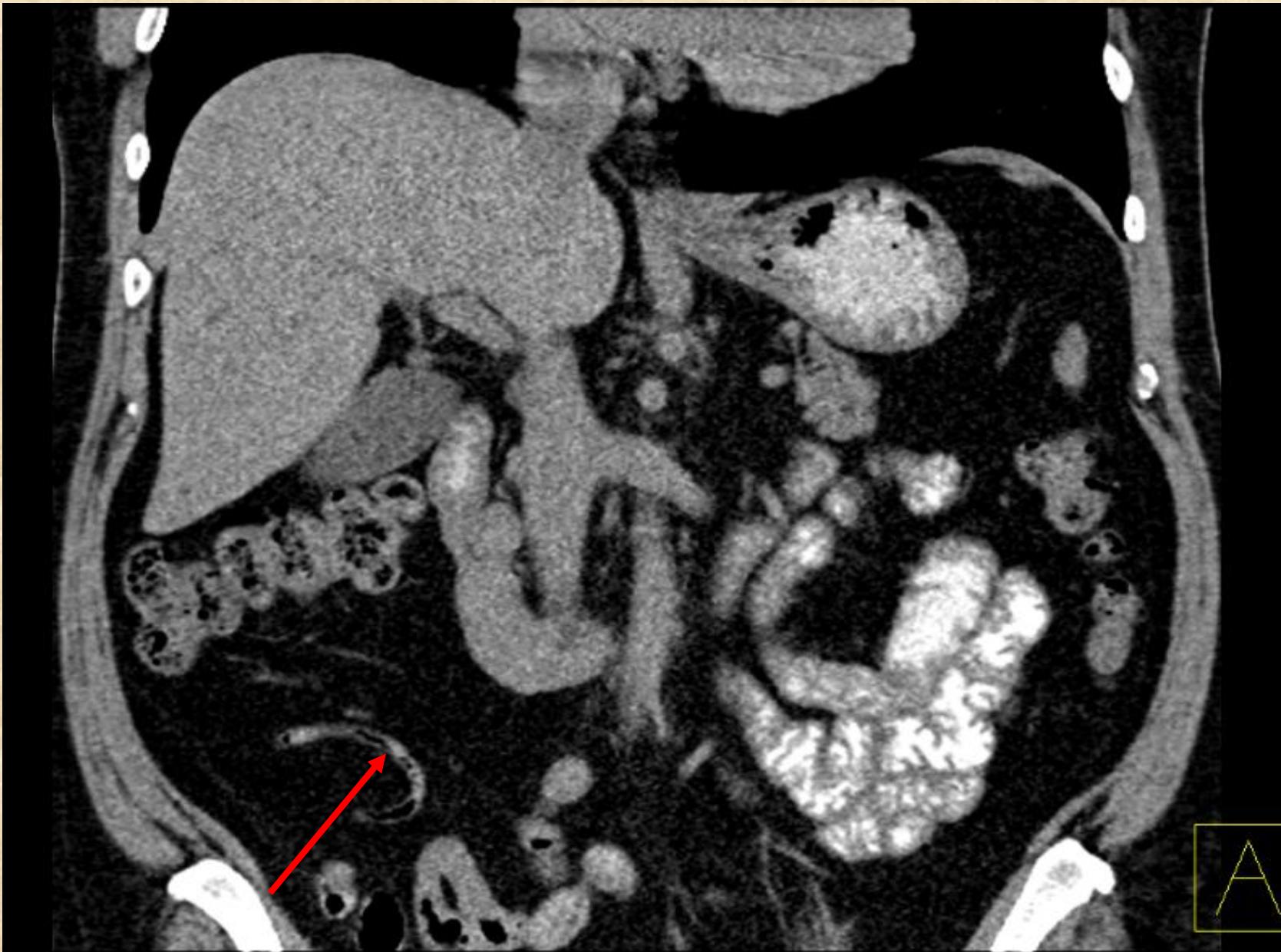




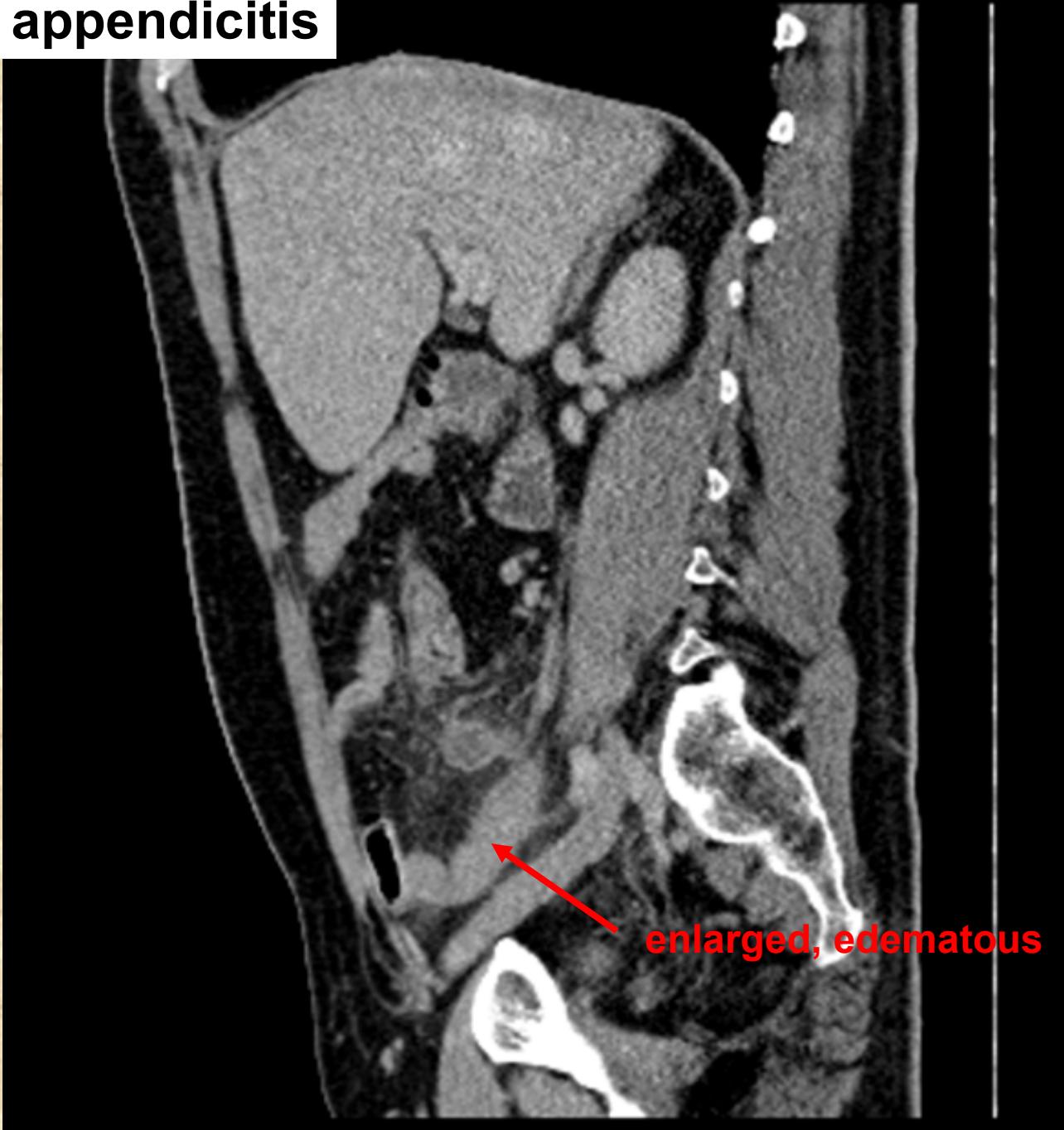
**Positio retrocaecalis**



## Positio retrocaecalis

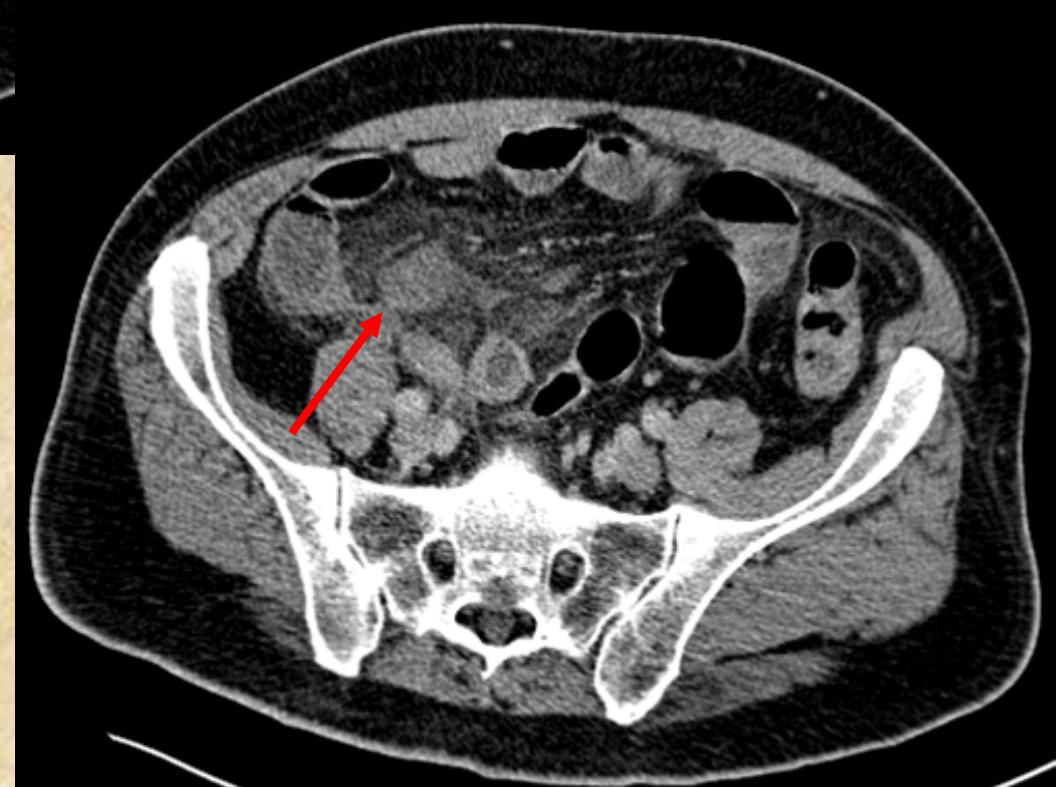


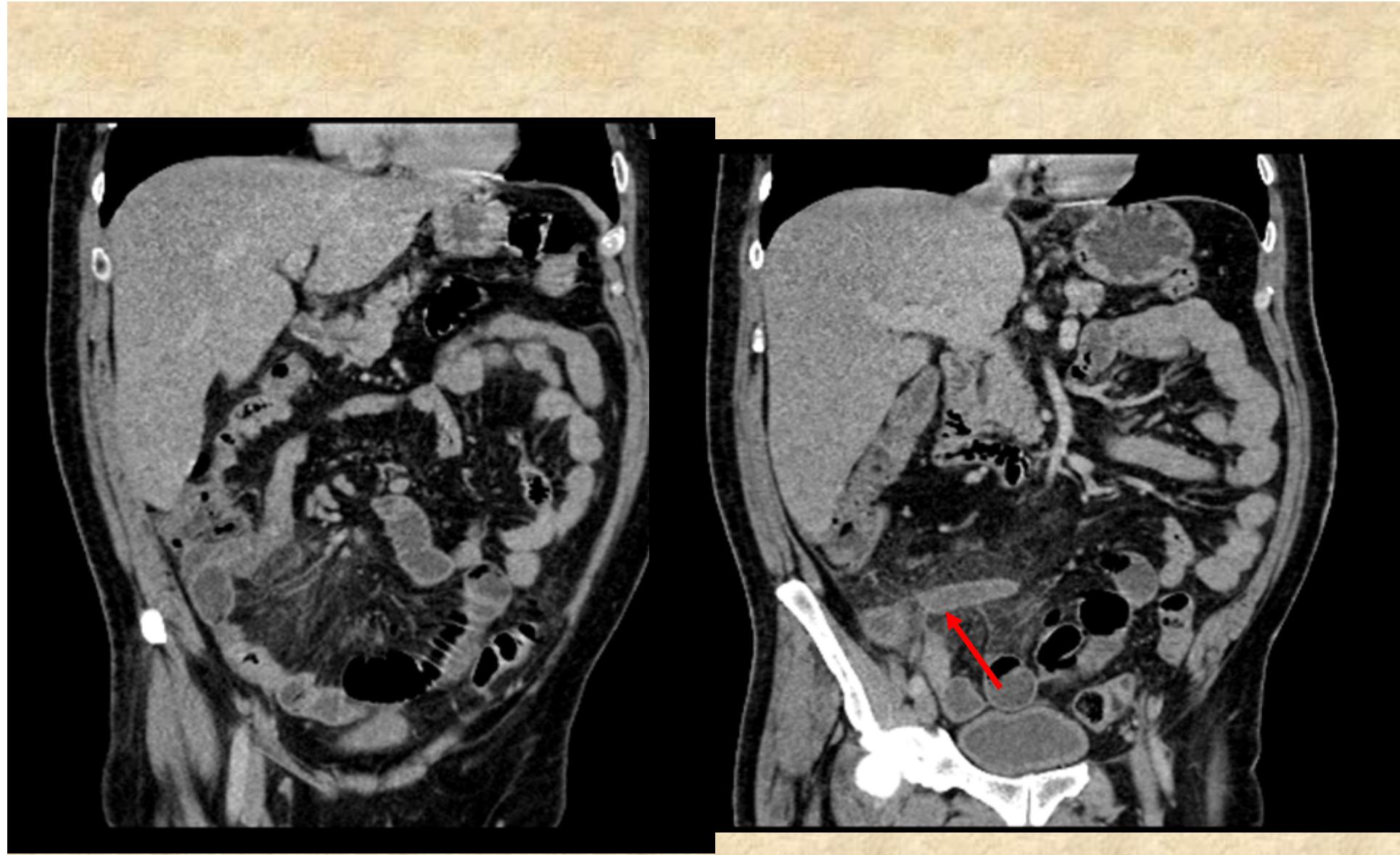
## Advanced appendicitis





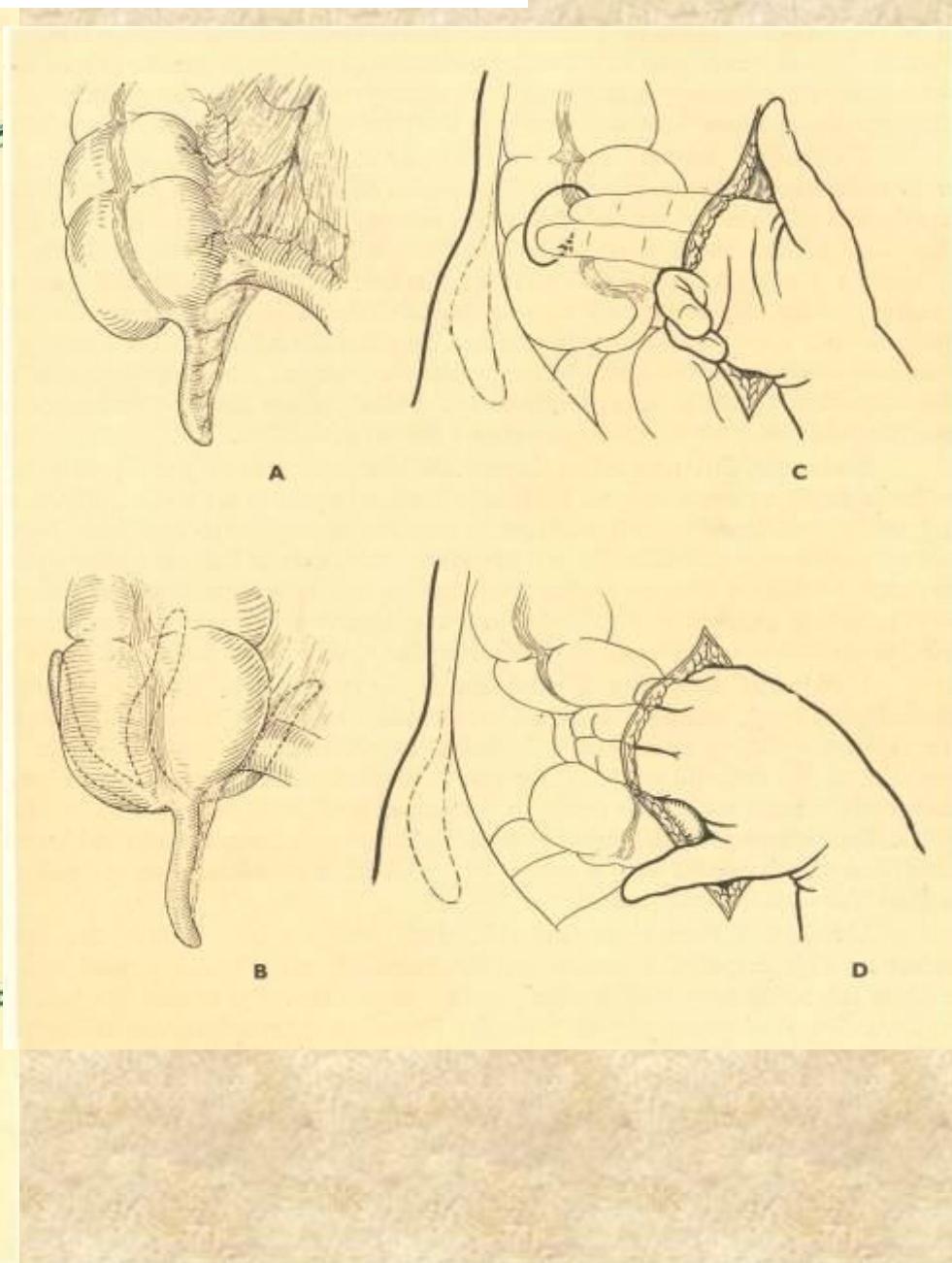
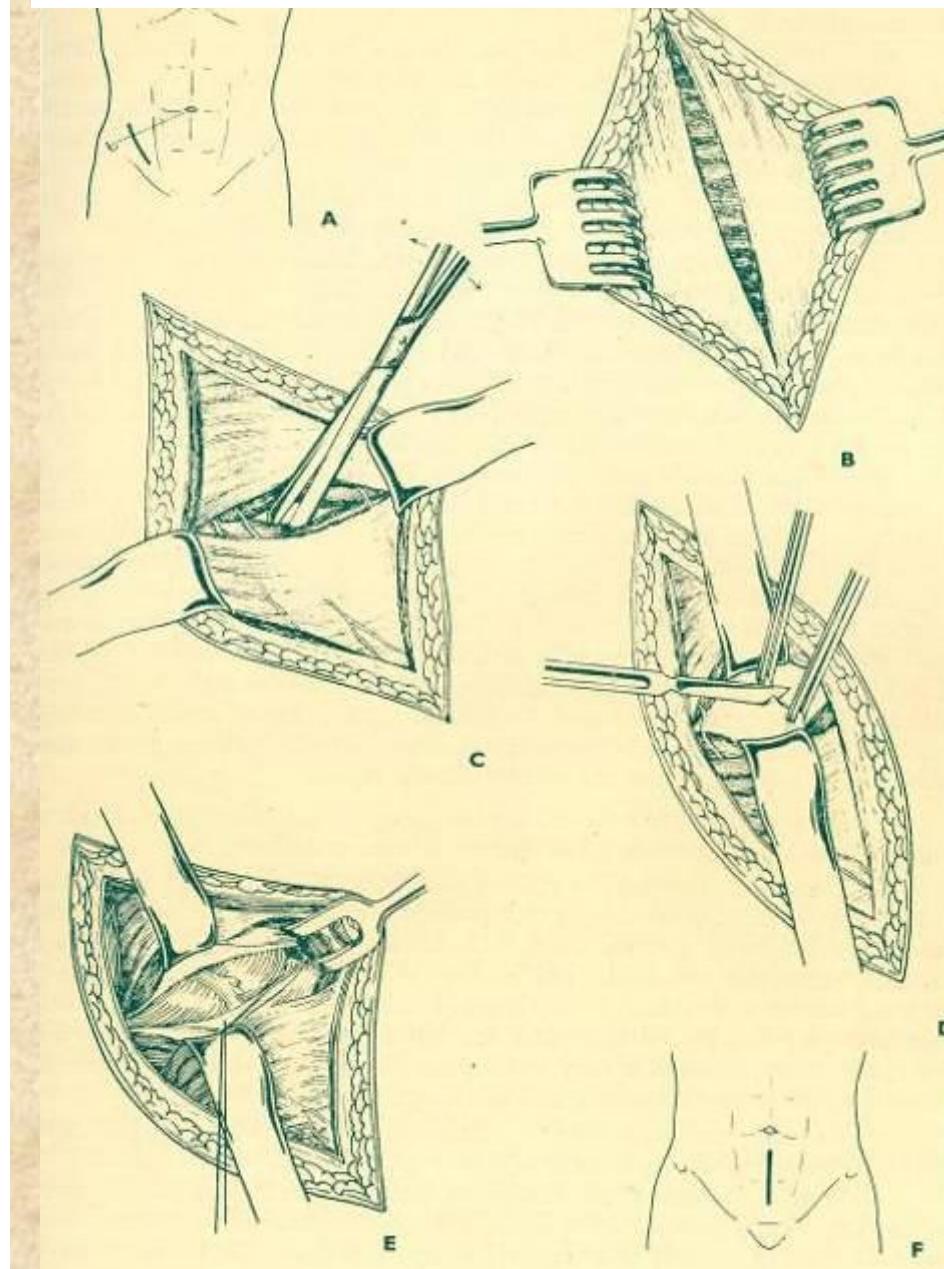
Advanced appendicitis

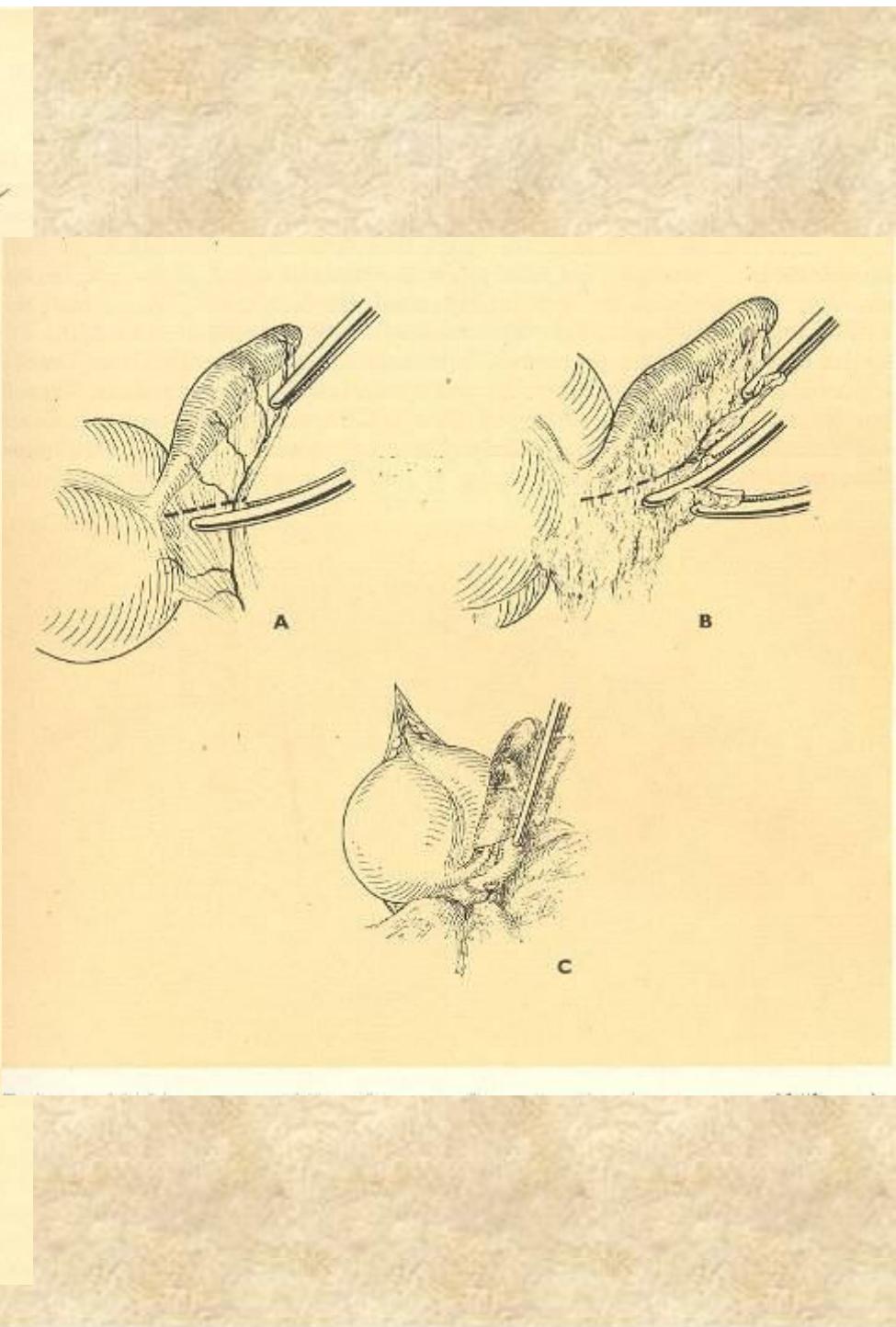
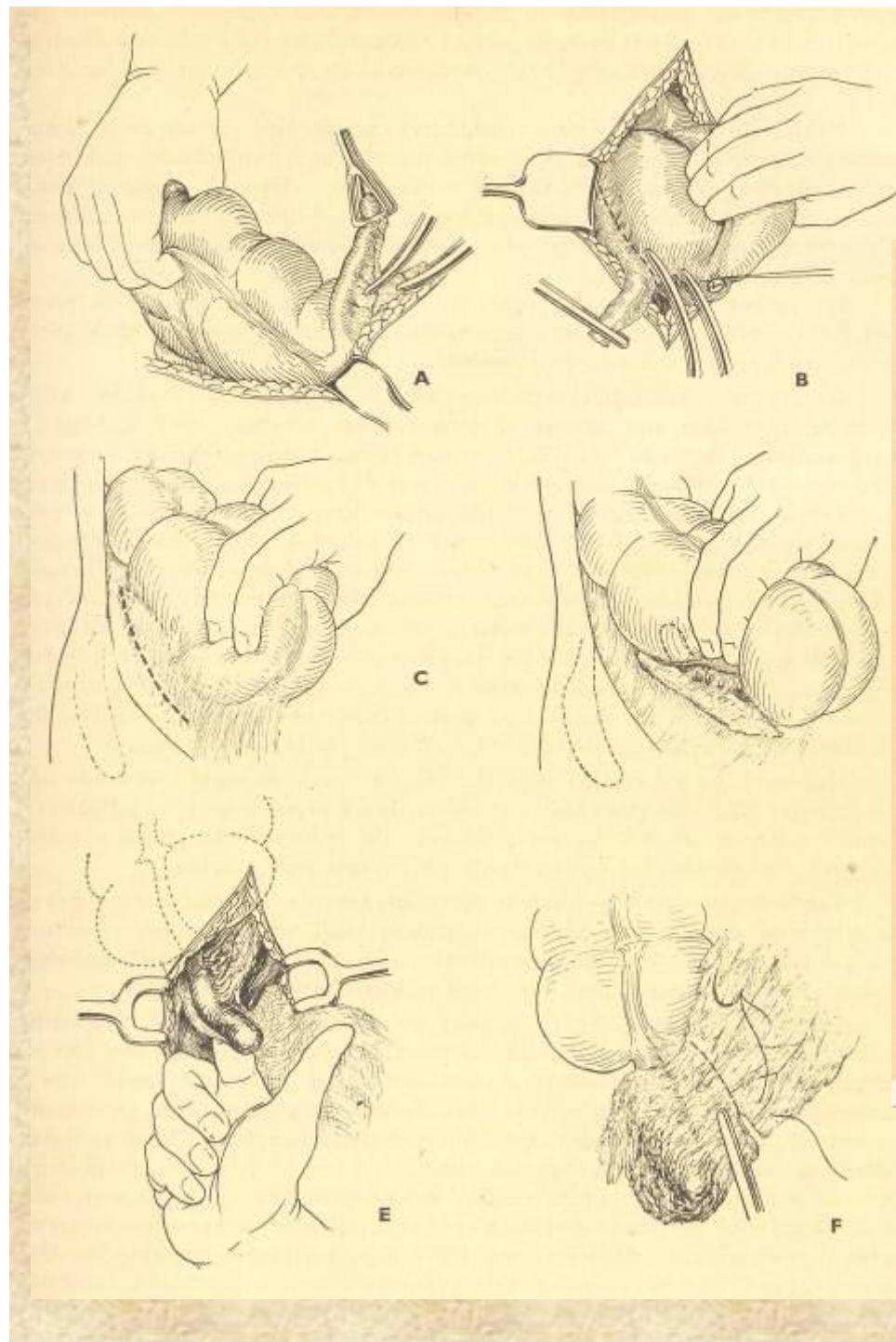




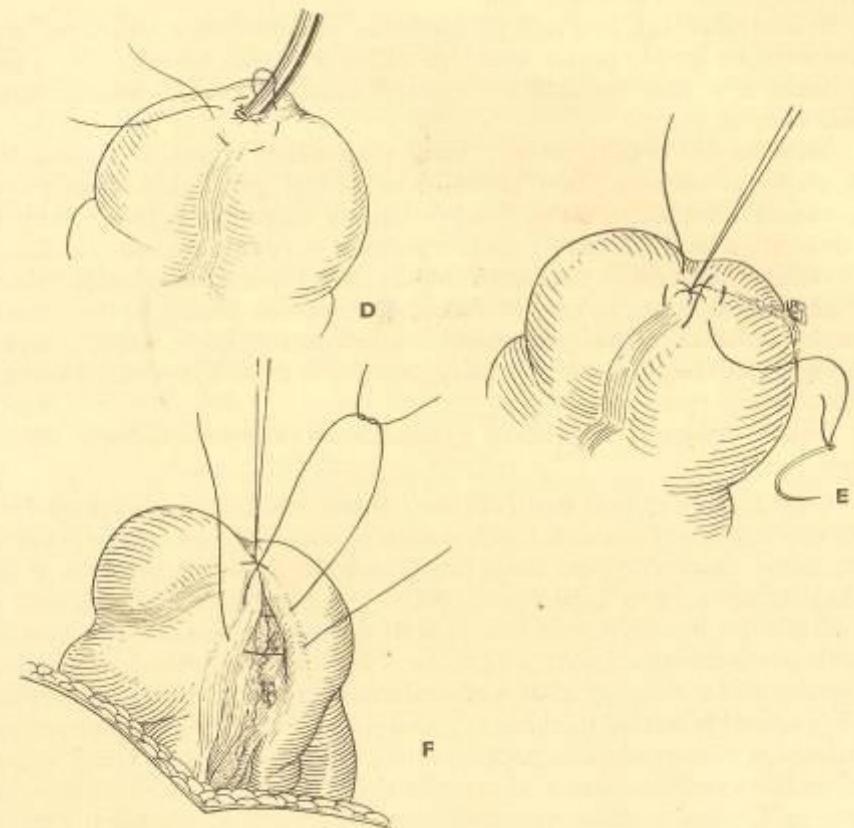
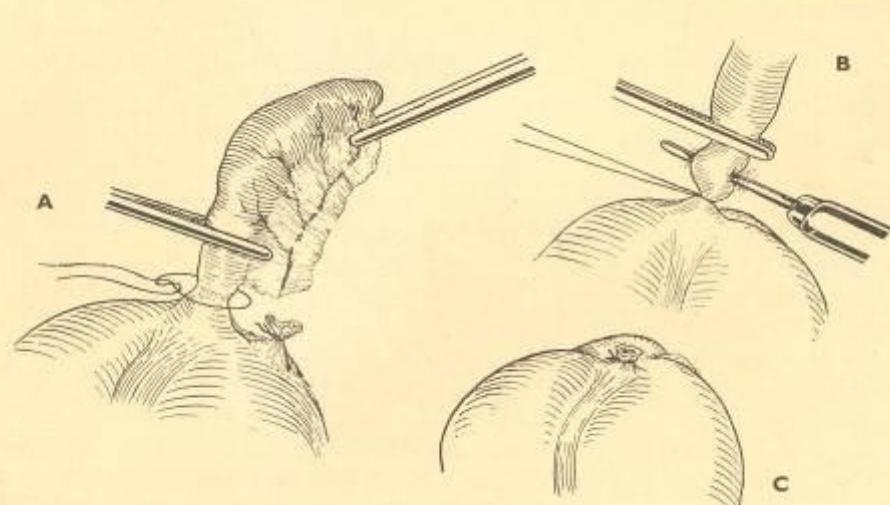
**Advanced appendicitis**

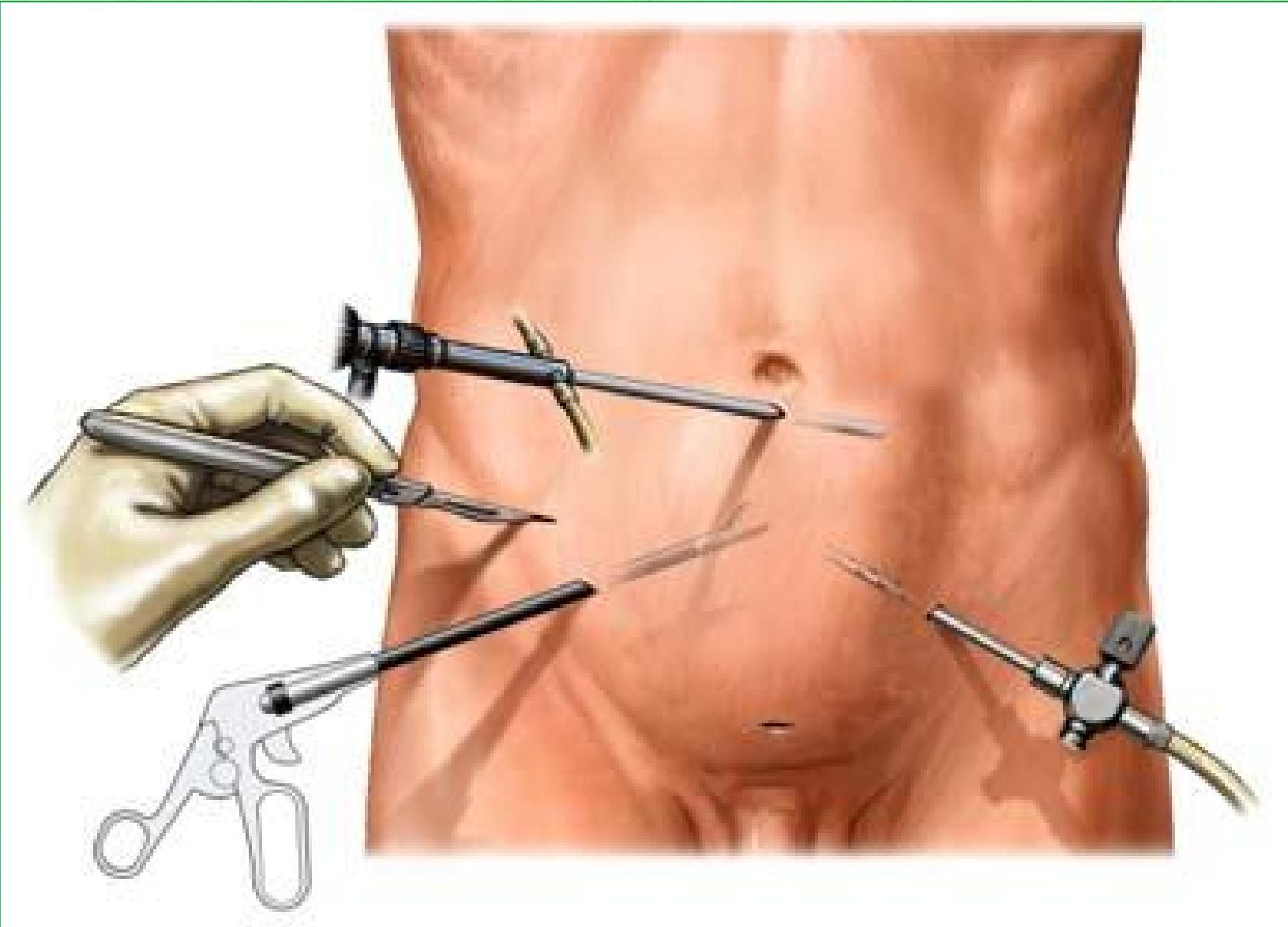
## Right lower incision (Sprengel and McBurney)





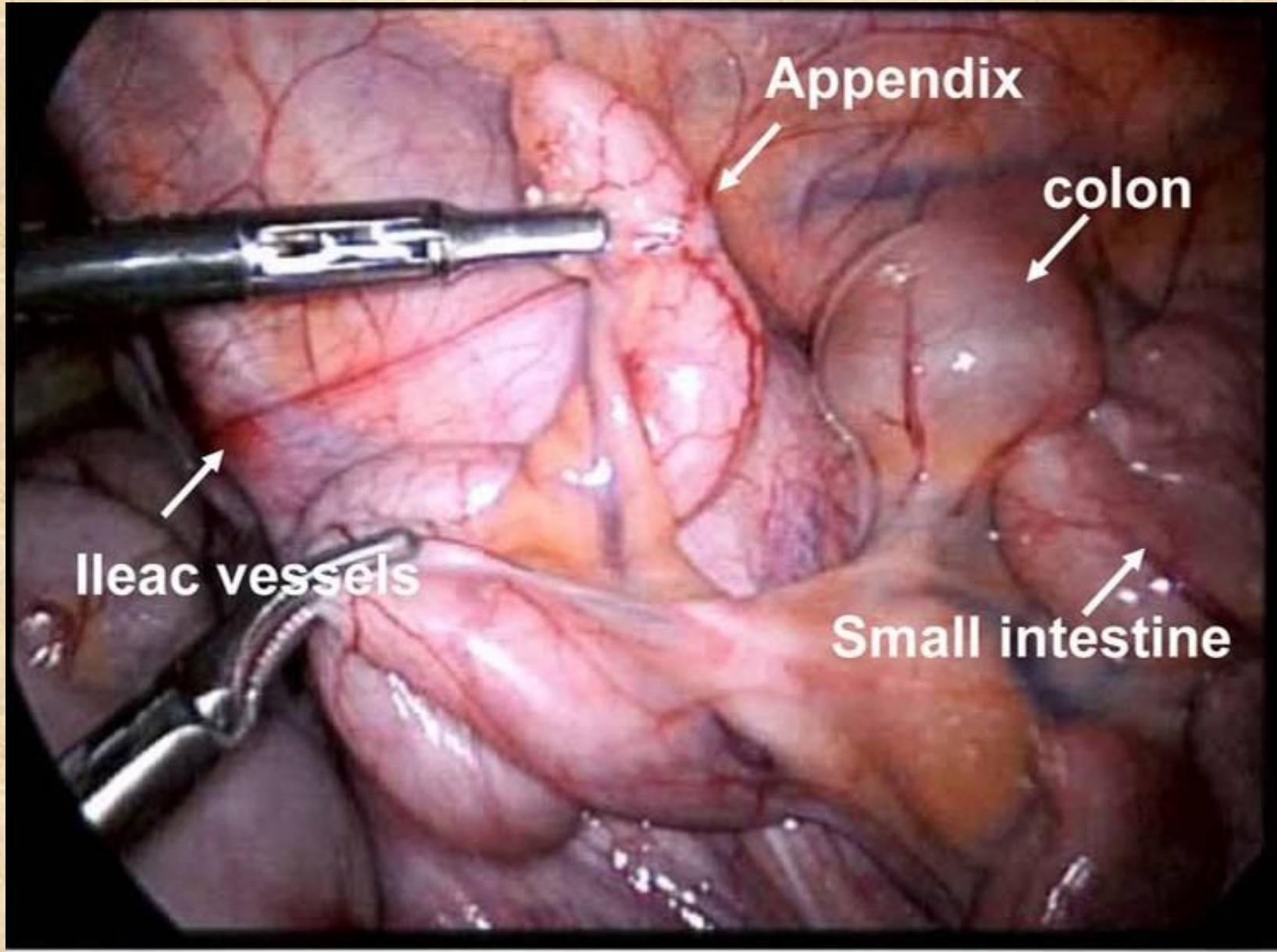
## RESECTION OF THE APPENDIX





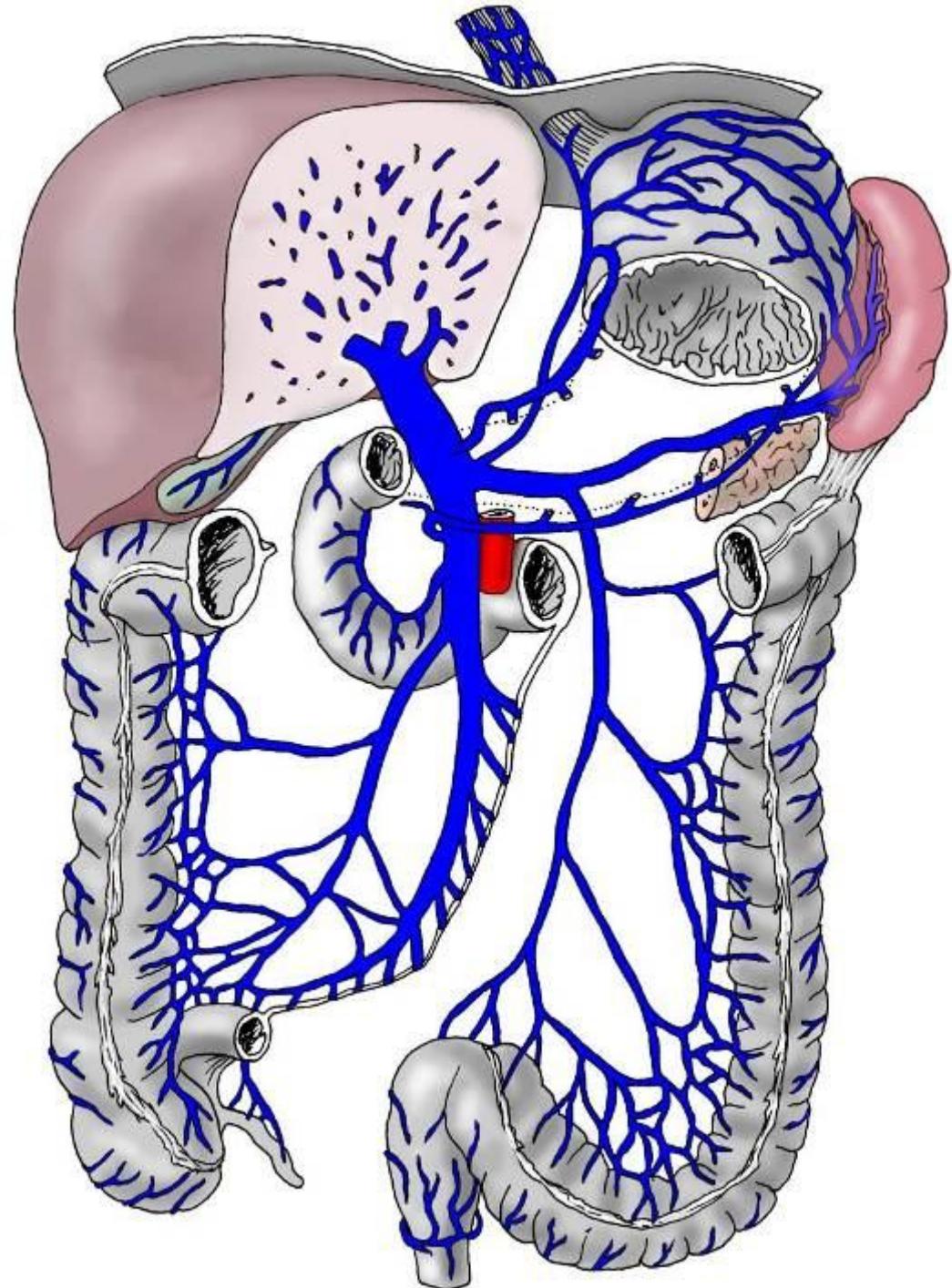
**Laparoscopic appendectomy**

## Laparoscopic appendectomy



**Pyletrombosis**

**Thrombosis of the  
portal vein**





## **Posttraumatic acute abdomen**

- 1. Hemoperitoneum**
- 2. Perforation  
of the GIT**
- 3. Combination  
of both**

02.10.2009

05:06:02

2 Sn 28

SP -271.5

## Intrahepatic bleeding

R



kV 120

mAs 148.0

SL 5.0

GT 0.0

321.0

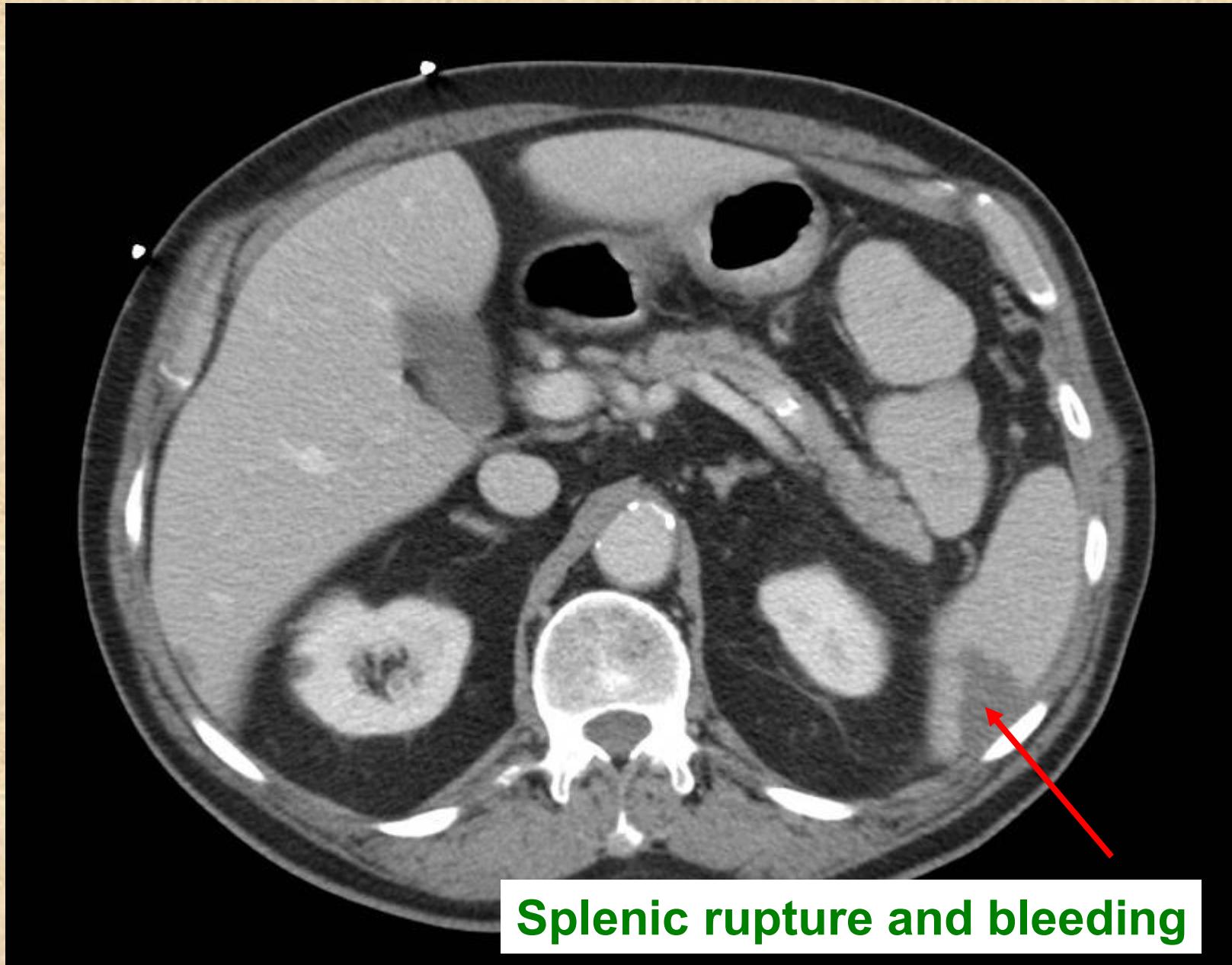
B30f

W 300

C 40

NATIV

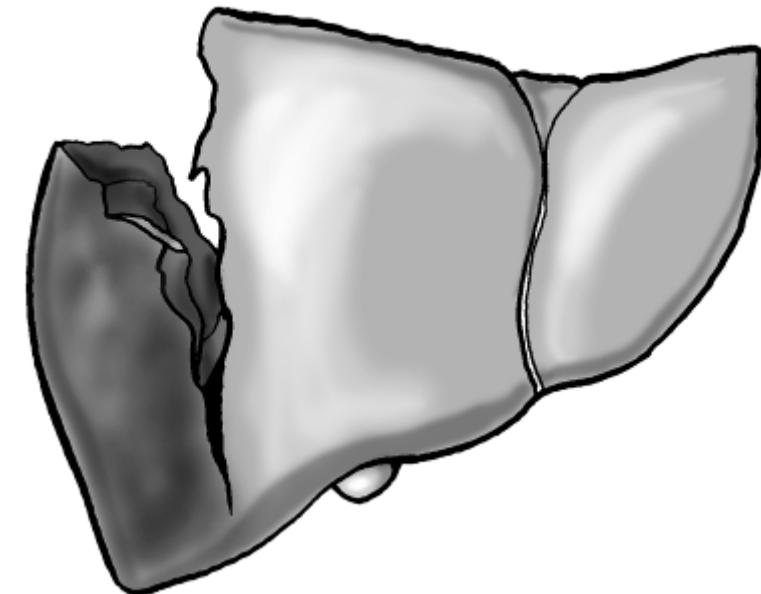
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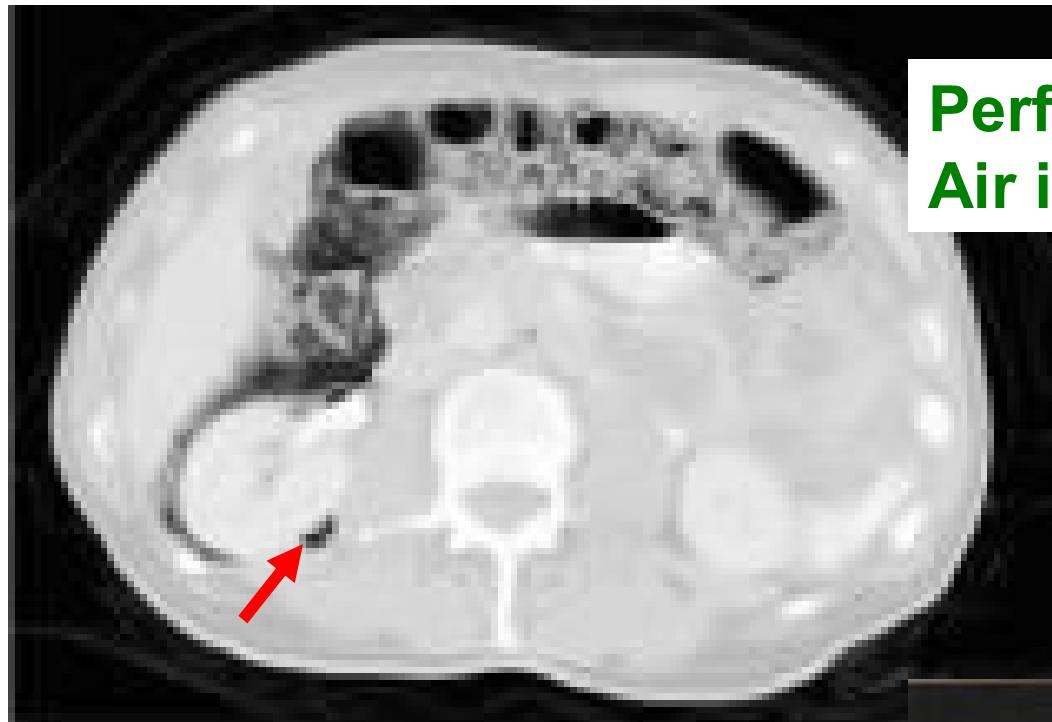


**Splenic rupture and bleeding**

7

## Hepatic rupture



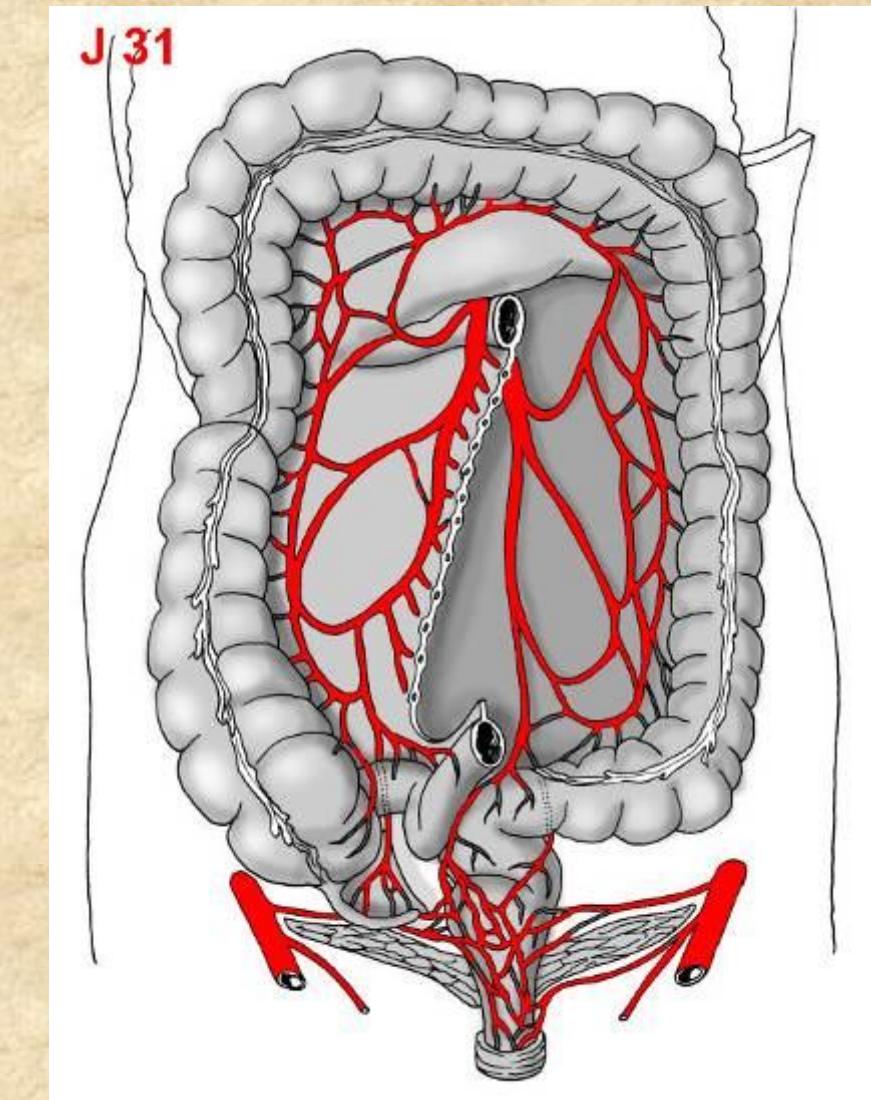


**Perforation of the duodenum,  
Air in the retroperitoneal space**

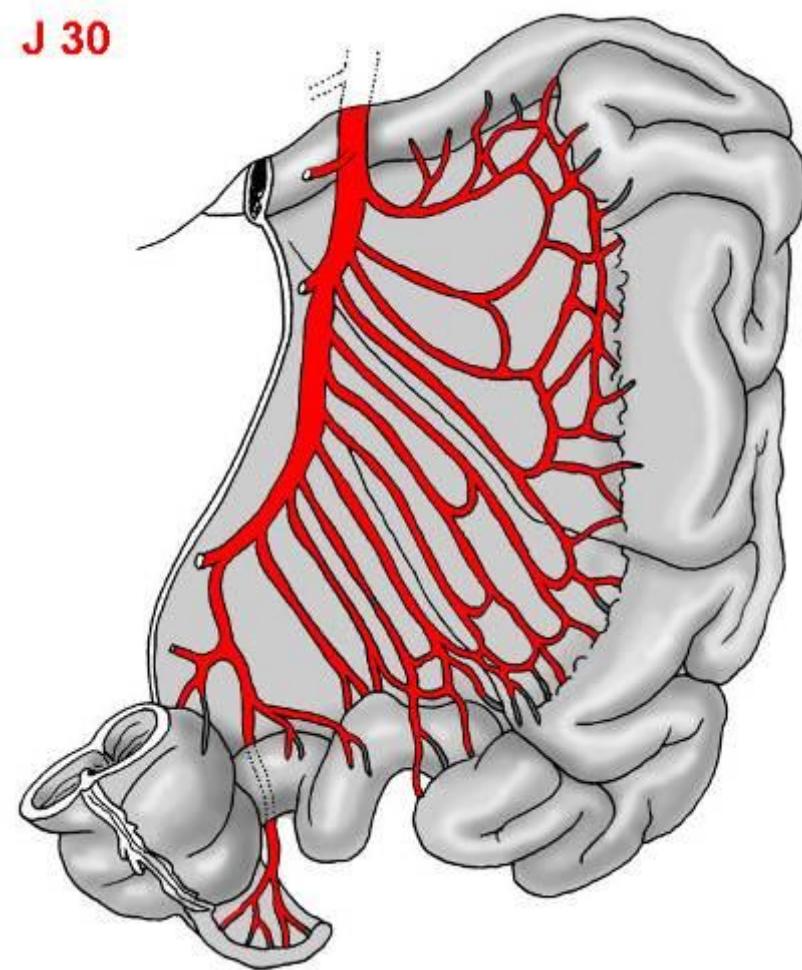


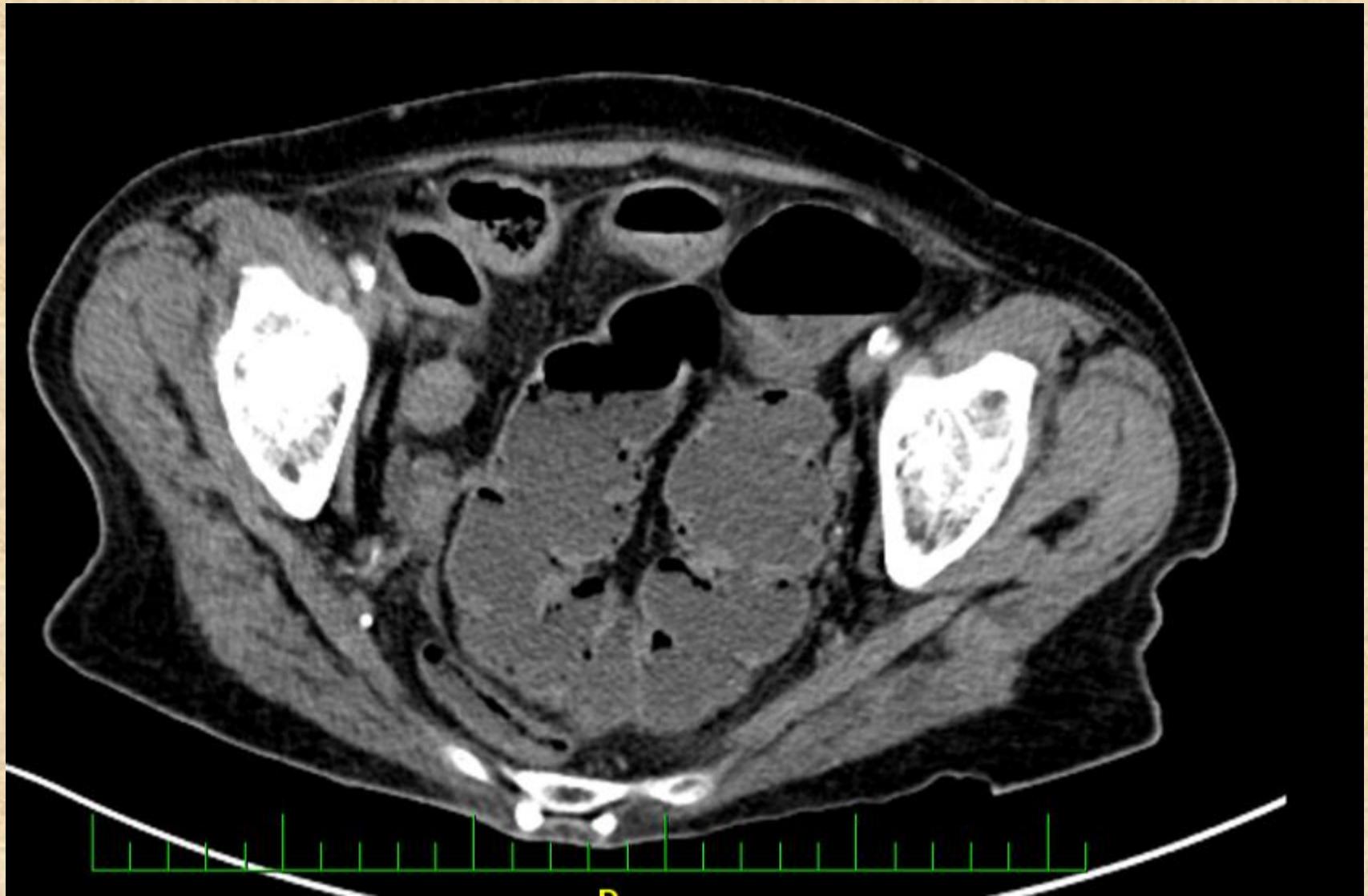
## Vascular diseases

J 31

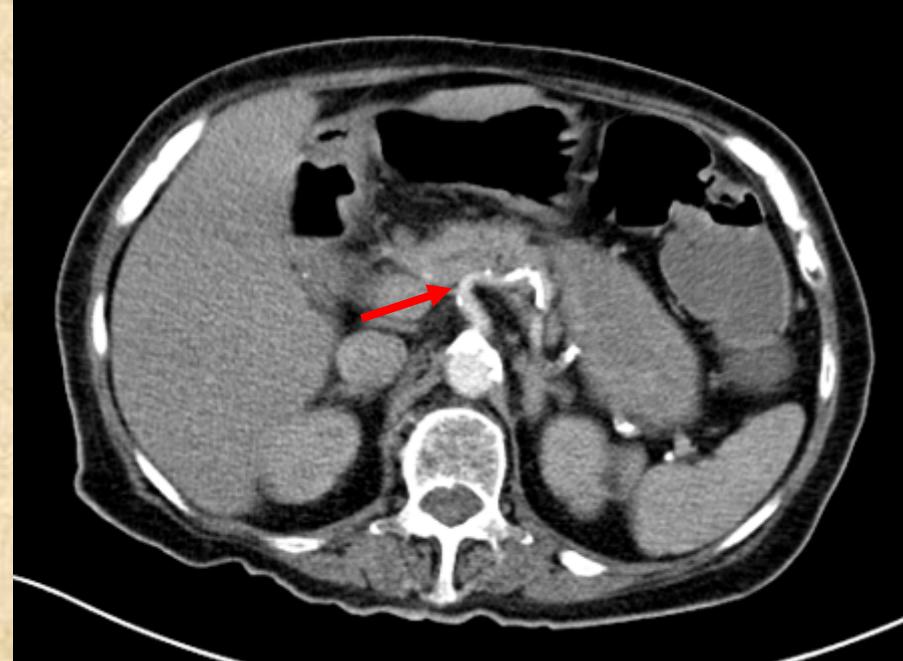


J 30

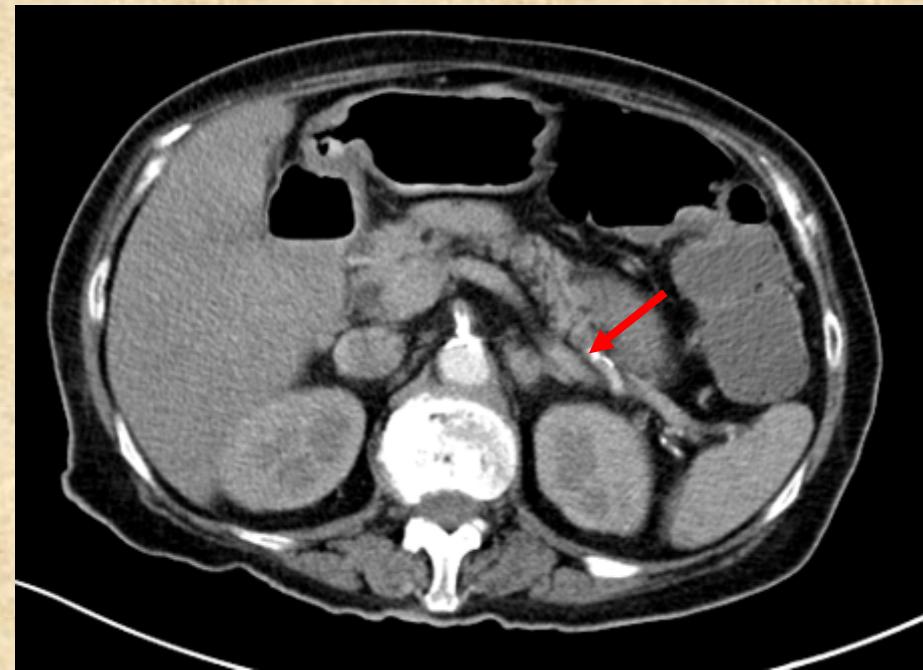


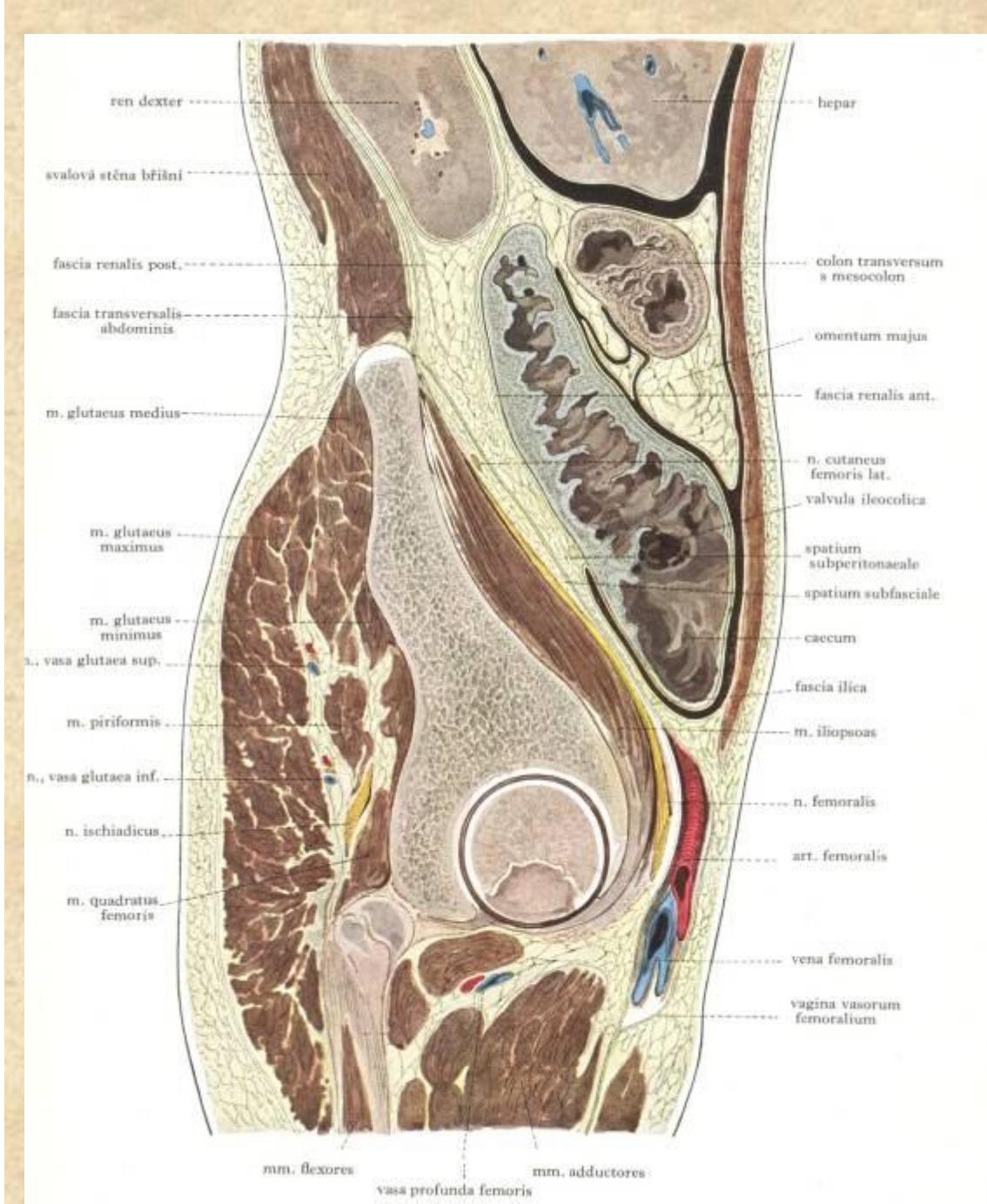


**Female 64 y, strong smoker 40 cigarettes daily,  
Stenoses of intestinal arteries**



**Stenosis and sclerotic changes  
of the coeliac trunk and its  
branches**





## Retroperitoneal space

Primarily  
Kidney  
Suprarenal gland  
Vessels and  
nerves  
Lymph nodes

Secondarily  
Duodenum  
Pancreas