

By the Name of ALLAH the Most Gracious the Most Merciful



Abdominal Wall, Hernias & Umbilicus L1

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الأحد ٢ / ١٠ / ٢٠٢٢

Bailey & Love's Short Practice of Surgery, 27th Edition . CH 60 .

Browse's Introduction to The Symptoms and Signs of Surgical Disease , 4th Edition.

Learning objectives

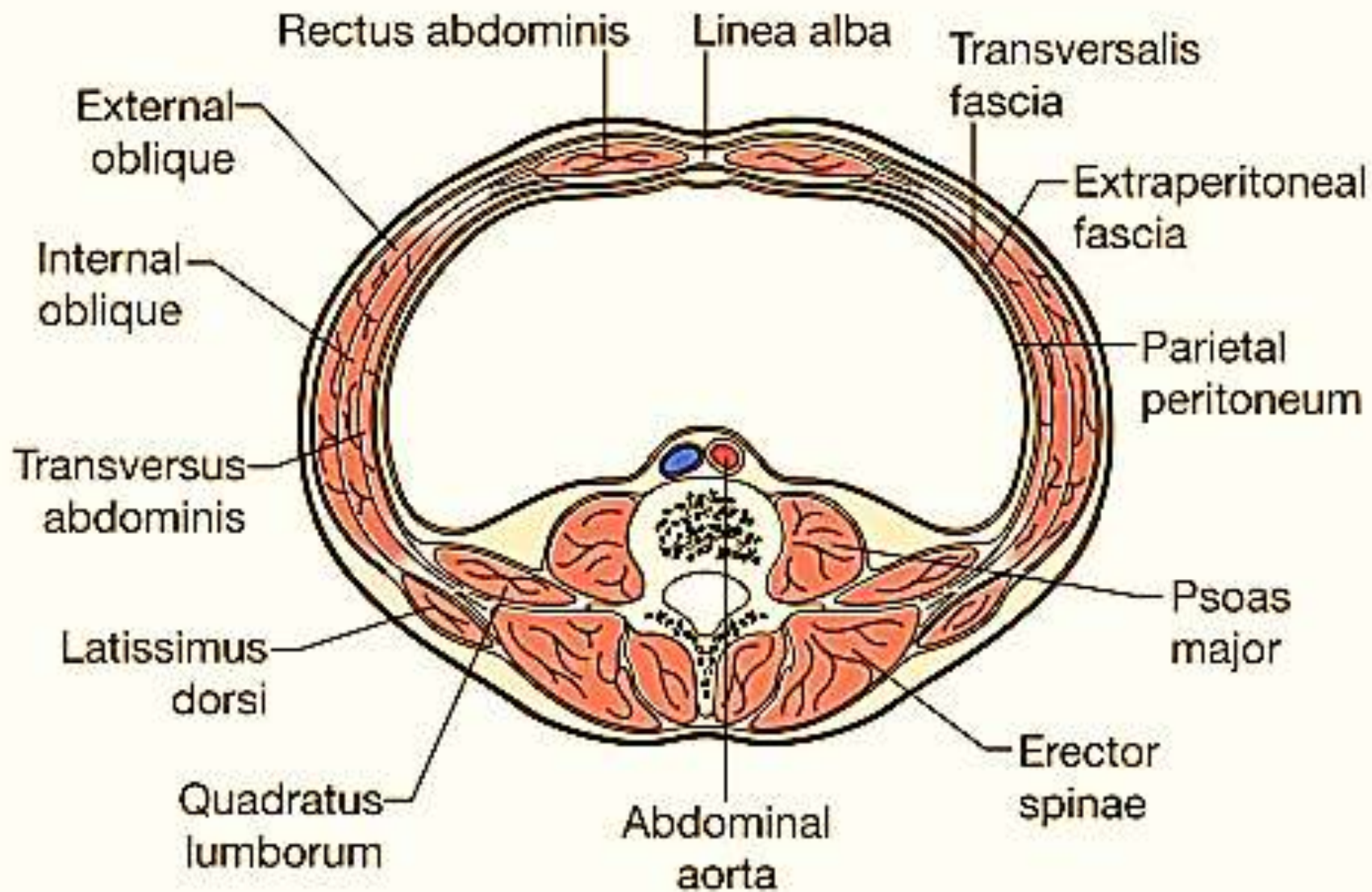
- General information.
- Basic anatomy of the abdominal wall and its weaknesses.
- Other abdominal wall conditions.
- Causes of abdominal hernia.
- Types of hernia and classifications.
- Clinical history and examination findings in hernia.
- Complications of abdominal hernia.
- Non-surgical and surgical management of hernia including mesh.

Layers of Anterior abdominal wall mnemonic.

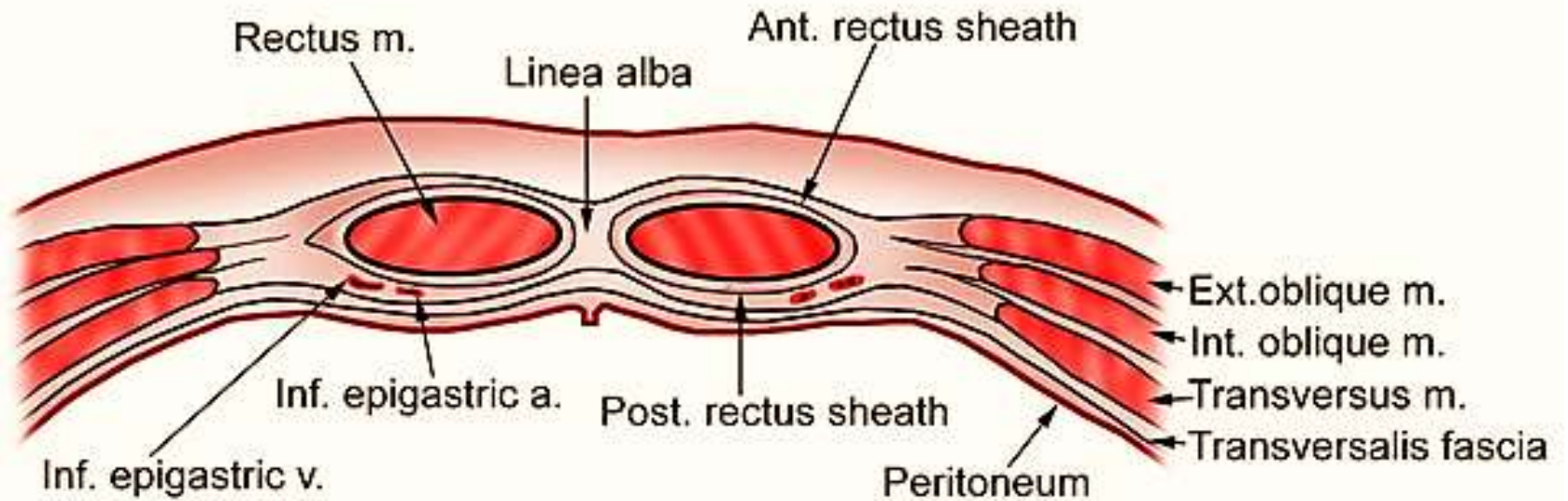
A useful mnemonic to remember the layers of abdominal wall muscles and fascia.

Mnemonic **SSS Exit** :

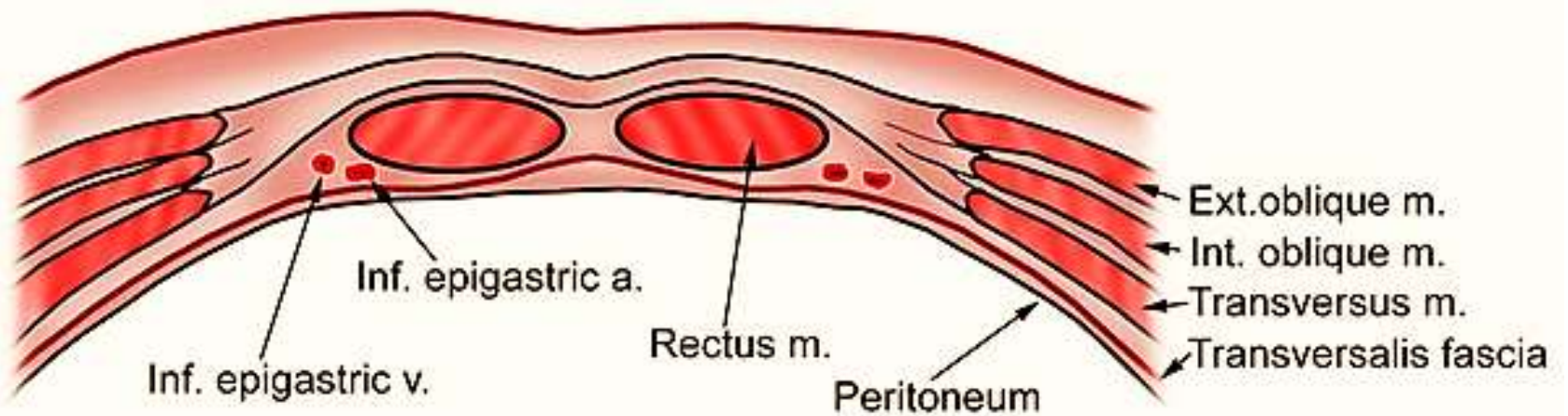
- **S**kin.
- **S**ubcutaneous fat (Camper's fascia).
- **S**uperficial fascia. (**S**carpa's fascia).
- **E**xternal oblique abdominis. (Most superficial laterally).
- (**R**) Rectus abdominis. (Most superficial medially).
- **I**: Internal Oblique abdominis • **T**: Transverse abdominis muscle.
- **T**ransversalis fascia.
- **P**reperitoneal fat (Extraperitoneal fascia).



Above Arcuate Line



Below Arcuate Line



Umbilical Conditions

- Chronic infection
- Chronic fistula.
- Patent urachus.
- Vitellointestinal duct.
- Cullen's sign.
- Caput Medosae.
- Malignancy at the umbilicus.

Chronic infection

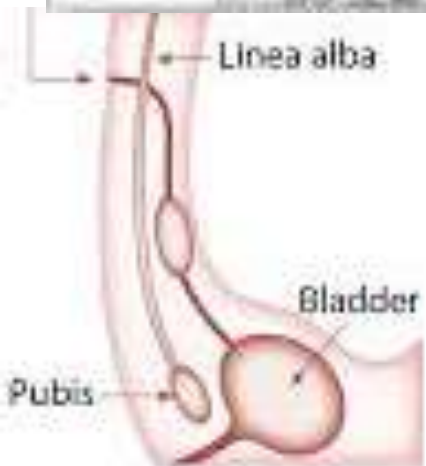
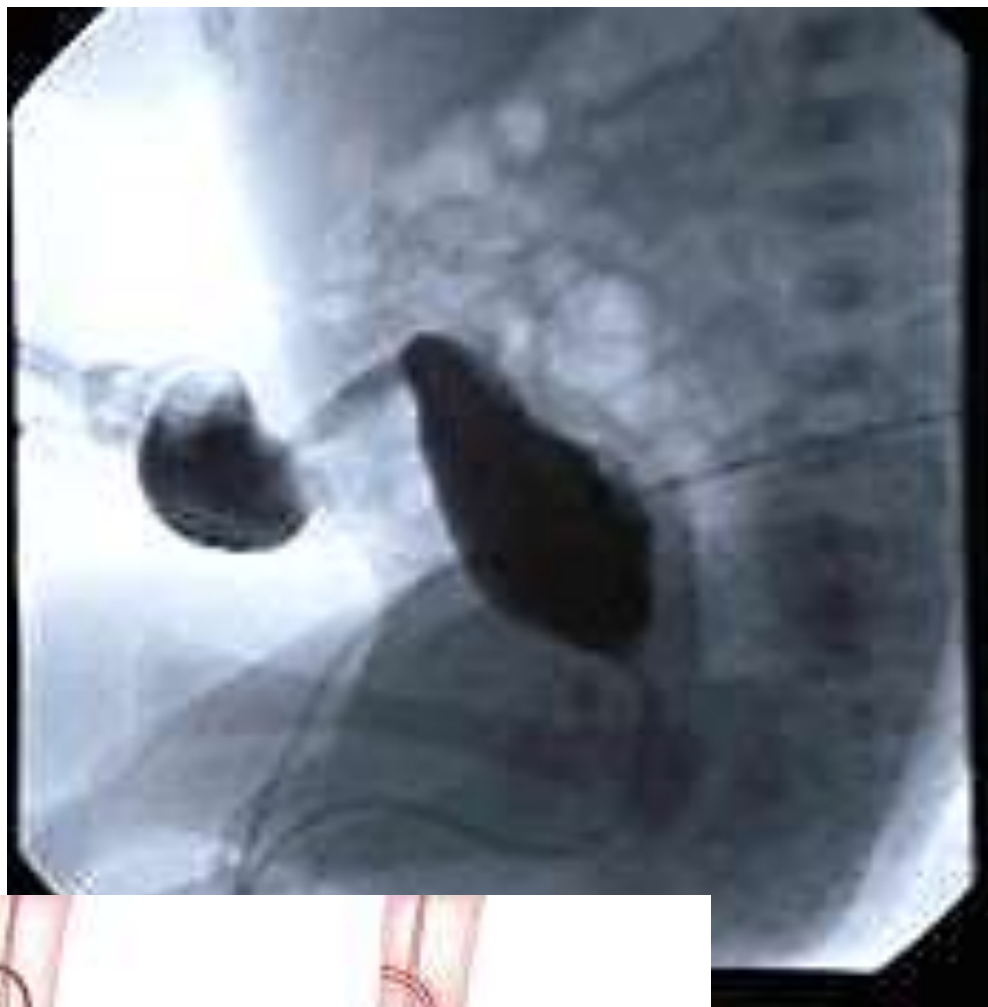
- Poor hygiene , Obese people, Paraumbilical hernia, Pilonidal Sinus.
- It is often encountered during elective surgery
- streptococcus.

Chronic fistula

- Simple, superficial infection or possibly an infected epidermoid cyst
- Intra-abdominal Malignancy, can extend along the ligaments to appear at the umbilicus as a mass or fistulous discharge.
- Complication of umbilical hernia repair due to infection of a mesh or around nonabsorbable suture material.
- Patent urachus.
- Vitellointestinal duct.

Patent Urachus.

- A connection between the urinary bladder and umbilicus usually presents in later life ("urachal fistula).It represents the failure of the entire course of the fetal allantois to involute into the median umbilical ligament.
- This is due to increased pressure in the bladder as a result of obstruction from conditions such as prostatic hypertrophy.
- Treatment the cause of obstruction should be dealt with initially, but if the problem persists then surgical excision of the patent urachus might be considered.



Urachal cyst



Urachal sinus



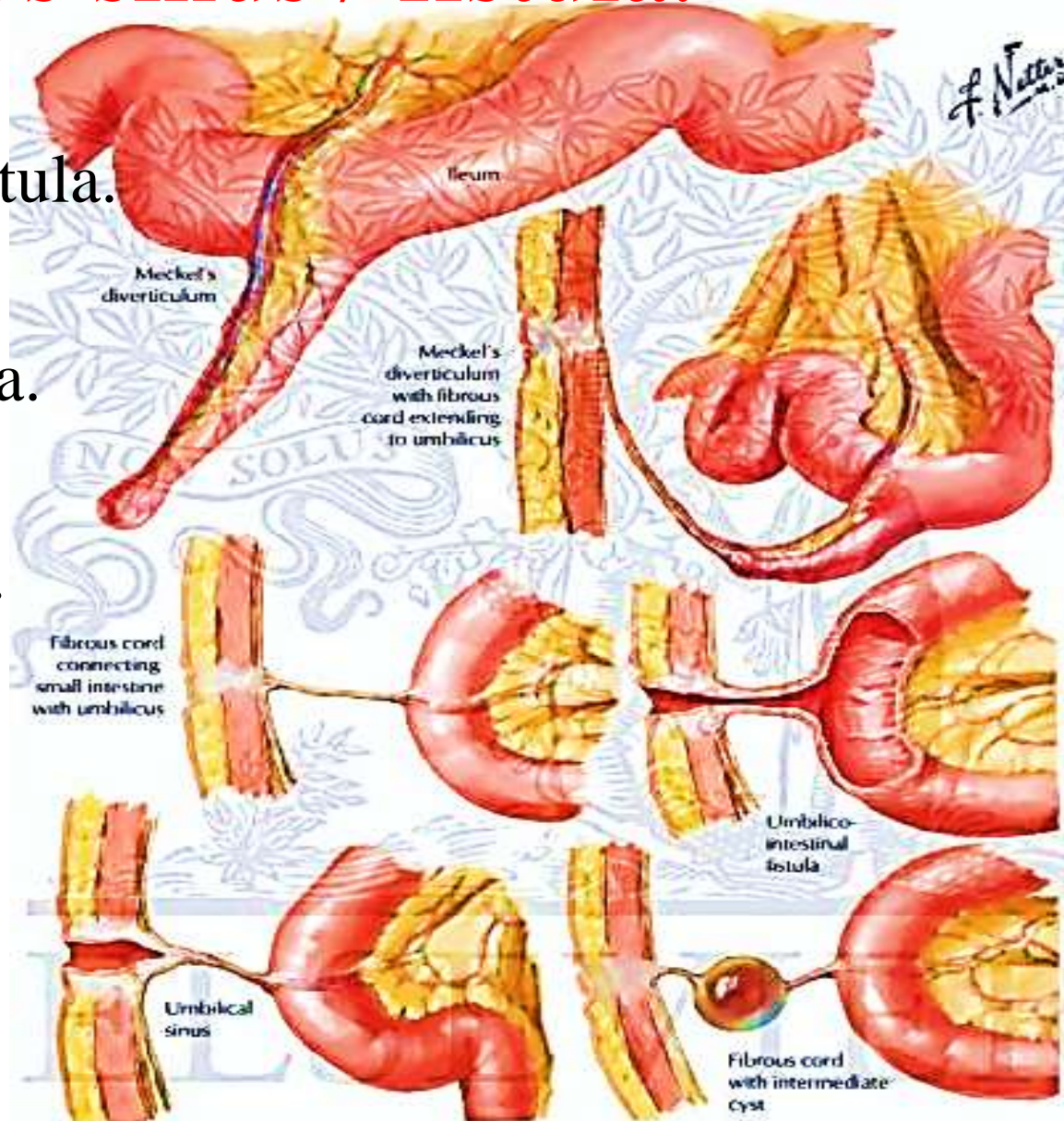
Urachal diverticulum



Patent urachus

Meckel's sinus / fistula.

- Congenital sinus / fistula.
- Vitellointestinal duct.
- Enterocutaneous fistula.
- Fistulogram / M.R.I.
- Treatment : Excision.







Malignancy at the umbilicus

- Primary squamous carcinoma may occur.
- Sister Joseph's nodule. It usually indicates very advanced malignant disease from the internal organs along internal ligaments, e.g. from the liver along the falciform ligament).



GENERAL INFECTION OF THE ABDOMINAL WALL

- Synergistic gangrene.
- Cutaneous fistula.
- Abdominal compartment syndrome.
- Neoplasms of the abdominal wall.

Synergistic gangrene

- Rapid tissue necrosis and overwhelming systemic infection is due to the synergistic action of non-hemolytic streptococci and staphylococci (it means various parts are working together to produce an enhanced result.) .
- Immune compromised patient > healthy people.
- (Flesh-eating disease) .
- Necrotising fasciitis (e.g. Fournier's gangrene (groin and scrotum) , Meleney's gangrene (surgical suture line) .
- Treatment : Wound swab , Abcs , debridement / wide excision, V.A.C., Hyperbaric oxygen therapy and reconstructive surgery.

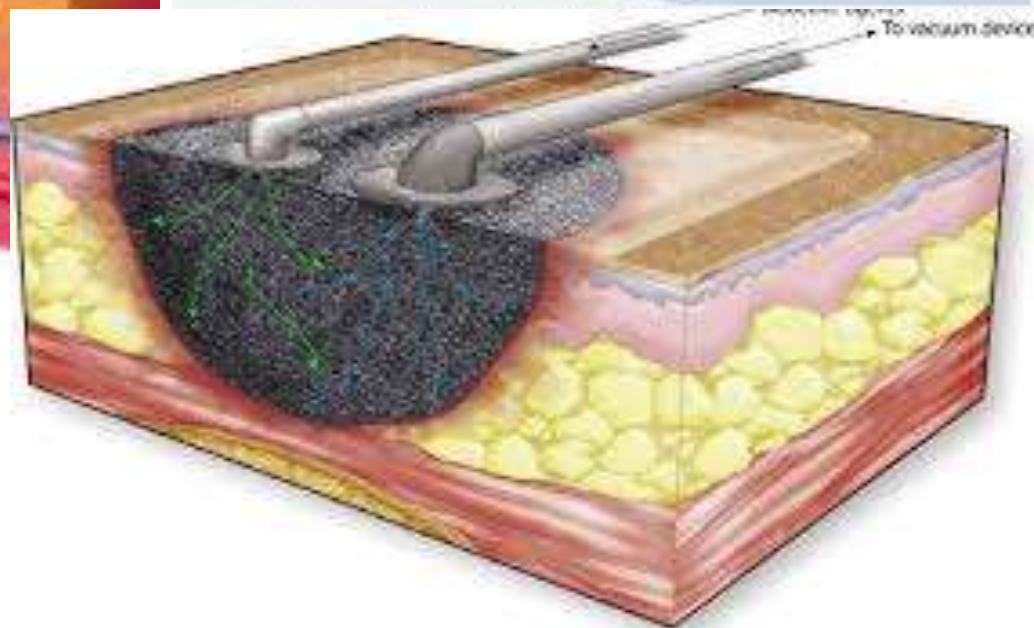










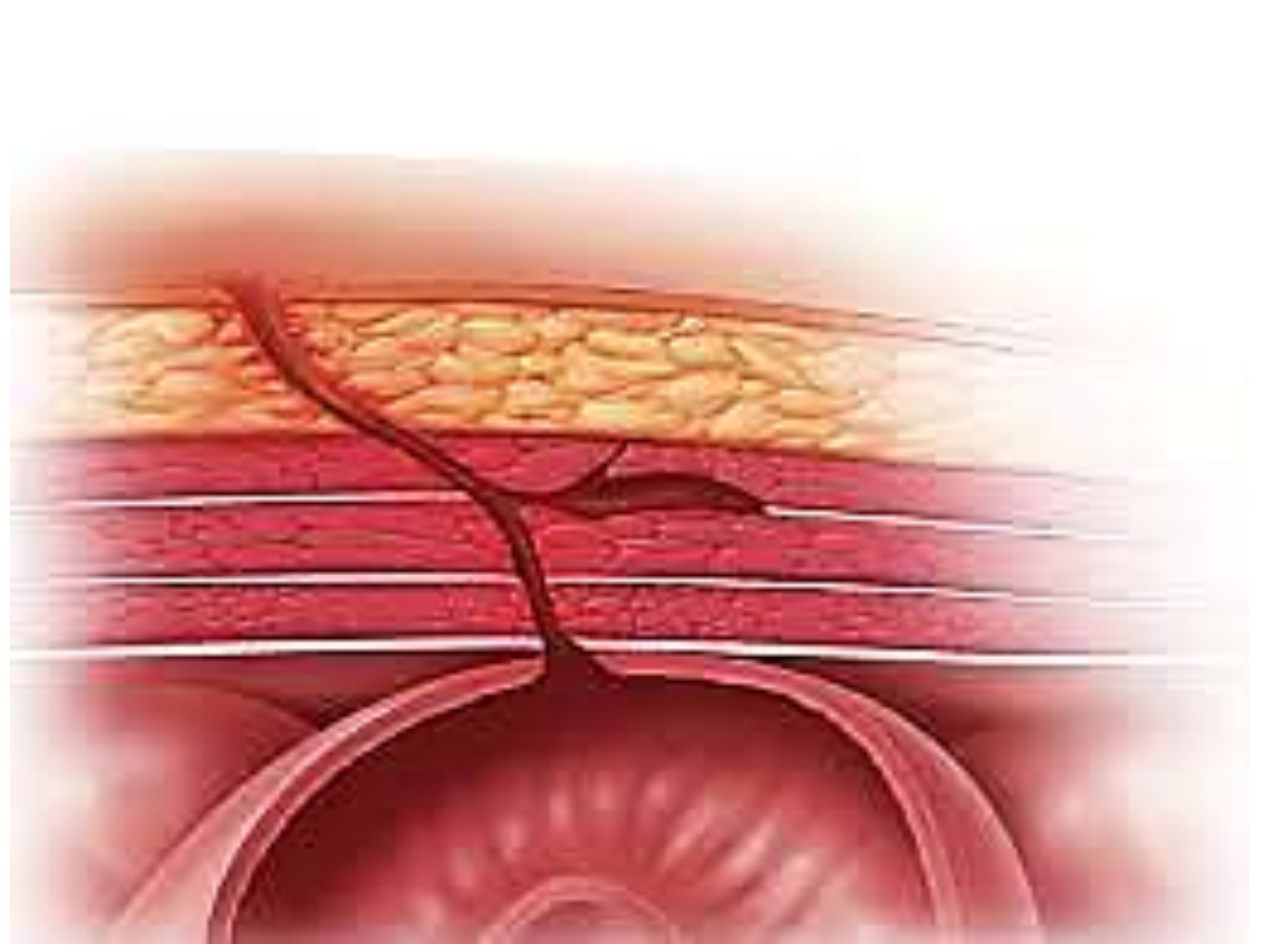




Cutaneous fistula

Fistula : an abnormal communication between two different epithelial surfaces.

- Chronic intraperitoneal abscesses arising after occult bowel perforation, appendicitis, diverticulitis and cholecystitis.
- Malignancy in its later stages can occasionally erode through the abdominal wall.
- Crohn's disease also has a tendency to develop an enterocutaneous fistula.
- T.B.



Classification

Two categories

- ▶ **Low-output fistula: < 500 mL/day**
- ▶ **High-output fistula: > 500 mL/day**

Three categories

- ▶ **Low-output fistula: < 200 mL/day**
- ▶ **Moderate-output fistula: 200-500 mL/day**
- ▶ **High-output fistula: > 500 mL/day**

The mnemonic **FRIENDS** can be used to memorize characteristics which impede the closure of enterocutaneous fistula .

- ▶ **F** Foreign body
- ▶ **R** Radiation
- ▶ **I** Infection or Inflammatory bowel disease
- ▶ **E** Epithelialization
- ▶ **N** Neoplasm
- ▶ **D** Distal obstruction
- ▶ **S** Short tract (<2 cm)

Treatment

- Low-output fistula : Spontaneous closure.
- High-output fistula :
 - Total Parental Nutrition.
 - Stent.
 - Fistula Control .

Abdominal Compartment Syndrome

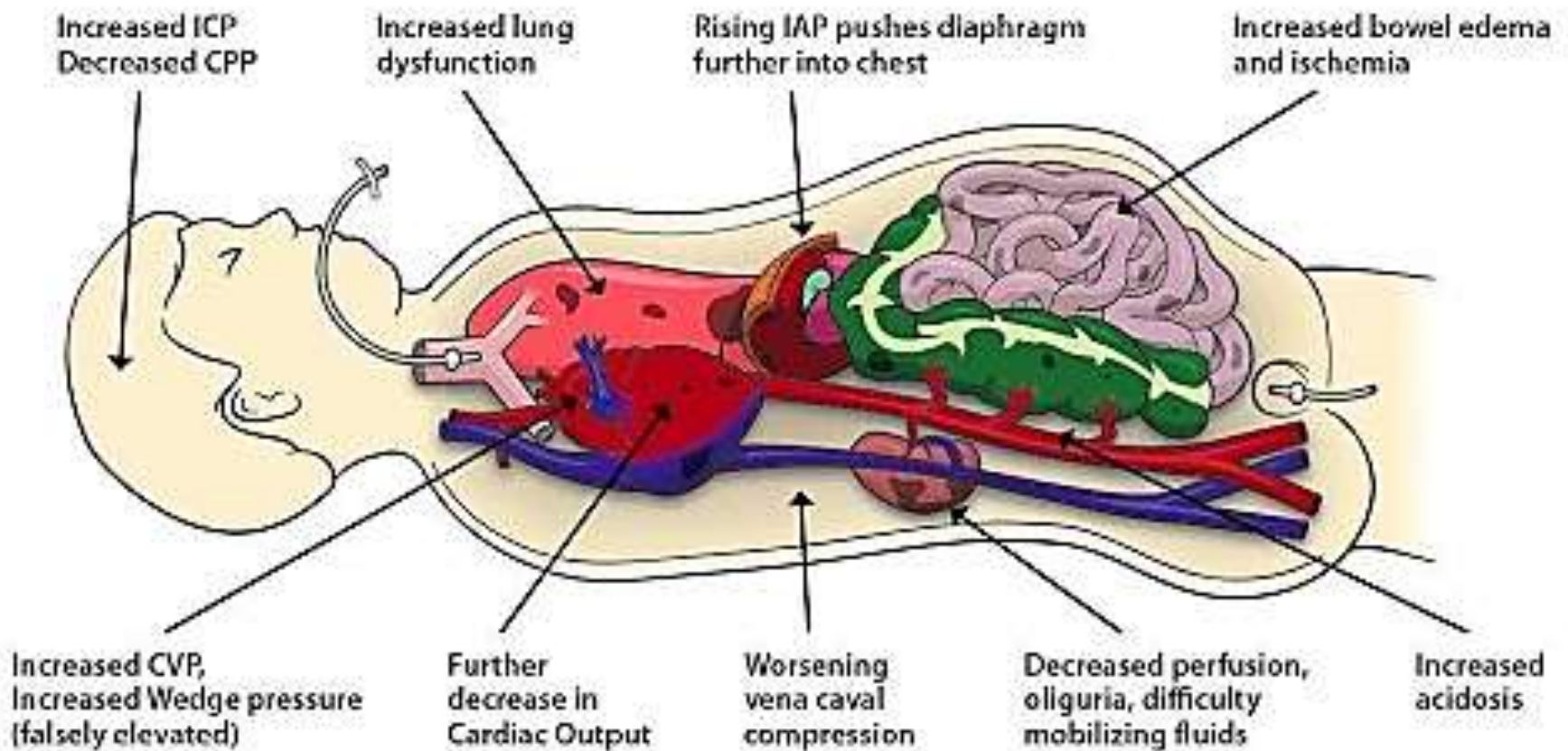
- High intra-abdominal pressure above 20 mmHg, leads to reduced blood flow and tissue ischaemia, which contributes to multiorgan failure.
- Can be sepsis and severe abdominal trauma. The underlying cause of the disease process is capillary permeability caused by the systemic inflammatory response syndrome (SIRS) that occurs in every critically ill patient (interstitial edema).
- Other causes (Ascites and pneumoperitoneum).
- Intra-abdominal pressure measurement :
 - Direct (Verress needle through umbilicus).
 - Indirect (Internal jugular vein / Intra-vesical pressure).
- Laparostomy decompression .
 - (mesh or a saline-soaked dressing) / Bogota bag.
 - Negative-pressure wound therapy (NPWT), also known as a vacuum assisted closure (VAC).

Clinical Presentation

- Nearly all patients with ACS have a tensely distended abdomen, however physical examination of the abdomen is a poor predictor of ACS. Findings such as progressive oliguria and increased ventilator requirement are common. Other findings such as hypotension, tachycardia, elevated jugular venous pressure, peripheral edema, abdominal tenderness, or acute pulmonary decompensation may be present.

Occult Organ Ischemia

IAP 16 – 20 mmHg





Bogota bag

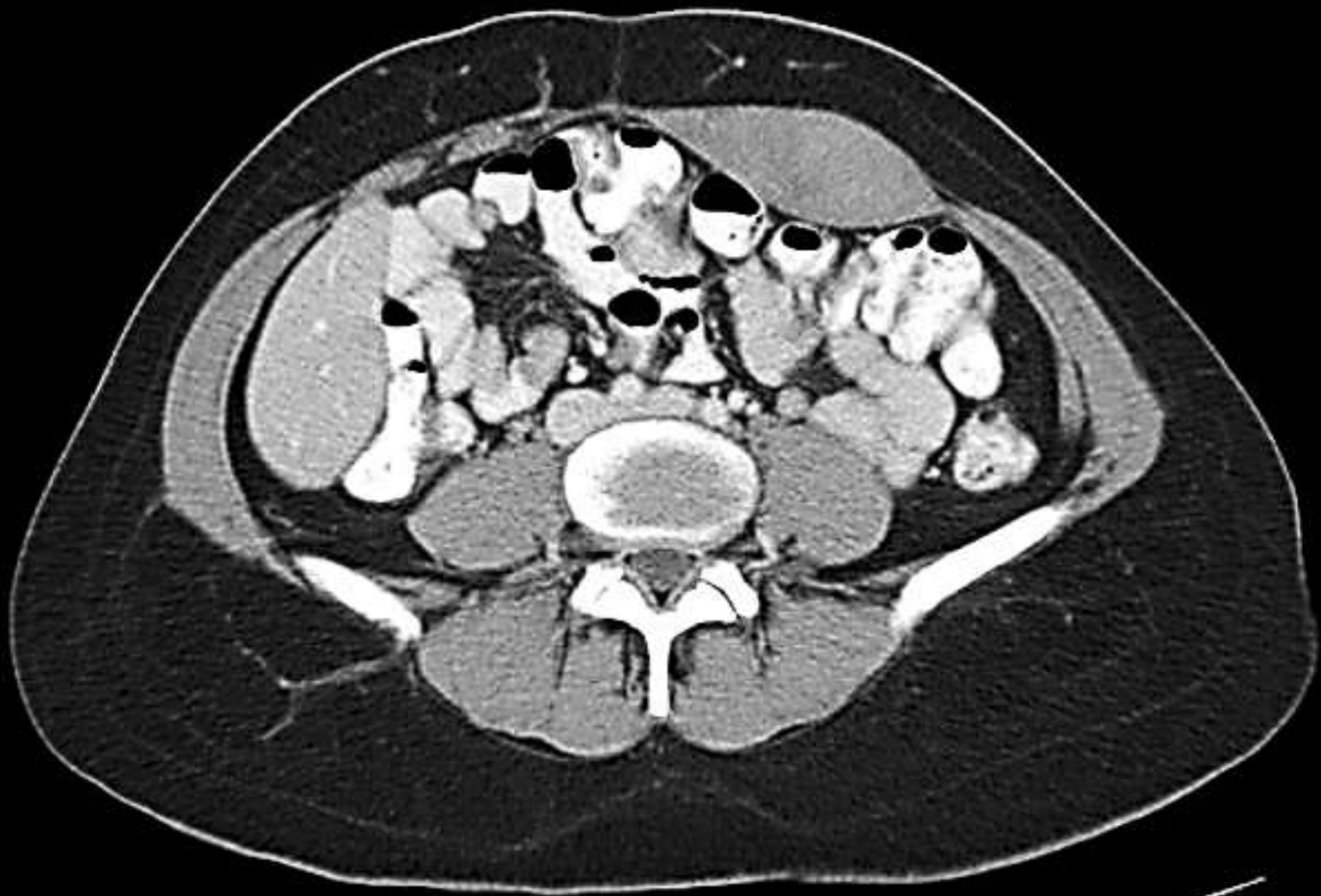


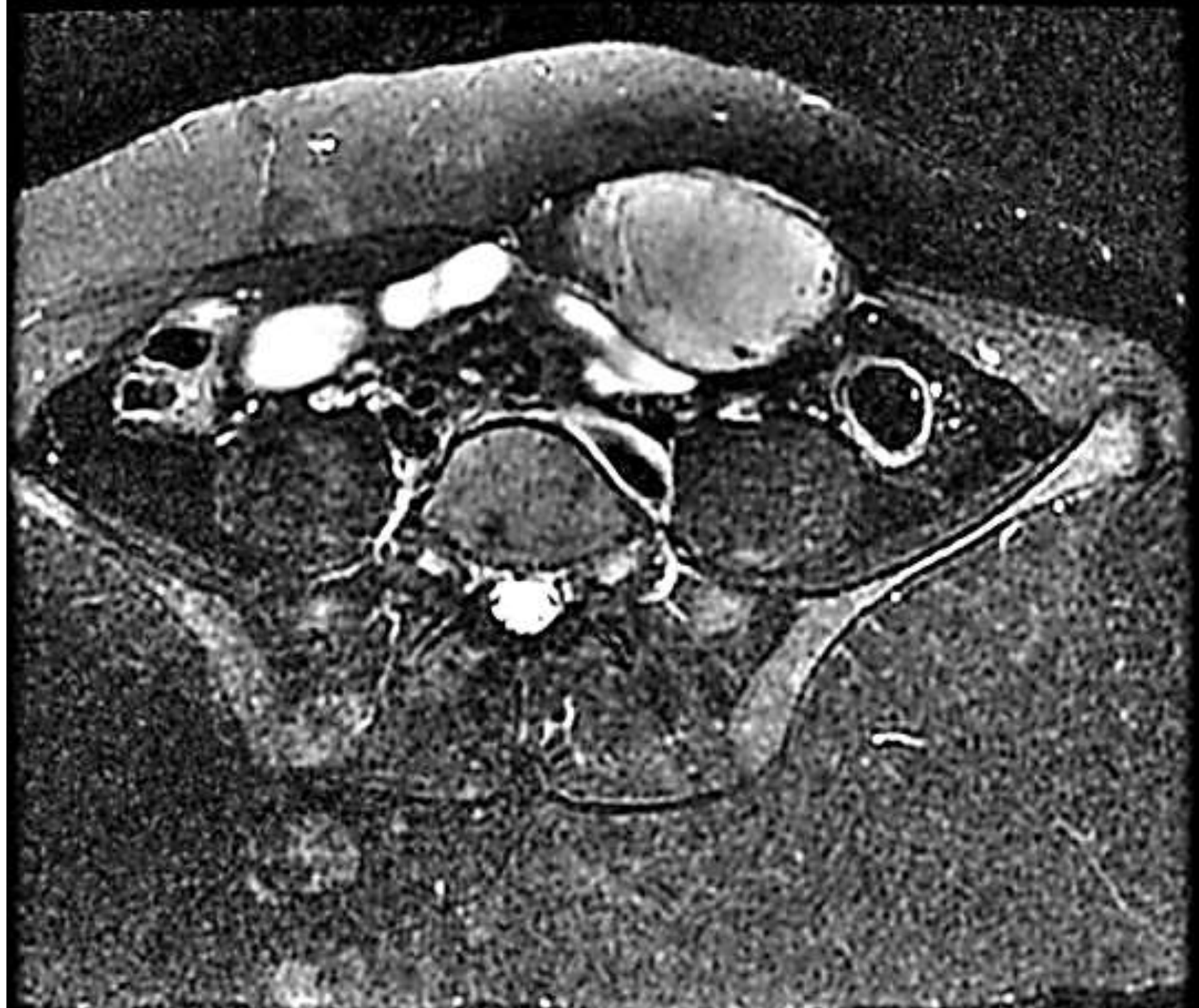
Neoplasms of the abdominal wall

- Benign.
- Malignant (1^{ry} , 2nd).
- Recurrent.
- As the abdominal wall is composed of muscle, fascia and bone, benign and malignant tumours can arise from each, although these are rare.
- Desmoid tumour.
- Fibrosarcoma.

Desmoid tumour

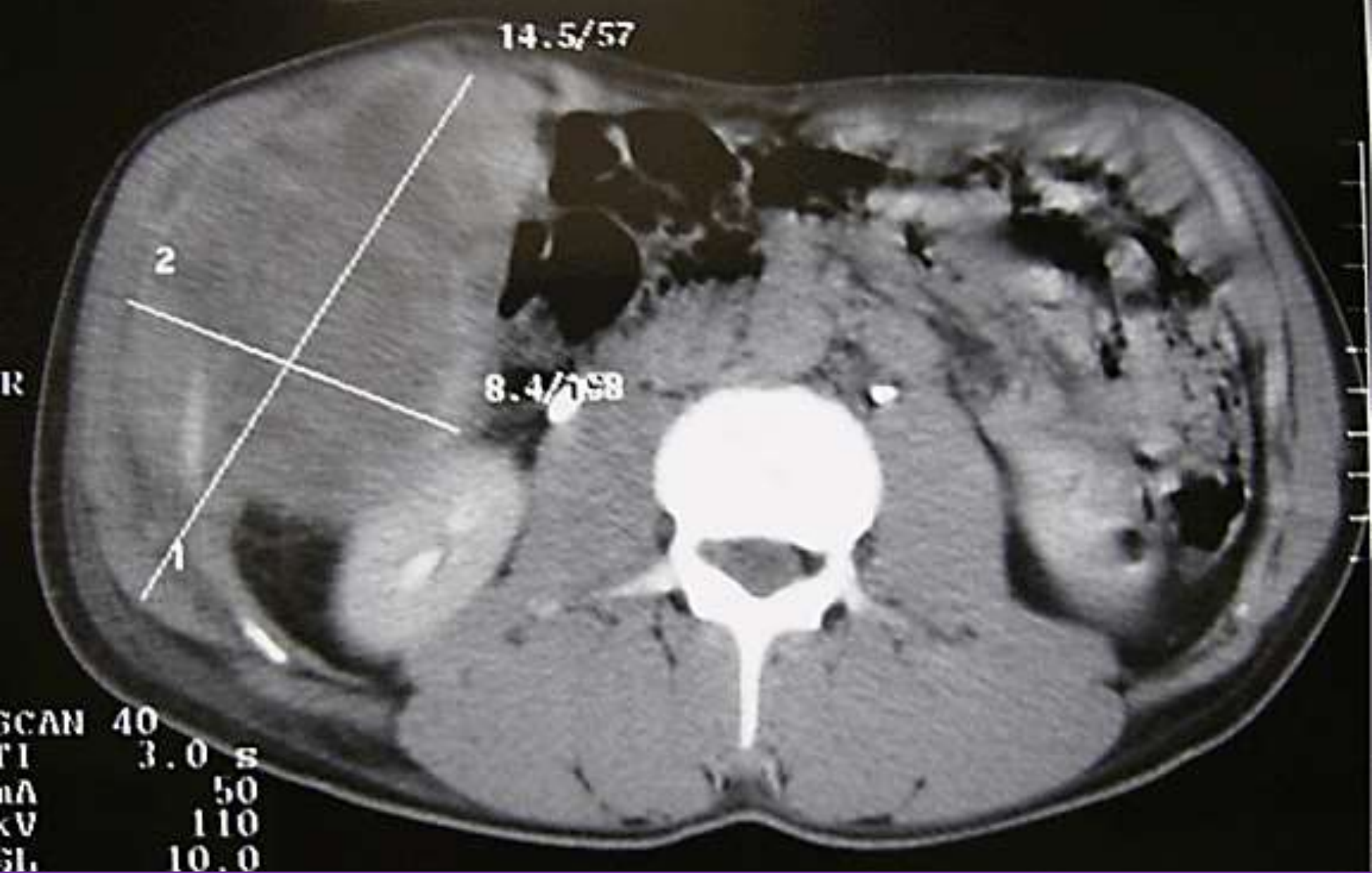
- It is listed in the WHO classification of soft tissue tumors under the category "fibroblastic/myofibroblastic tumors."
- They are benign, non-inflammatory fibroblastic tumors with a tendency for local invasion and recurrence but without metastasis.
- Present as masses, and as such presentation depends on location.
- Surgical excision with a wide margin is required to prevent recurrence, which is a frequent problem.



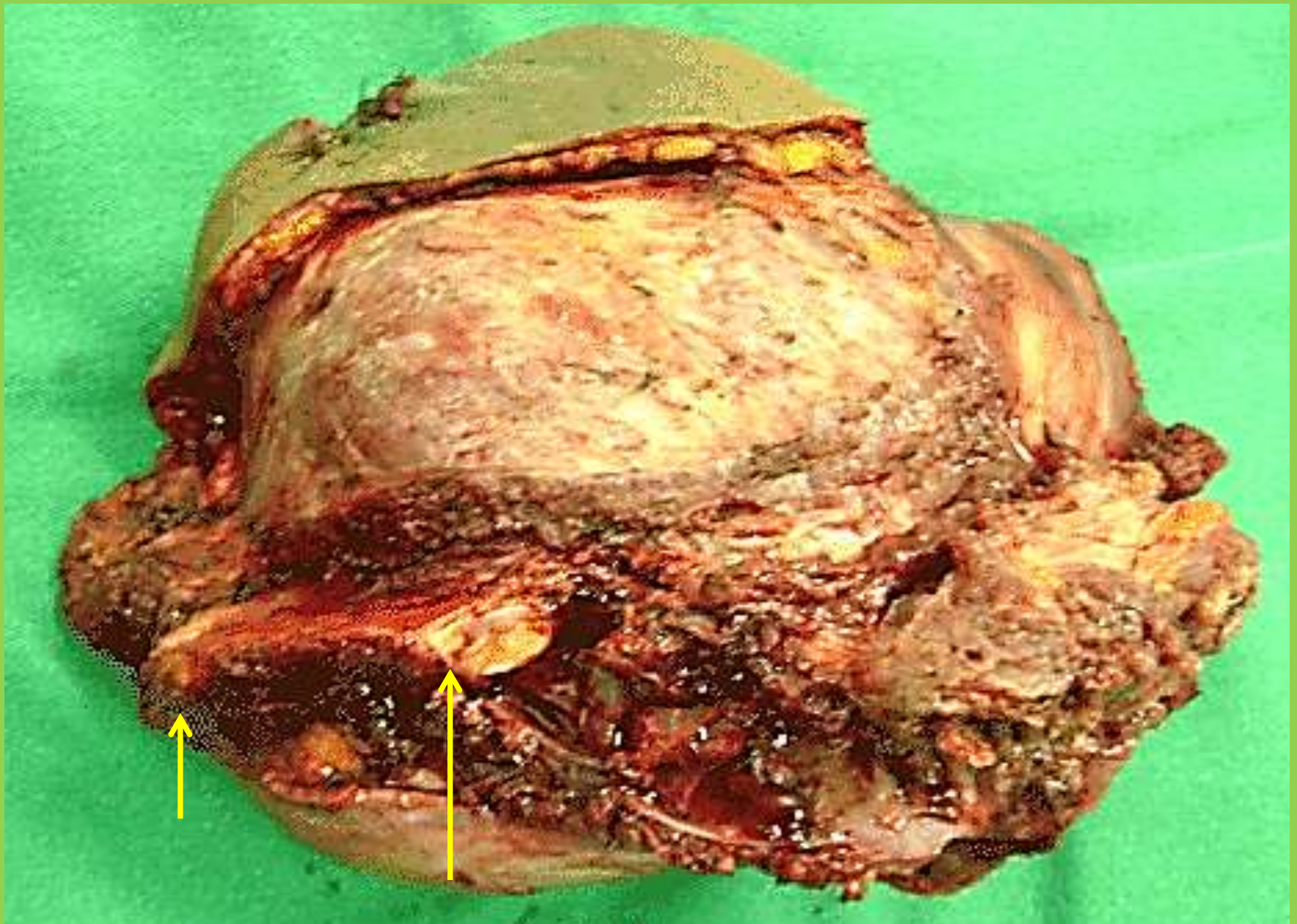


Fibrosarcoma

- Highly malignant tumor and respond poorly to both radio and chemotherapy.
- Wide excision and (Chemo-radiotherapy)with plastic surgical reconstruction later on.



Computed tomography scan of abdomen showing tumor with heterogeneous density on anterolateral abdominal wall (right flank) measuring 12 x 10 cm.



Surgical specimen with all the layers of the abdominal wall in the flank together with the segment of the 12th resected right rib (arrow).



Reconstruction of the wall with fixing of the polypropylene mesh anterior to aponeurosis and suturing of the greater omentum inside the wall defect. Presence of pleural drainage associated with the procedure.

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- Clinical history and examination findings in hernia.
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- Non-surgical and surgical management of hernia including mesh.
- Other abdominal wall conditions.

- Hernia is a protrusion of a viscus through an opening.
- It is composed of a neck , sac and content .
- Could be primary (Normal hernia orifices) or secondary (Incisional) hernia.

ABDOMINAL HERNIA

- 1) External hernia (Ventral) (Normal hernia Orifice)[common & rare) and perennial .
- 2) Internal hernia (Diaphragmatic, intra-abdominal).

External Abdominal Hernias

Primary

Common

- Inguinal
- Umbilical / Paraumbilical
- Epigastric
- Parastomal
- Spigelian
- Lumbar

Rare

- Perineal hernia.
- Obturator hernia.
- Gluteal and sciatic hernias.

Incisional

Traumatic

Hiatal Hernia

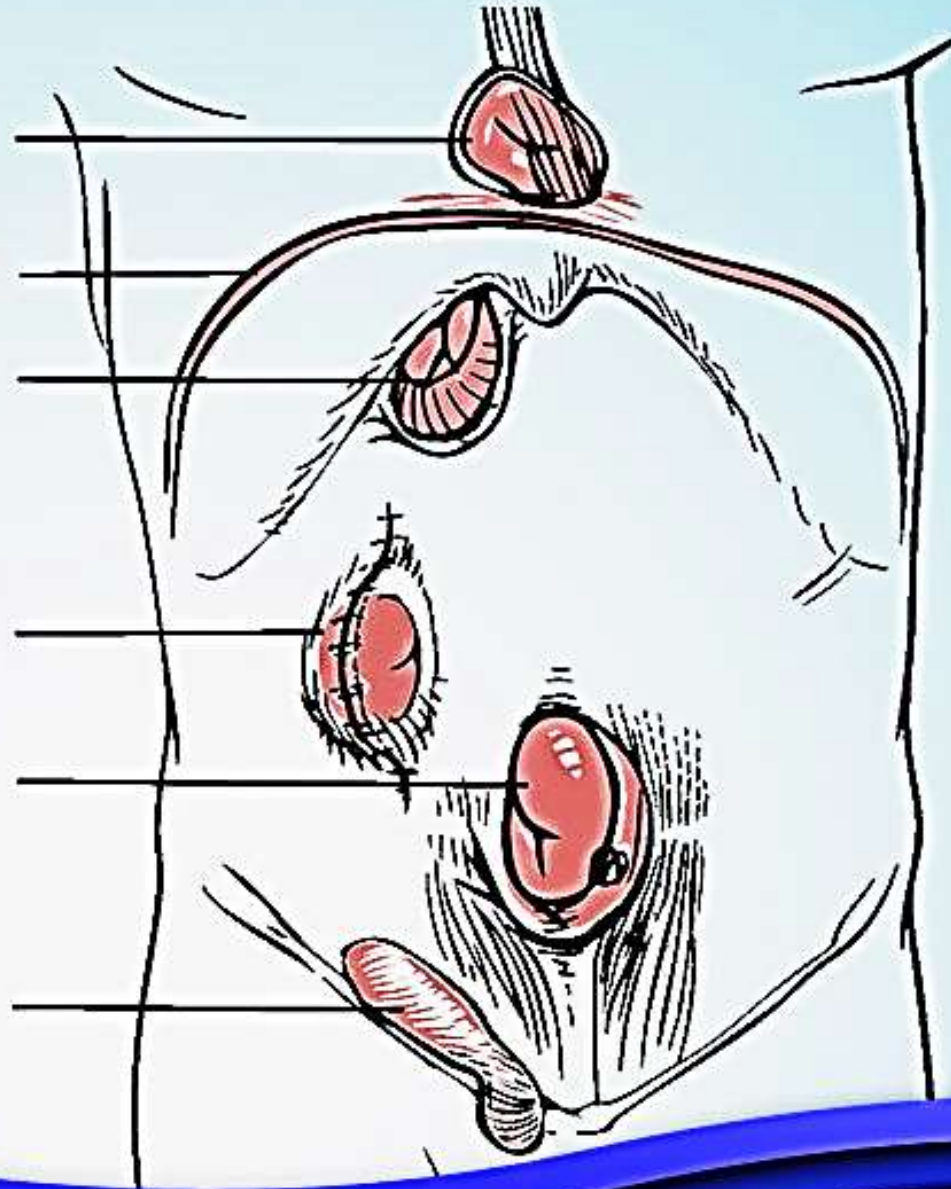
Diaphragm

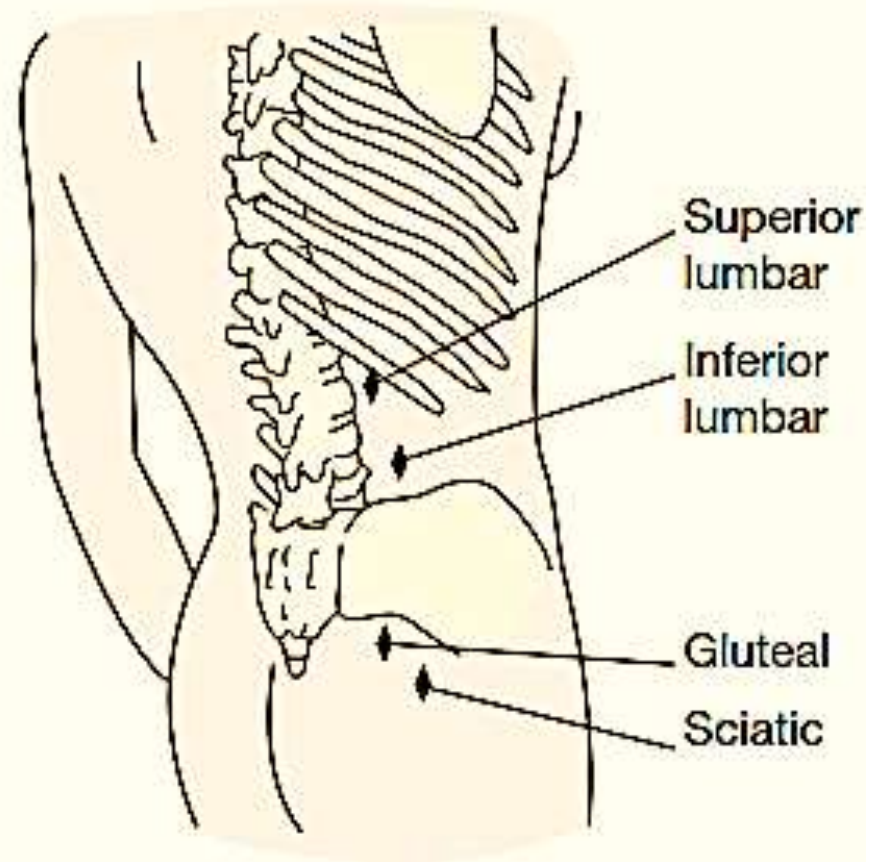
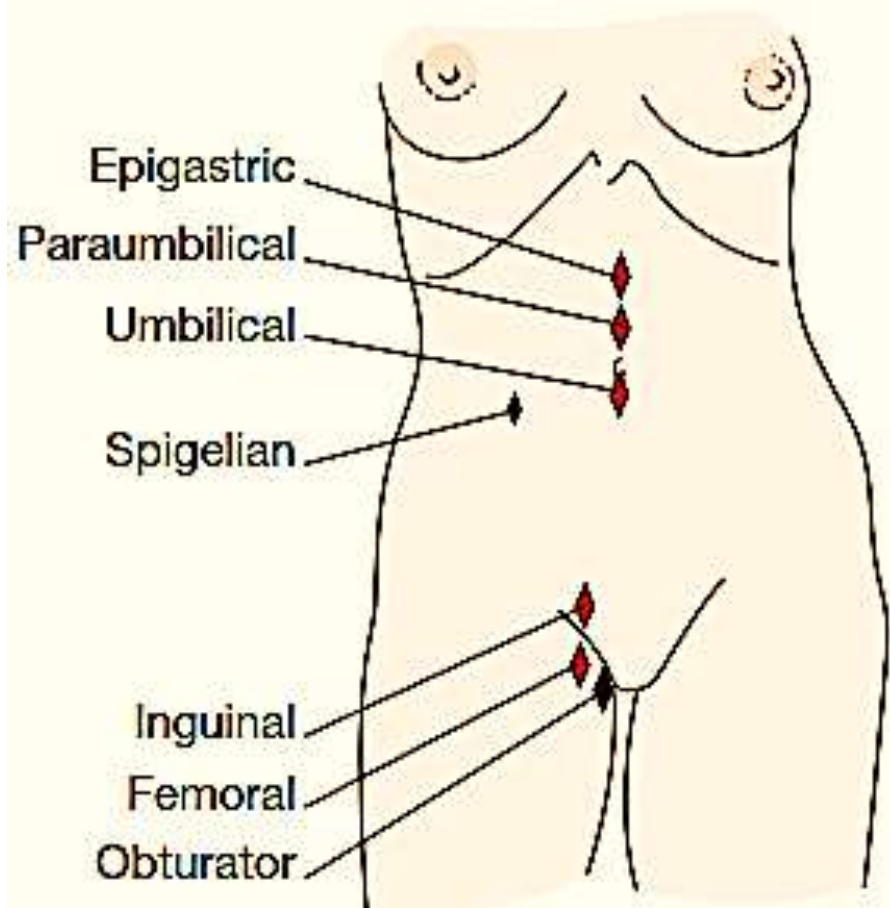
Epigastric Hernia

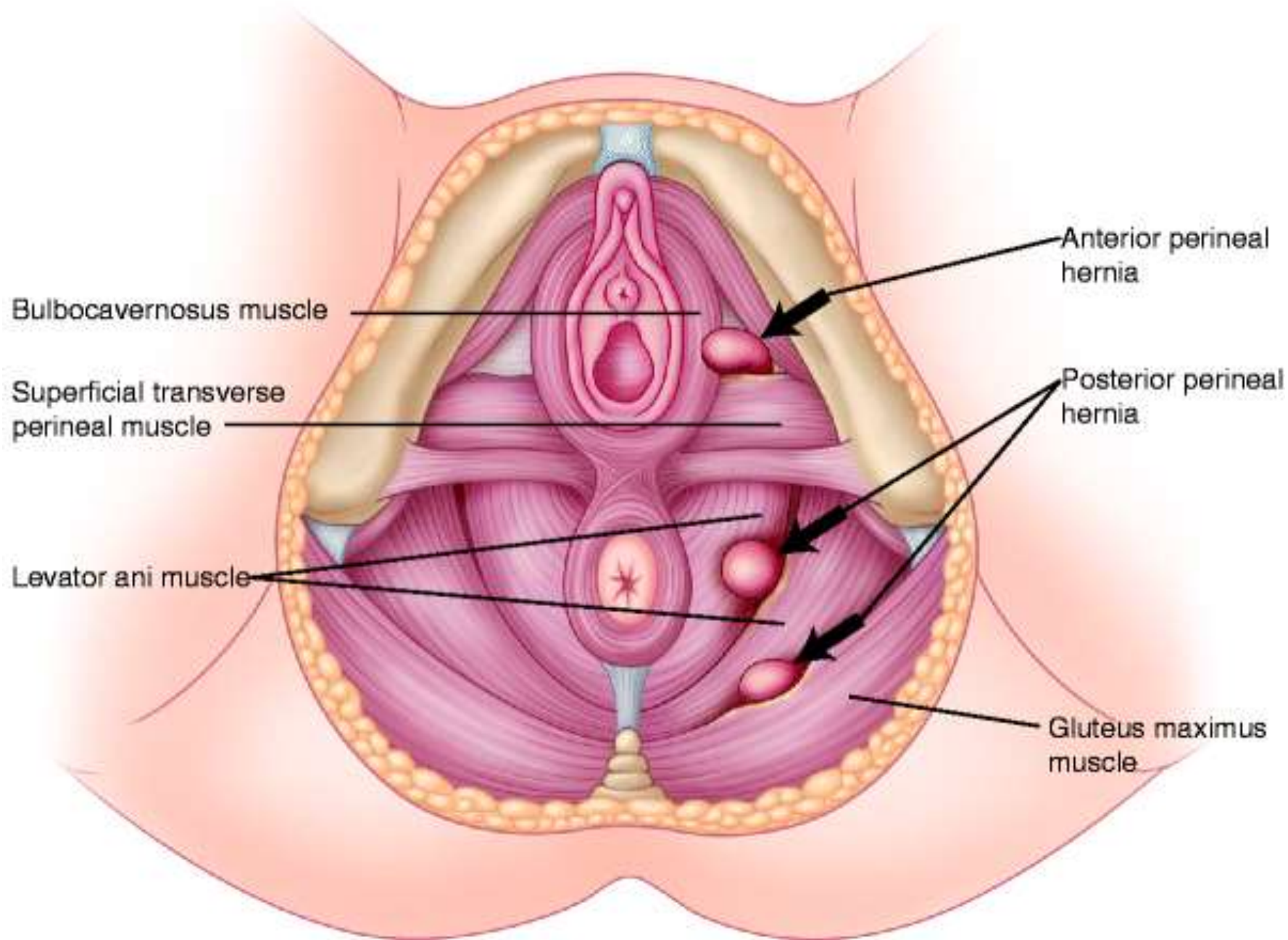
Incisional Hernia

Umbilical Hernia

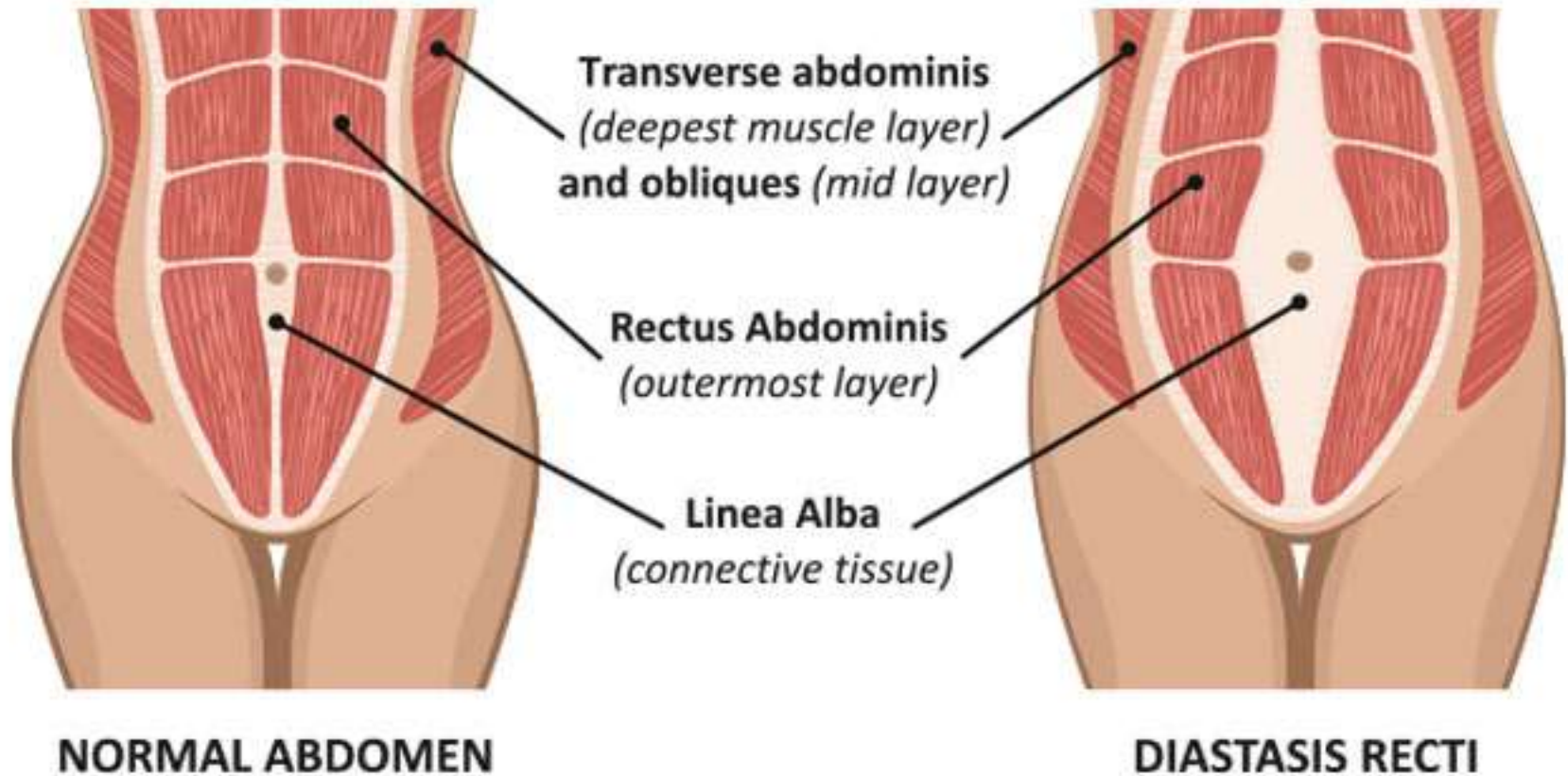
Inguinal Hernia



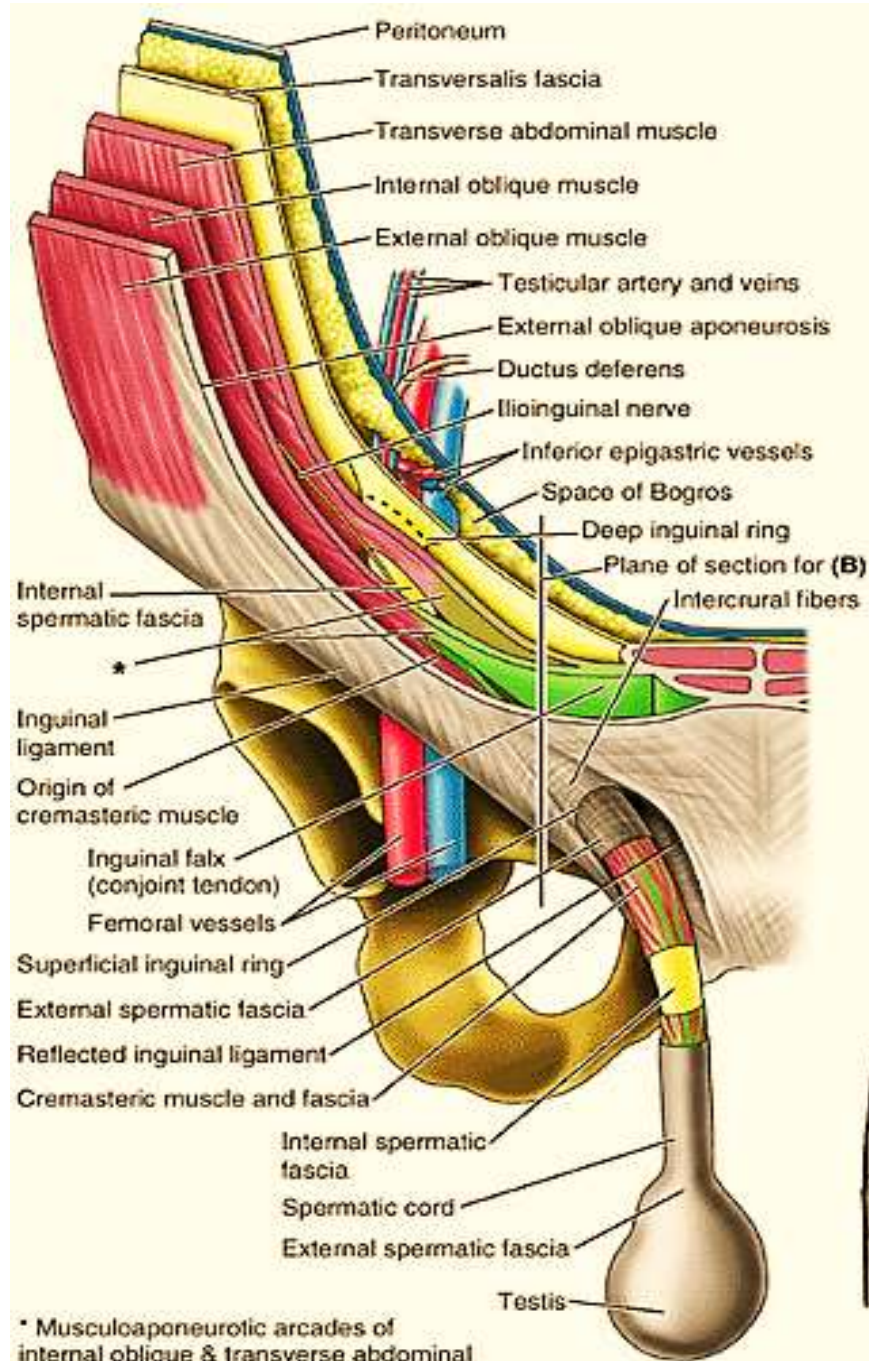




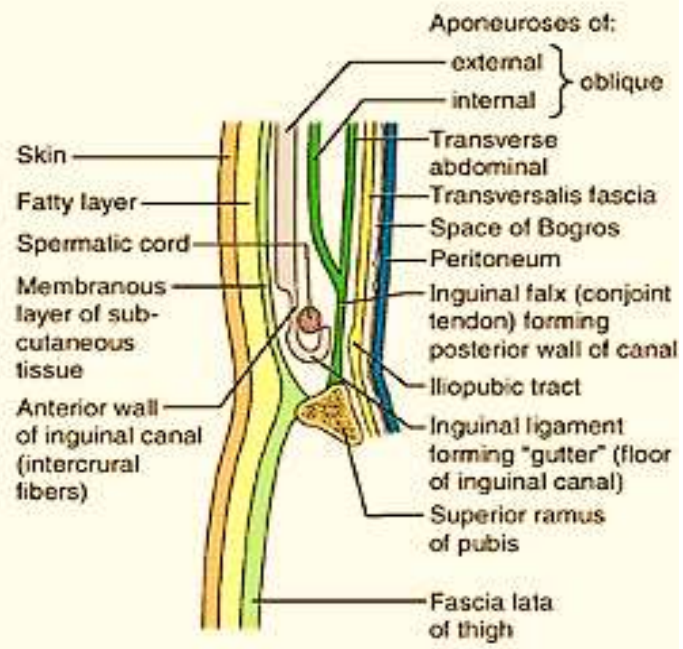
DIASTASIS RECTI



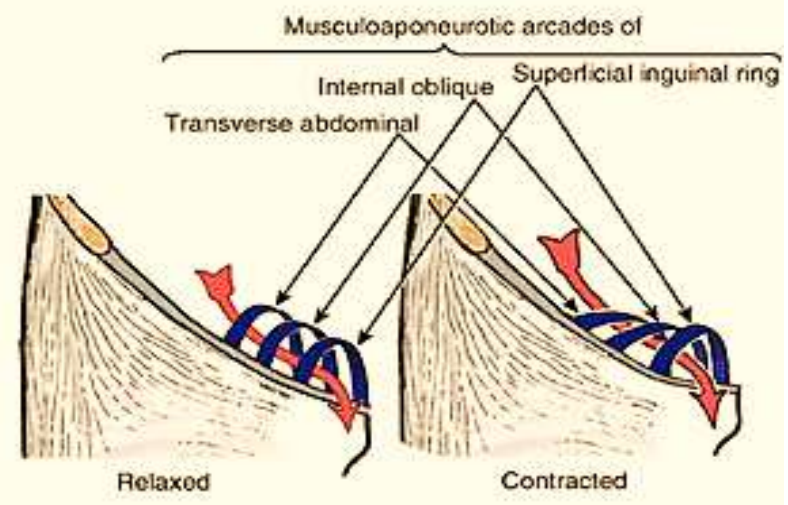
Recti Divarication



(A) Anterior view

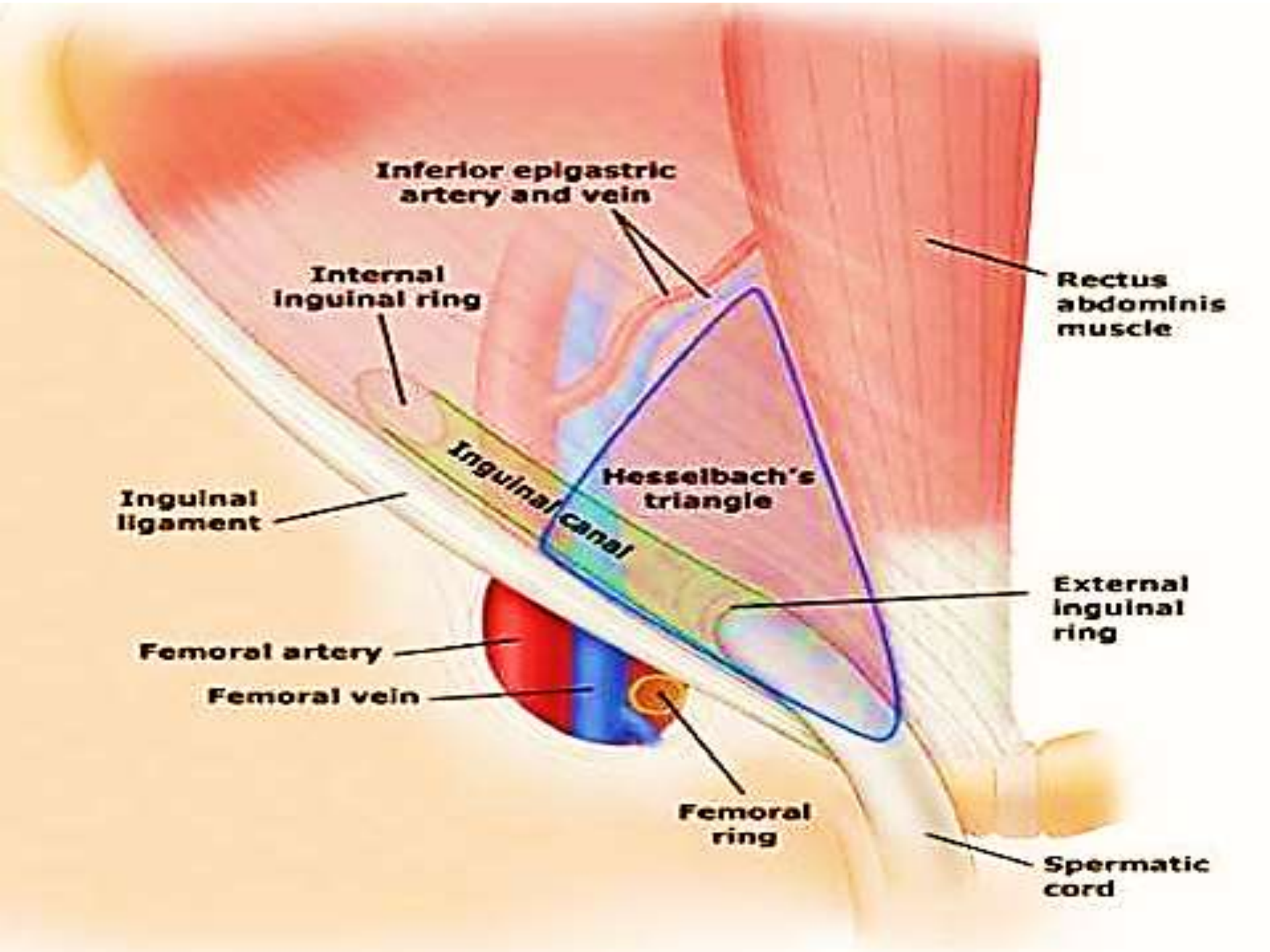


(B) Schematic sagittal section



(C) Anterior view

* Musculoaponeurotic arcades of internal oblique & transverse abdominal

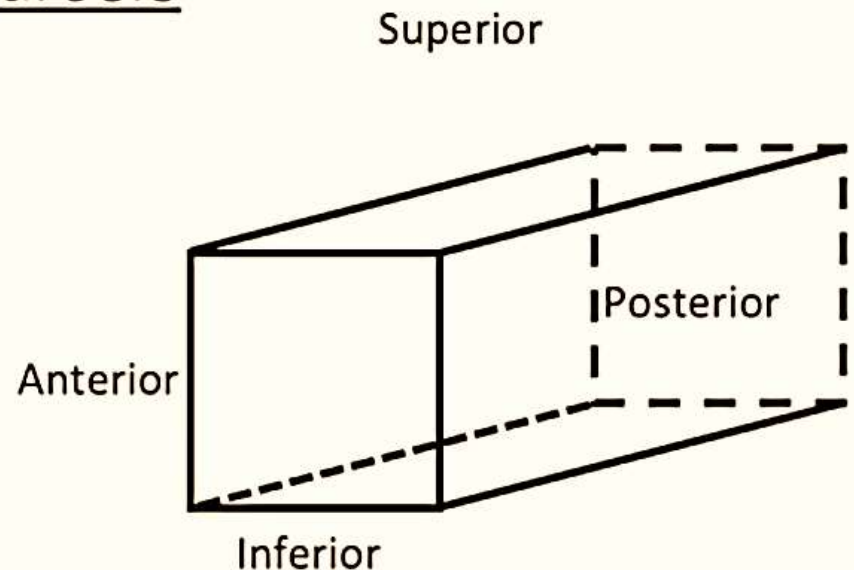


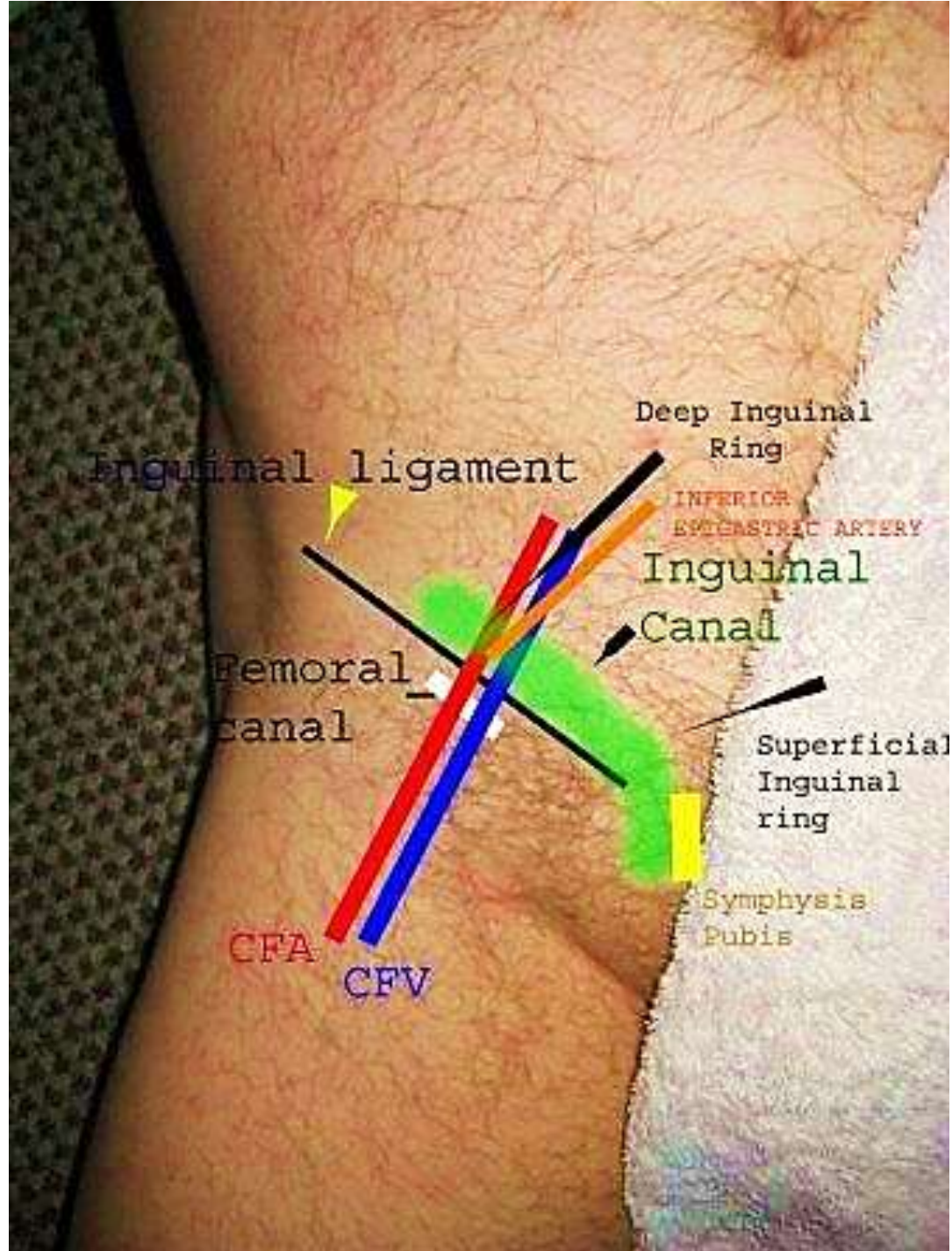
- M** - Internal oblique muscle
- Transversus abdominus muscle

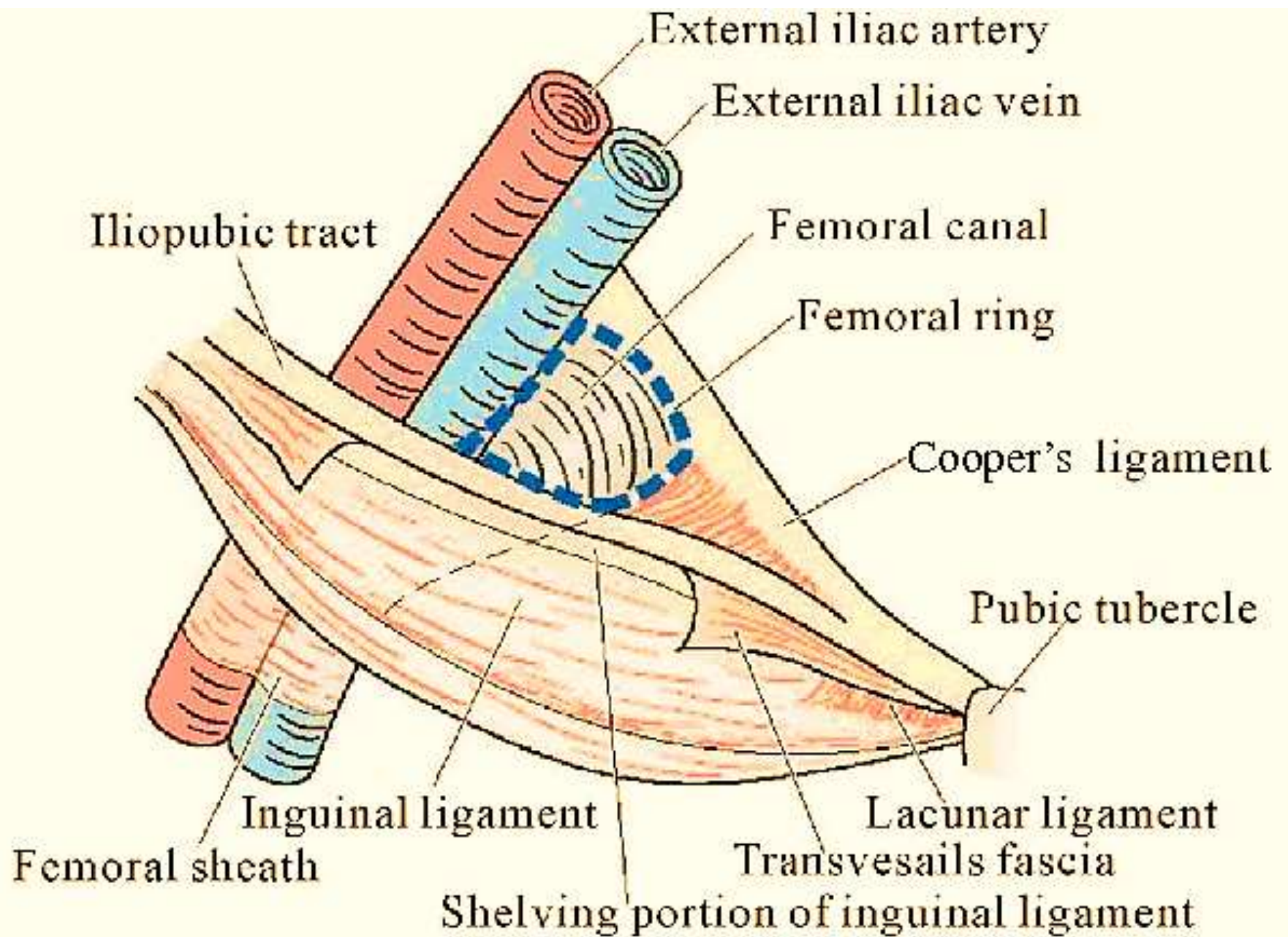
- A** - External oblique aponeurosis
- Internal oblique aponeurosis

- L** - Inguinal ligament
- Lacunar ligament

- T** - Transversalis fascia
- Conjoint tendon







Inferior Epigastric
Vessels

Peritoneum Layer

Indirect Hernia
(lateral)

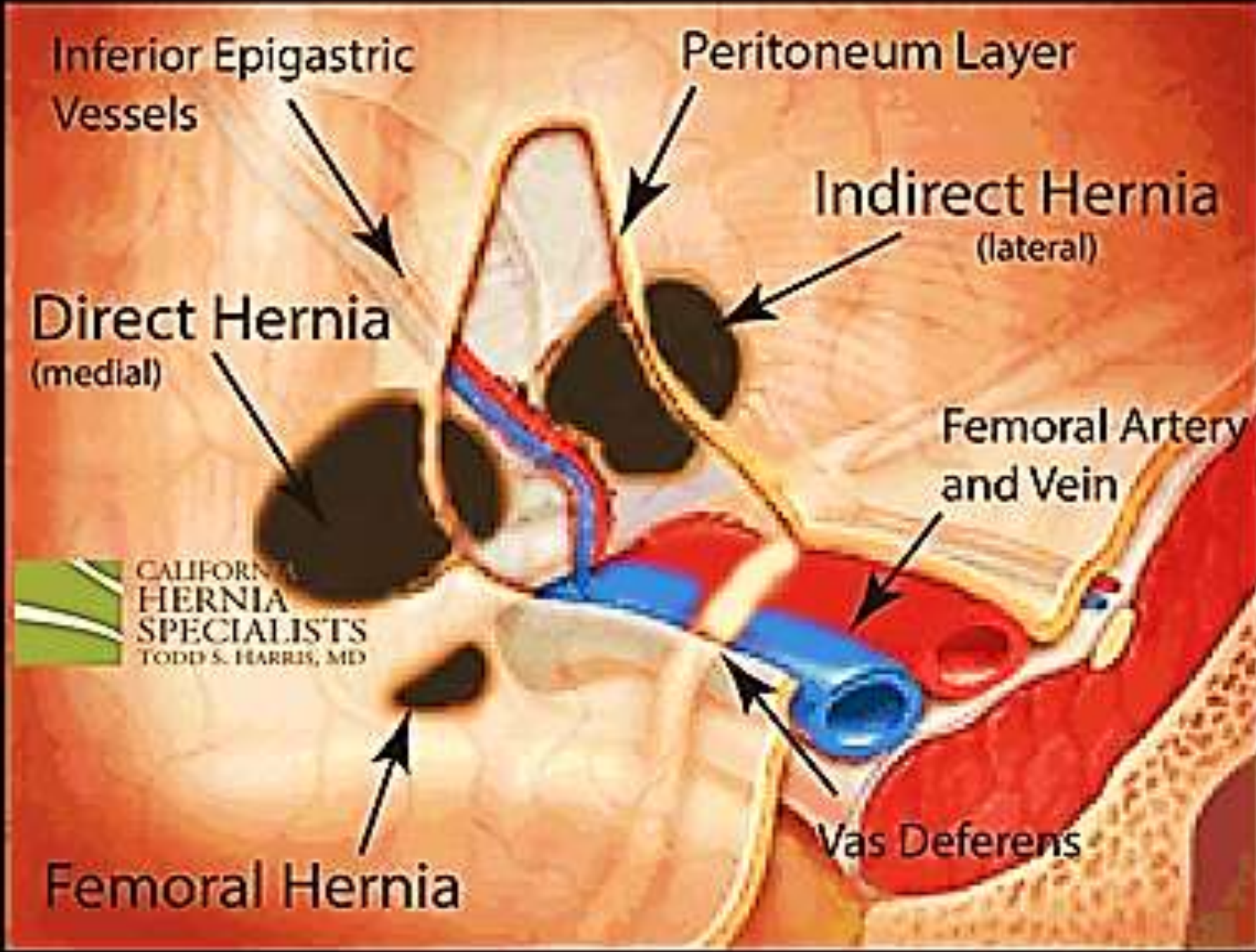
Direct Hernia
(medial)

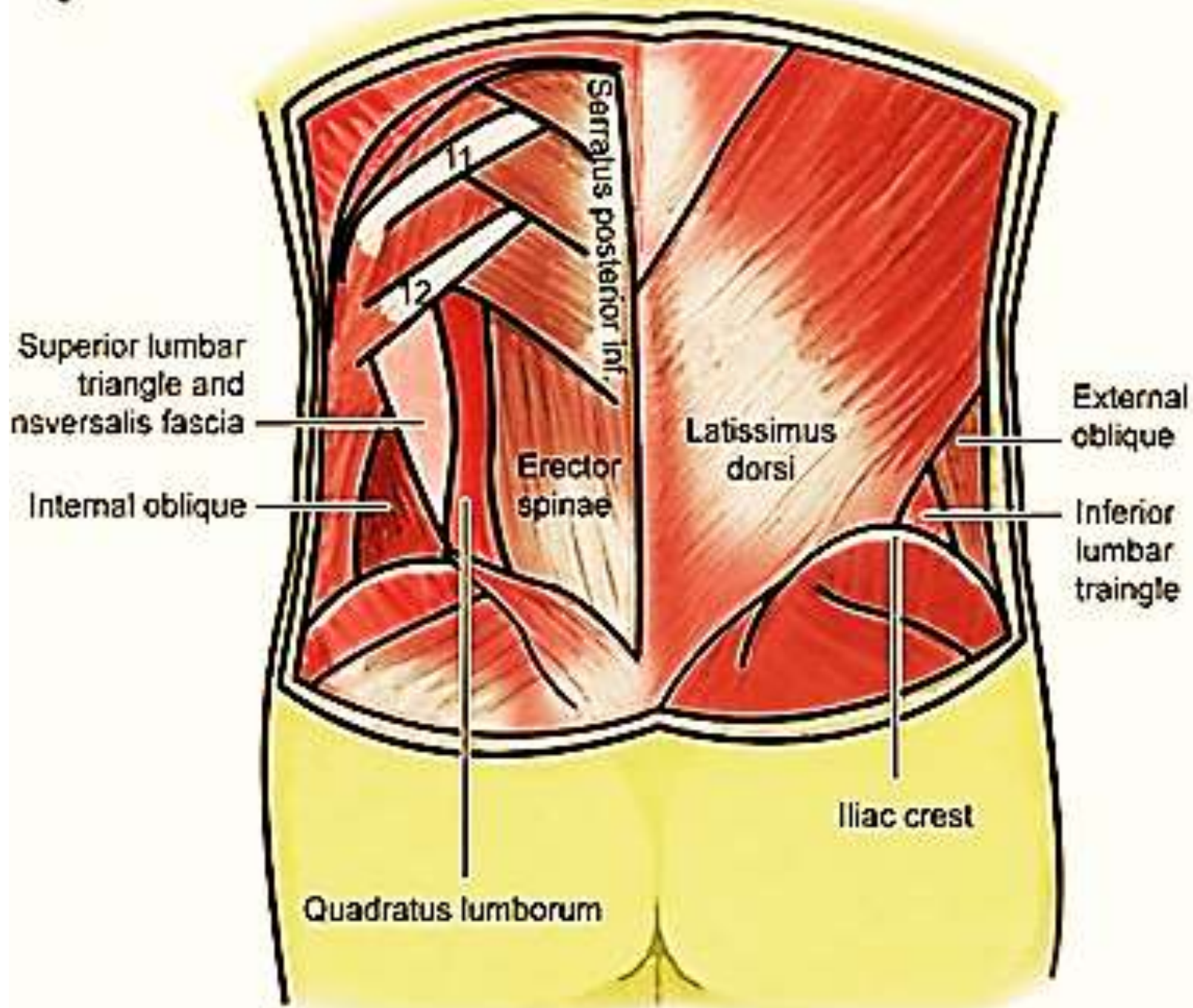
Femoral Artery
and Vein

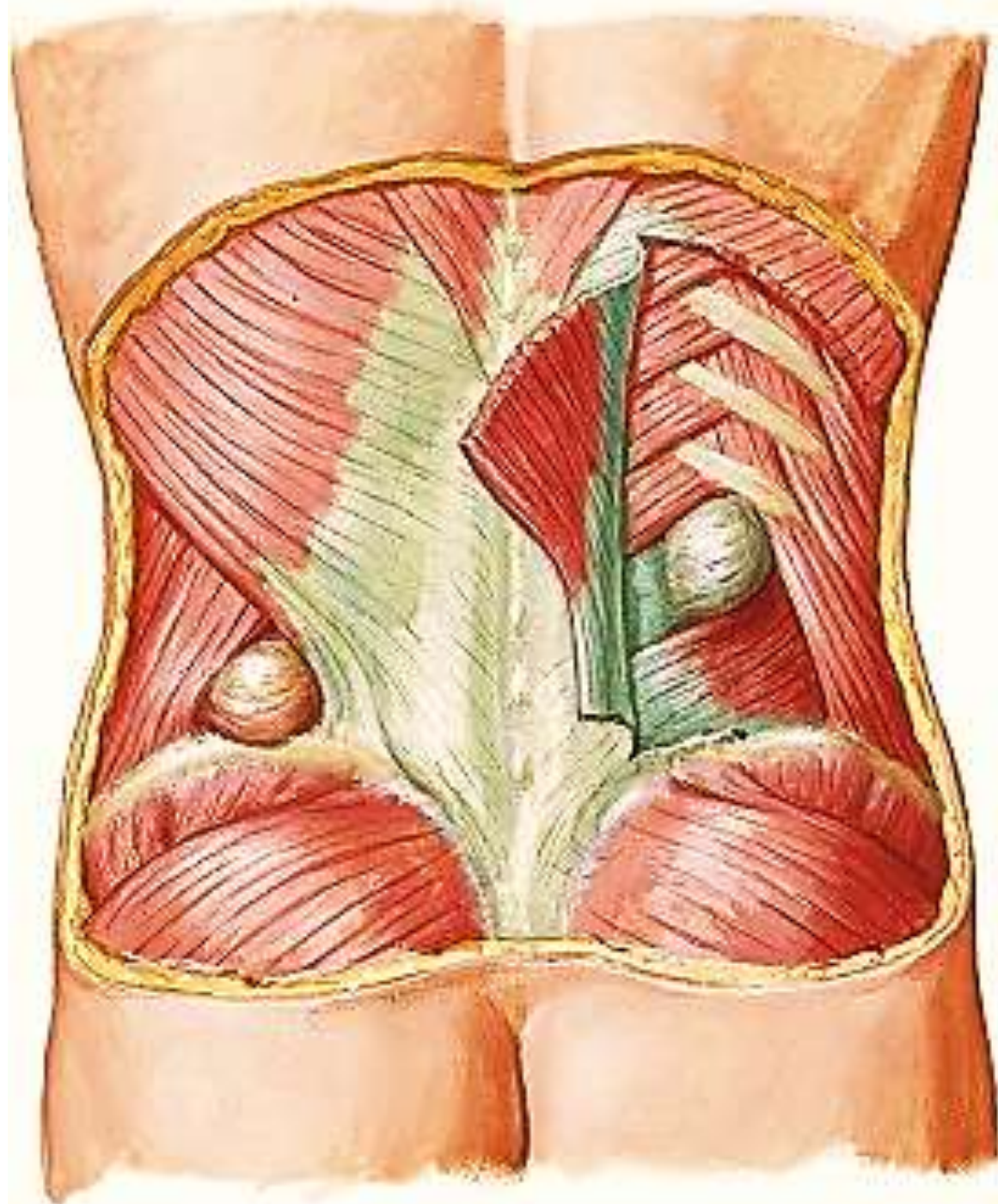
CALIFORNIA
HERNIA
SPECIALISTS
TODD S. HARRIS, MD

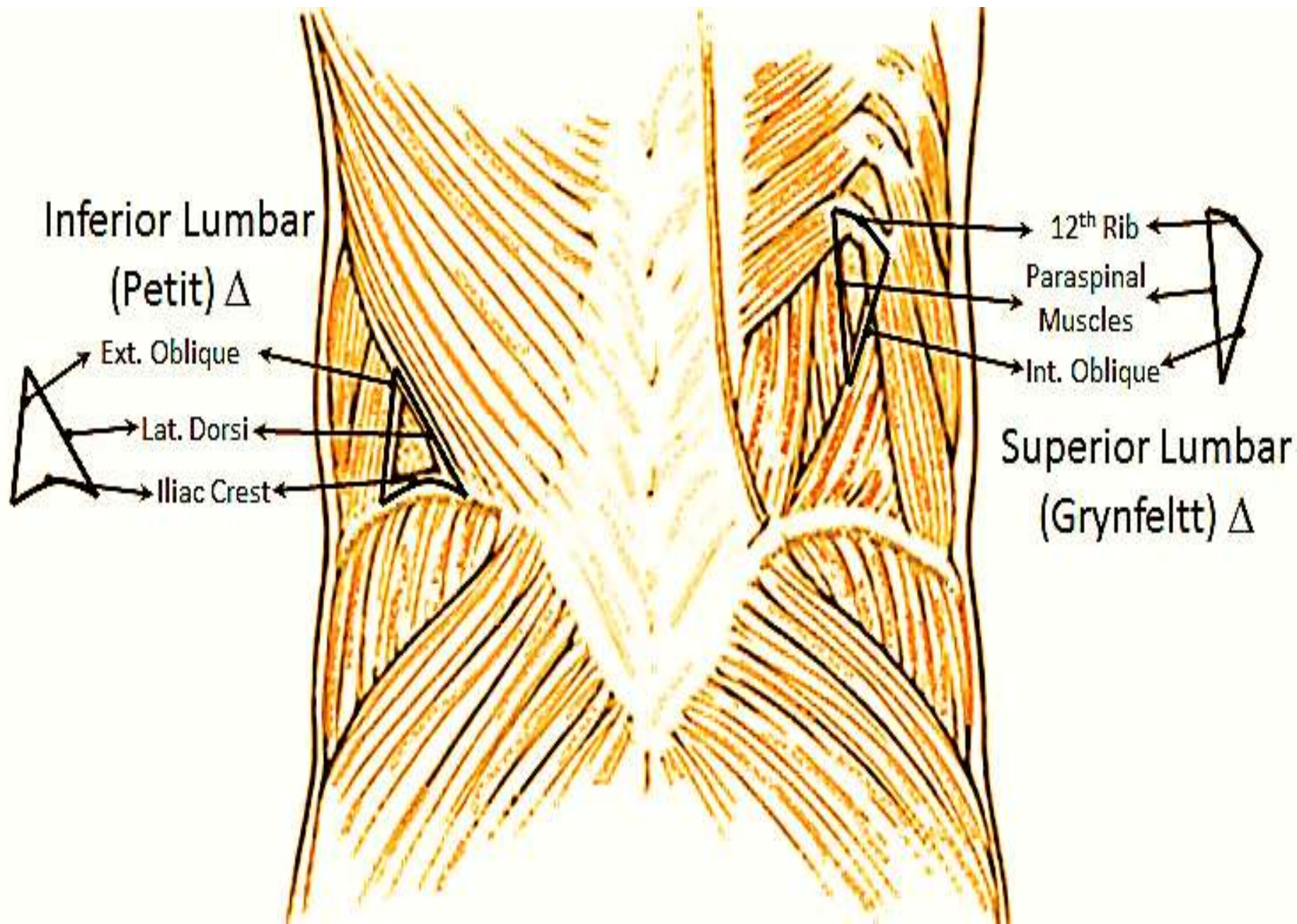
Vas Deferens

Femoral Hernia









Pathophysiology

Cause Vs. Risk factor

- Natural opening.
- Weak muscular wall. (loss of strength / trauma , nerve injury , myoneuropathies, congenital defect).
- Risk factor (Increase intraabdominal pressure)

Pathophysiology

- A normal abdominal wall has sufficient strength to resist high abdominal pressure and prevent herniation of content.
- High intraabdominal pressure from constipation, prostatic symptoms, excessive coughing in respiratory disease, pregnancy , obesity and heavy weight lifting (Risk factor).
- There is good evidence that hernia is a ‘collagen disease’ and due to an inherited imbalance in the types of collagen.
- Congenital .
- Common in elderly people due to degenerative weakness of muscles and fibrous tissue.
- Is more common in smokers.
- Injury to the abdominal wall.

- The nature of the defect is important to understanding the risk of hernia complications.’ **Neck** ;
- The **content** of the hernia may be tissue from the extraperitoneal space alone, such as fat within an epigastric hernia (false hernia) or viscus (true hernia) urinary bladder in a direct inguinal hernia / small bowel as in indirect inguinal hernia.
- More commonly, when peritoneum is lying immediately deep to the abdominal wall weakness, pressure forces the peritoneum through the defect and into the subcutaneous tissues. ‘**Sac**’.
- Tissue is trapped inside a hernia (Reducible / Irreducible [Normal if wide neck, Incarceration, Obstruction, strangulation and ends with gangrene]).

Clinical history

- Self-diagnosis is common.
- Discomfort .
- Swelling.
- Pain (entrapment)
- Reducibility .
- Recurrence.
- Complication (redness , tenderness).
- Risk factors.
- Causes.
- Comorbidities.
- Assessment .
- Evaluation.
- Anaesthetic risks

Examination

- Exclude abdominal masses.
- Lying down initially and then standing as this will usually increase hernia size.
- Multiple defects/contralateral side.
- Reducibility.
- Cough impulse.(irreducible there may be no cough impulse). Cough impulse can also occur in a saphena varix.
- Divarification is best seen by asking a supine patient to simply lift his head off the pillow.
- The overlying skin (cellulitis then hernia content is strangulating and the case should be treated as an emergency.
- Signs of previous repair.
- Scrotal content for groin hernia.
- Bowel obstruction.



Types of hernia by complexity

- Occult – not detectable clinically; may cause severe pain.
- Reducible – a swelling that appears and disappears
- Irreducible – a swelling that cannot be replaced in the abdomen, high risk of complications
- Strangulated – painful swelling with vascular compromise, requires urgent surgery
- Infarcted – when contents of the hernia have become gangrenous, high mortality

Investigations

- A plain radiograph of the abdomen is of little value (EXCEPT in intestinal obstruction).
- An ultrasound scan may be helpful in cases of irreducible hernia.
- Contrast herniogram, to identify an occult sac, especially in occult inguinal hernia.
- Computed tomography is helpful in complex incisional hernia, interstitial hernia and intestinal obstruction.
- MRI can help in the diagnosis of sportsman's groin where pain is the presenting feature and the surgeon needs to distinguish an occult hernia from an orthopaedic injury.
- Laparoscopic insufflation.

Management

- watchful waiting.
- A truss can be used to control a hernia.
- Surgical repair. (Open Vs. Laparoscopic).
 - 1- **Reduction** of the hernia content into the abdominal cavity with removal of any non-viable tissue and bowel repair if necessary;
 - 2- Excision and closure of a peritoneal sac (**Herniotomy**)
Open
 - 3- Reapproximation of the walls of the neck of the hernia if possible.(**Hernioraphy**).
OR
 - 4- Permanent **Reinforcement** of the abdominal wall defect with sutures or mesh.
(Ramirez slide' used in large incisional hernia repair)
- Remove the cause (before +/- or after) .

Mesh in hernia repair

- To bridge a defect: the mesh is simply fixed over the defect as a tension-free patch.
- To plug a defect: a plug of mesh is pushed into the defect (meshoma).
- To augment a repair: the defect is closed with sutures and the mesh added for reinforcement.
- Good overlap around all margins of the defect, at least 2 cm but up to 5 cm if possible.
- Complication (infection, migration, meshoma ,adhesion with viscera).
- Limitation (infection).

Mesh types

Material

- **A** (Synthetic)
 - Non-absorbable (Polypropylene makes a strong monofilament mesh , polyester (polythelen terephthalate) & polytetrafluoroethylene (PTFE).
 - Absorbable meshes which is made from polyglycolic acid fibre. They are used in temporary abdominal wall closure and to buttress sutured repairs.
- **B** (Natural)
 - Biological meshes. They provide a ‘scaffold’ to encourage neovascular in-growth and new collagen deposition. (decellularised, non-immunogenic connective tissue. They derive from human or animal dermis, bovine pericardium or porcine intestinal submucosa).

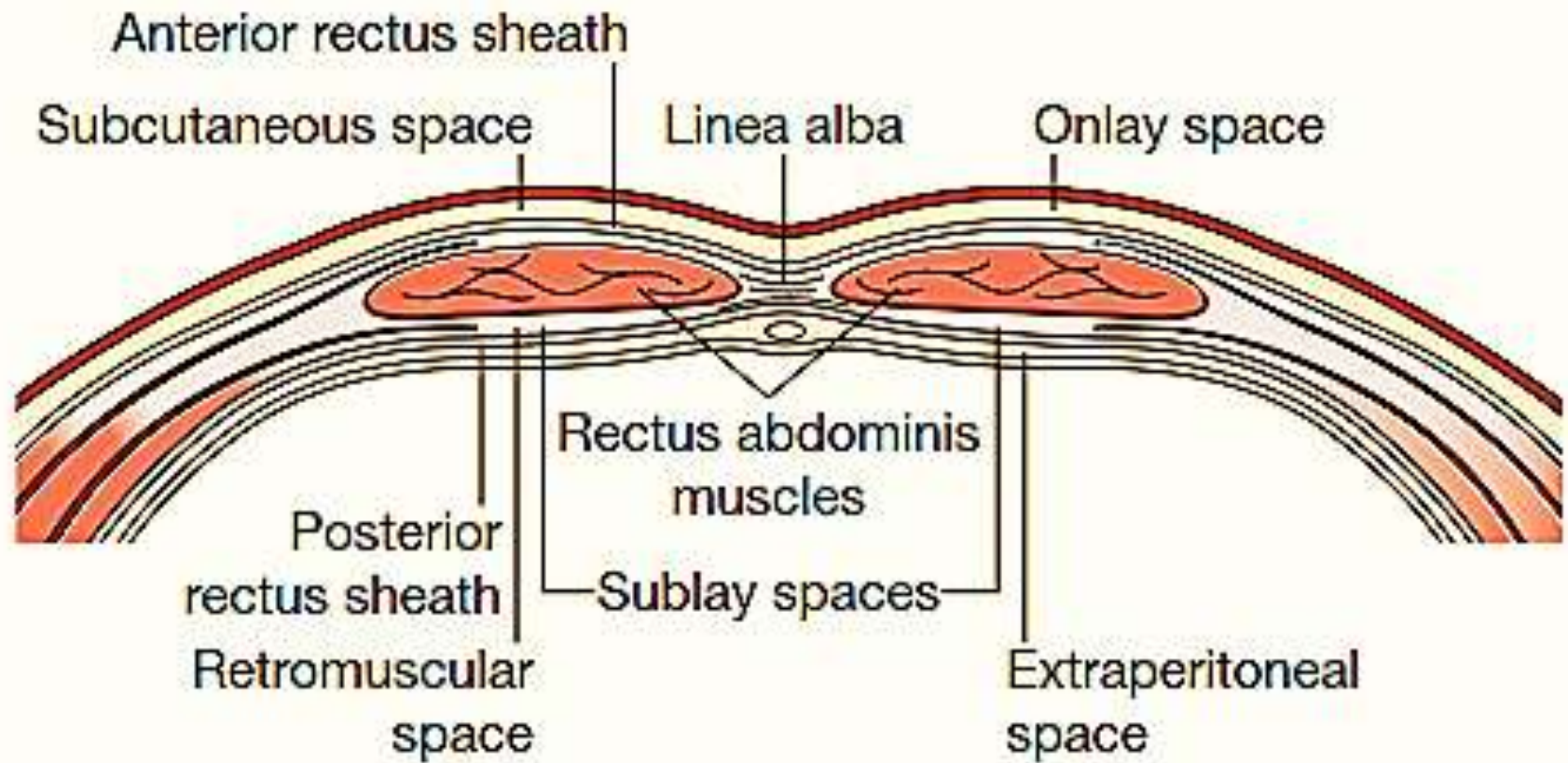
Manufacturing

- Net meshes are woven or knitted / Flat sheets are not porous.
- Tissue separating mesh. (dual mesh).(absorbable and non absorbable components.
- Weight & Porosity. (‘mesh shrinkage ’)

Positioning the mesh

- Just outside the muscle in the subcutaneous space (**onlay**)
- Within the defect (**inlay**) – only applies to mesh plugs in small defects.
- Between fascial layers in the abdominal wall (intraparietal or **sublay**);
- Immediately extraperitoneally, against muscle or fascia (**sublay**);
- Intraperitoneally (against peritoneum).

At open surgery all of these planes are used but laparoscopic surgeons currently use only intraperitoneal or extraperitoneal planes



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