

Monday Morning Teaching

Anatomy of the Inguinal and Femoral Canals
TEPP view of hernias



Mon 5th Mar 2012, 0700-0730hrs

Scope of Session

- Spot Test (0700-0705hr)
- Anatomy of Inguinal Canal (0705-0710hr)
- Anatomy of Femoral Canal (0710-0715hr)
- TEP Hernia (0715-0725hr)
 - What is TEP
 - TEP Anatomy
 - TEP Triangles
 - Triangle of Doom
 - Triangle of Pain
 - Mesh Anatomy in TEP
- Questions / Discussions

Time Awareness Alert

- This anatomy session scheduled 0700 – 0730hrs
 - In order for this session to finish at 0730hrs extended discussion regarding hernia's will be limited.
 - Hernia's
 - Aetiology
 - Types
 - Operative Techniques
 - Indications / Contraindications
 - Benefits / Superiority
 - Management of Recurrence etc...
- Please direct at Fellowship contenders at a later time

Spot Test

Question

- What are the muscles of the anterolateral abdomen

(5 in total)

Answer

- External oblique
- Internal oblique
- Transversus abdominus
- Rectus abdominus
- Pyramidalis

Spot Test

Question

- What nerves supply Rectus abdominus and external oblique?
- What nerves supply Internal oblique and transversus abdominus?

Answer

- External oblique and Rectus by:
 - Lower intercostal and subcostal nerves T7-T12
- Internal oblique and Transversus abdominus by:
 - T7-12 (as above) *and*
 - L1
 - Iliohypogastric
 - Ilioinguinal

Spot Test

Question

- Which nerve supplies sensation to the root of penis and anterior 1/3rd scotum
- Which nerve supplies the femoral triangle
- Which nerve innervates the cremaster muscle ?

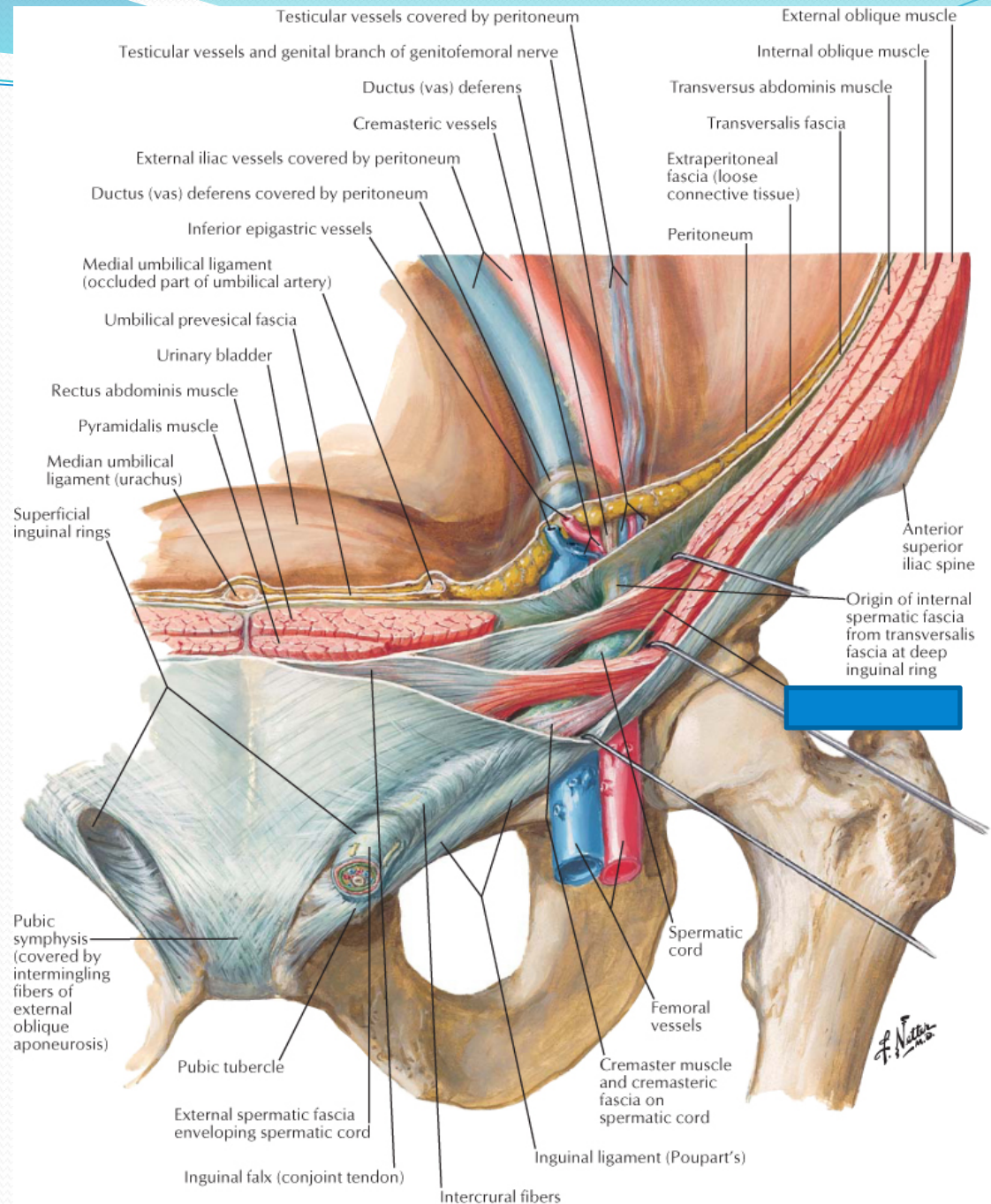
Answer

- Ilioinguinal
- Femoral branch (L₁) of Genitofemoral nerve (L₁/L₂)
- Genital branch (L₂) of Genitofemoral nerve (L₁/L₂)

Spot Test

Question

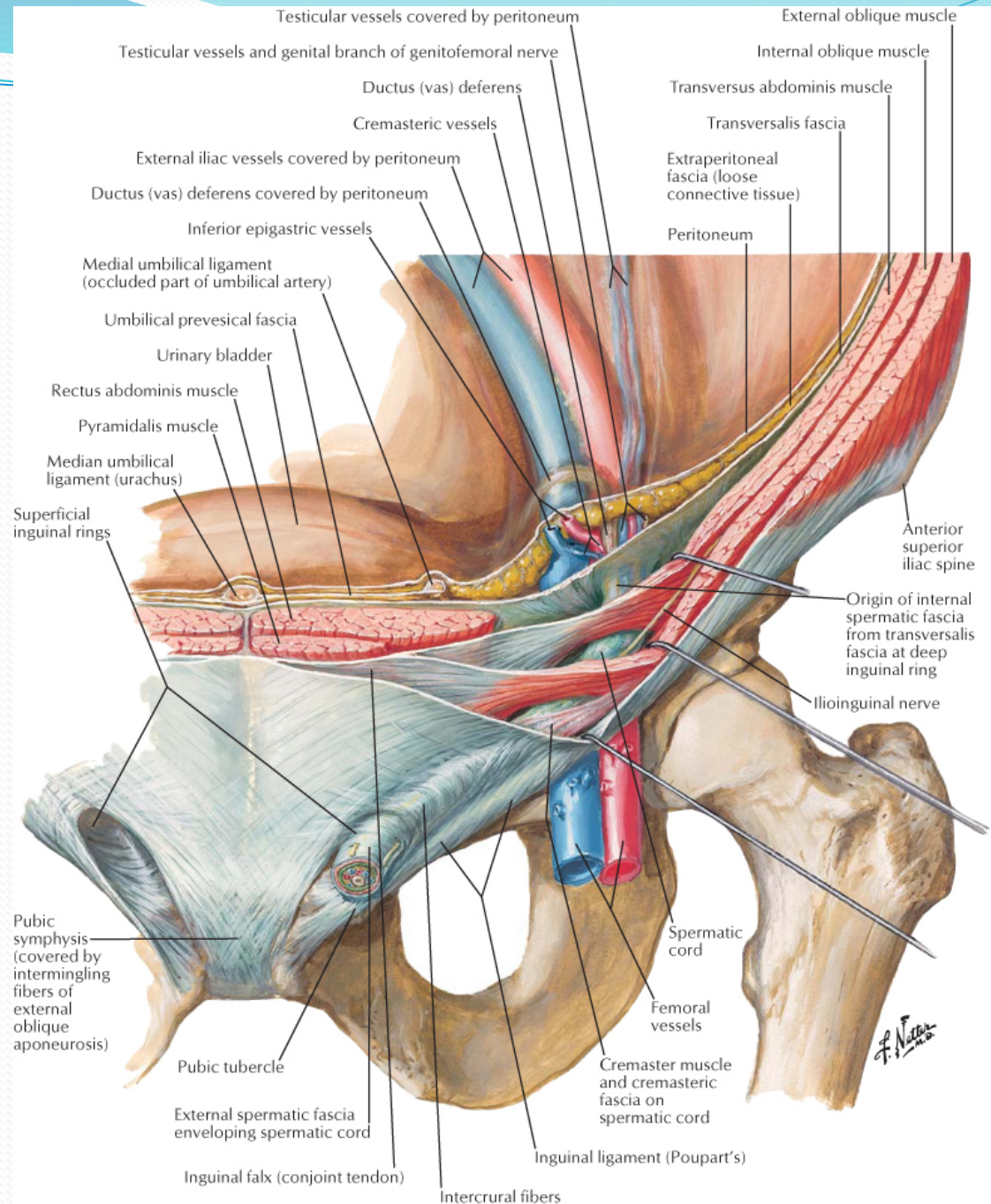
- What is the name of structure covered



Spot Test

Question

- What is the name of structure covered

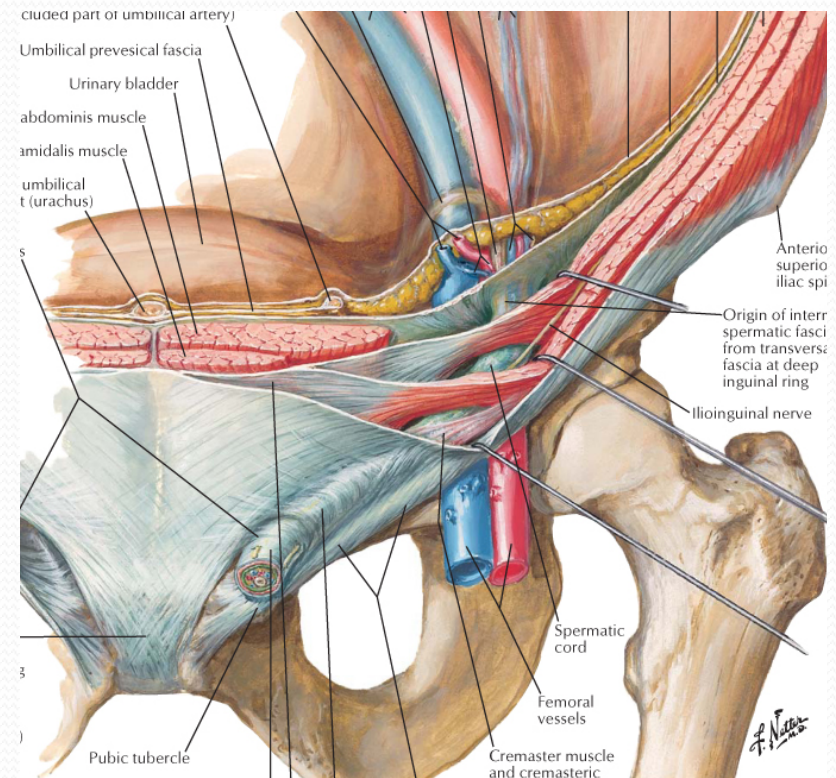


Question

- What is the midinguinal point?
- Name the structure for which the midinguinal point is a landmark?

Answer

- 1/2 way between PS and ASIS
- Femoral artery



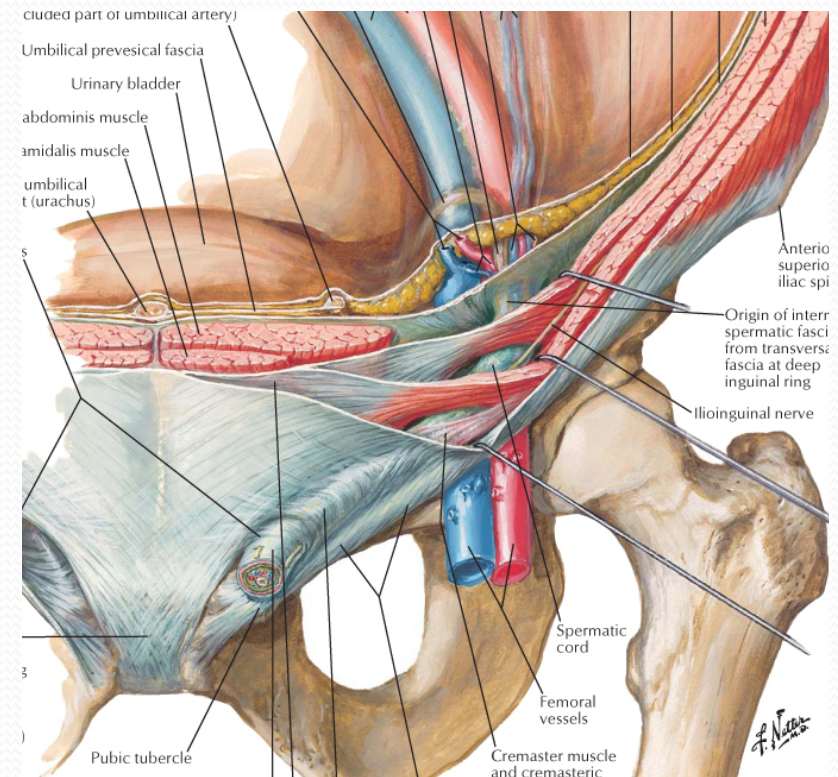
Spot Test

Question

- What is the Midpoint of Inguinal Ligament?
- Name the structure for which the midinguinal point is a landmark?

Answer

- $\frac{1}{2}$ way between PT and ASIS
- Deep inguinal ring



Spot Test

Question

- What are the Boundaries of the Inguinal Canal?

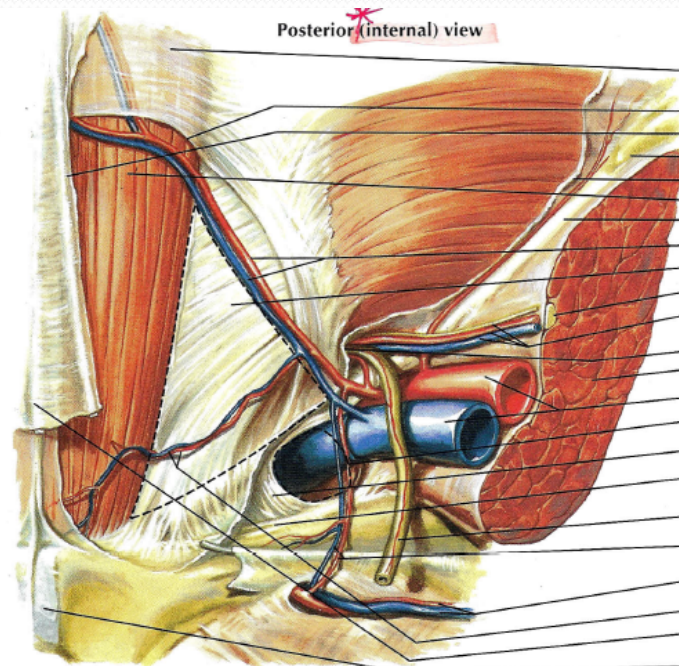
Answer

- Anterior – aponeurosis external oblique + (lat) internal oblique
- Floor – inrolled edge ing lig supported med by lacunar lig
- Roof – ↓ edges of IO + transversus, forms conj tend medially
- Posterior – transversalis fascia(lat), conjoint tendon (med)

Spot Test

Question

- What are the borders of the Femoral Ring?



Hesselbach's triangle by Carlos Machado after Frank Netter

Answer

- Anterior – medial part of inguinal ligament
- Lateral – femoral vein
- Posterior – pectineal ligament and pectaneus
- Medial – crescentic edge of lacunar ligament

Spot Test

Question

- Internal oblique arises from how much of the inguinal ligament ? (also has wider origin)
- Transversus Abdominus arises from how much of the inguinal ligament ? (also has wider origin)

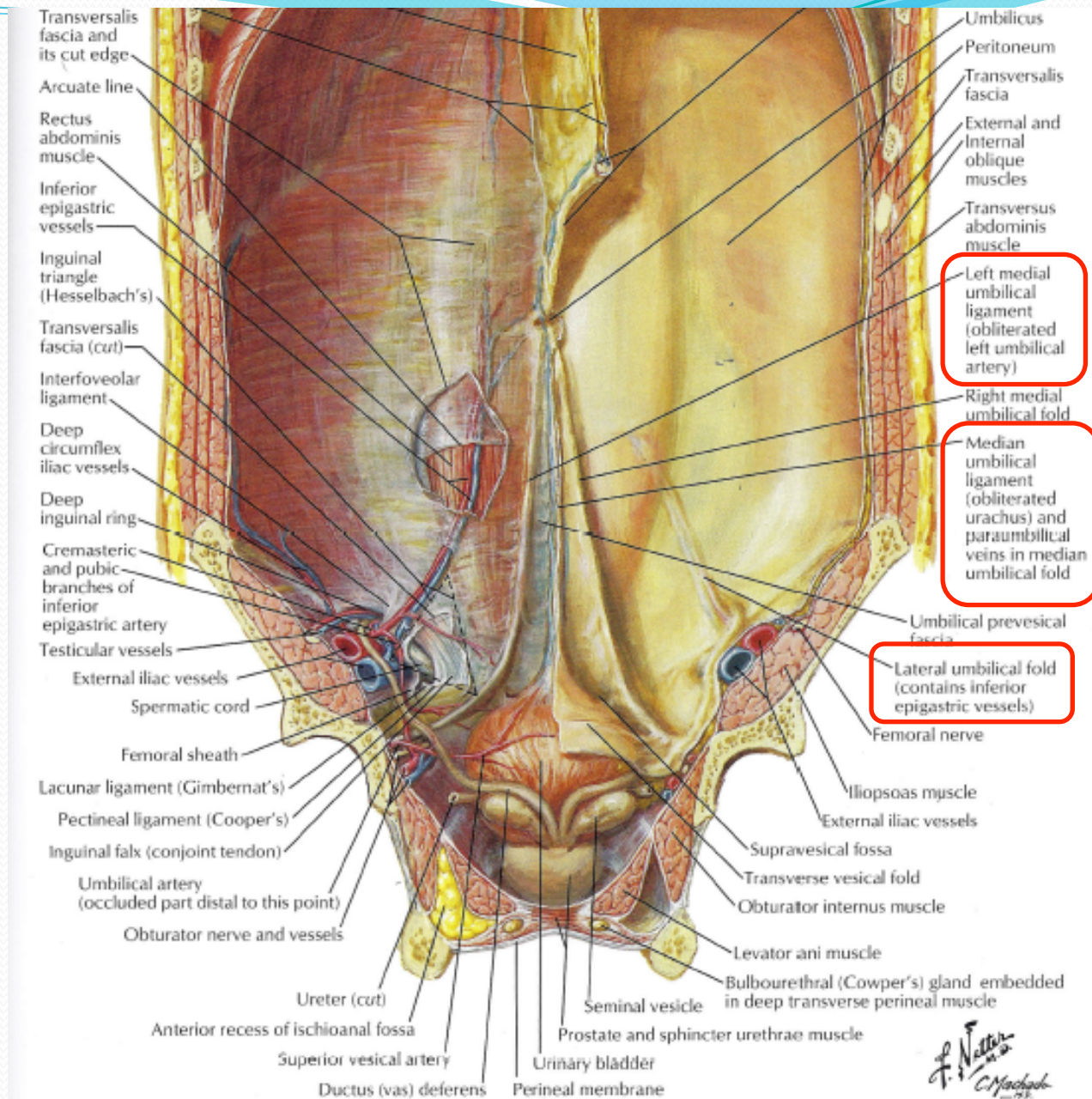
Answer

- Lateral $2/3^{\text{rd}}$ of inguinal ligament
- Lateral $1/3^{\text{rd}}$ of inguinal ligament

Spot Test

Question

- Name the Umbilical Ligaments ?
- Now their Contents?



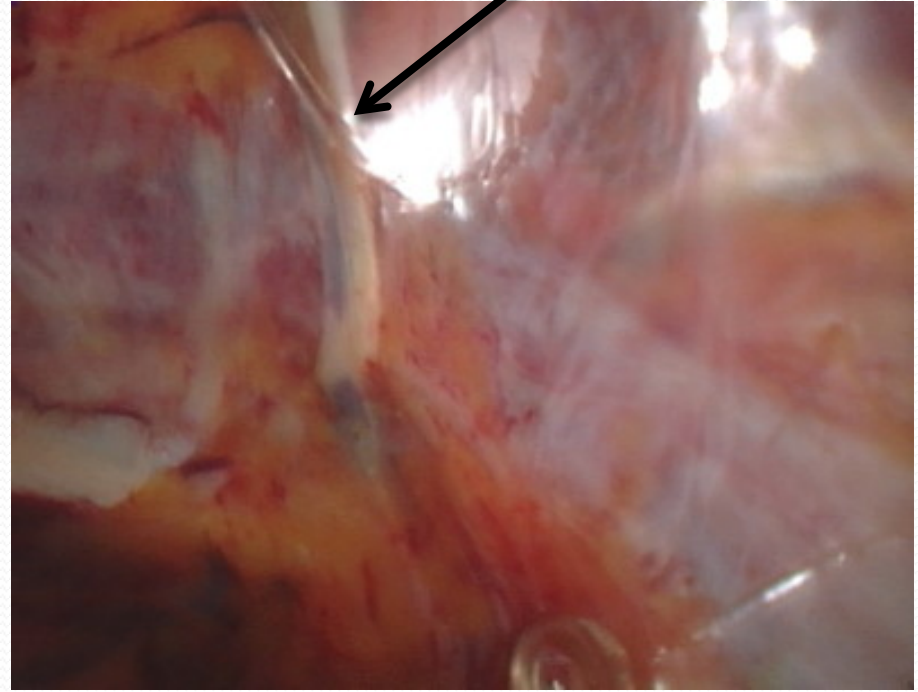
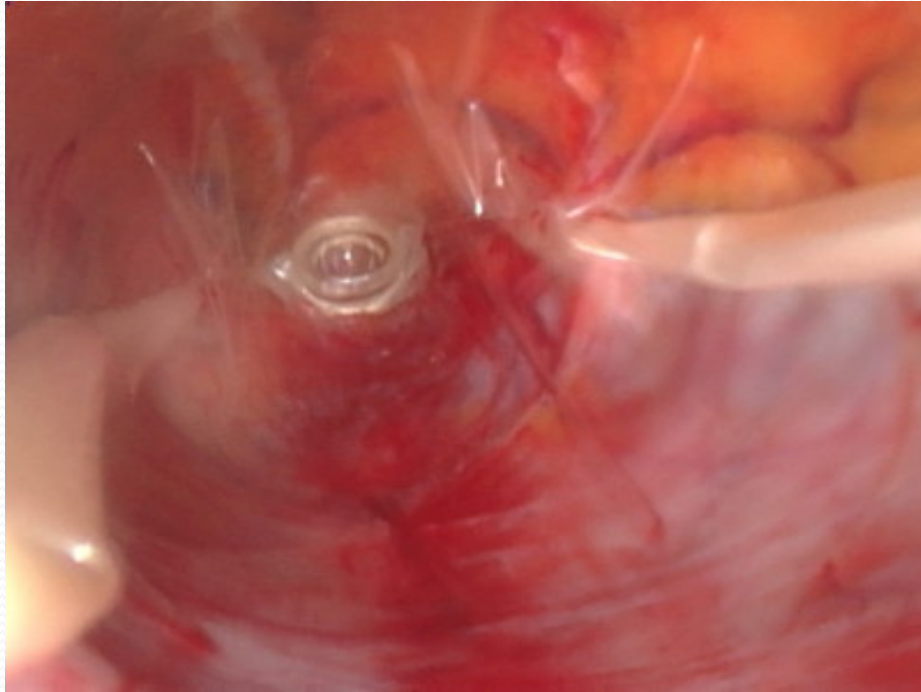
Spot Test



Question

- What pathology does this intra-peritoneal image show?

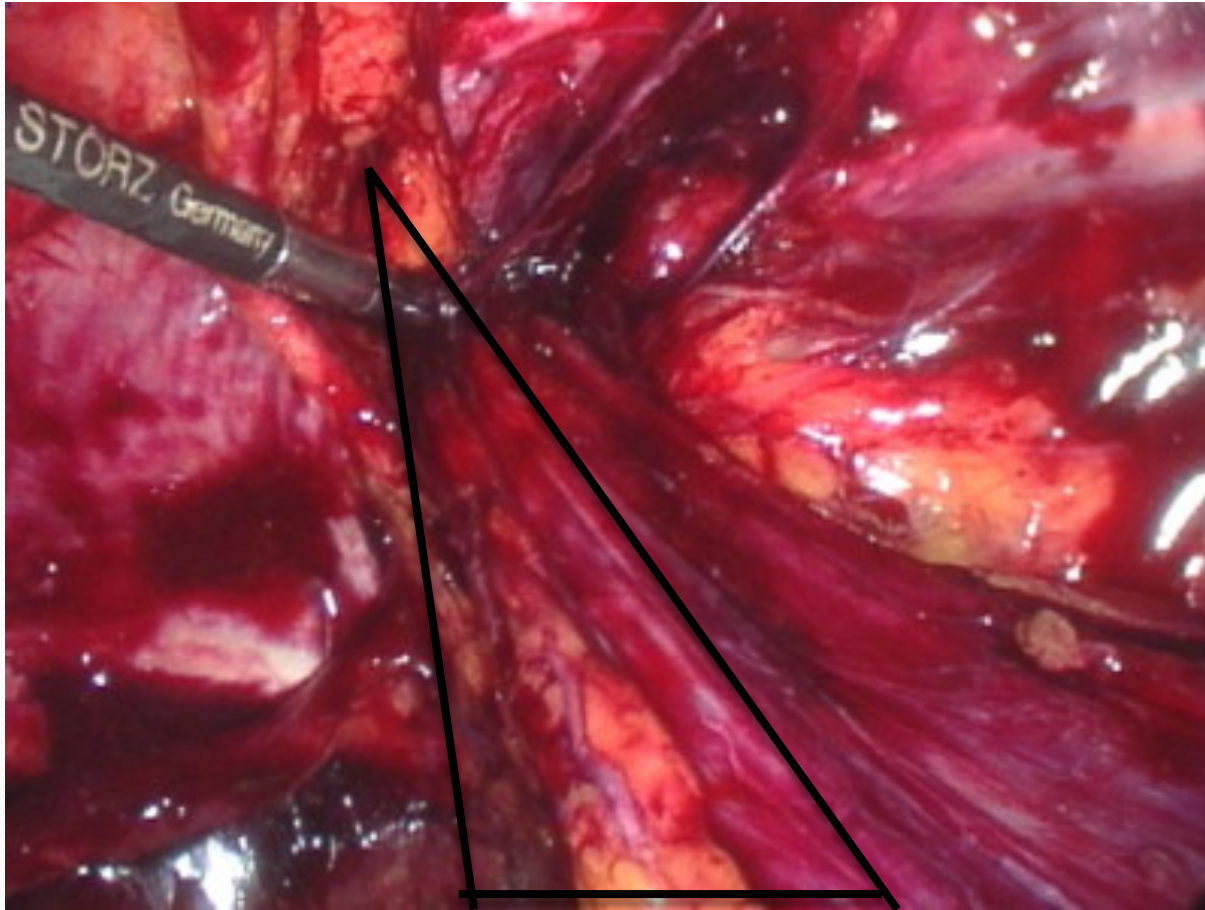
Spot Test



Question

- This is direct vision whilst conducting balloon dissection in TEPP, what is the vessel most likely identified by marker?

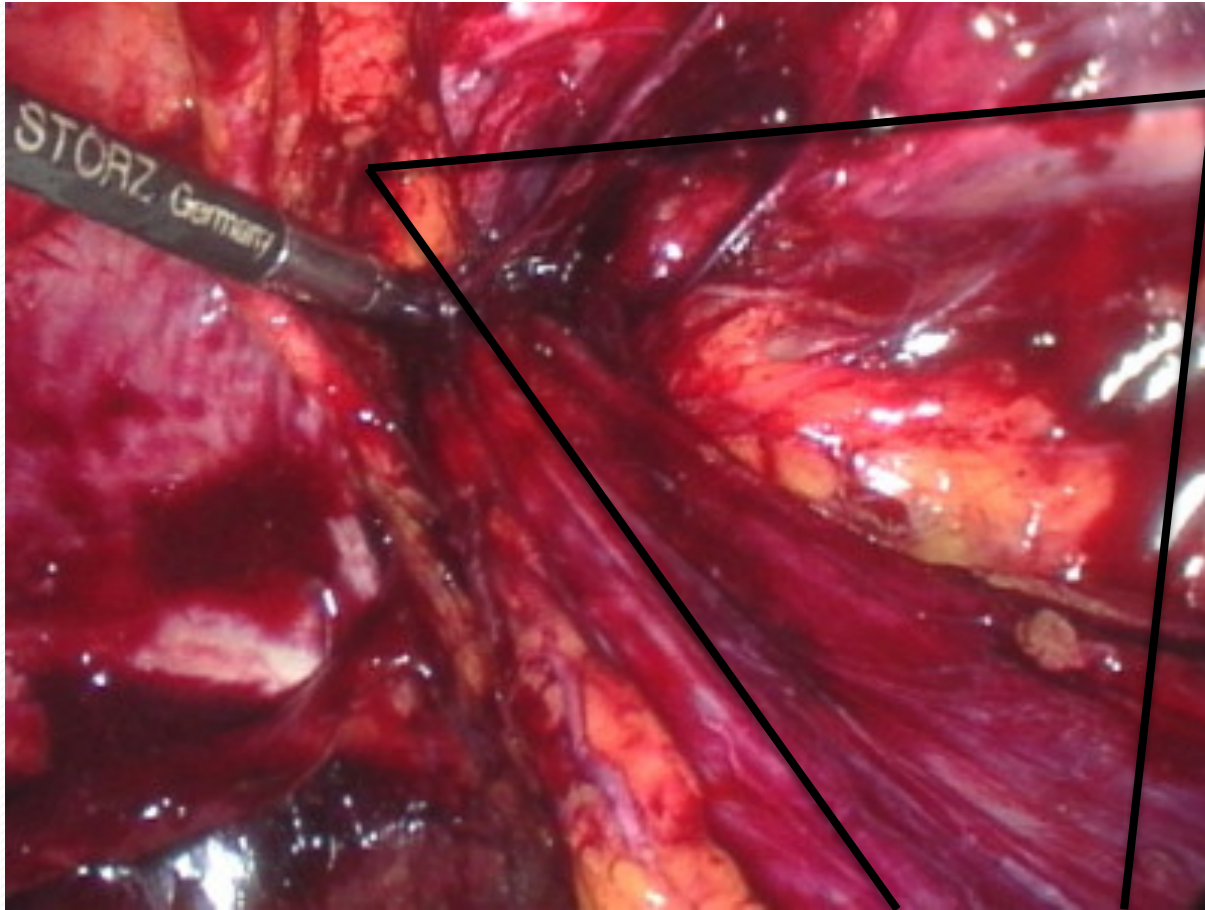
Spot Test



Question

- If once the sac was dissected away and mesh inserted ready to be place, I fired an absorbatac in this triangle what structures could I hit?

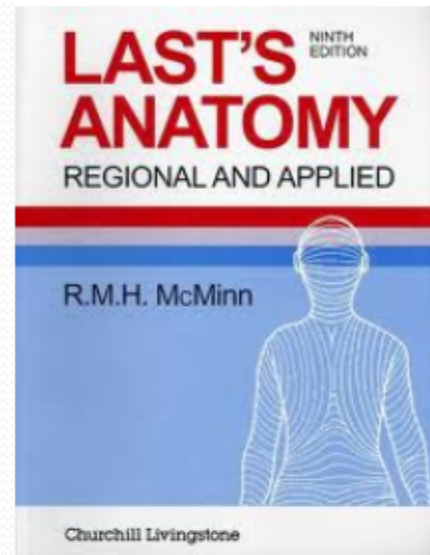
Spot Test



Question

- If once the sac was dissected away and mesh inserted ready to be place, I fired an absorbatac in this triangle what could be the patient experience in the long term
- So what structure would I have hit?

Inguinal Canal



Inguinal Canal

- Oblique intermuscular slit ~6cm, long lying above the medial $\frac{1}{2}$ of inguinal lig.
 - Commences: Deep inguinal ring
 - Ends: Superficial Inguinal ring
 - Transmits:
 - Males: spermatic cord and ilioinguinal nerve
 - Females: round ligament of uterus and ilioinguinal nerve
- Walls
 - Anterior – aponeurosis external oblique + (lat) internal oblique
 - Floor – inrolled edge ing lig supported med by lacunar lig
 - Roof – \downarrow edges of IO + transversus, forms conj tend medially
 - Posterior – transversalis fascia(lat), conjoint tendon (med)

Inguinal Canal

- **Further Review of Associated Structures**

- **Superficial Inguinal Ring**

- V-shaped opening in aponeurosis of ext. oblique
 - Lat. Crus attaches to pubic tubercle, some fibres reflect – posterior crus
 - Med. Crus attaches to pubic crest
 - Inter-crural fibres form base of triangular opening and hold crus together

- **Deep Inguinal Ring**

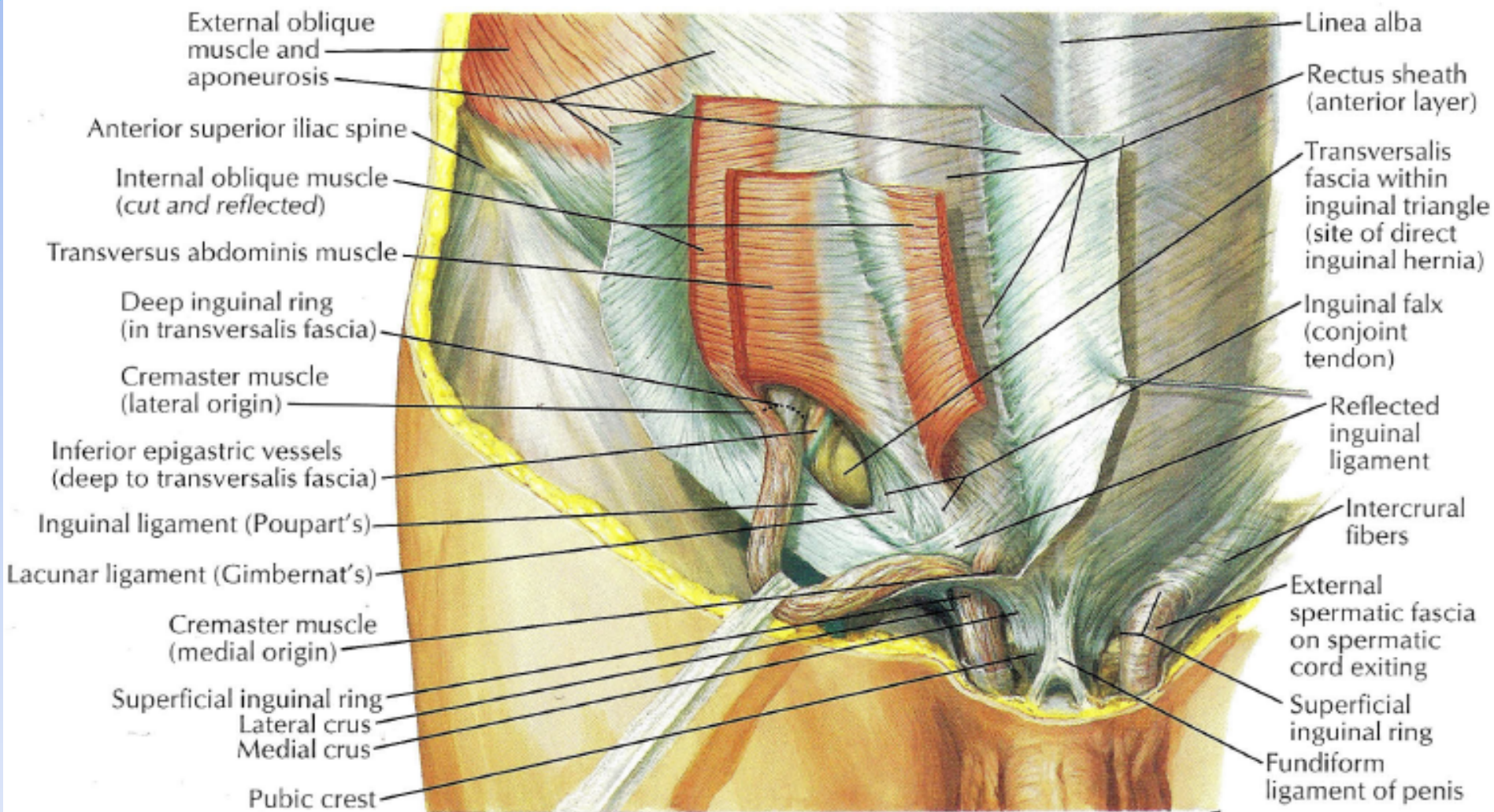
- Opening in the transversalis fascia
 - Bounded
 - Laterally by the angle between transversus muscle fibres and inguinal ligament
 - Medially by thickened transversalis fascia named interfoveolar ligament
 - Note the transversalis fascia continues as internal spermatic fascia

- **Structures Deep to Posterior Wall**

- Deep inferior epigastric artery and vein
 - Lateral to deep inf. epigas. vessels – vas deferans or round ligament

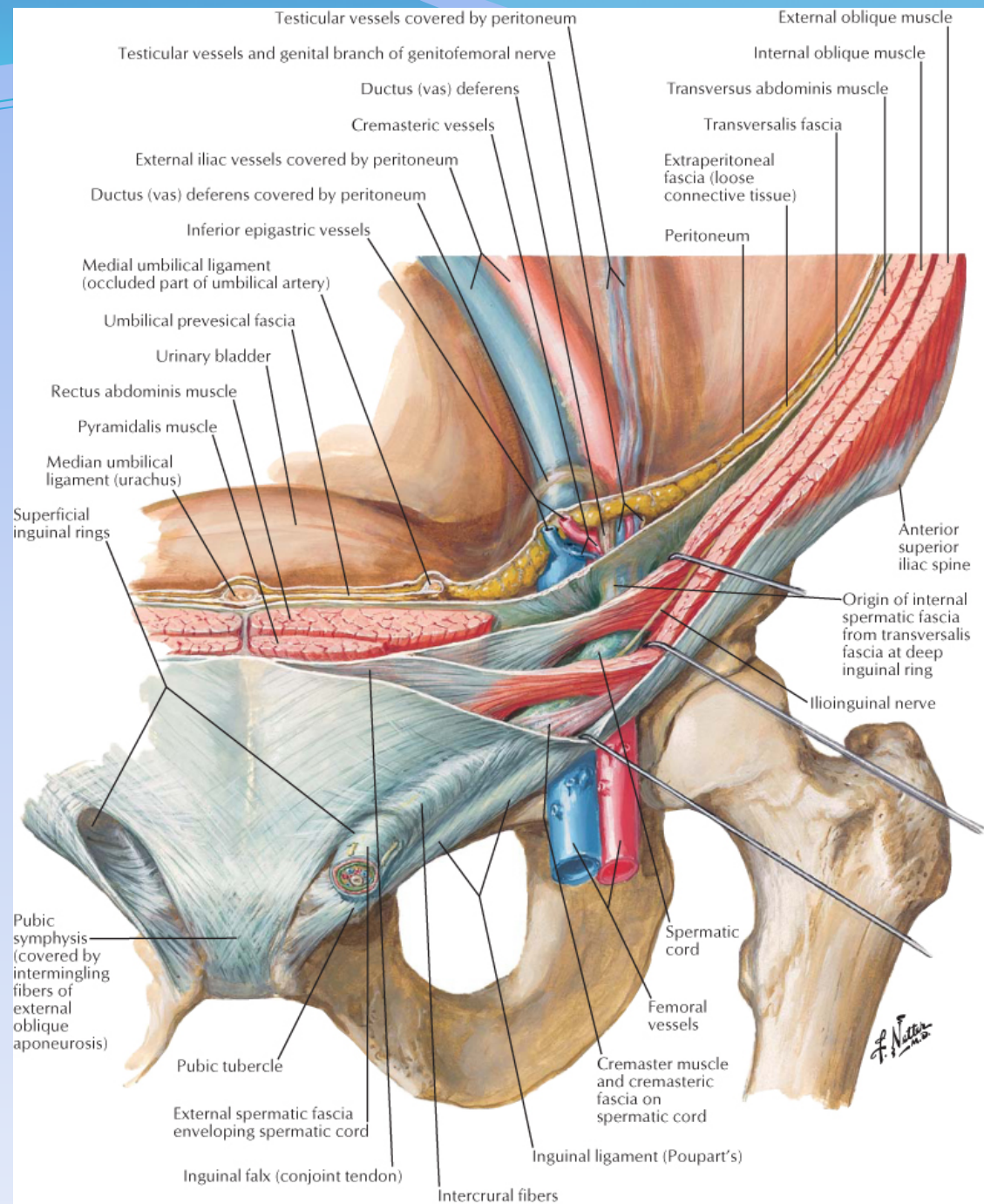
- **Hasselbach Triangle (Inguinal Triangle)**

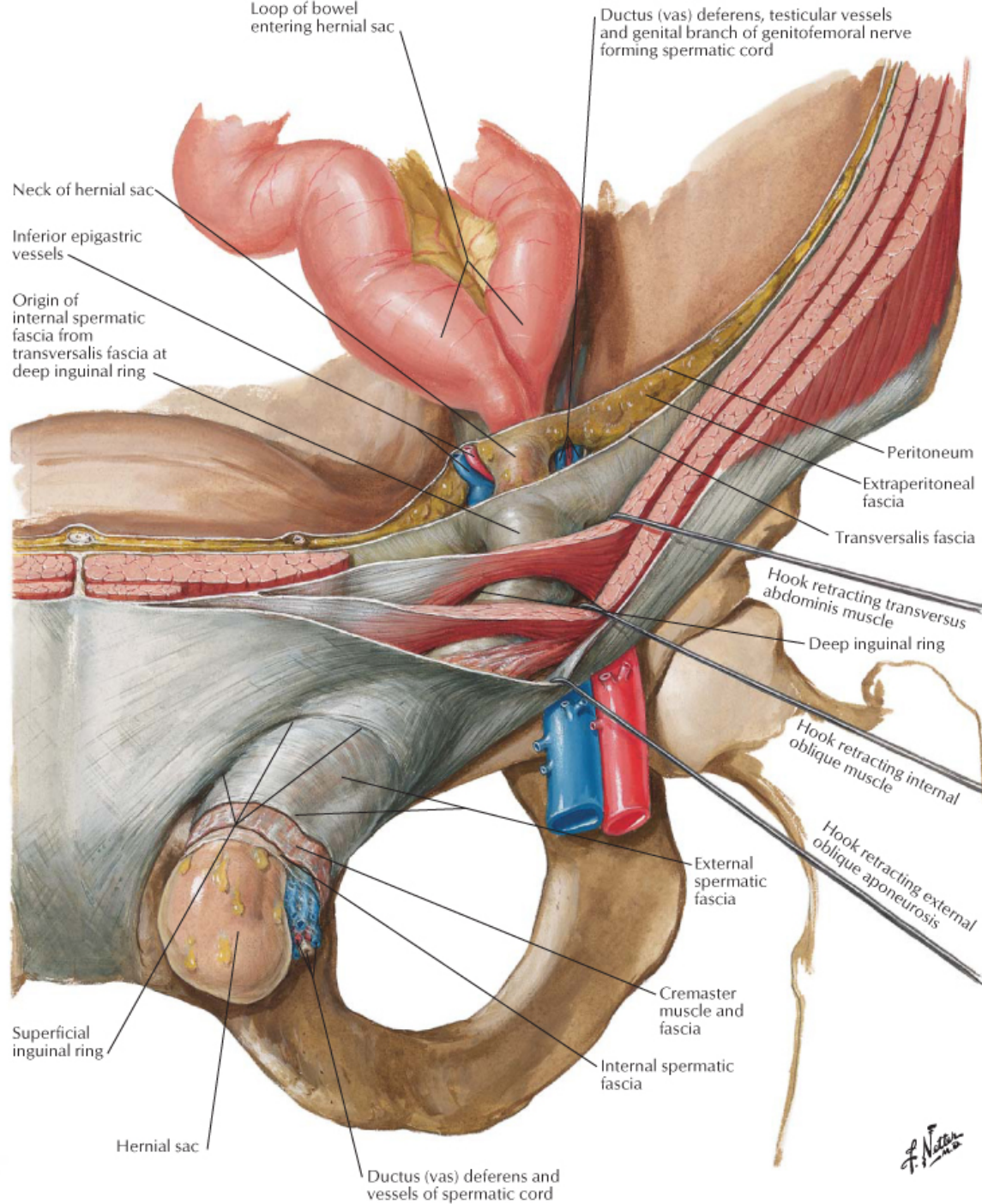
- Boundaries
 - Lateral: deep inferior epigastric artery
 - Medial: Lateral border of rectus muscle
 - Below: inguinal ligament



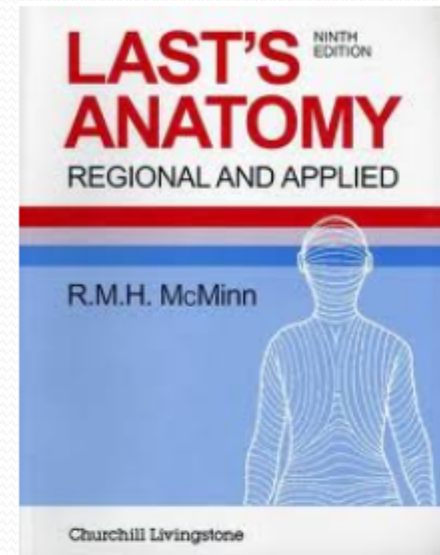
Anterior view

F. Netter M.D.





Femoral Canal



Femoral Canal

- **Femoral Ring**

- Is the Abdominal opening to the Femoral Canal
- Boundaries:
 - Anterior – medial part of inguinal ligament
 - Lateral – femoral vein
 - Posterior – pectineal ligament and pectaneus
 - Medial – crescentic edge of lacunar ligament

- **Femoral Canal** only about 1-2cm long before the walls fuse

- **Purpose**

- Route by which efferent lymph vessels from deep inguinal nodes pass to the abdomen
- Allow space for femoral vein to expand

- **Contents:**

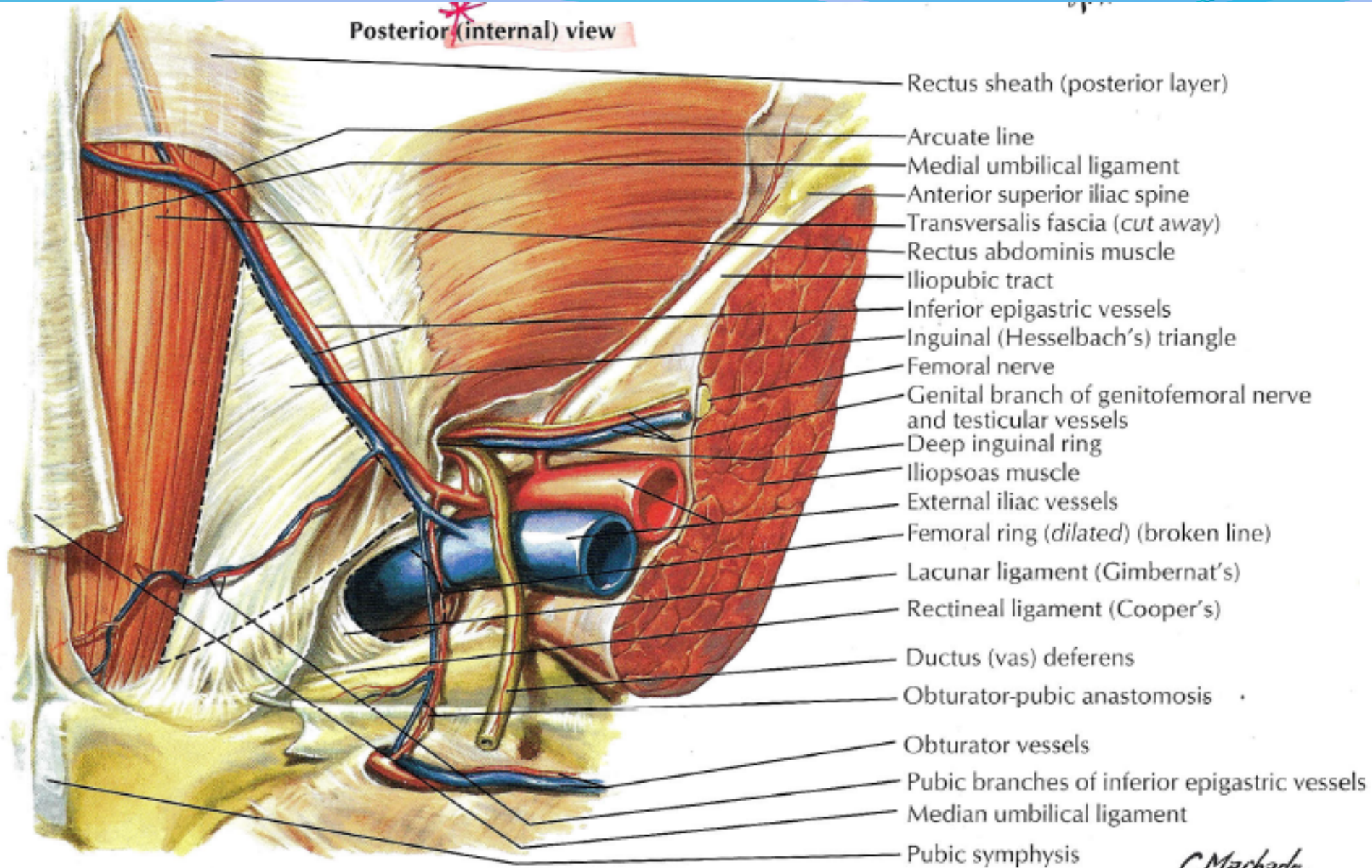
- Empty space
- Fat
- Lymphatics
- Lymph node of Cloquet – drains clitoris/glans penis

Femoral Canal

- **Note**

- During open femoral hernia repair lacunar ligament may have to be incised – this puts an accessory obturator artery at risk
- 50% of people have an *accessory* or *abnormal obturator artery*
- ***Accessory Obturator Artery:***
 - Deep inferior epigastric gives a pubic branch to the periosteum of superior pubic ramus – this anastomoses with the pubic branches of obturator artery
 - If obturator artery absent – then this anastomosis is patent

Posterior (internal) view



Hesselbach's triangle by Carlos Machado after Frank Netter

C. Machado
—M.D.—



Totally Extra Peritoneal (TEP)

Totally Extra Peritoneal (TEP)

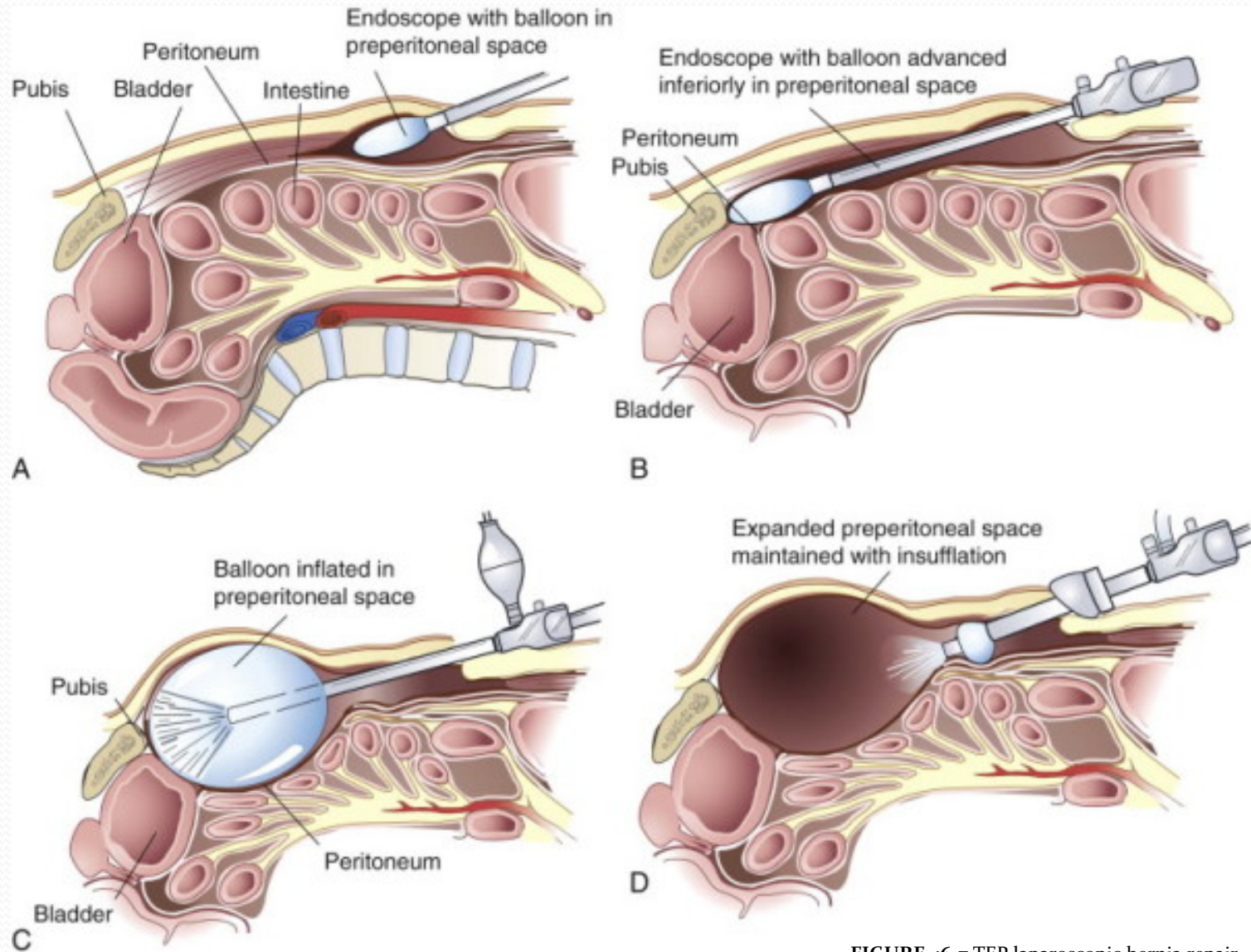
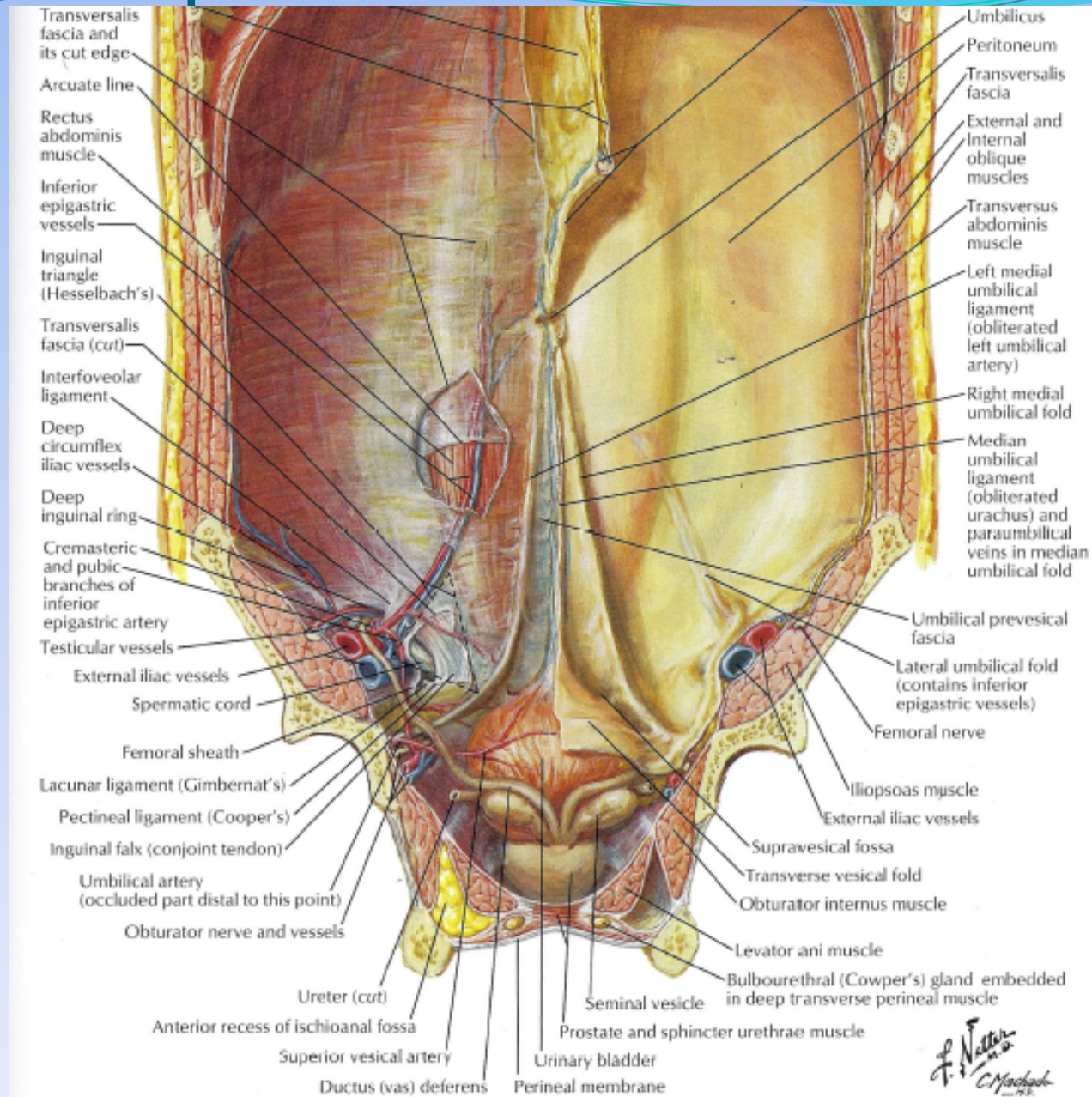


FIGURE 46-7 TEP laparoscopic hernia repair.
Townsend: Sabiston Textbook of Surgery, 19th ed , 2012

Posterior Aspect of Anterior Abdominal Wall



Anatomy in TEP Views

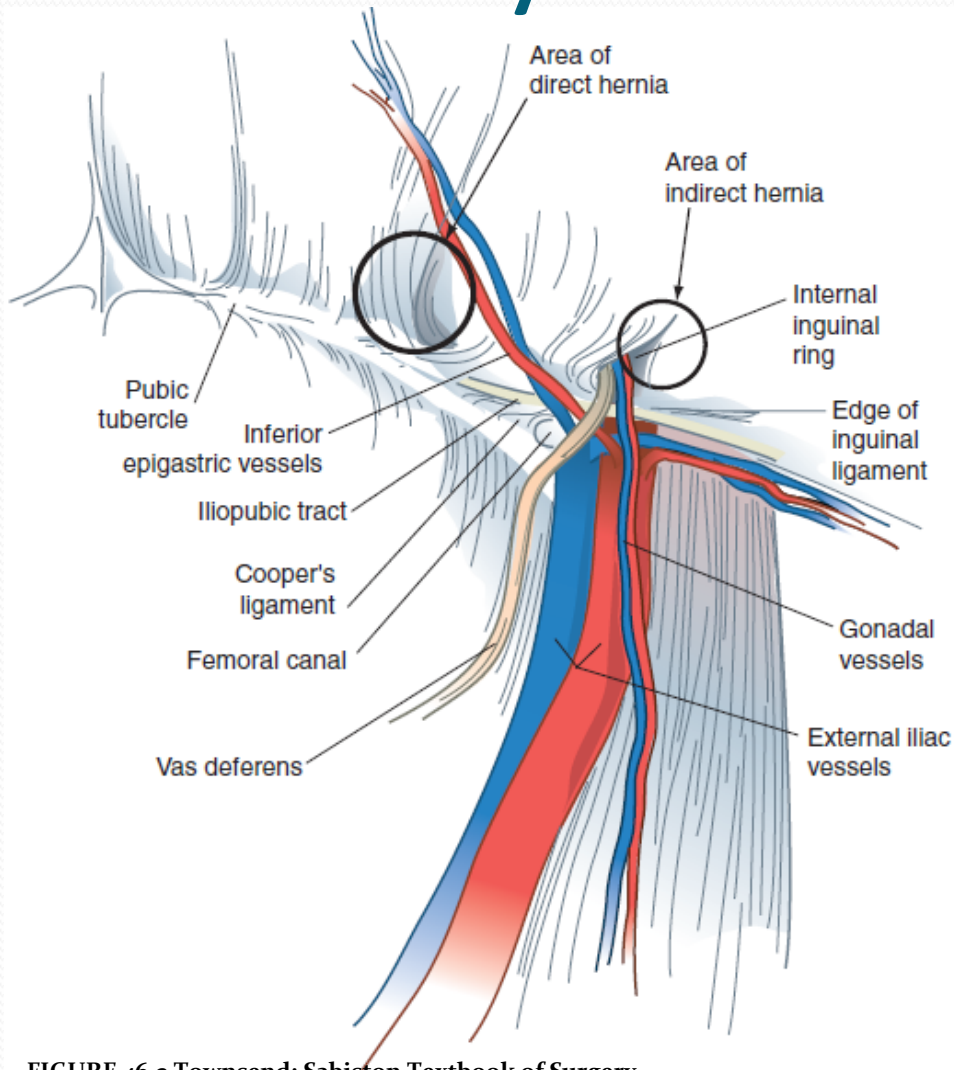


FIGURE 46-3 Townsend: Sabiston Textbook of Surgery, 19th ed , 2012

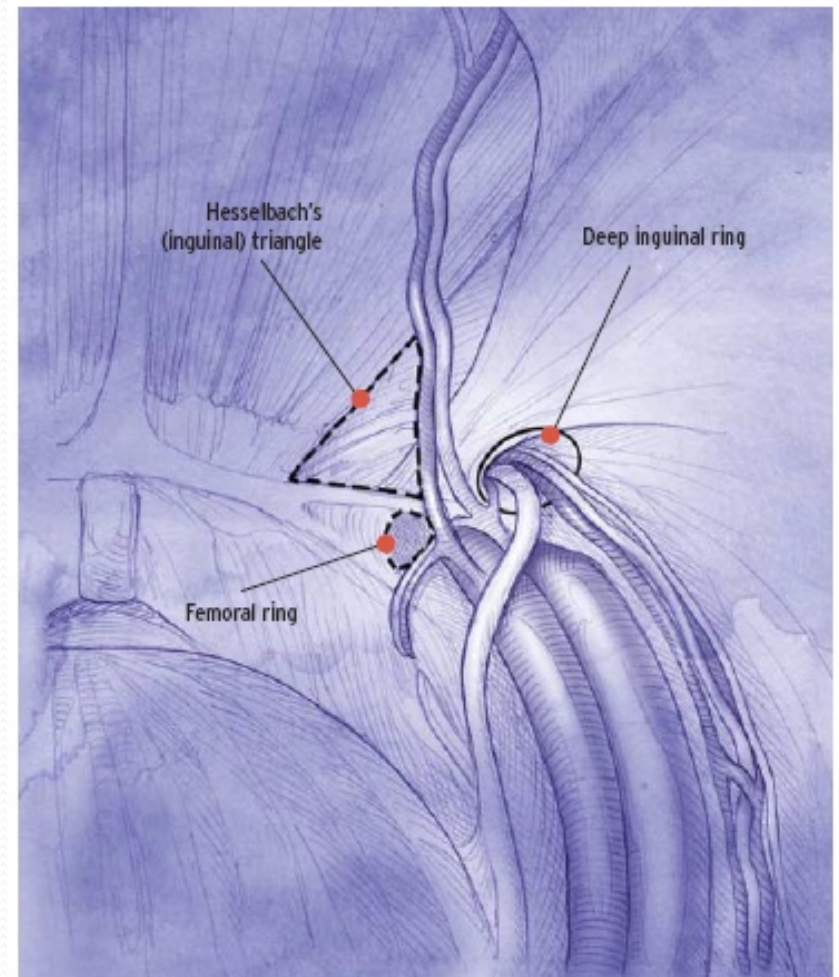
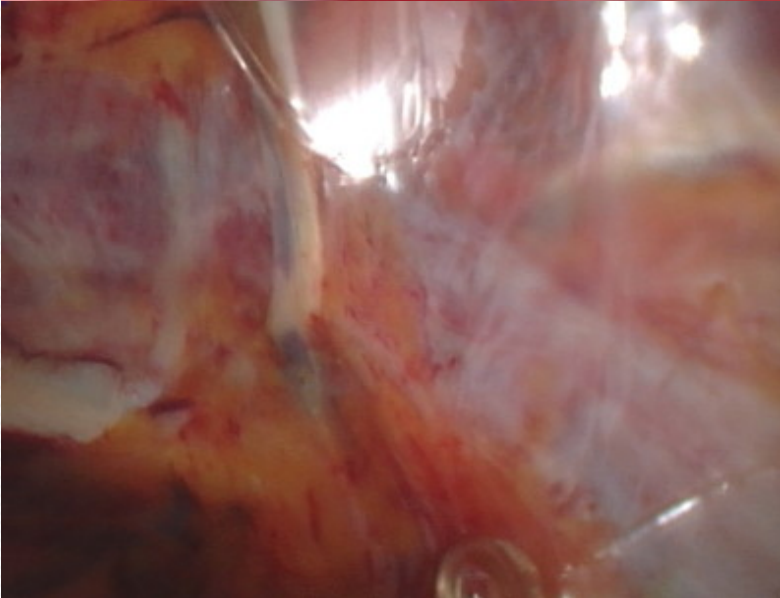


FIGURE 1. The borders of a direct inguinal hernia are identified by the triangle superior to the inguinal ligament. The site for femoral herniation is indicated by the circular dotted line beneath the inguinal ligament. The deep inguinal ring is the origin for indirect hernias.

Intra Op Views - Anatomy in TEP

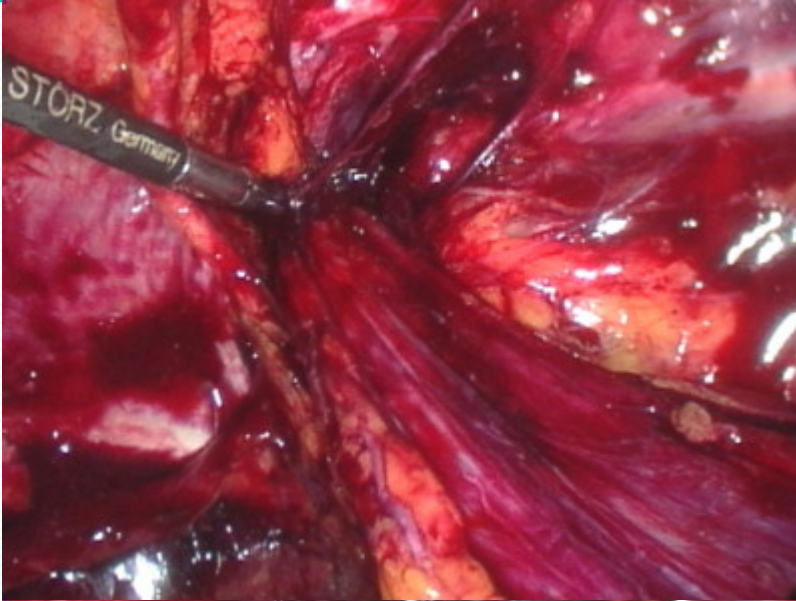


- Dissecting Balloon inflation under vision in the pre-peritoneal space

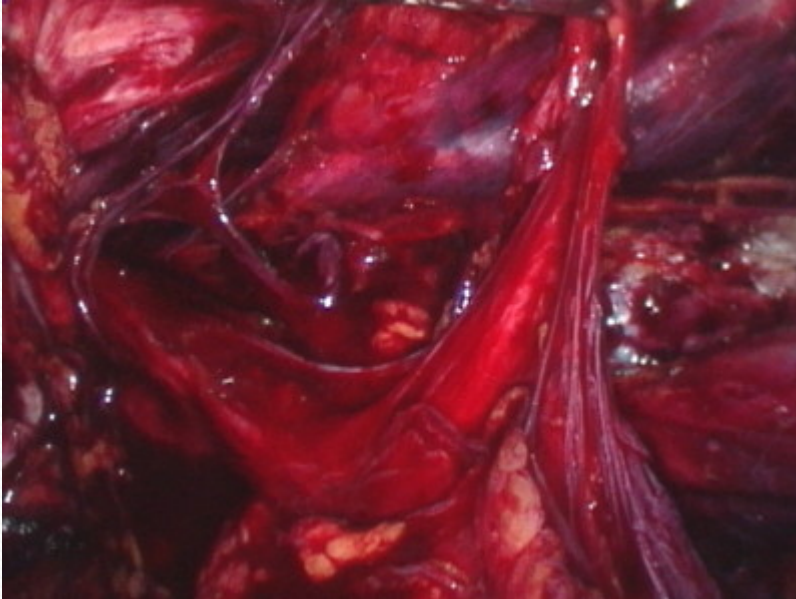


- Direct vision of deep inferior epigastric vessels staying above dissecting balloon

Intra Op Views - Anatomy in TEP



- Identification of Sac and Anatomy in pre peritoneal space



- Views post blunt dissection of sac off cord

Stapling/Tacking Dangers in TEP

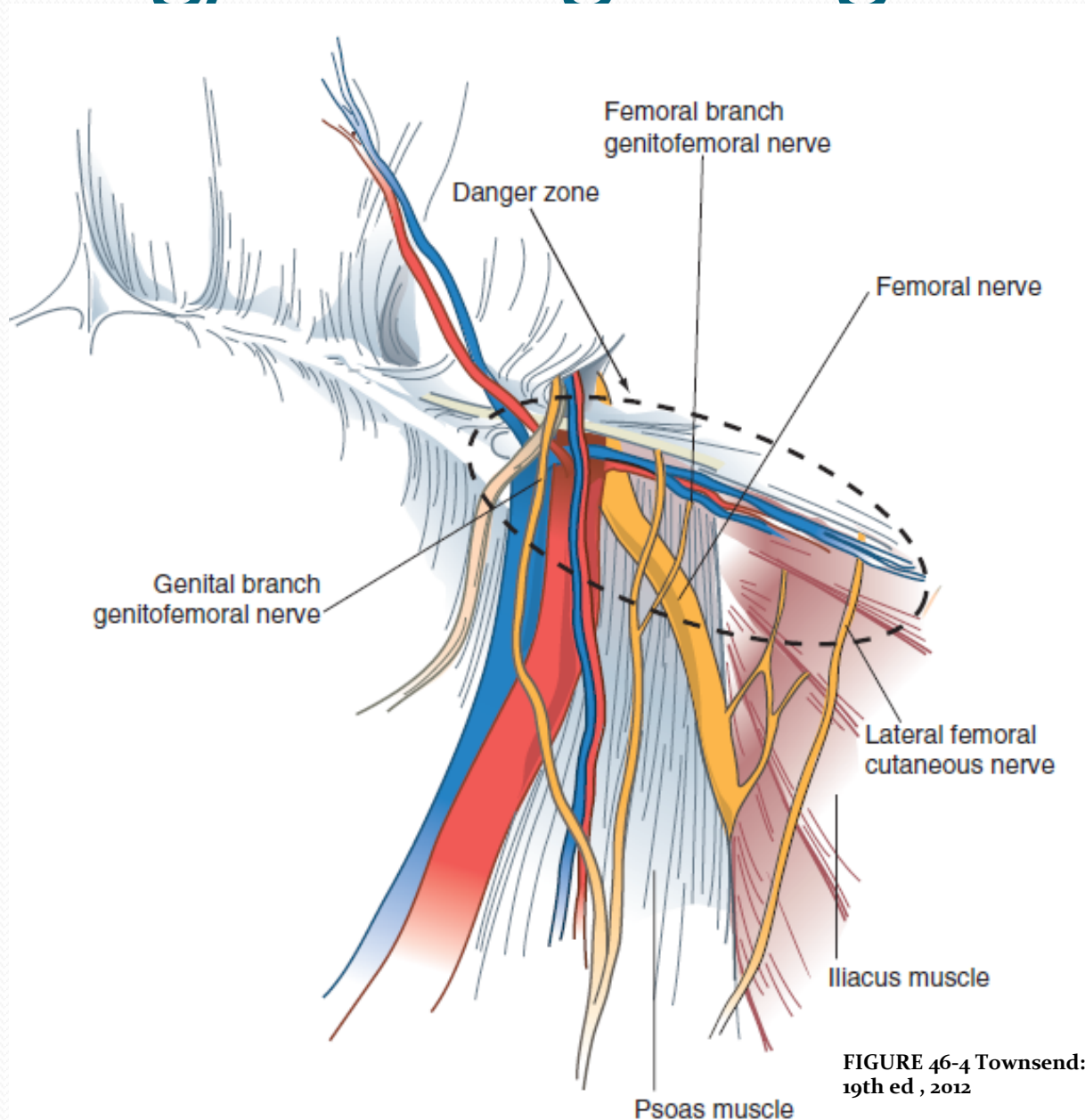


FIGURE 46-4 Townsend: Sabiston Textbook of Surgery, 19th ed , 2012

TEP Triangle of Doom

- Staples / Tacking to be avoided
- Bounded by:
 - Ductus deferens medially
 - Spermatic vessels laterally
- Avoids injury to the external iliac vessels and femoral nerve.

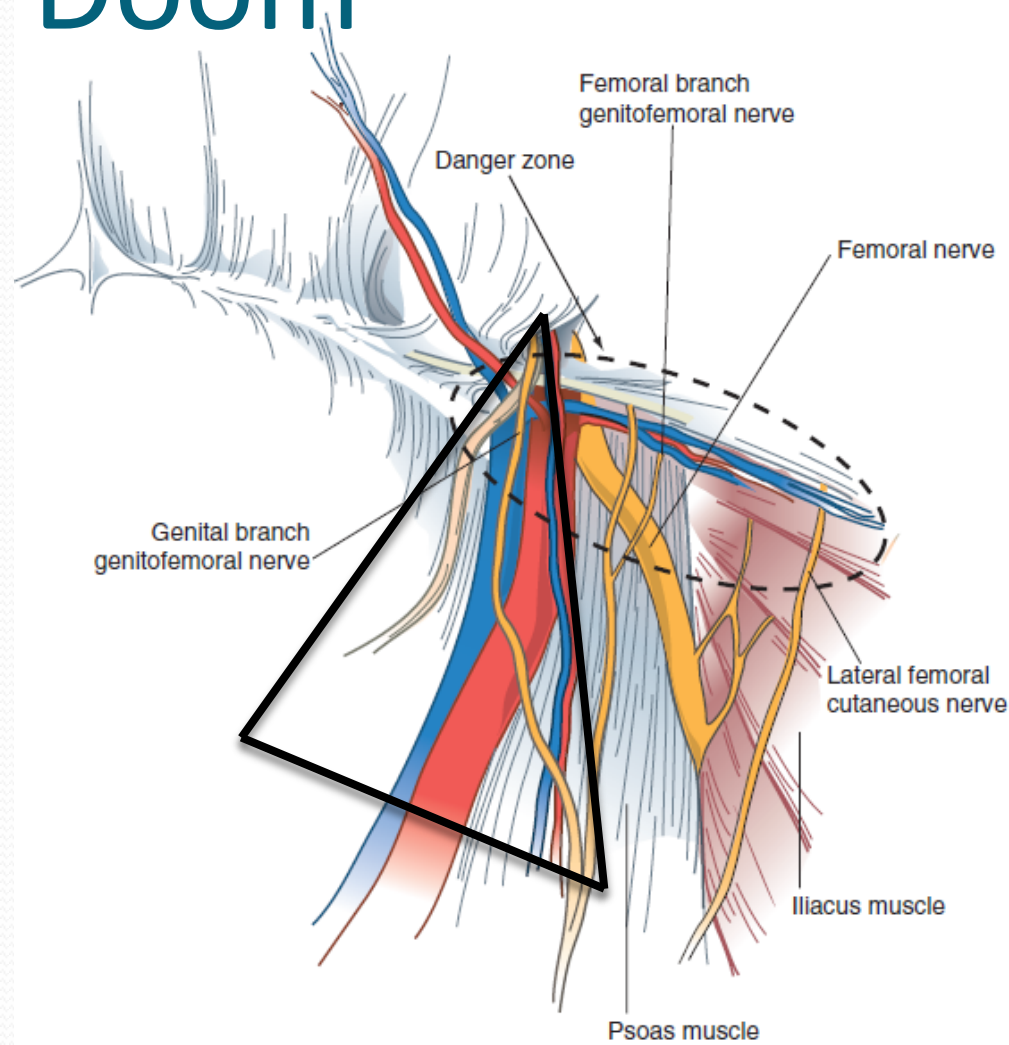


FIGURE 46-4 Townsend: Sabiston Textbook of Surgery, 19th ed , 2012

TEP Triangle of Pain

- Staples / Tacking to be avoided
- Bounded by:
 - Iliopubic tract
 - External iliac artery
- Avoids injury to the femoral branch of the genitofemoral nerve or lateral femoral cutaneous nerve.

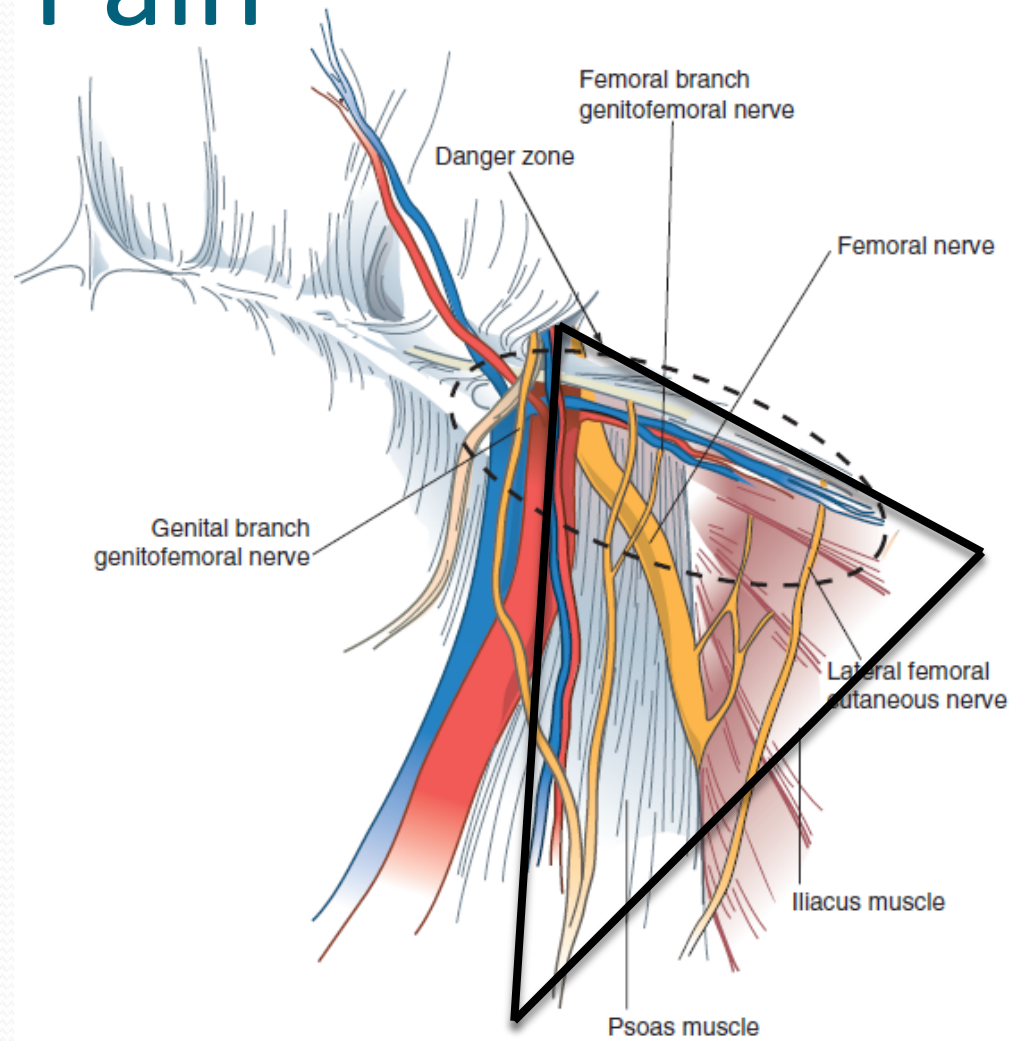


FIGURE 46-4 Townsend: Sabiston Textbook of Surgery, 19th ed , 2012

Mesh Anatomy in TEP Hernia Repair

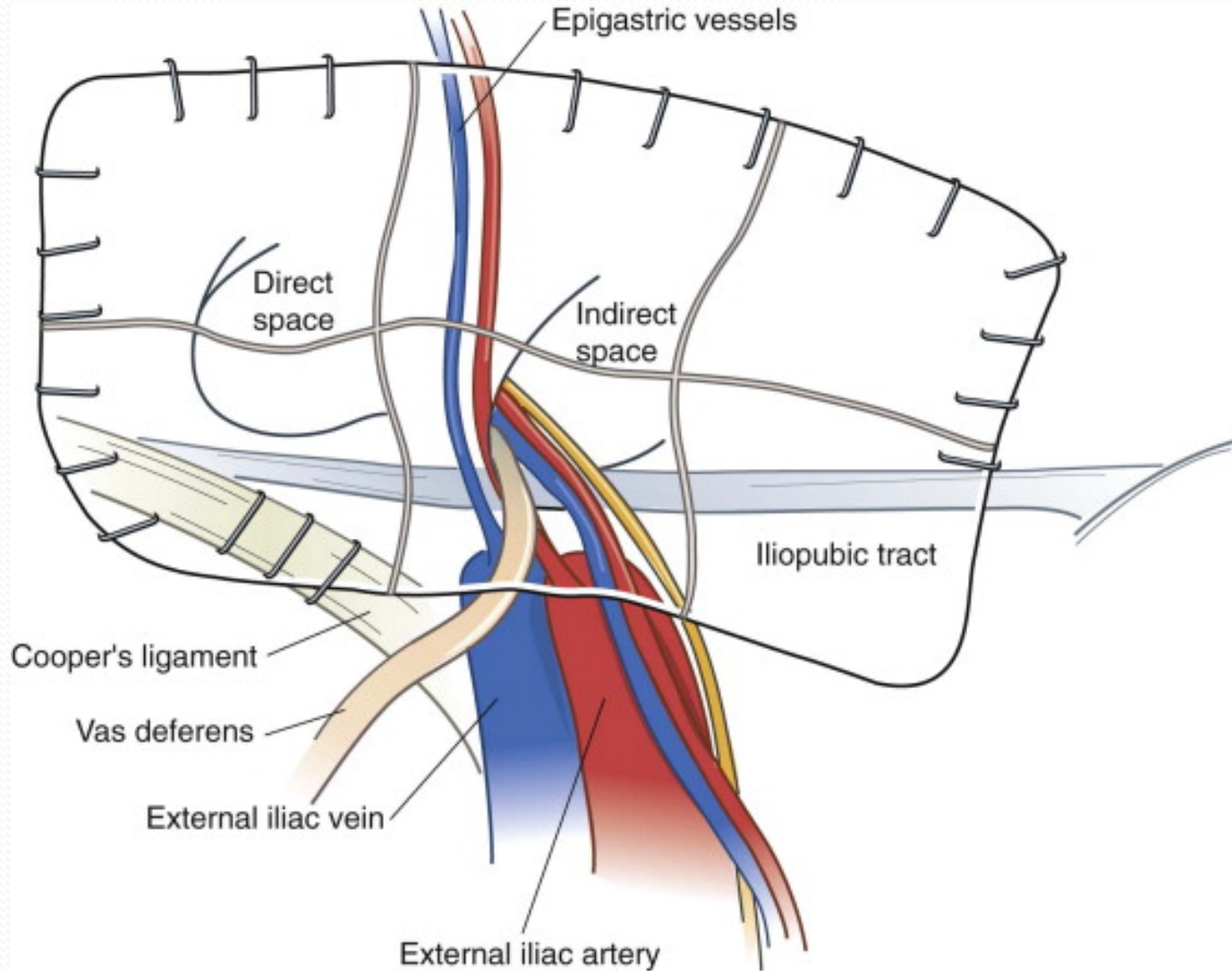


FIGURE 46-8 Prosthetic mesh placement for TEP hernia repair
Townsend: Sabiston Textbook of Surgery, 19th ed , 2012

Thank you

Questions / Discussions