



THE UNIVERSITY OF
TENNESSEE
HEALTH SCIENCE CENTER.

Abdominal Wall Reconstruction

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Outline

- Scope
- History
- Anatomy
- Preoperative
- Repairs
- Mesh Types

Scope

Scope

- Back in 2006 the total cost of ventral hernia repair in the United states was \$3.2 billion. (That is \$4.99 billion in today's money)
- A 2015 study brought together 14 specialists from the boards of European surgical societies to determine recommendations on the preferred choice of surgical technique for nine typical primary ventral and incisional hernias.
 - No consensus was obtained on any of the cases.

History

History

- 1920 Gibson developed his relaxing incisions on the anterior rectus sheath to repair ventral hernias
- 1944 Don Eugène Acquaviva first used a permanent prosthesis in the retrorectus space
- 1946 Alfonso Albanese created “discharge incisions” on the external and internal oblique muscles to help repair “catastrophic eventrations”
- 1960s to 1980 Jean Rives and Rene Stoppa describe the use of a mesh in the retromuscular space for groin hernias and then ventral hernias

History

- 1990 Oscar Ramirez coins the term “component separation” and describes division of the external oblique aponeurosis
- 2008 Carbonell coined the term “posterior components separation” for a technique where mesh expanse extended beyond the semilunar lines in a plane between the internal oblique and transversus abdominis muscles
- 2012 Novitsky described the transversus abdominis release
- 2012 Fabian & Croce described the Memphis Modification

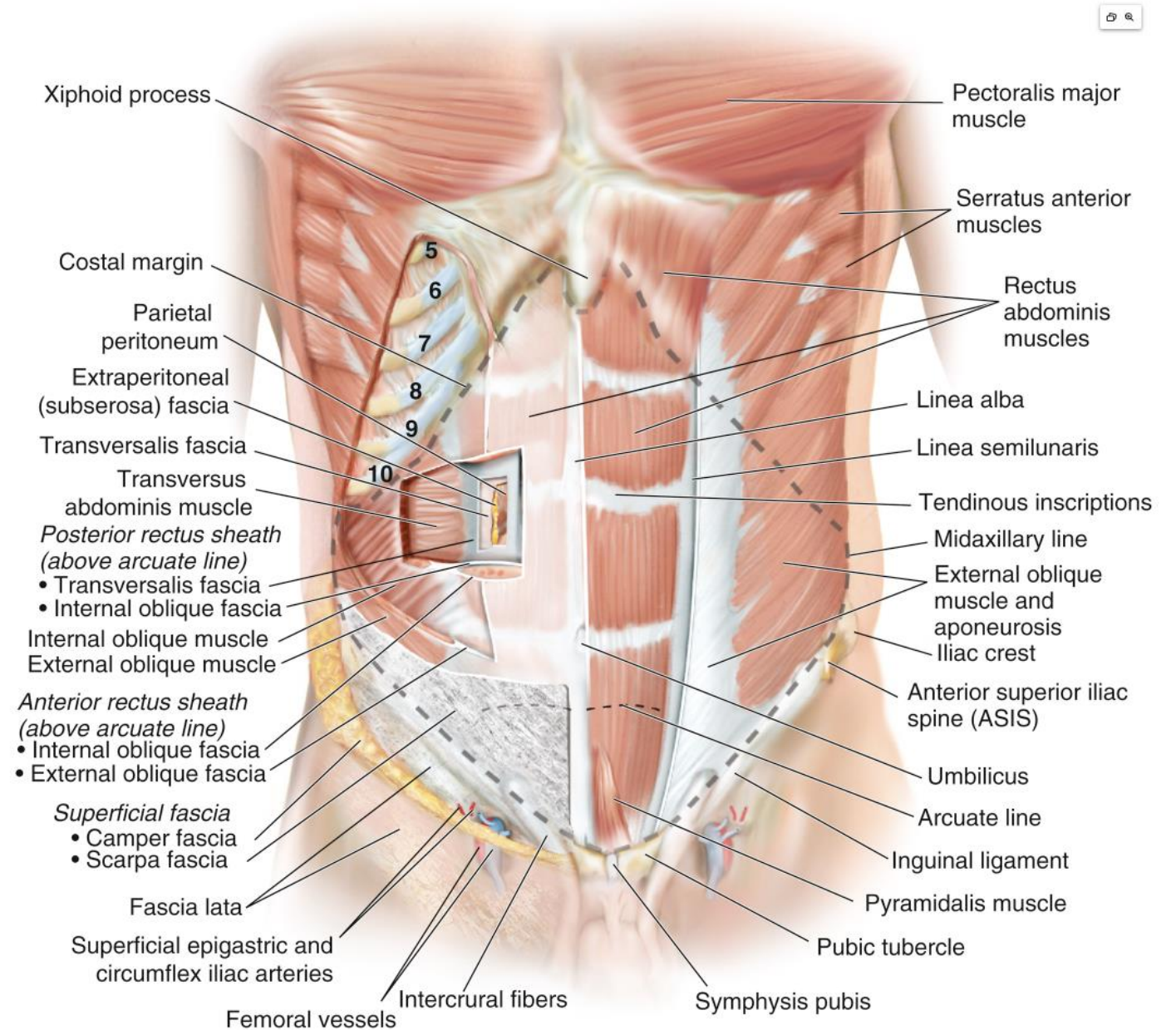
History Minimally Invasive

- 1993 LeBlanc described the first laparoscopic underlay ventral hernia repair
- 2002 Miserez and Penninckx describe a minimally invasive approach for retromuscular repairs.
- 2013 Carbonell performs a robotic transverse abdominus release
- 2016 Belyansky describes laparoscopic transperitoneal transversus abdominis release

Anatomy

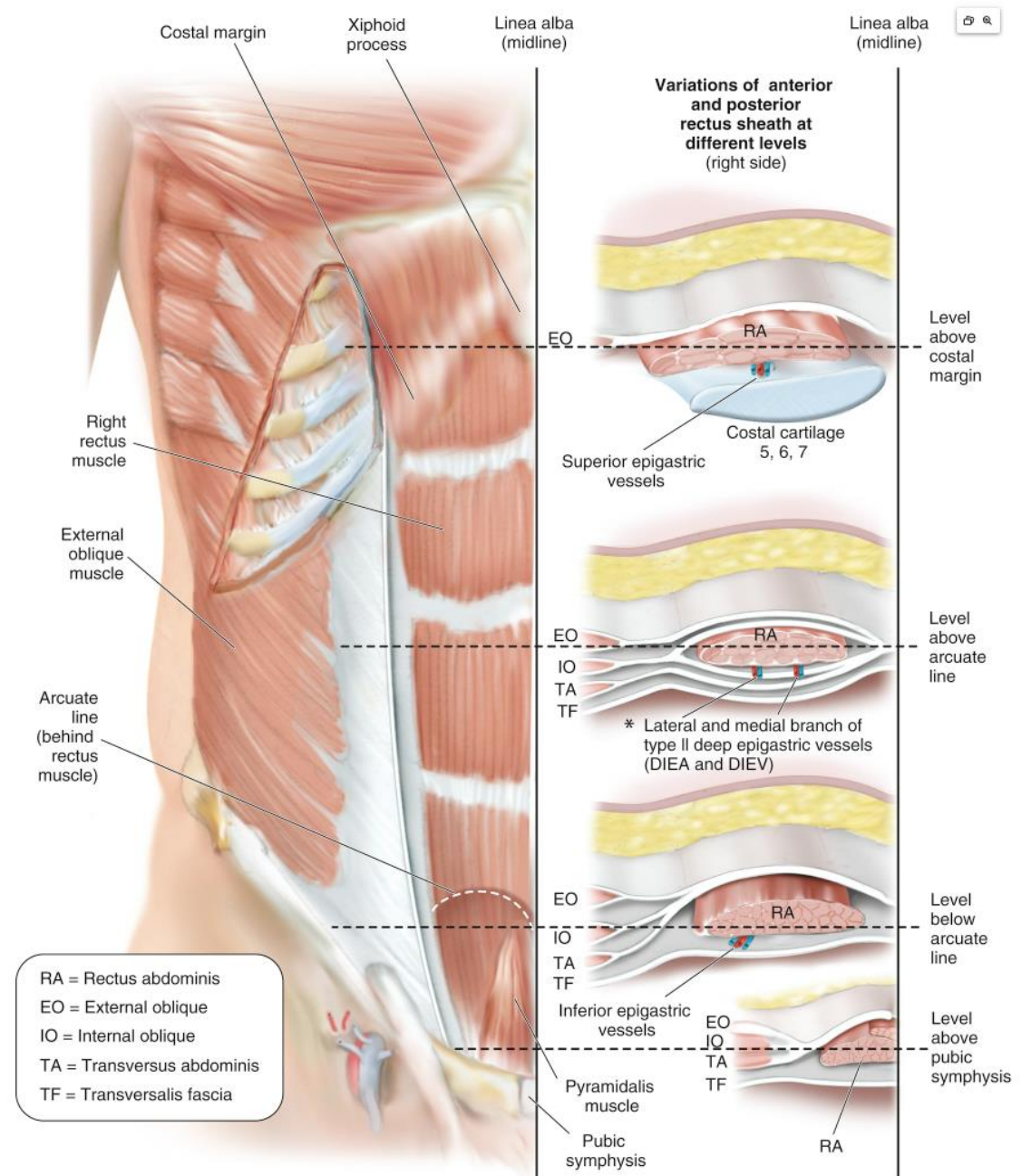
Anatomy

- The abdominal wall is a complex dynamic combination of multiple muscles, nerves, blood vessels and changes as one moves laterally and craniocaudal.



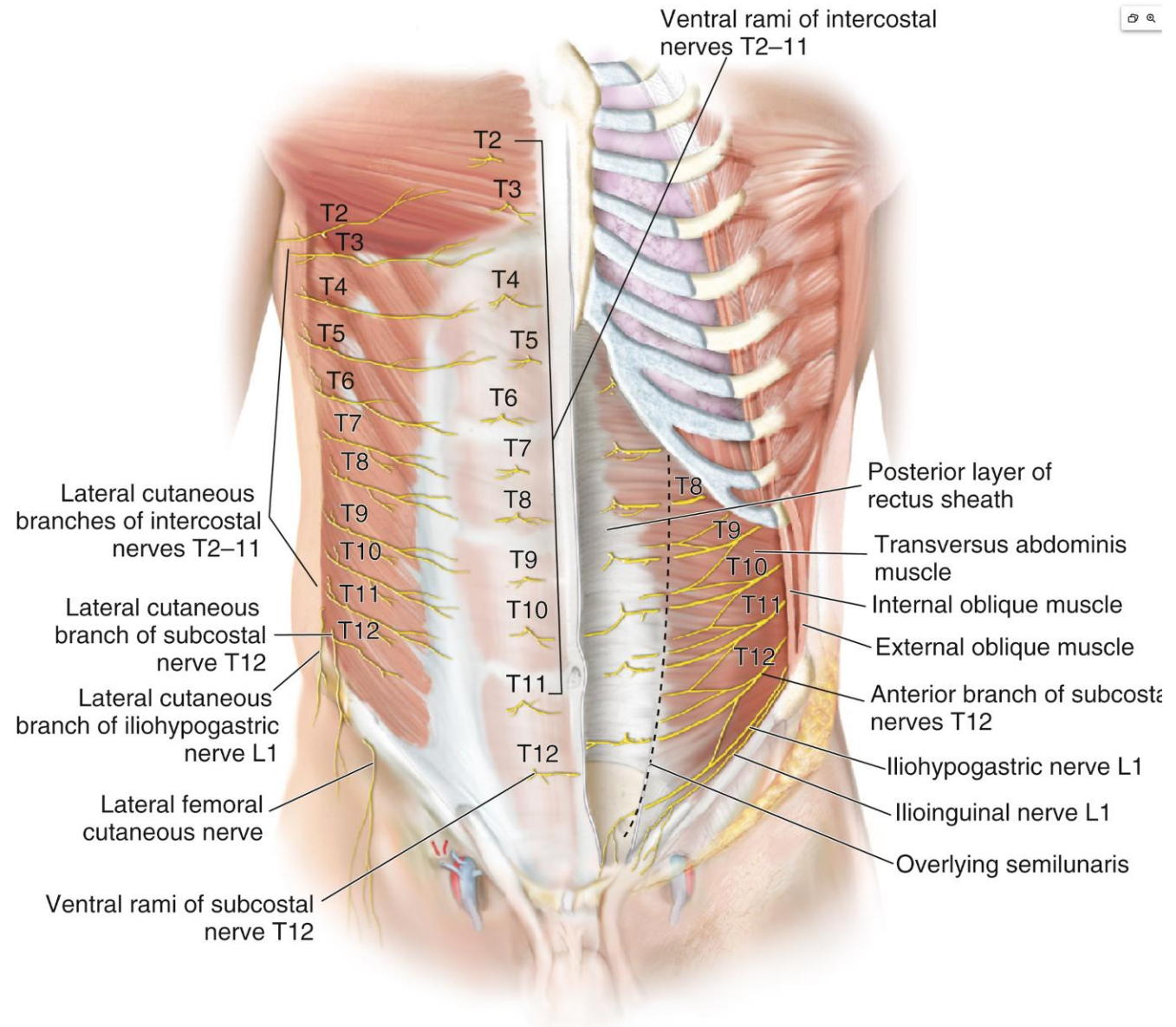
Anatomy

- The transverse abdominus muscle is more robust superiorly
- The internal oblique and transverse abdominus are only anterior to the rectus muscle inferior to the arcuate line.
- Branching patterns of the deep inferior epigastric artery:
 - One vessel 29%, 2 vessel 57% and 3 vessels 14%



Nerve Supply

- Sensory innervation is from from the anterior branches of the intercostals and subcostal nerves, from T7 to L1.
- Motor innervation is from the 7th through 12th intercostal nerves, iliohypogastric nerves, and ilioinguinal nerves.
- These nerves in the plane between the internal oblique and transversalis muscles



Preoperative Work Up

History and Exam

- In addition to the past medical and past surgical history one needs to know the details of any prior hernia repairs.
- A complete abdominal exam with sizing of the all the hernia defects.

Imaging

- An up to date CT scan of the abdomen and pelvis will help with operative planning.
- The location, size, content, and amount of hernias are key.
- Some meshes and evidence of prior operations are visible.

Imaging

- The hernia sac to neck ratio of >2.5 can help predict the risk of requiring an emergent operation.



Optimization

- Smoking

- Smokers are twice as likely to develop a hernia recurrence after repair (odds ratio [OR] 2.07; 95% confidence interval [CI], 1.23–3.47) and more than twice as likely to develop a wound complication (OR 2.27; 95% CI, 1.82–2.84).

- Obesity

- Aim for a BMI under 35, most studies will quote around a 2 fold increase in hernia recurrence in obesity with risk rising as BMI rises.

- Diabetes

- Will want a Hgb A1c under 7 because if >7 they are twice as likely to develop an infection after their operation (OR 2.13; 95% CI, 1.23–3.70).

Optimization

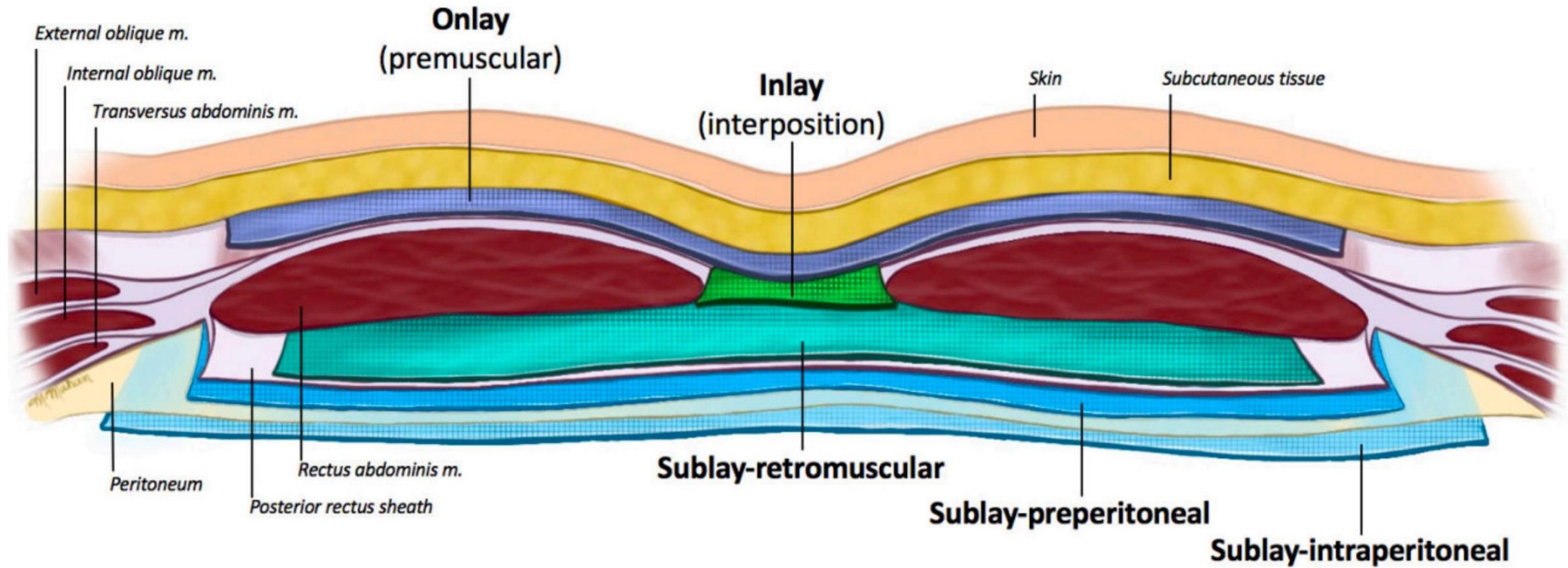
- MRSA infection

- MRSA colonization is detected in 7% of patients and that increases the risk of MRSA infection within the following year (19% vs 2%).
- History of MRSA infection more than doubles the risk of postoperative surgical site infection after a ventral hernia repair (OR 2.3; 95% CI, 1.1–4.8).
- For positive carriers, mupirocin 2% nasal ointment and 4% chlorhexidine gluconate wash daily for 5 days is prescribed as well as vancomycin with ancef as their preoperative antibiotic

Repair Options

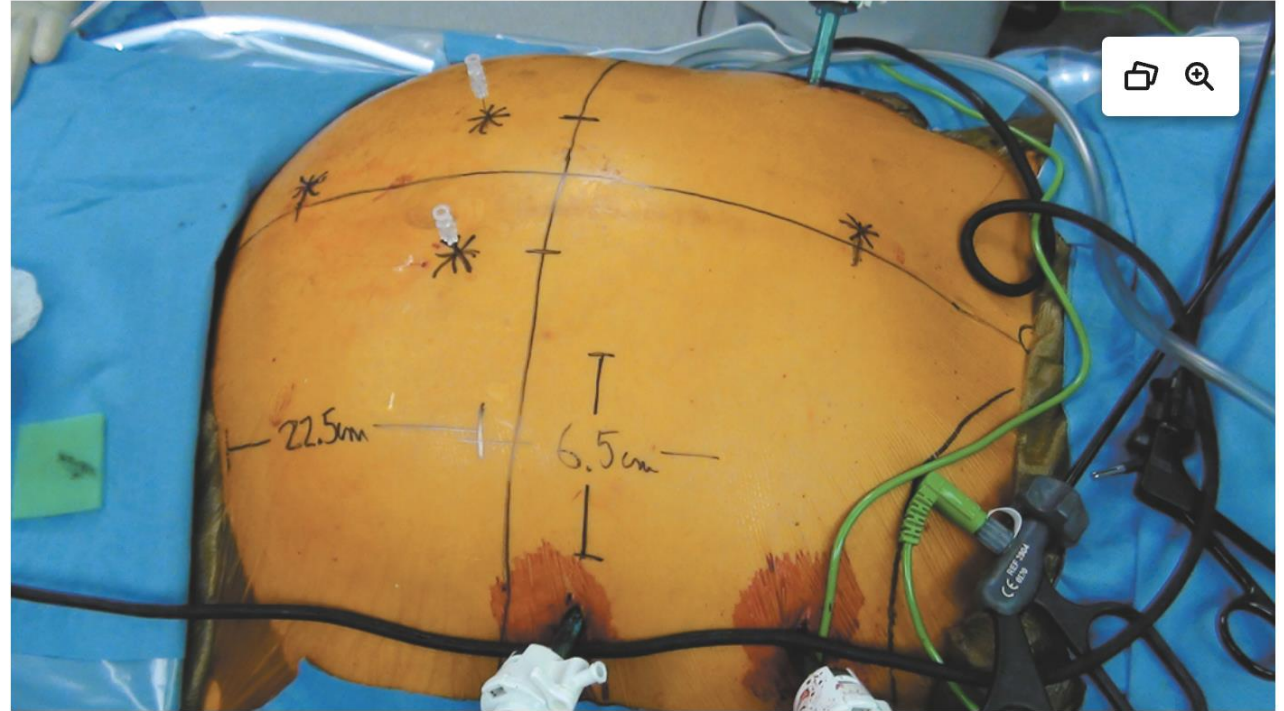
Where to put the mesh?

- Sublay, Inlay, or Onlay

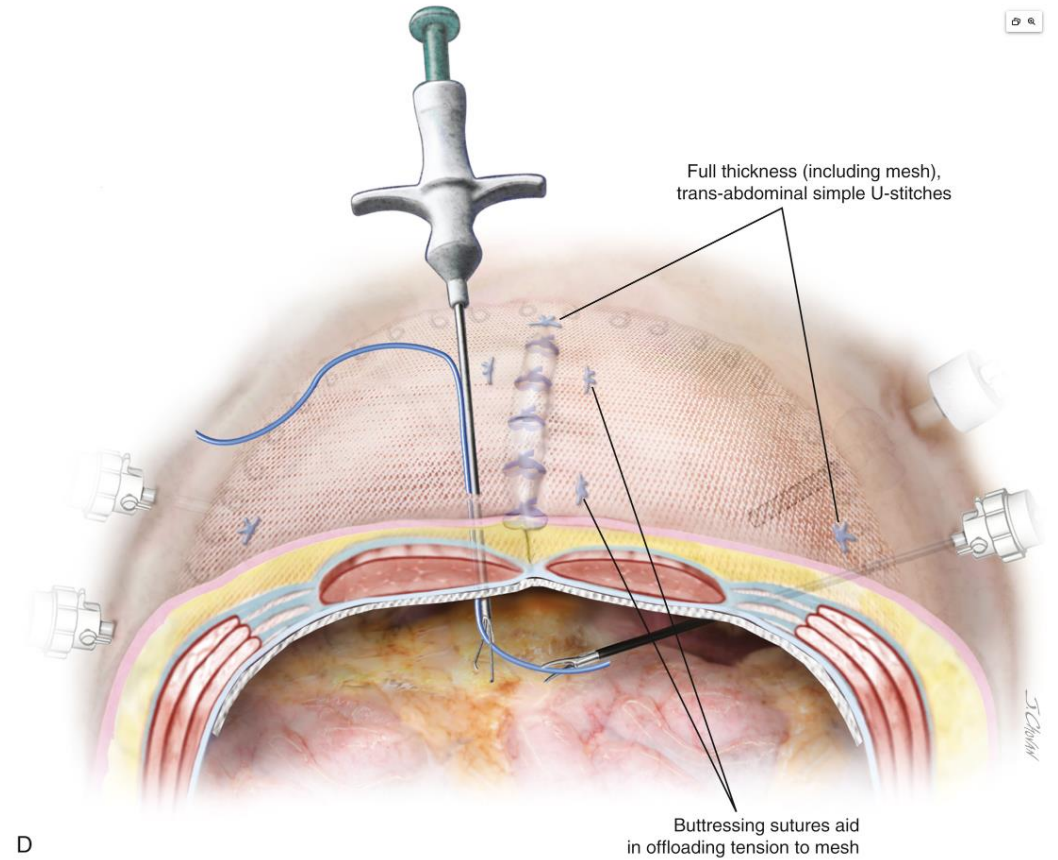
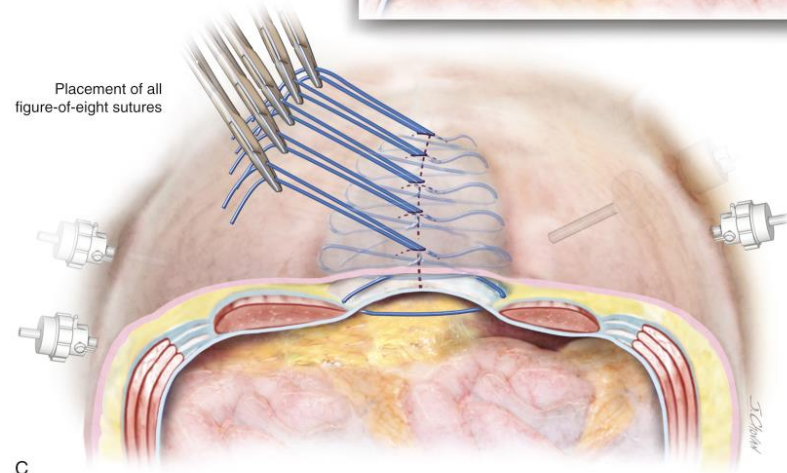
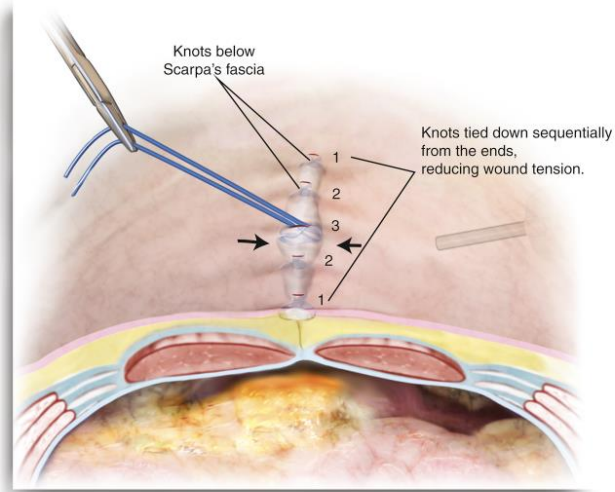


Intraperitoneal Onlay Mesh (IPOM)

- Port Placement
- Defect measurement
- Defect Closure
 - (IPOM +)

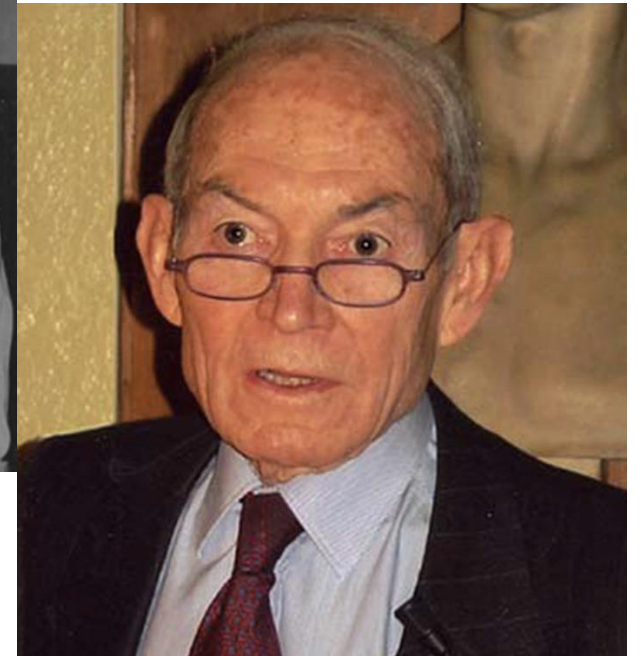


IPOM +

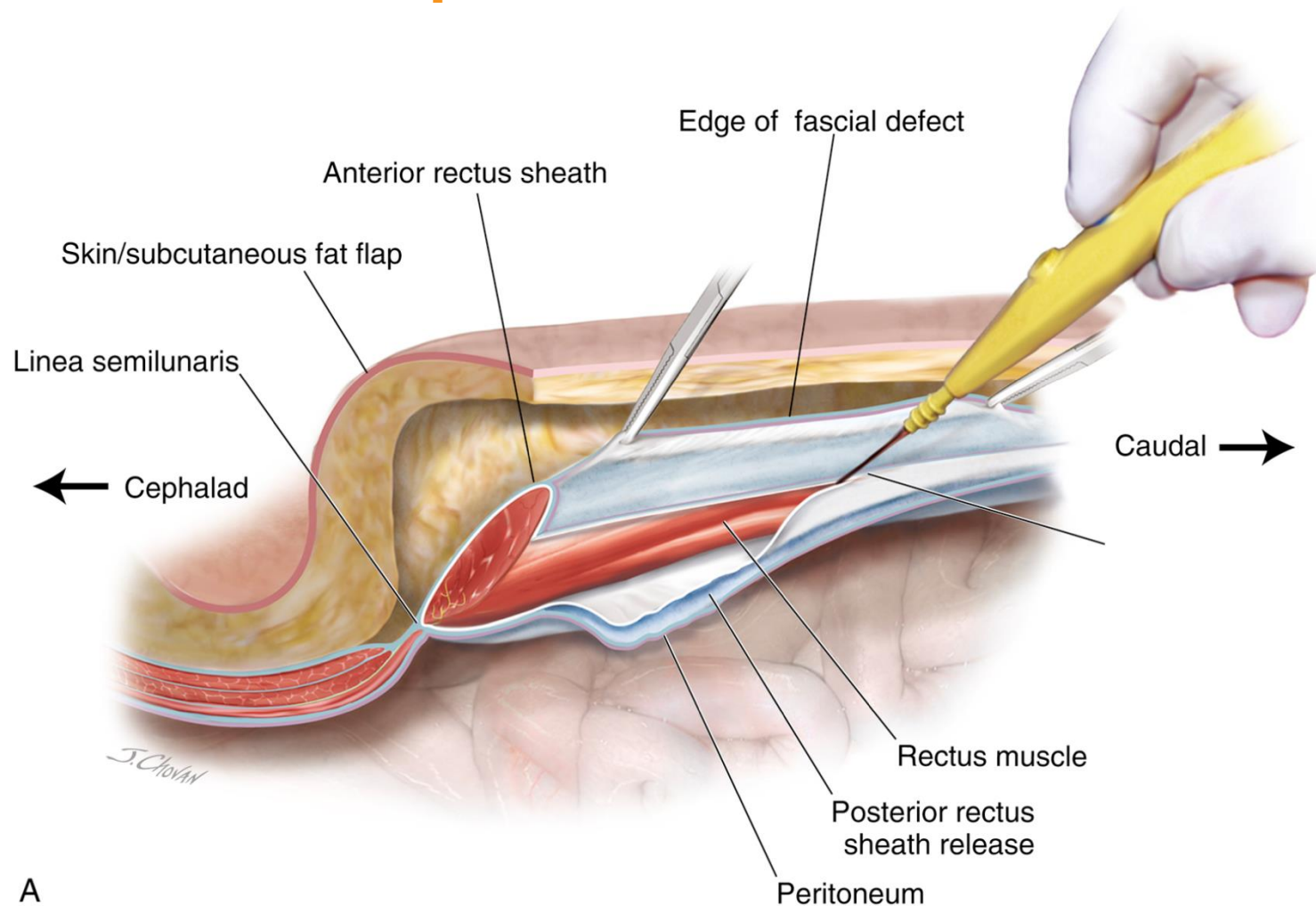


Retrorectus Repair (Rives-Stoppa)

- Midline incision, isolation of the hernia sac.
- Enter the retrorectus space and separate the posterior rectus sheath from the rectus muscle.



Retrorectus Repair

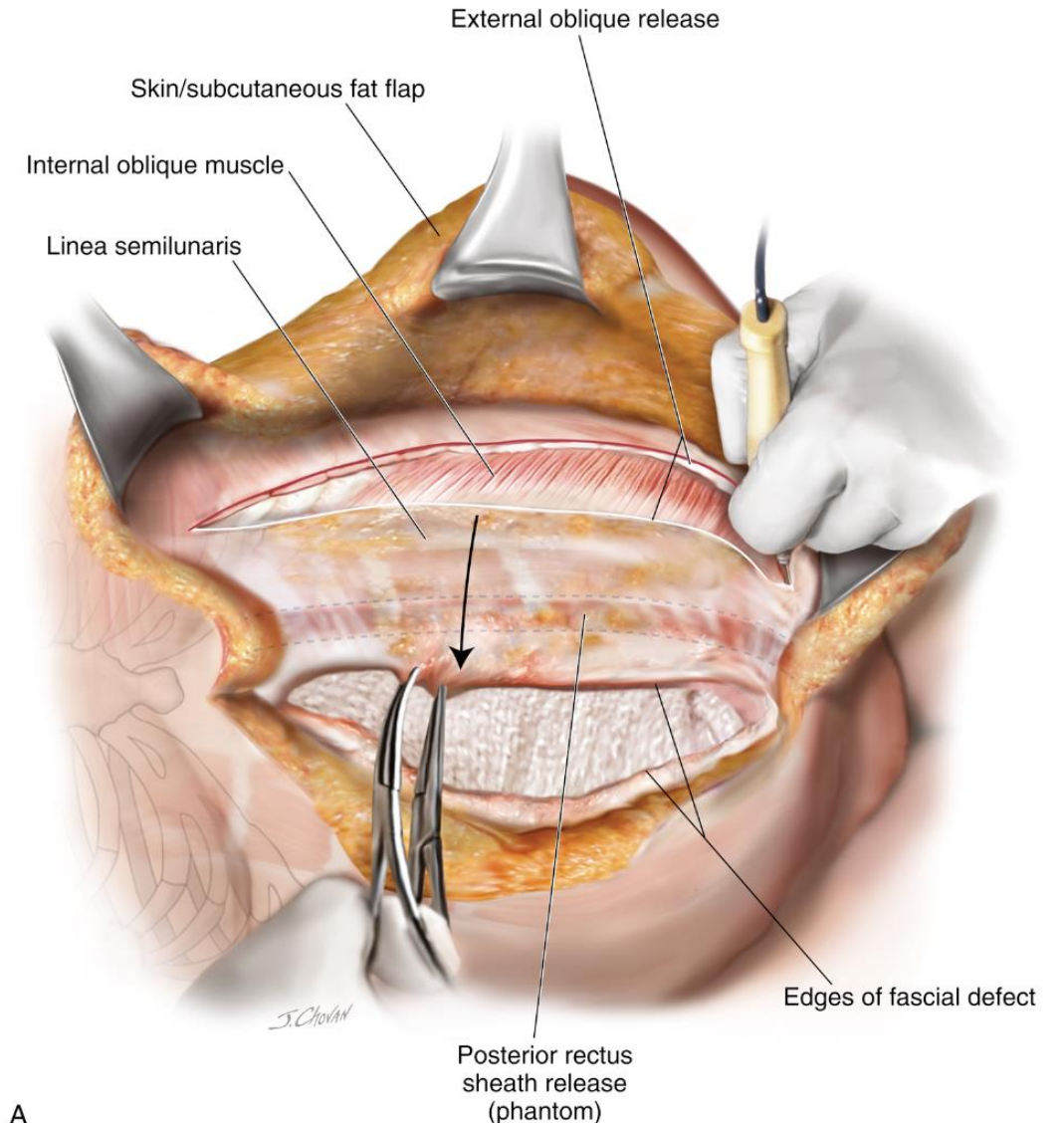


Component Separations

- When a hernia defect is too large to allow a tension free closure one or more of the abdominal wall layers may be cut in order to achieve recreation of the linea alba in the midline without tension.

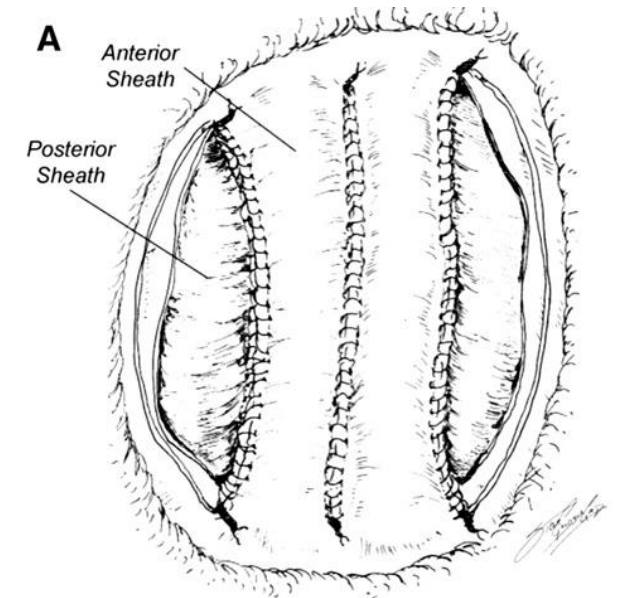
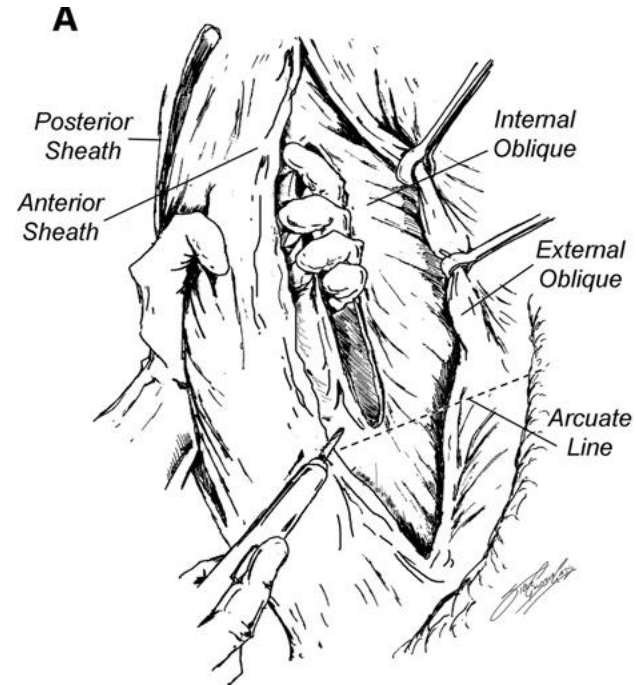
Anterior Component Separation (ACS)

- Retrorectus dissection is performed.
- Subcutaneous skin flaps area created laterally.
- The external oblique is cut 1-2 cm lateral to the semilunar line.
- An onlay mesh is placed after the linea alba is closed in the midline.



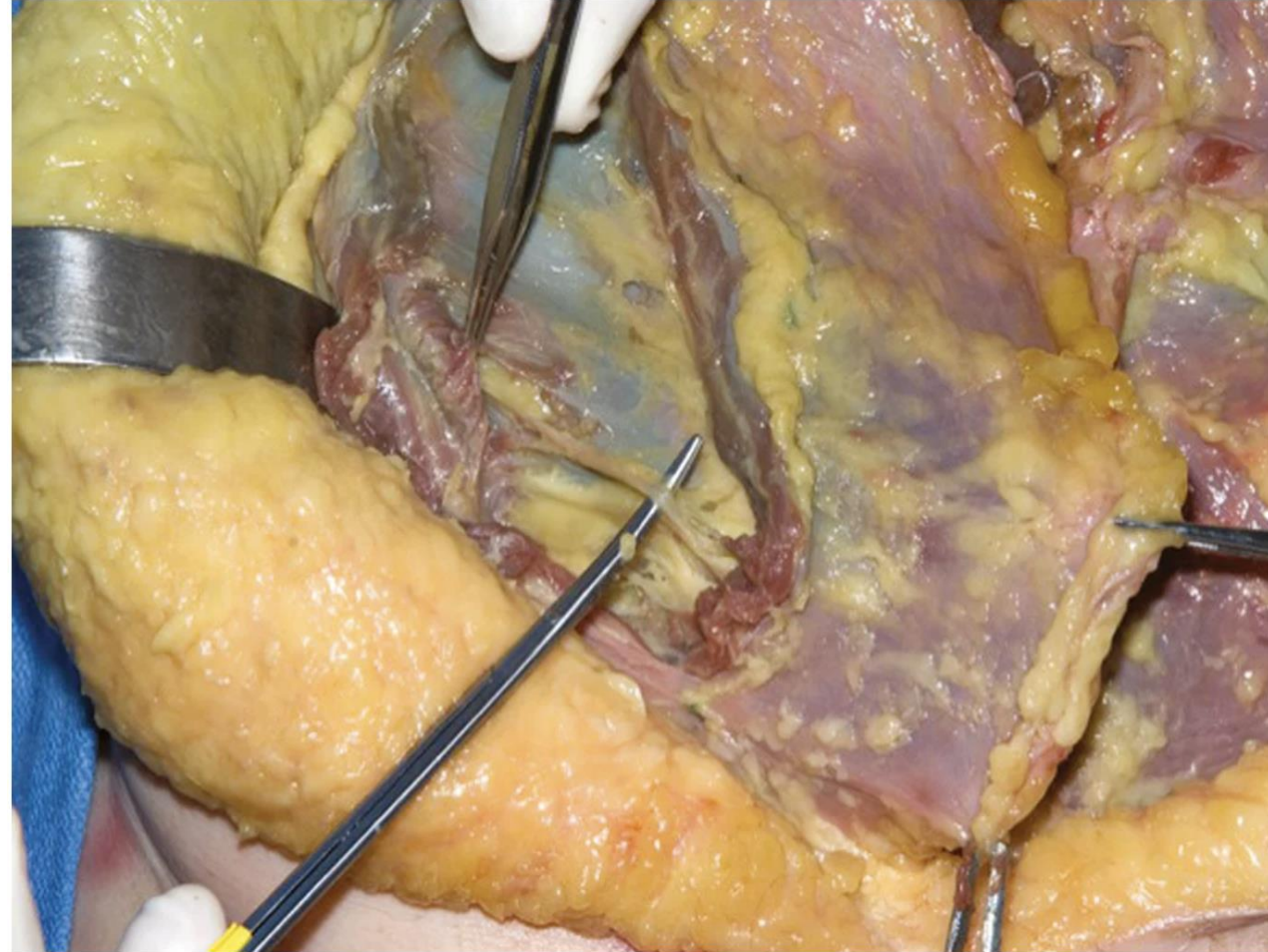
Memphis Modification

- The retrorectus dissection and the anterior component separation are done similar as in an ACS.
- Then the anterior leaf of the internal oblique is cut and the lateral edge of the rectus is sutured to the medial edge of the posterior components.
- Linea alba is closed in the midline.



Posterior Component Separation

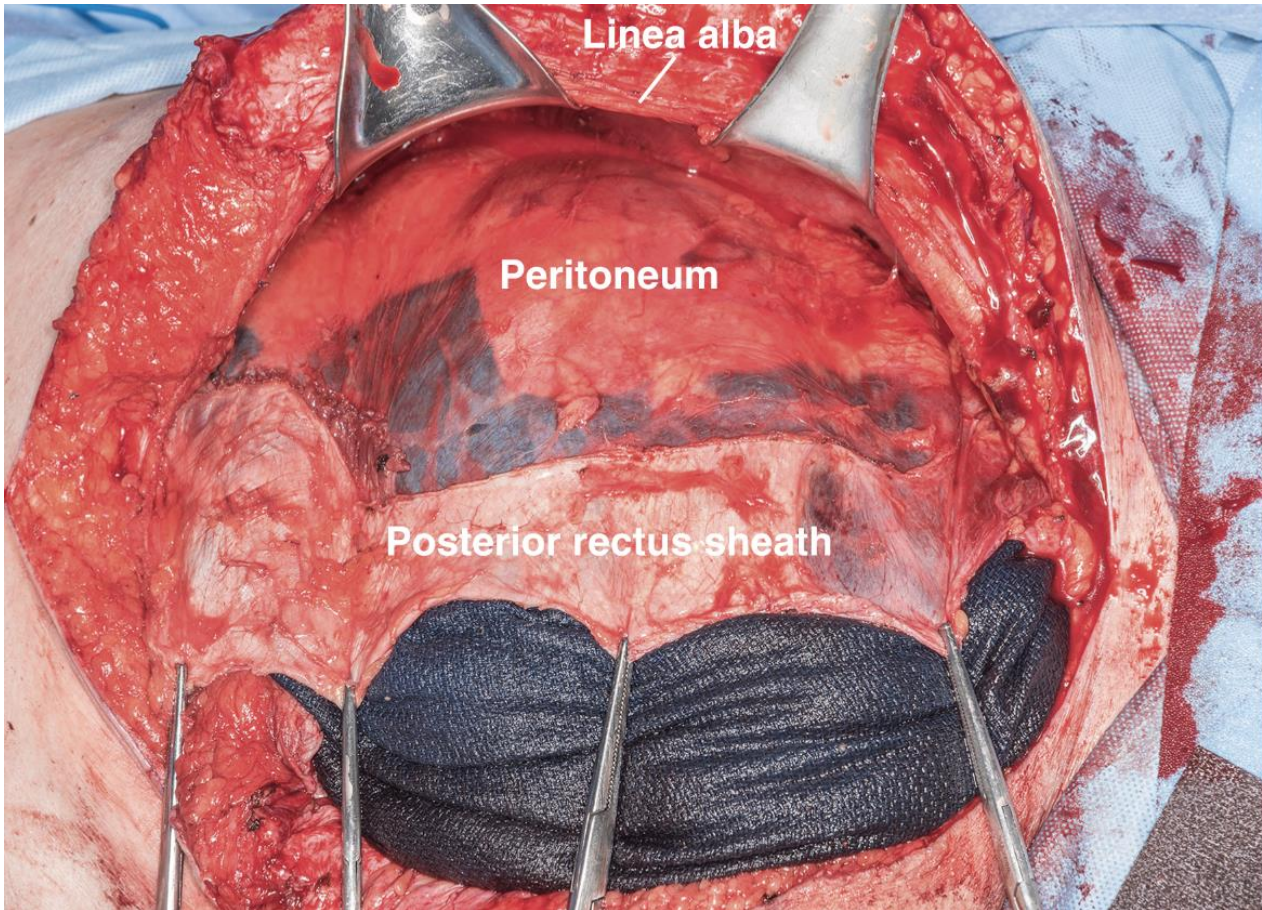
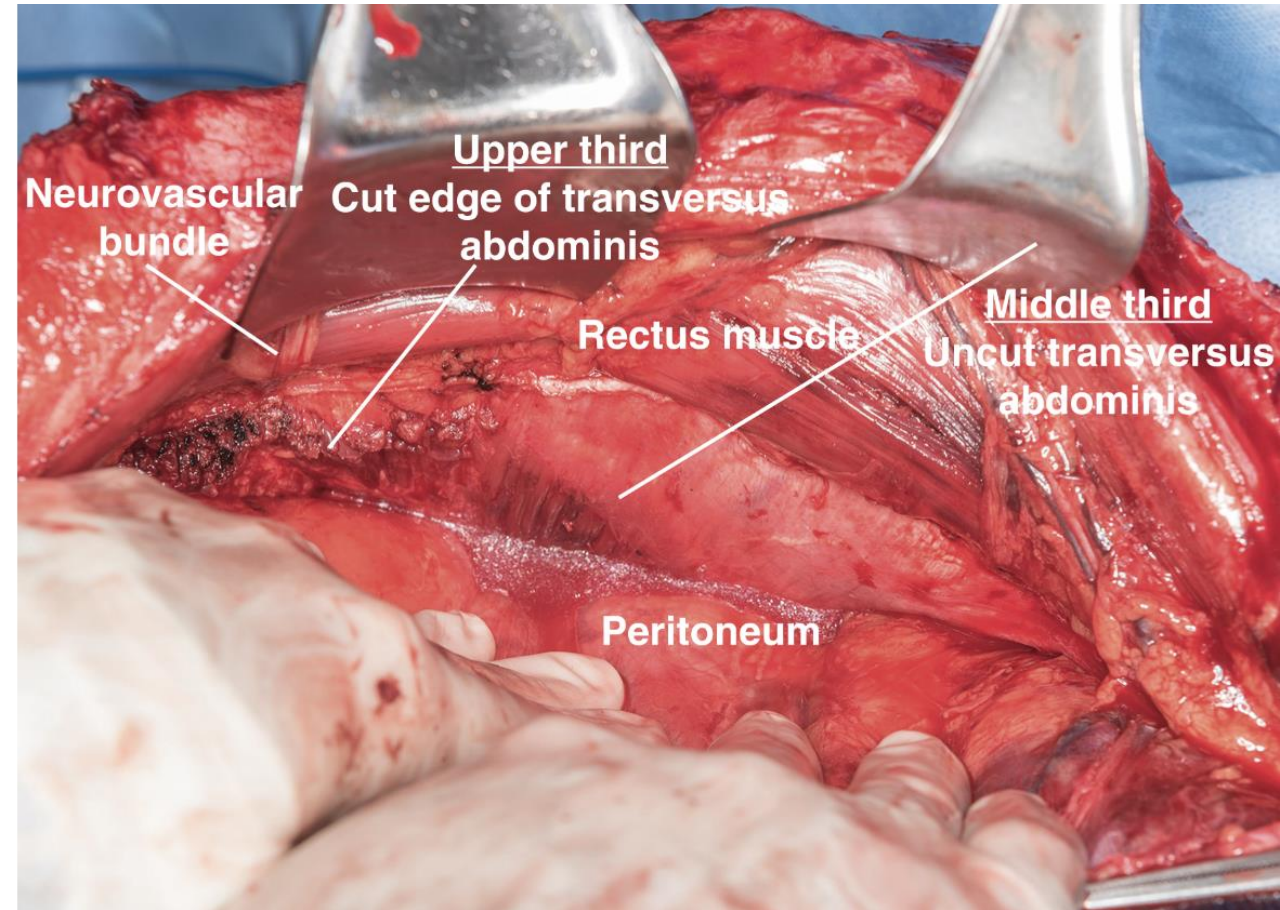
- Retrorectus dissection performed and then enter the plane between the internal oblique and transversus abdominis bilaterally.
- The internal oblique muscle has been divided, showing the nerve deep to the internal oblique muscle and superficial to the transversus abdominis muscle.



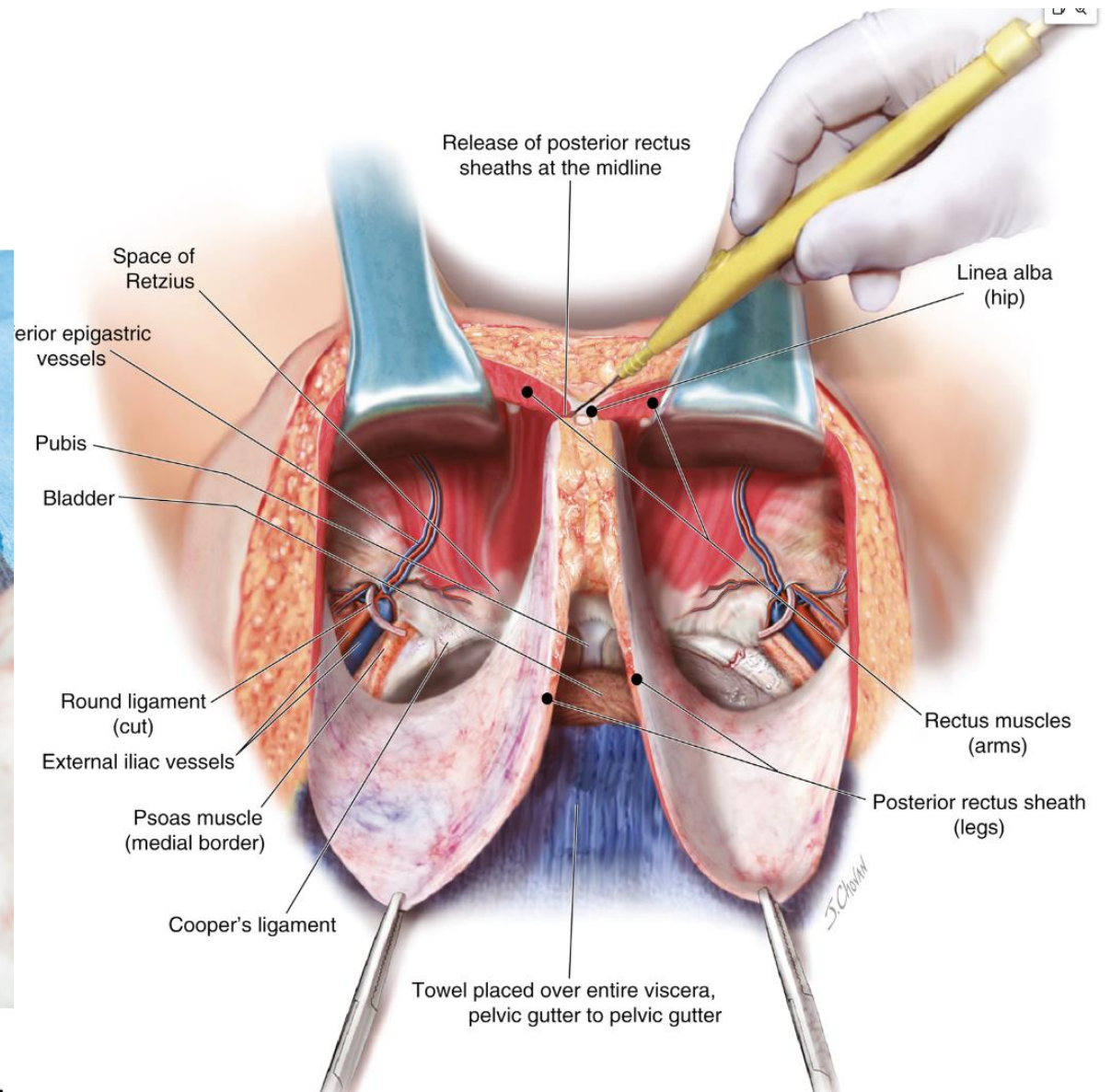
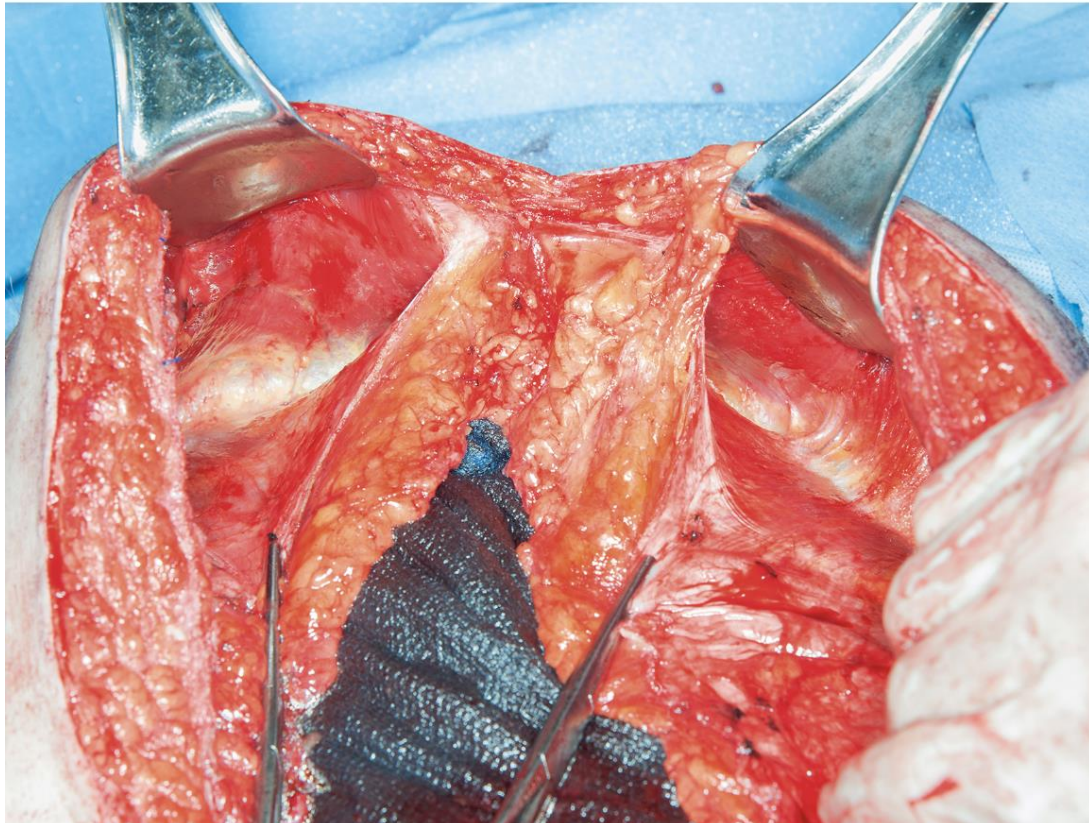
Transverse Abdominus Release (TAR)

- Retrorectus dissection and then incise the transversus abdominus just medial to semilunaris and avoid the neurovascular bundles.

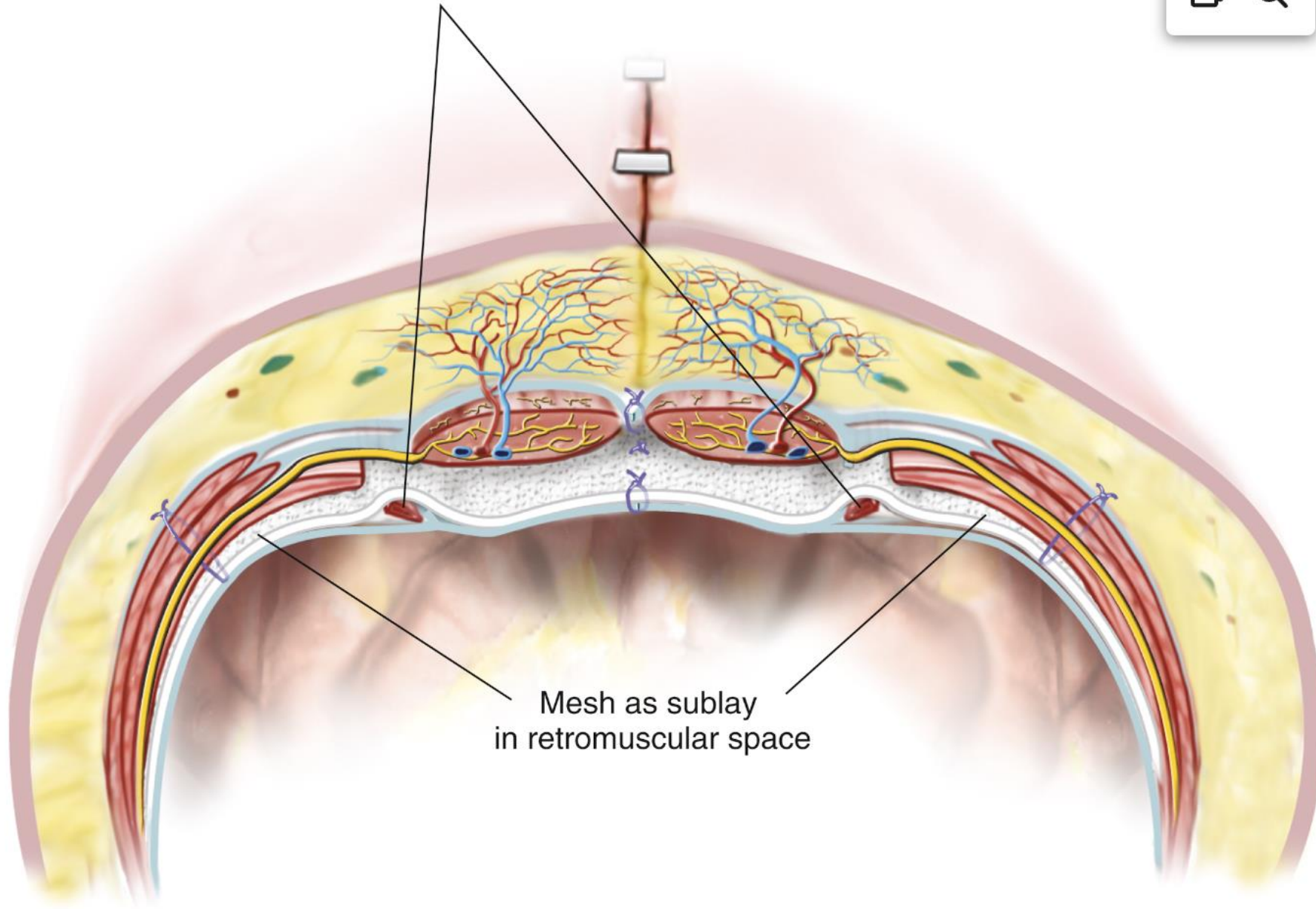
TAR



TAR



Bilateral released edges of
transversus abdominis muscle



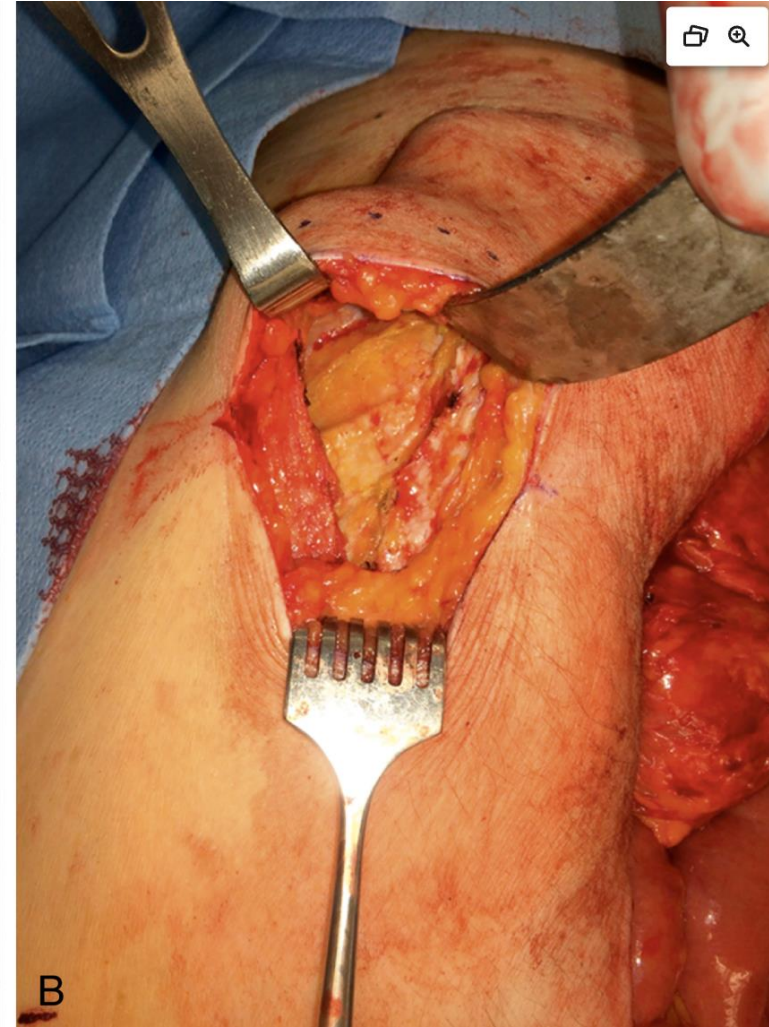
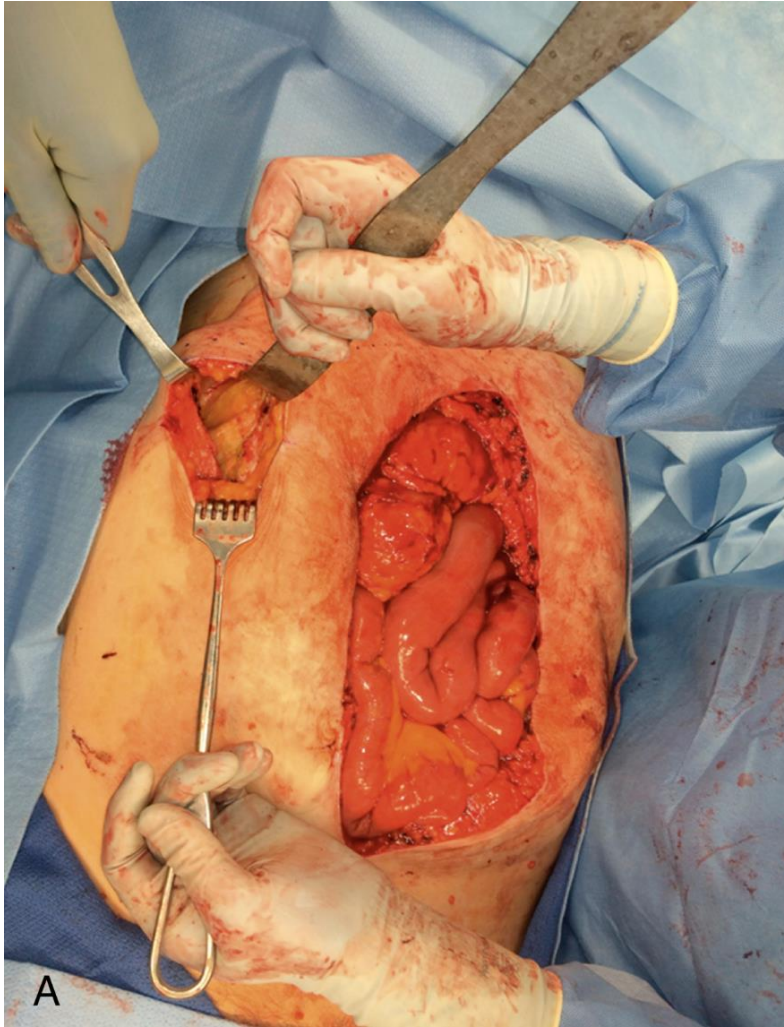
Mesh as sublay
in retromuscular space

Minimally Invasive Options

Anterior Component Separation

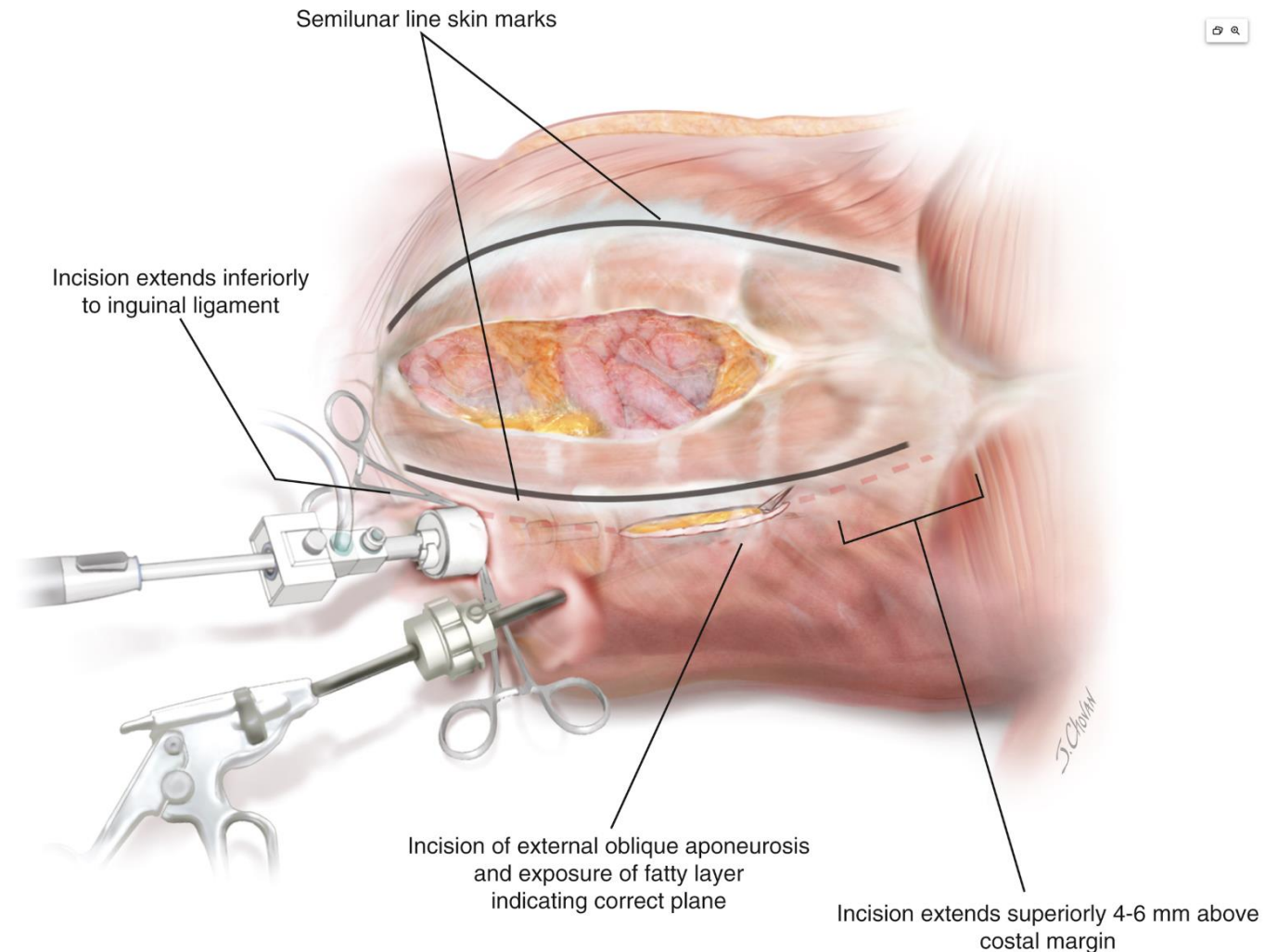
- Perforator sparing anterior component separation
- Endoscopic anterior component separation
- Try to alleviate the downside of large flaps leading to wound complications.

Anterior Component Separation



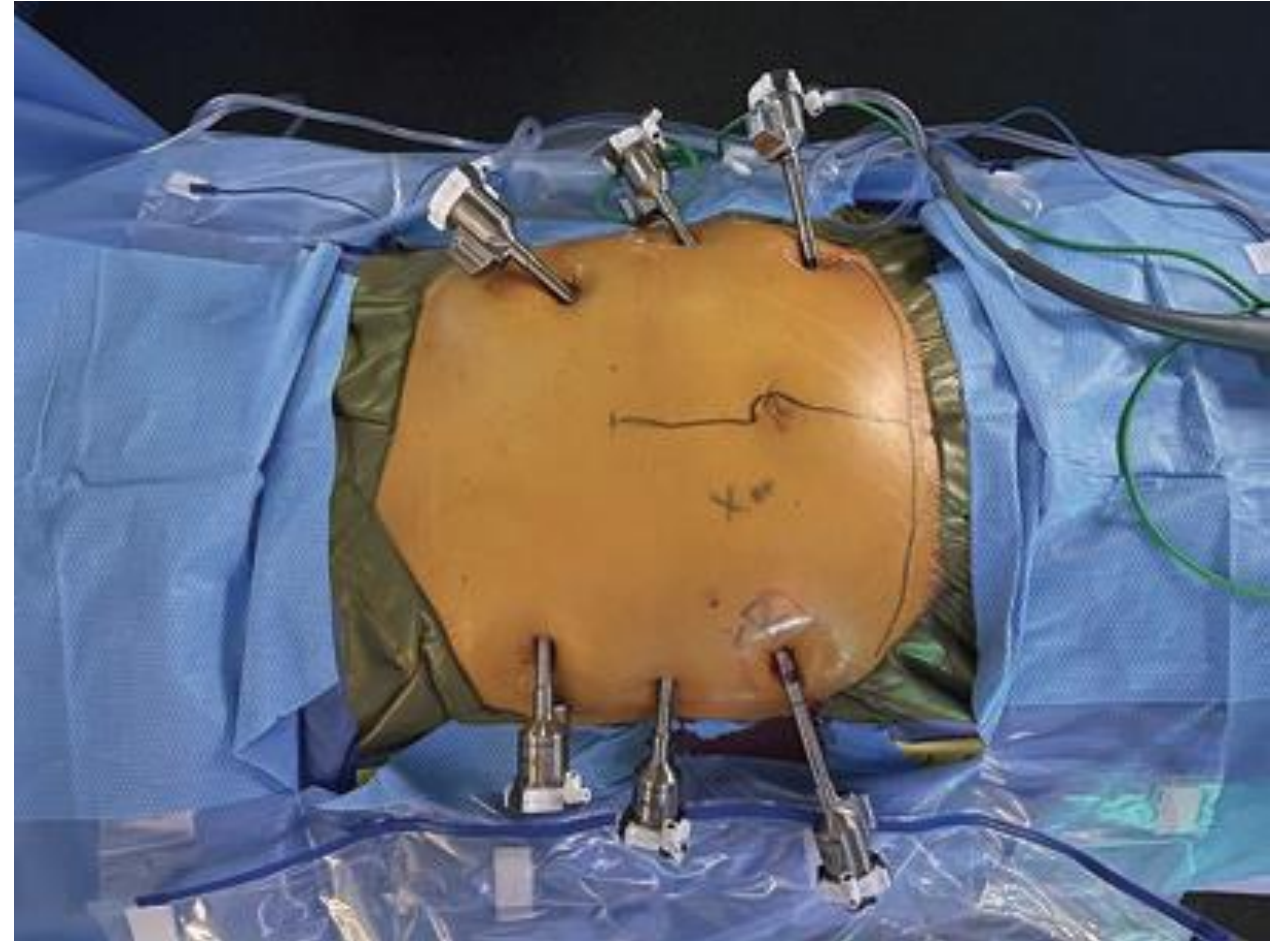
Anterior Component Separation

- A balloon dissector with camera is placed in the subcutaneous plane lateral to the semilunar line.
- The external oblique is incised with laparoscopic scissors or energy device.

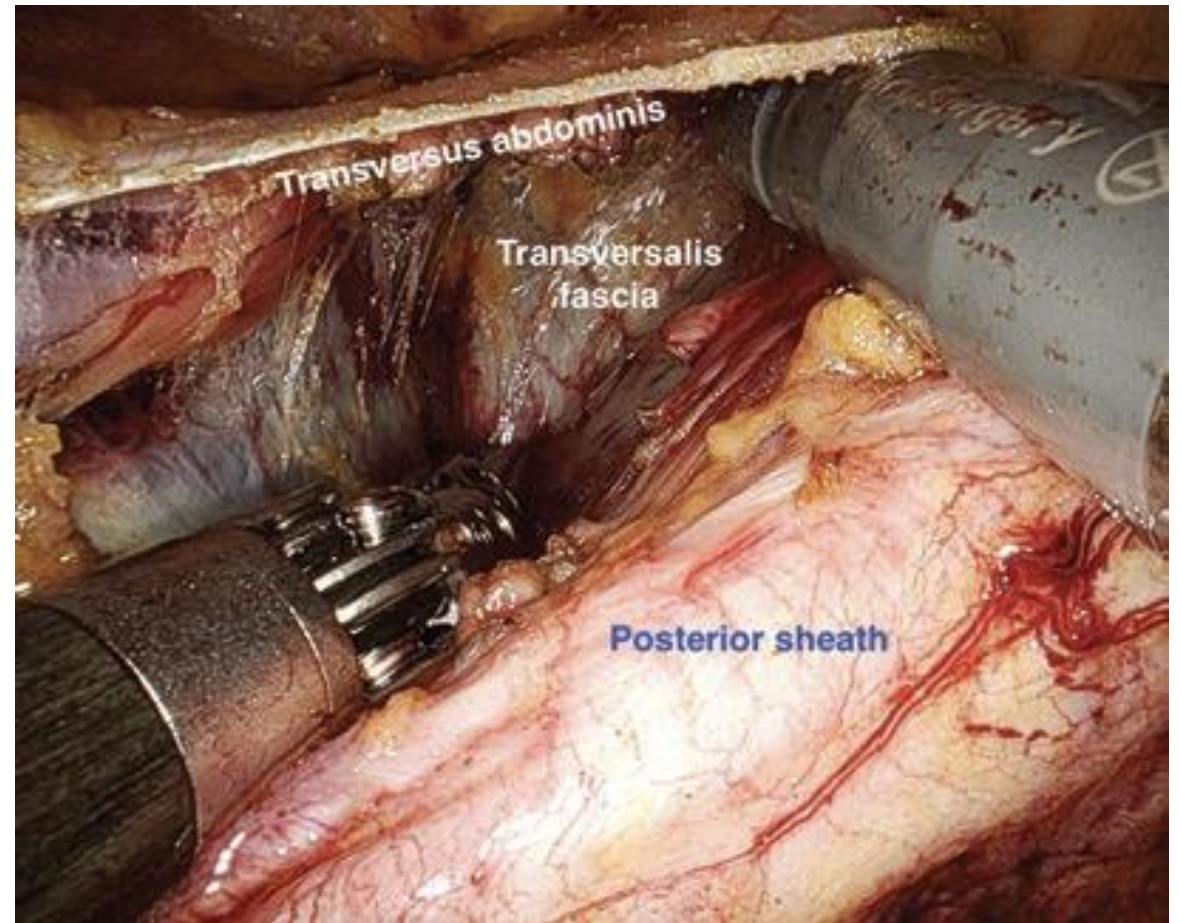
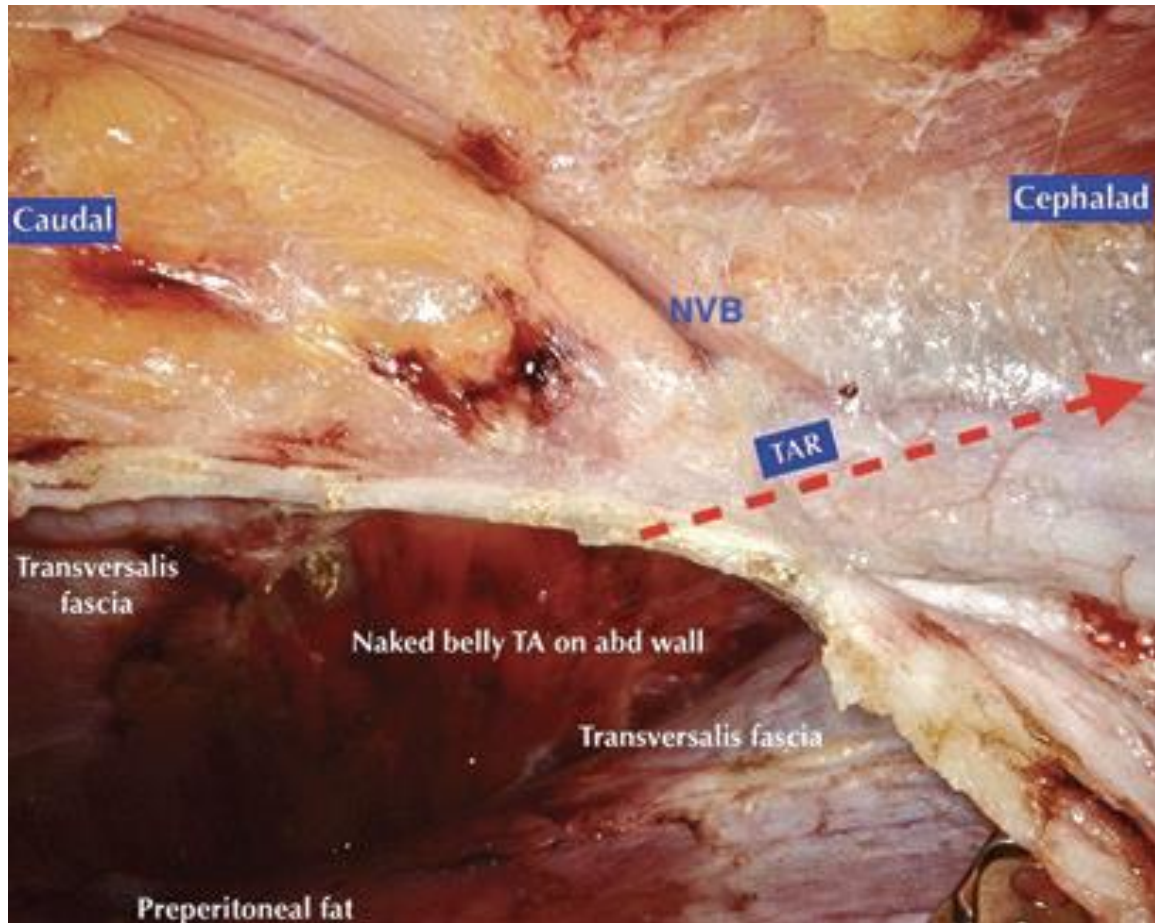


RoboTAR

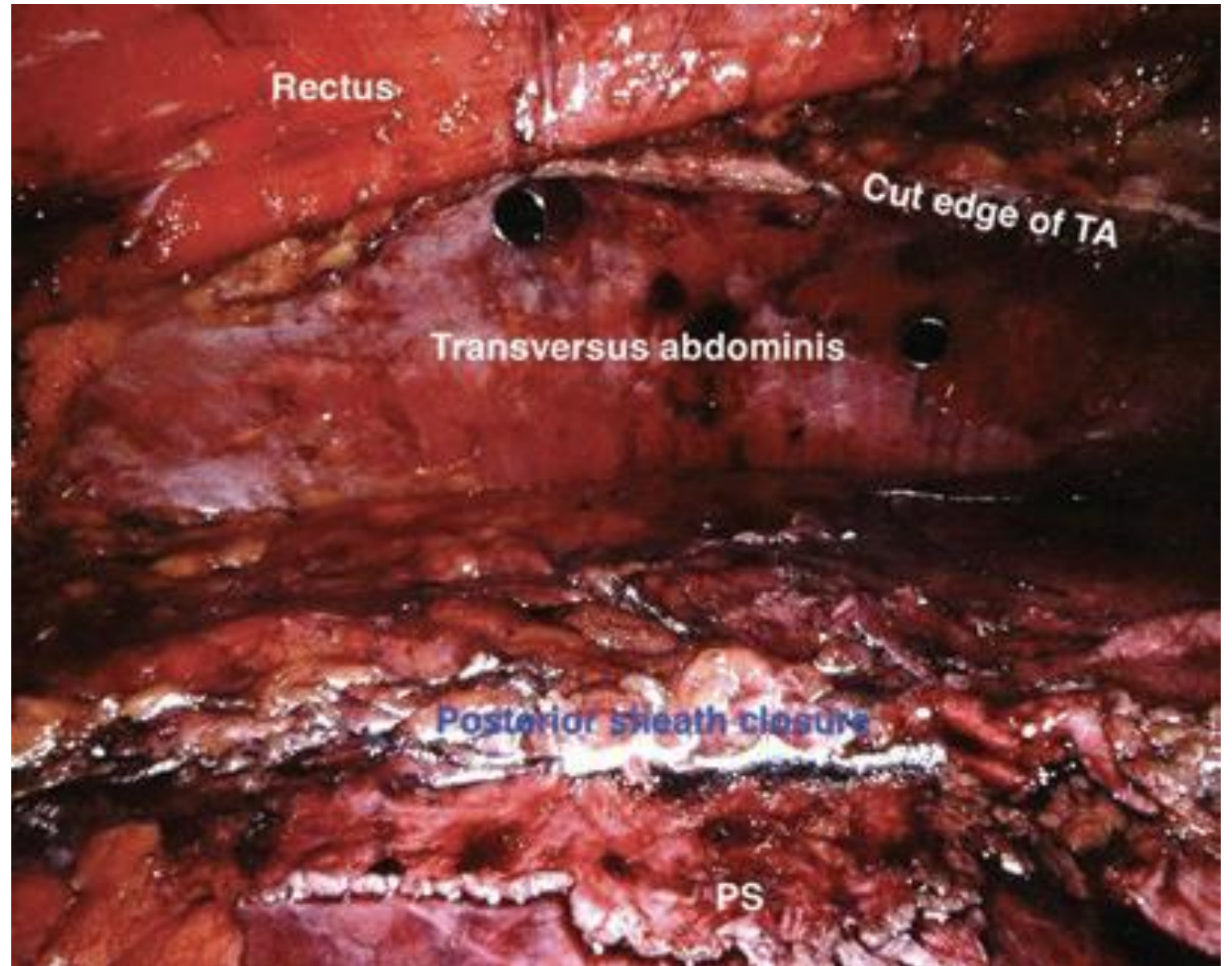
- Peritoneal access laterally, reduce hernia sac, and enter retrorectus space.
- Will often need bilateral approach.
- Will plan for same dissection plane as an open repair.



RoboTAR: Top Down or Bottom Up?



RoboTAR



Mesh Choices

Weight

- There is no official definition of what makes a heavyweight vs a lightweight mesh but there is a general consensus:
- ≤ 60 g/m² is a lightweight mesh
 - Pros: Less Infection
 - Cons: Less Strength
- ≥ 70 g/m² is a heavyweight mesh
 - Pros: High Strength
 - Cons: Pain, Infection

Large vs Small Pores

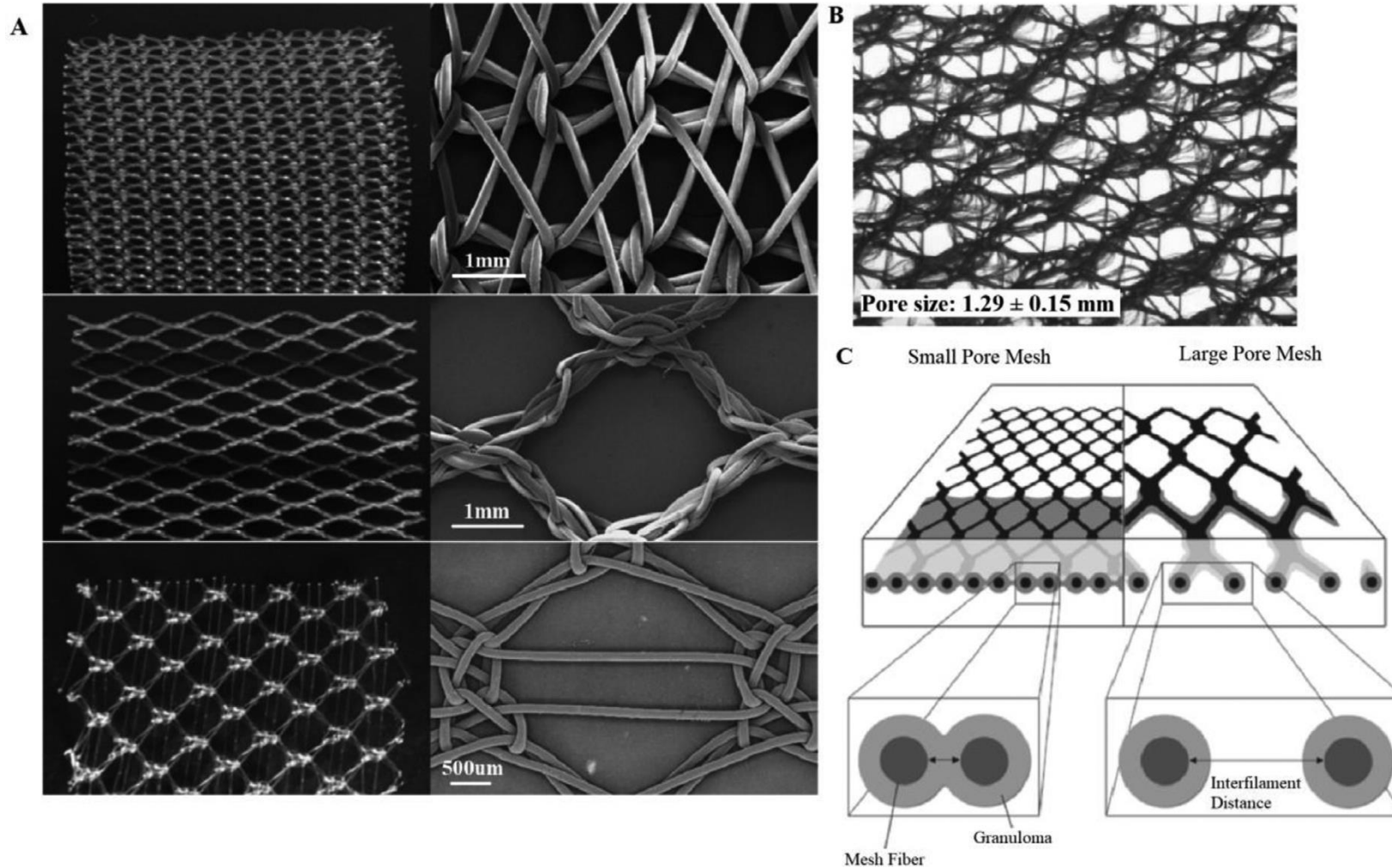
- Large Pore

- Size > 1mm diameter
- Pros: Better tissue ingrowth (less shrinkage, less infection)
- Cons: weaker

- Small Pore

- Size < 1mm diameter
- Pros: stronger
- Cons: shrinkage, infection, “scar plate”

Mesh



Mesh Material

- Permanent Synthetic
 - Polypropylene, Polytetrafluoroethylene (PTFE), and Polyester
- Biologic
 - Dermis, pericardium, rumen, or small intestine submucosa and usually derived from human, porcine, bovine, or ovine sources
- Absorbable Synthetic
 - Poly-4-hydroxybutyrate, Polyglycolic acid, Trimethylene carbonate

Permanent Synthetic

- 3D Max and Bard Mesh (Bard/Davol Inc.)
- DynaMesh
- Freedom Octomesh
- INFINIT Mesh
- Marles
- Mersilene
- MotifMesh
- Omyra
- Optilene
- Parietene
- Parietx
- PerFix
- Premilene
- Prolene
- ProFlor
- ProLite
- ProLoop
- Surgimesh
- Surgipro
- Versatex
- Visilex
- Vitamesh
- Crurasoft
- Dualmesh
- Dulex
- Mycromesh
- Composix
- Surgimesh XB
- Ventralex
- Ventrío
- Timesh
- Adhesix
- C-Qur
- Gore Synecor
- Parietx Composite
- Physiomesh
- Proceed
- Sepramesh
- Symbotex
- Ventralex ST
- Ventrío ST
- Seramesh PA
- Ultrapro
- Vypro

Biologic

- AlloDerm, AlloMax
- CollaMend
- DermaMatrix
- FlexHD
- Fortiva MatriSt4em
- Medeor Matrix
- Permacol
- Strattice
- SurgiMend
- XenMatrix
- OvitTex



Absorbable Synthetic

- BIO-A Tissue Reinforcement
- DEXON
- Safil
- Seri Scaffold
- TIGR Matrix
- VICRYL Knitted/Woven Mesh
- Phasix and Phasix™ ST
- Transorb



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