RECENT CONCEPTS IN LAPAROSCOPIC HERNIA AND ABDOMINAL WALL RECONSTRUCTION

DR.KUMARAGURUBARAN
SENIOR CONSULTANT SURGEON
DEPARTMENT OF GI SURGERY AND MINIMAL ACCESS SURGERY
BILLROTH HOSPITAL
SHENOY NAGAR, CHENNAI

WHY THIS TOPIC ON HERNIA ?

- Hernia is the one of the commonest medical condition known to us
- Hernia is also one of the oldest medical conditions known to us,
- But still the treatment for hernia has not been perfected and continuously undergoing change compare to LAPAROSCOPIC Cholecystectomy and Appendicectomy.
- This is because of the frustrating problem of incidence of RECURRENCE.
- The various modifications in Hernia surgery and Herinology has been aimed at reduceing the Recurrence rate.

RECURRENCE RATE OF HERNIA

- As per the latest statistics the RECURRENCE rate after
- 1)Open Inguinal Hernia repair with mesh-1.2 to 4.9%
- 2)Laparoscopic Ingunial Hernia Repair -TAPP-0.4to 4.3%

  TEP-1.4 to 5.9%
- 3)Open Umbilical Hernia Repair with Mesh -1 to 4.3%
- 4)Laparoscopic Umbilical Hernia repair-IPOM-0.8 to 2.1%

  IPOM Plus-0.5 to 2.5%

  TAPP-0.7 to 3.2%

  eTEP-0.4 to 2.9%

- 5) Open Incisional Hernia Repair with Mesh -10 to 15%
- 6)Laparoscopic Incisional Hernia Repair-IPOM Plus-0.5 to 3.5%

  TAPP-2.5 to 6.5%

  eTEP-1.5 to 4.5%

  TAR-1.2 to 3.8%

INCIDENCE OF INCISIONAL HERNIA FOLLOWING LAPAROTOMY

- Current statistics shows Incidence of Incisional Hernia following Laparotomy is

  10-15% for midline incisions

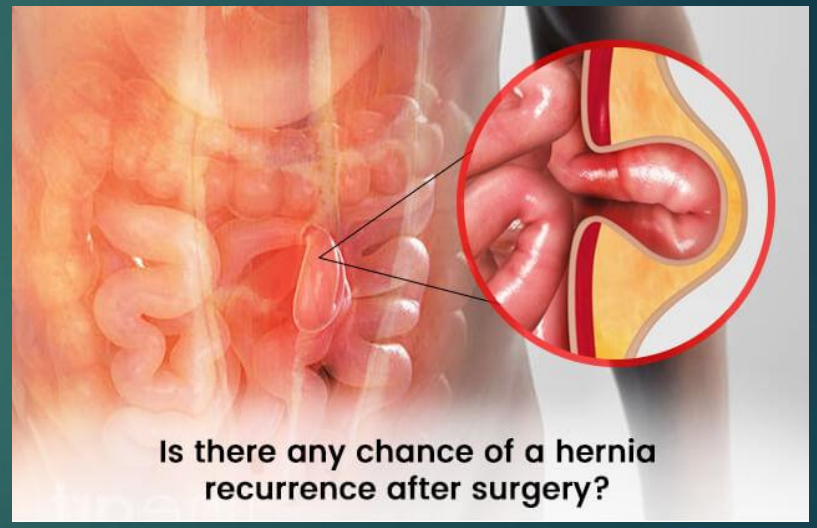
  5-10% for transverse incisions

  2-5% for paramedian incisions

- Current Statistics shows Incidence of Incisional Hernia following Primary Hernia Repair is

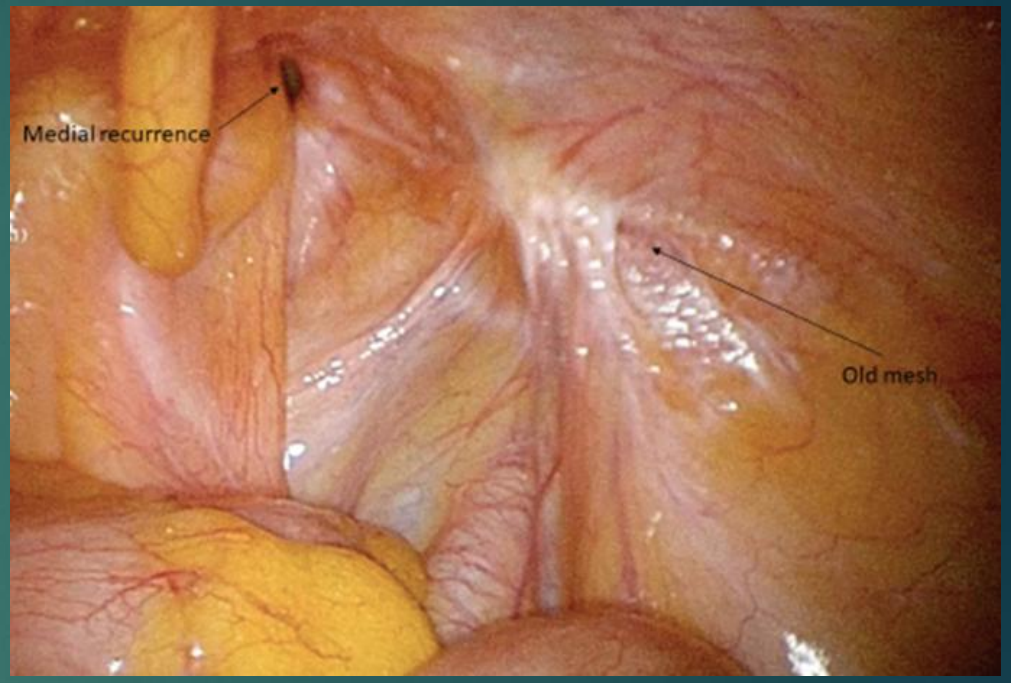
  4.3% for open repairs

  1.4% for laparoscopic repairs



CAUSES OF RECURRENCE

- Inadequate initial repair
- Weakness in the repair site
- Increased intra-abdominal pressure
- Poor wound healing
- Technical errors during initial surgery
- Patient factors (e.g., obesity, smoking, chronic cough)
- Mesh related problem- smaller mesh,migration,slitting /rolling

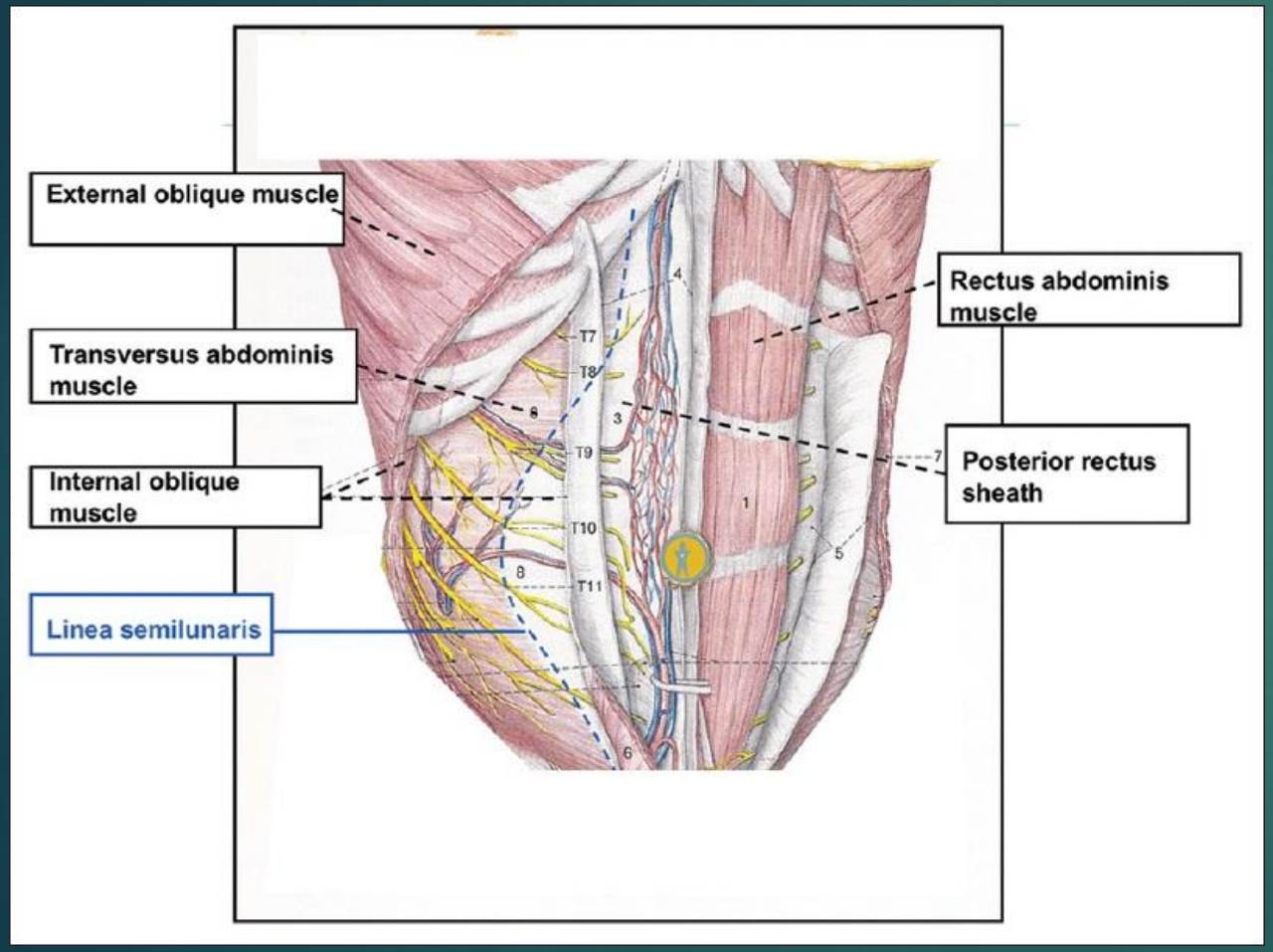


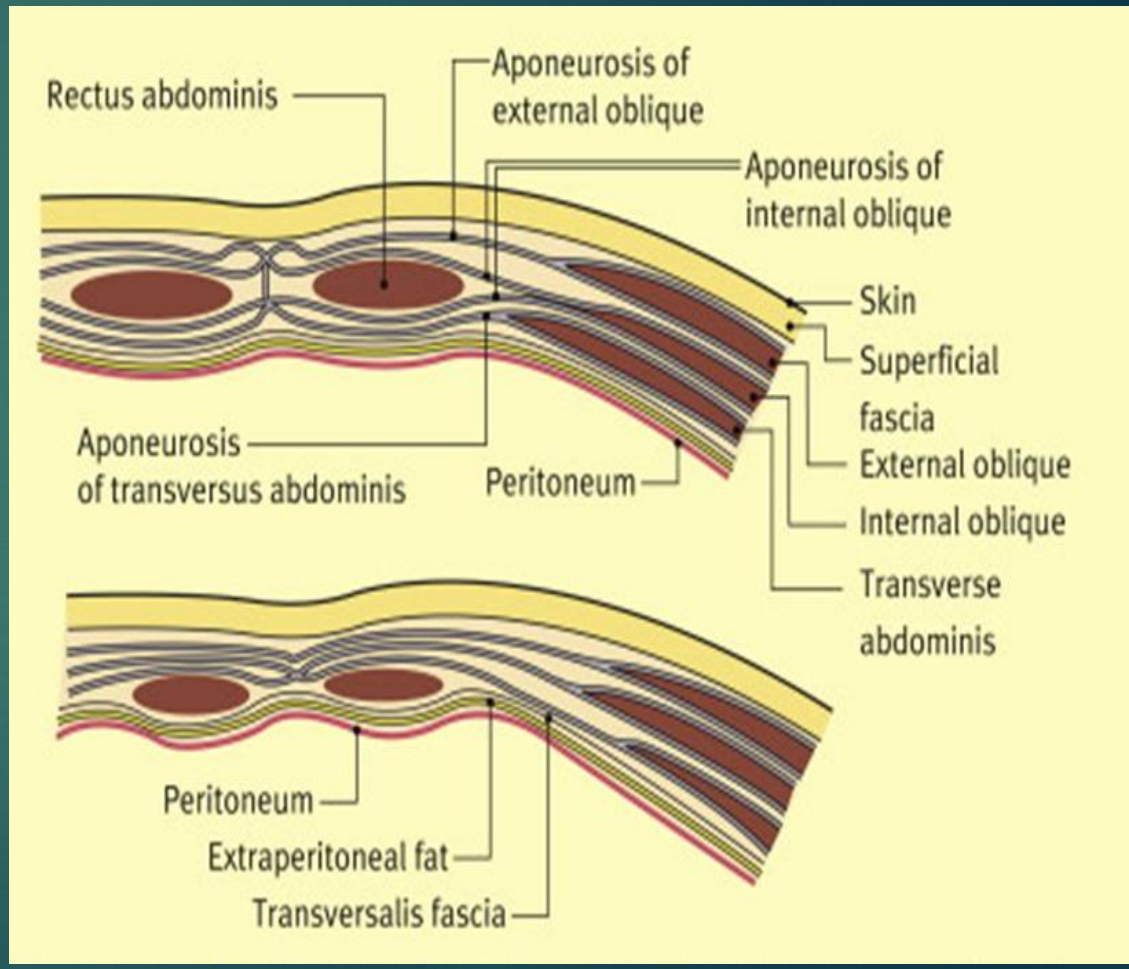
- Recurrent hernias often require more complex surgical repairs, and the choice of technique and mesh material may differ from the initial repair.

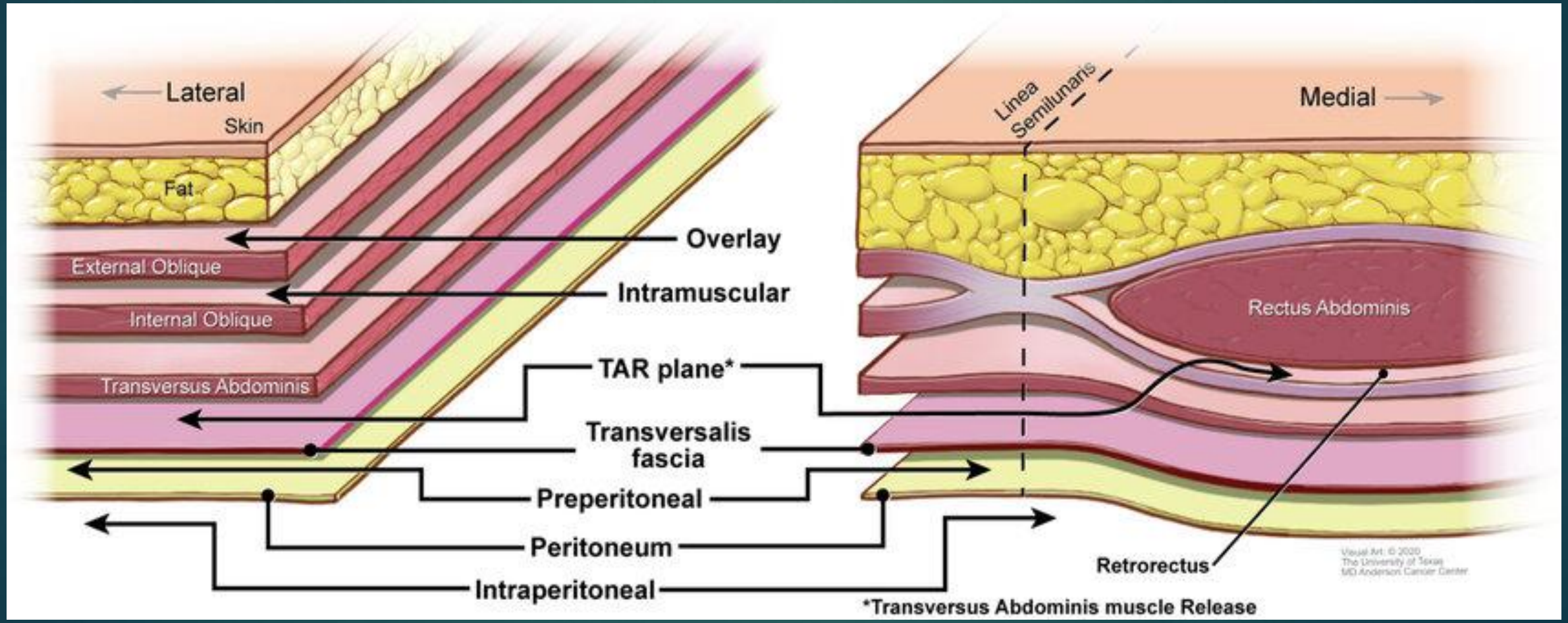
SHIFT IN APPROACH TO HERNIA FROM A HOLE(HERNIA DEFECT) TO THE WHOLE (ABDOMEN)

- Previously the concentration was to repair the hernial defect with an mesh overlap of 5cm.
- Now the approach is to rectify the whole abdominal wall mechanism .
- To Achieve tension less abdominal wall closure.
- Usage of bigger Meshes.
- Advent of the newer Meshes like Composite Meshes,Anatomical Meshes,Tacker,Fixing Devices and Fixing glue and Bard sutures .
- Advent of Robotics and fasciotens.

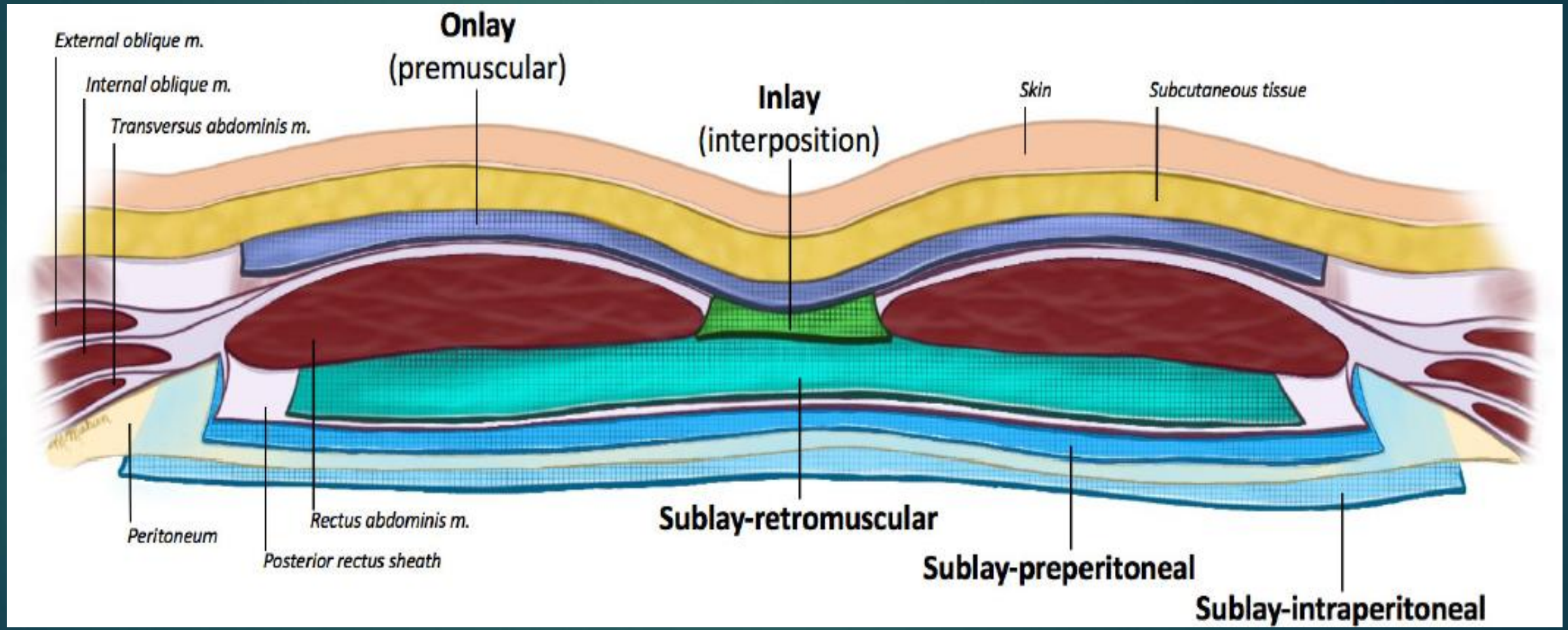
ANATOMY OF ABDOMINAL WALL



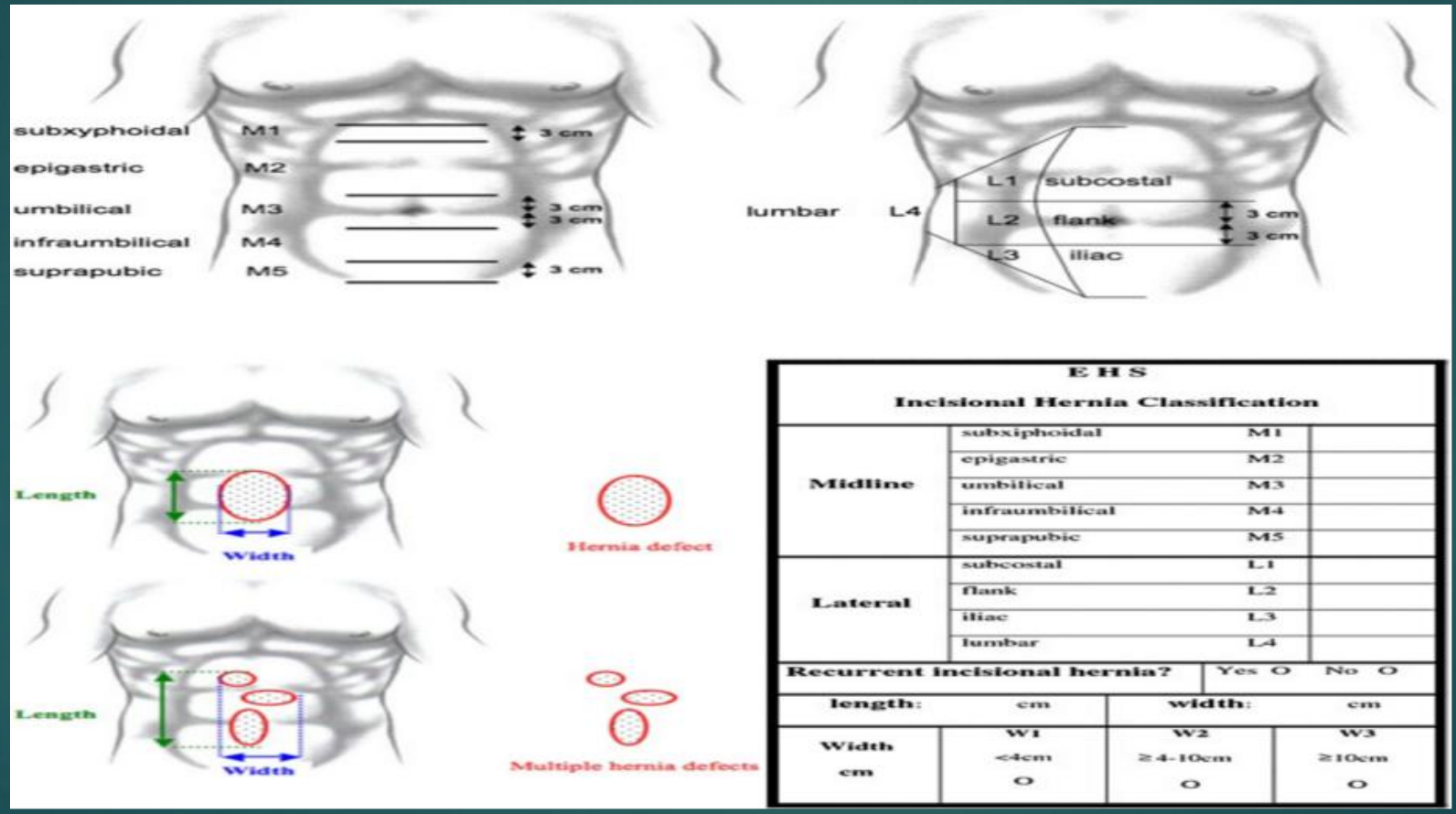



Lateral
Skin
Fat
External Oblique
Internal Oblique
Transversus Abdominis
Overlay
Intramuscular
TAR plane*
Transversalis fascia
Preperitoneal
Peritoneum
Intraperitoneal
Linea Semilunaris
Medial
Rectus Abdominis
Retrorectus
*Transversus Abdominis muscle Release

PLANES OF MESH PLACEMENT



CLASSIFICATION OF HERNIA



E H S Incisional Hernia Classification			
Midline	subxiphoidal	M1	
	epigastric	M2	
	umbilical	M3	
	infraumbilical	M4	
	suprapubic	M5	
Lateral	subcostal	L1	
	flank	L2	
	iliac	L3	
	lumbar	L4	
Recurrent incisional hernia?		Yes O	No O
length:	cm	width:	cm
Width cm	W1 <4cm O	W2 ≥4-10cm O	W3 ≥10cm O

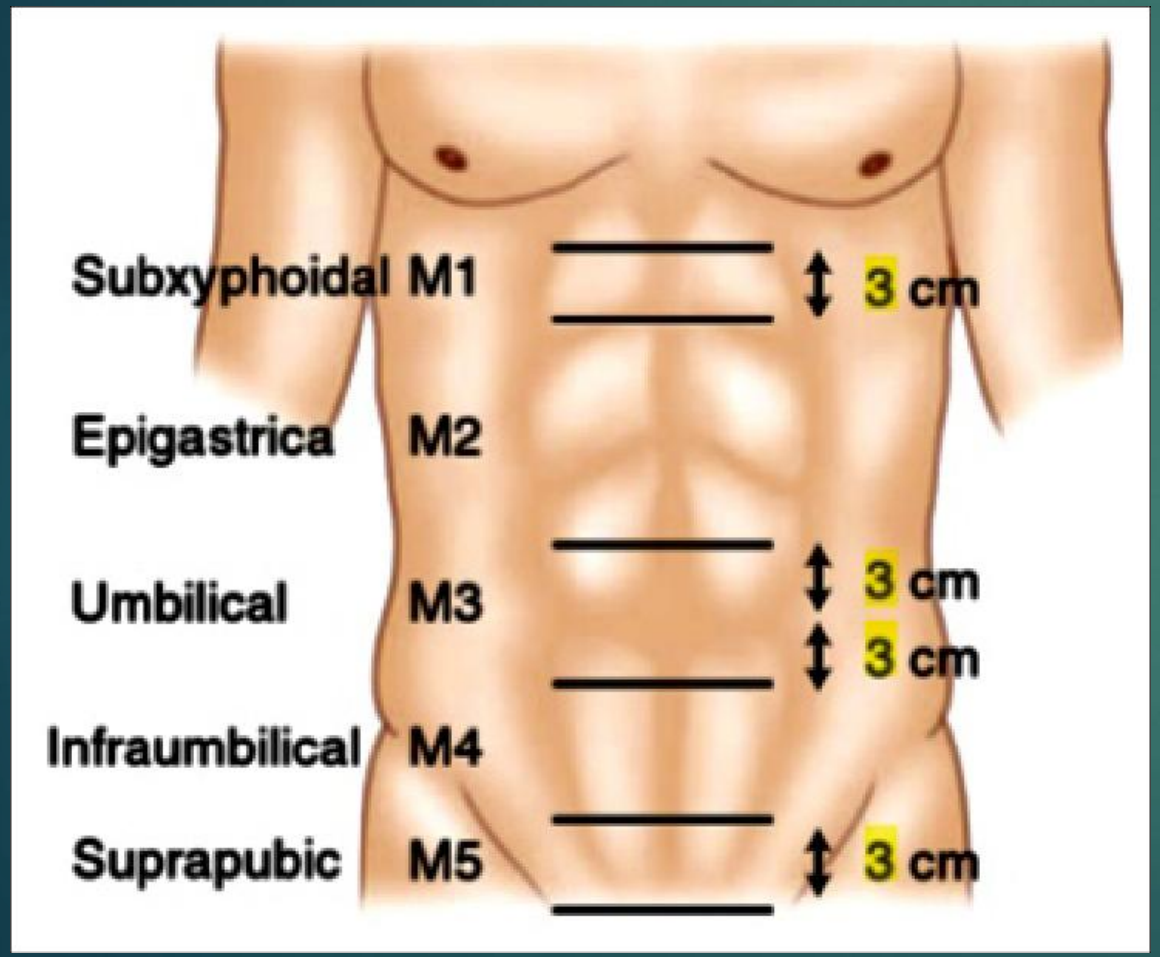


Table 4.1 The EHS Incisional Hernia Classification

Hernia	Characteristics		
Medial	Subxiphoid	M1	O
	Epigastric	M2	O
	Umbilical	M3	O
	Infraumbilical	M4	O
	Suprapubic	M5	O
Lateral	Subcostal	L1	O
	Femoral hernia	L2	O
	Iliac	L3	O
	Lumbar	L4	O
Recurrent incisional hernia?		Yes O	No O
Length (cm)	–	Width (cm)	–
Width (cm)	W1 < 4 cm O	W2 ≥ 4–10 cm O	W3 ≥ 10 cm O

Abbreviation: EHS, European Hernia Society.

CHANGE IN CONCEPTS IN HERNIA REPAIR

- 1) From onlay mesh to sublay mesh
- 2) Layer/ component separation
- 3) Use of bigger meshes giving wider covage
- 4) Use of barbded suture
- 5) Use of Anatomical Meshes
- 6) Use of muscle lengthening techniques

VARIOUS TECHNIQUES OF LAPAROSCOPIC HERNIA

- IPOM-Intraperitoneal Onlay Mesh Repair
- IPOM PLUS-Intraperitoneal Onlay Mesh Repair Plus
- TAPP-TRANSABDOMINAL PREPERITONEAL TECHNIQUE
- TEP-Totally extraperitoneal (TEP)
- eTEP-Extended Totally Extraperitoneal Repair
- TARM- Trans-Abdominal Retromuscular Repair
- TAR-Transversus abdominis release (TAR) procedure

Intraperitoneal Onlay Mesh Repair (IPOM) For Umbilical Hernia

- Clearing the hernia of its Contents and placing a suitable sized intraperitoneally by fixing it.
- Most commonly used Technique to manage ventral Hernia and umbilical Hernia.

TECHNIQUE

Content reduced,adhesions released and hernial orifice is examied.

Size of the Mesh is decided based on the size and number of hernia defects,overlap more than 4cms.

Mesh inserted oriented coated surface is placed against the viscera and centred over the hernial orifice.

Mesh is fixated with tackers and trans-facial suture.

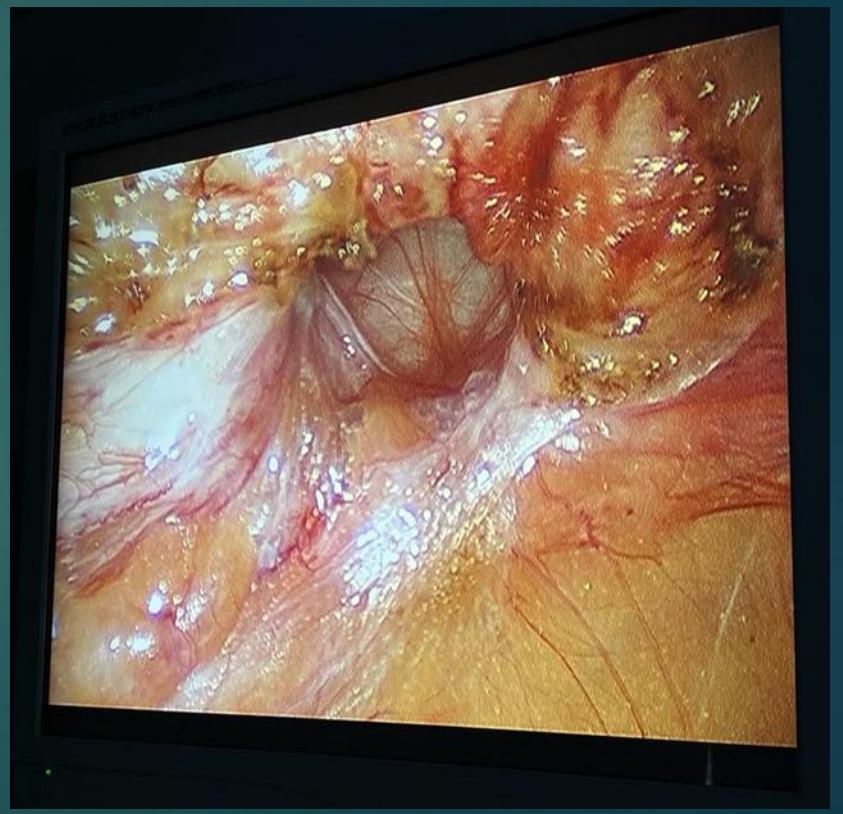
Intraperitoneal Onlay Mesh Repair Plus-IPOM Plus

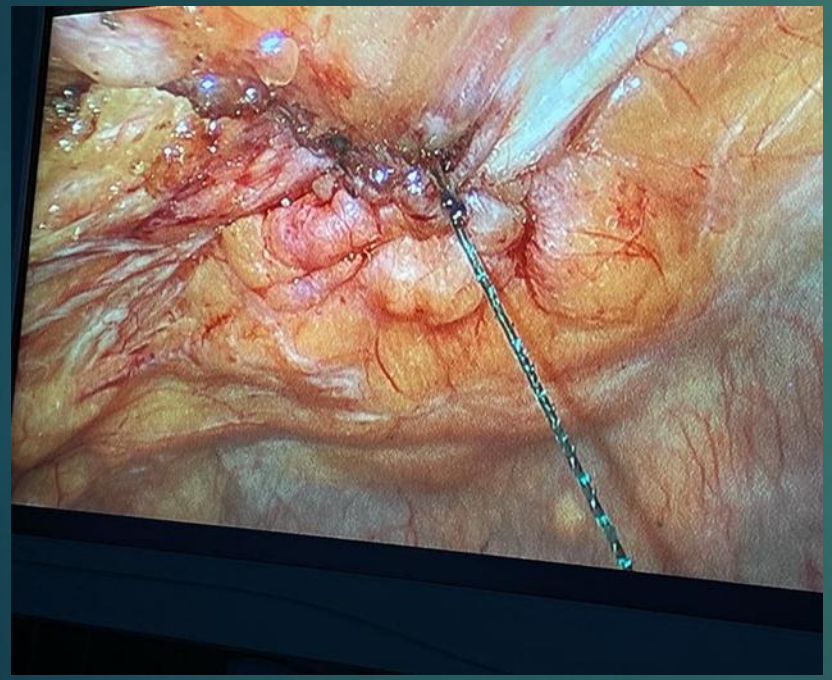
- IPOM PLUS = Defect closure with suture + IPOM technique

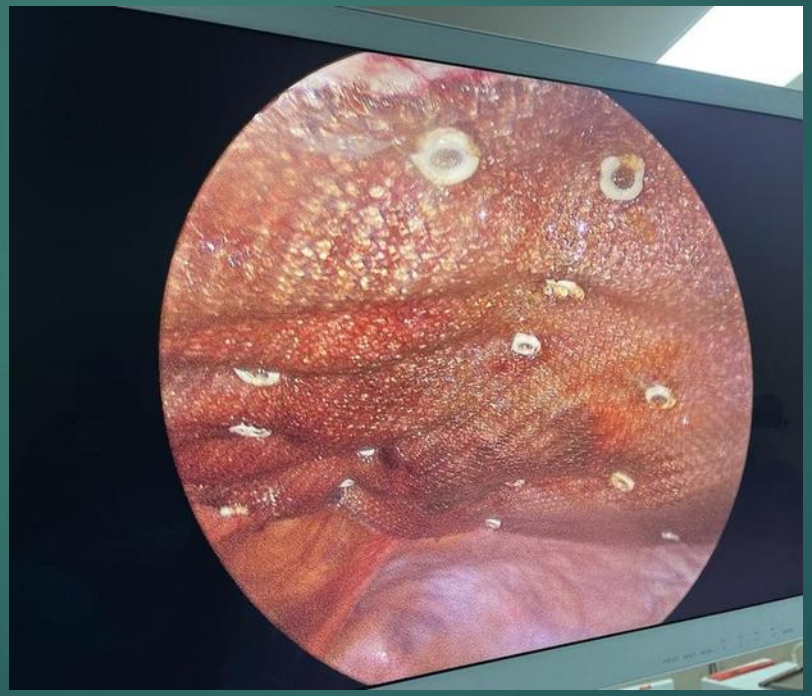
INDICATIONS

- Ventral Hernia
- Incisional Hernia
- Recurrent Hernia
- Defect more than 2cm

Intraperitoneal Onlay Mesh Repair (IPOM) plus For Umbilical Hernia





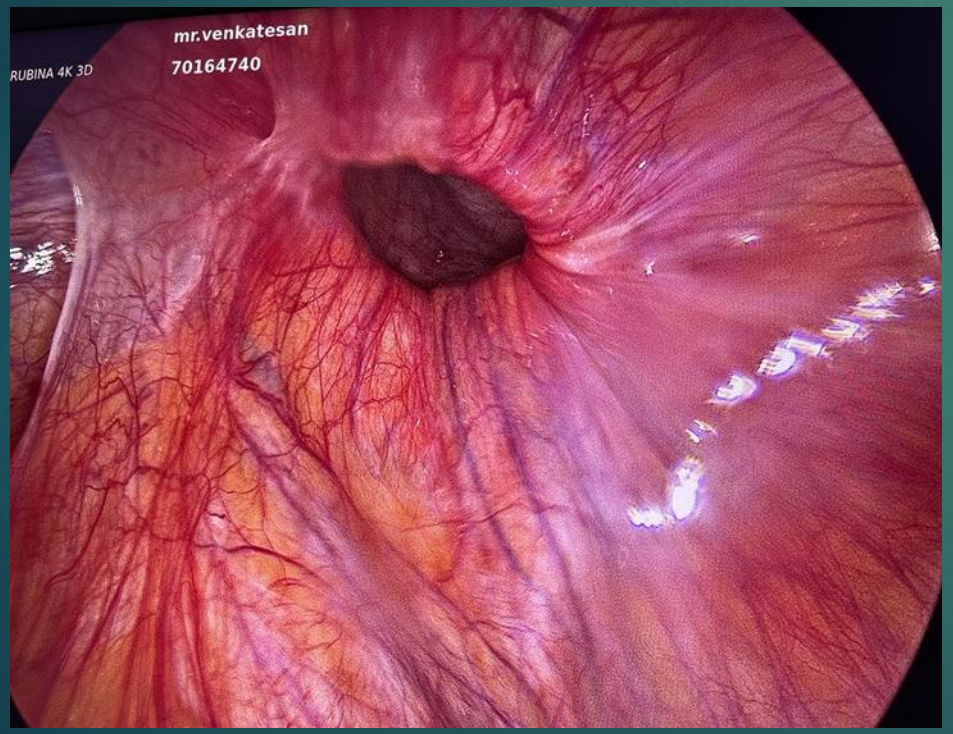


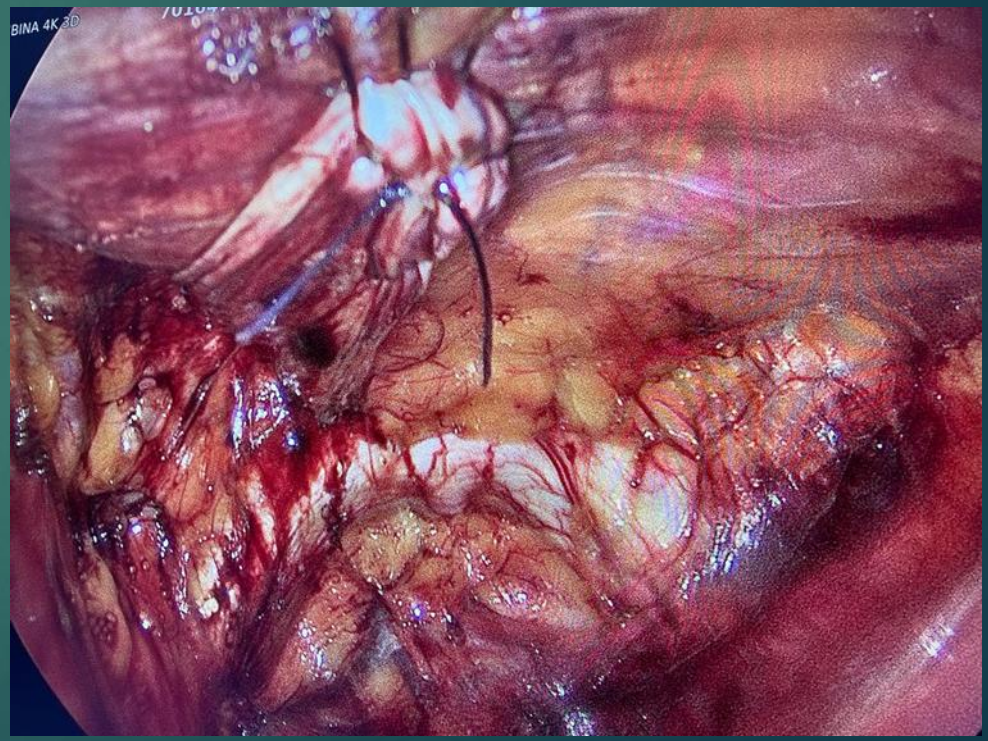
TAPP- TRANSABDOMINAL PREPERITONEAL TECHNIQUE

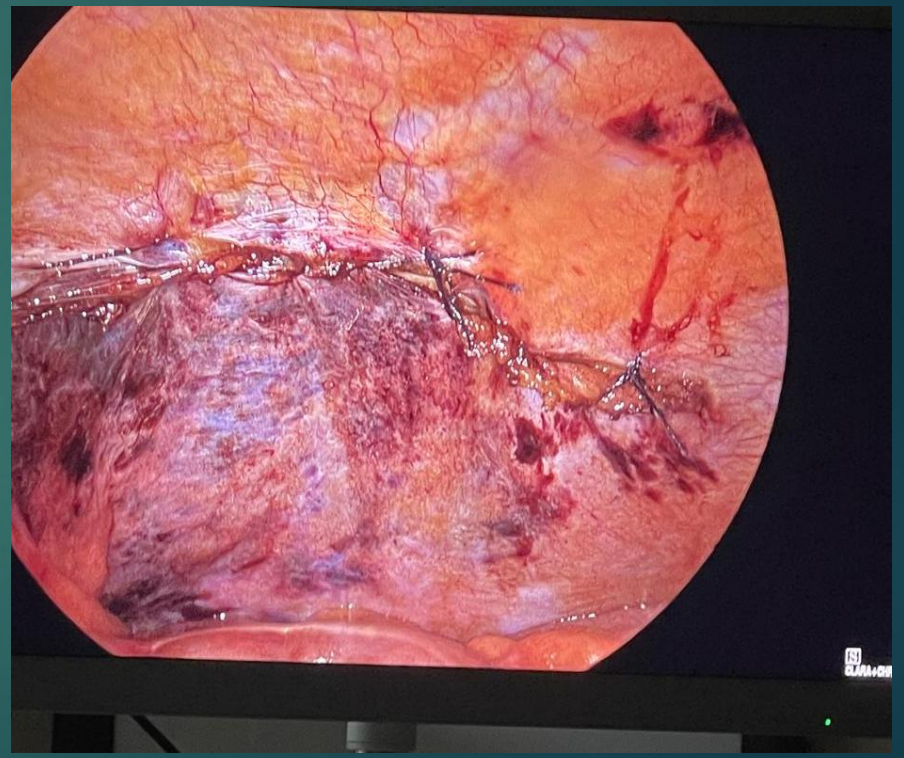
TAPP (Transabdominal Preperitoneal) technique:

- T - Transabdominal (through the abdominal cavity)
- A - Access to the preperitoneal space (area behind the abdominal lining)
- P - Placement of mesh to reinforce the weakened area
- P - Preperitoneal (in front of the peritoneum, the abdominal lining)

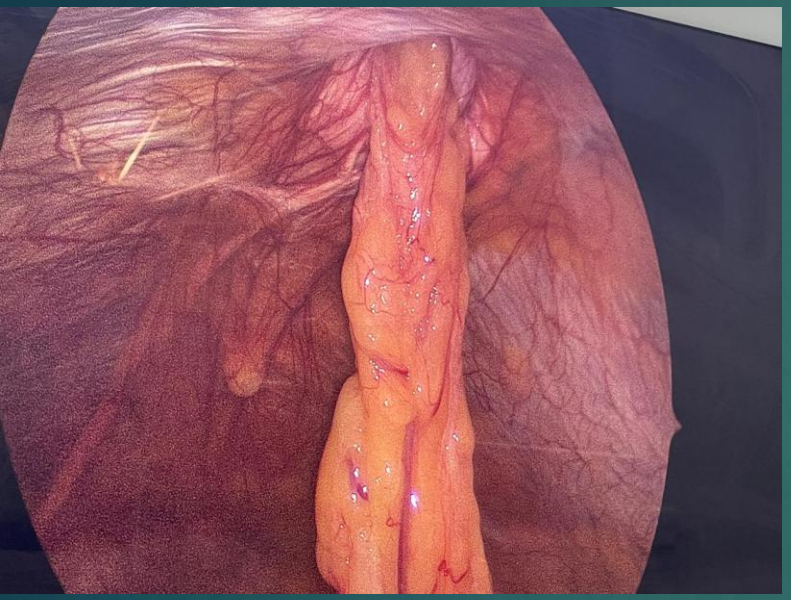
TRANSABDOMINAL PRE-PERITONEAL (TAPP)TECHNIQUE FOR INGUINAL HERNIA

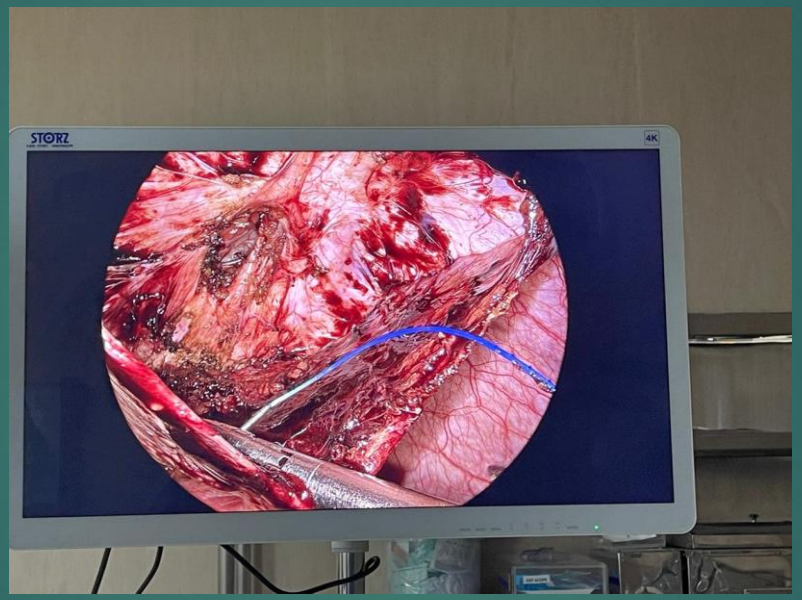


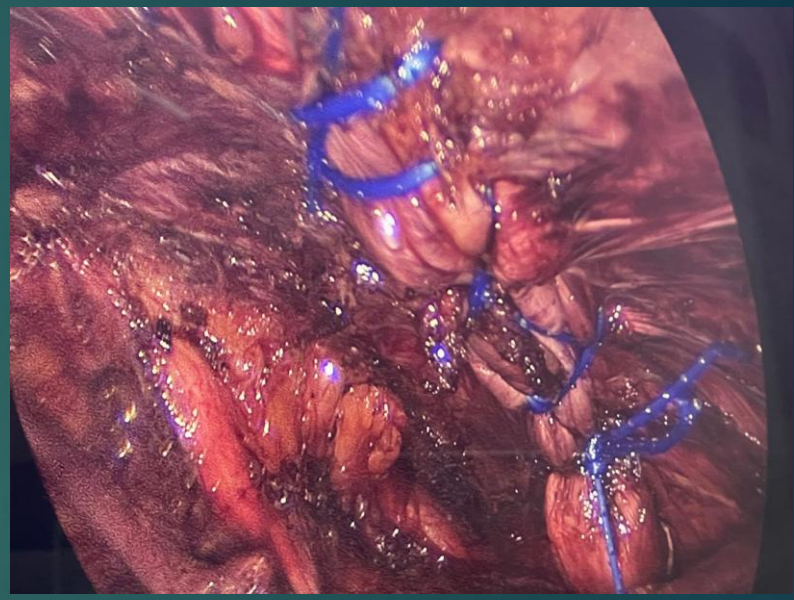


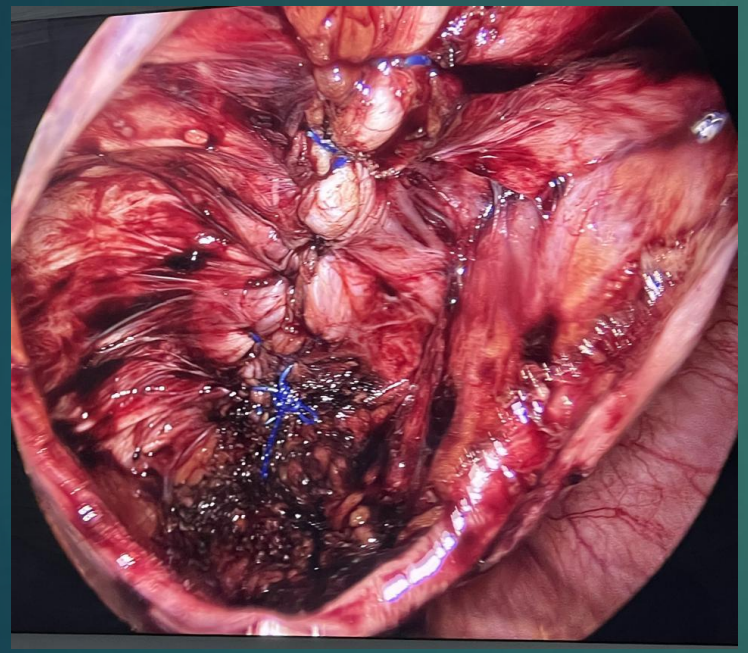


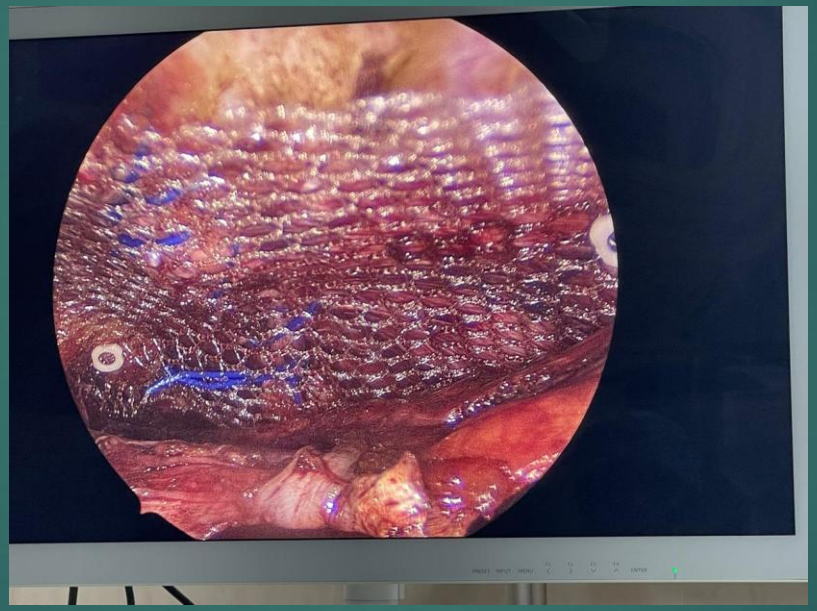
TAPP IMAGE OF UMBILICAL HERNIA

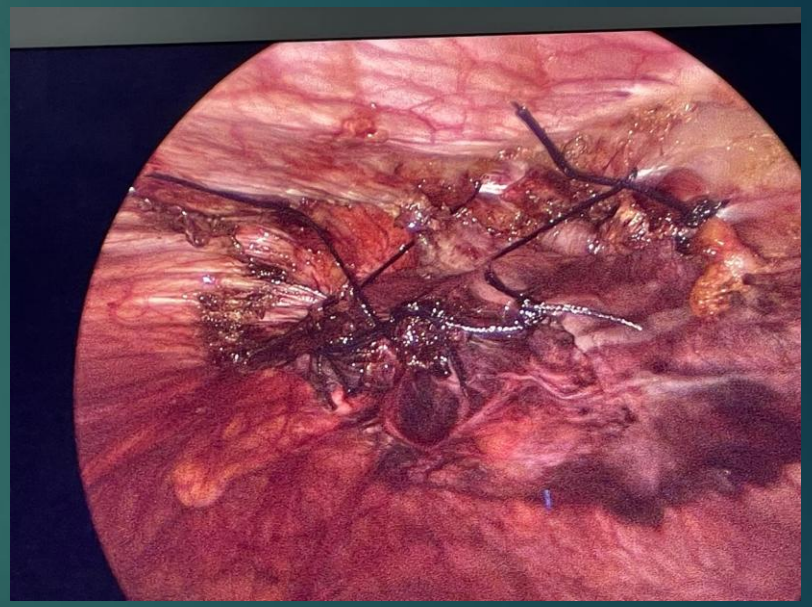












Totally extraperitoneal (TEP)

- TEP-Total Extraperitoneal Technique
- Totally (completely), Extraperitoneal (outside the abdominal lining, without entering the abdominal cavity).

TEP technique:

- Does not enter the abdominal cavity
- Avoids contact with intra-abdominal organs
- Reduces risk of adhesions and complications
- Offers a minimally invasive option for inguinal hernia repair

TEP vs TAPP:

- TEP: No entry into abdominal cavity, less risk of adhesions
- TAPP: Enters abdominal cavity, may have higher risk of adhesions

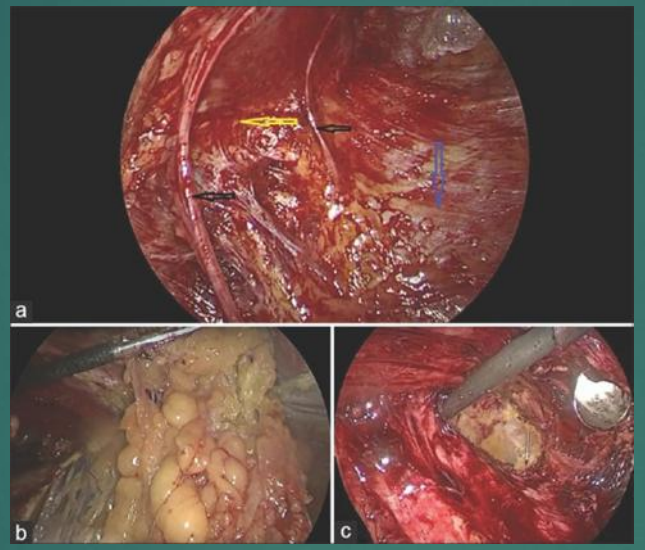
Extended Totally Extraperitoneal Repair (eTEP)

- eTEP is an advancement of the traditional TEP (Total Extraperitoneal) technique, offering improved visualization and access to the hernia area.

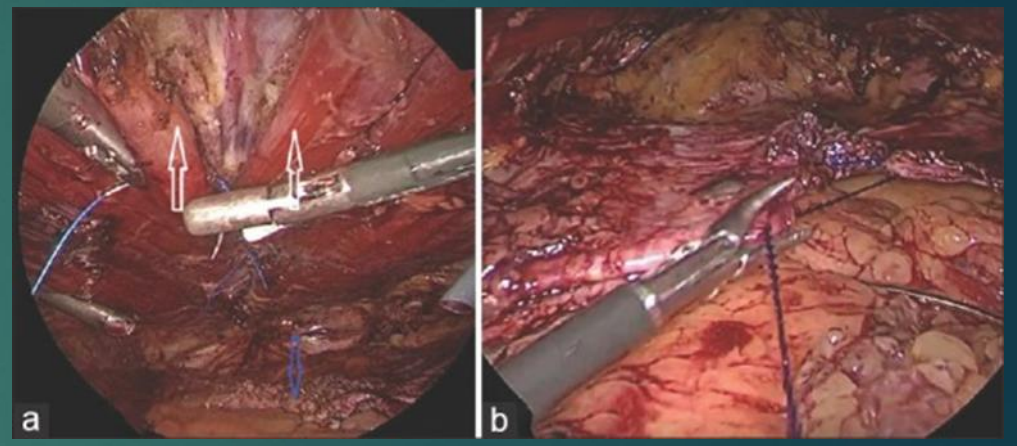
- 1. Wider dissection: A larger space is created between the abdominal muscles and the peritoneum, allowing for better visualization and access to the hernia.
- 2. Extended view: The camera is placed in a more lateral position, providing a wider view of the hernia area and surrounding structures.
- 3. Improved mesh placement: The mesh can be placed more precisely, ensuring optimal coverage of the hernia defect.
- 4. Reduced risk of nerve damage: The wider dissection and improved visualization help minimize the risk of nerve damage during the procedure.

Extended Totally Extraperitoneal Repair (eTEP RS) For Ventral Hernia

Port positions. (a) for umbilical and infraumbilical hernia; (b) for supraumbilical hernia



a) Creation of retro-rectus space. Note the neurovascular bundles - black arrow, Linea Semilunaris - yellow arrow, posterior rectus sheath - blue arrow (b) intraperitoneal dissection and taking down hernia contents (c) crossing the

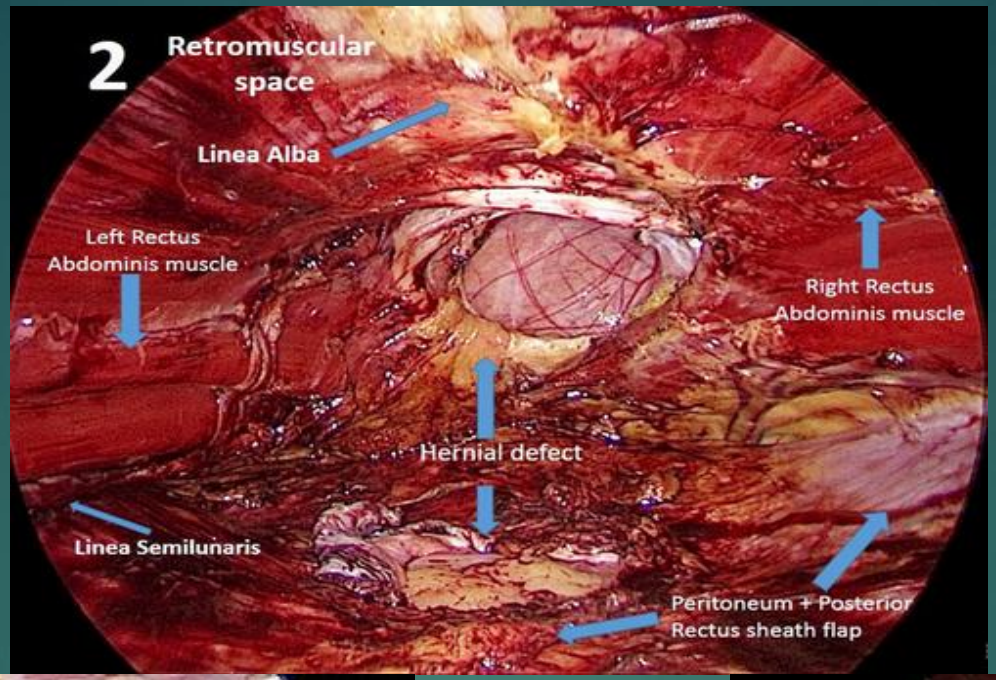


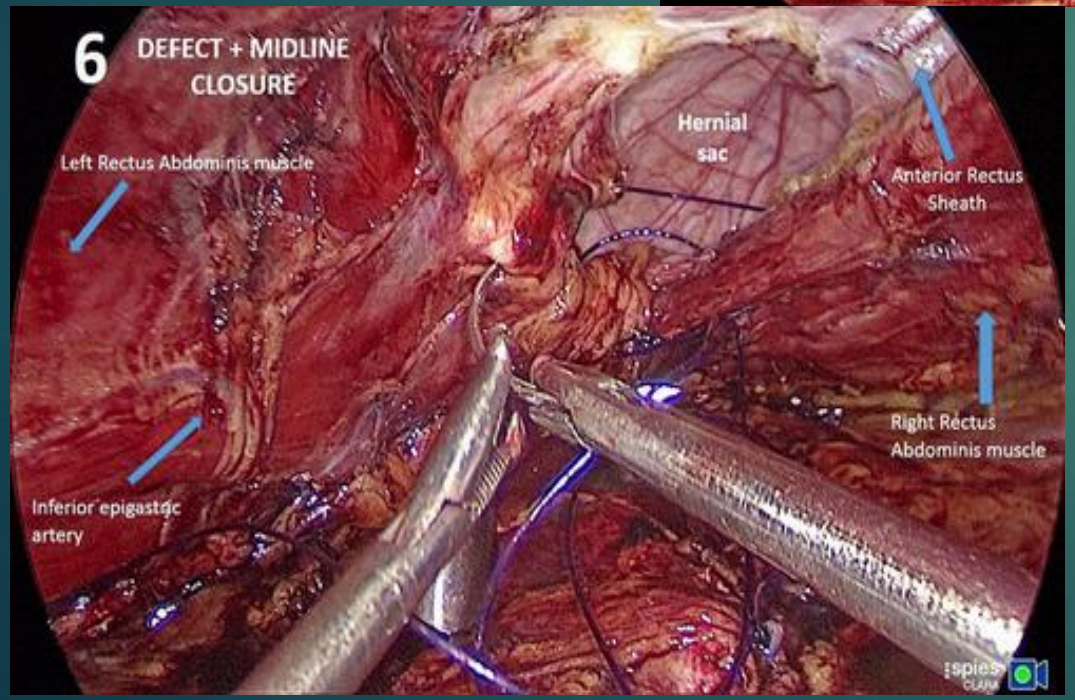
(a) Closure of linea alba. Rectus abdominis are marked with white arrows (b) closure of posterior rectus sheath

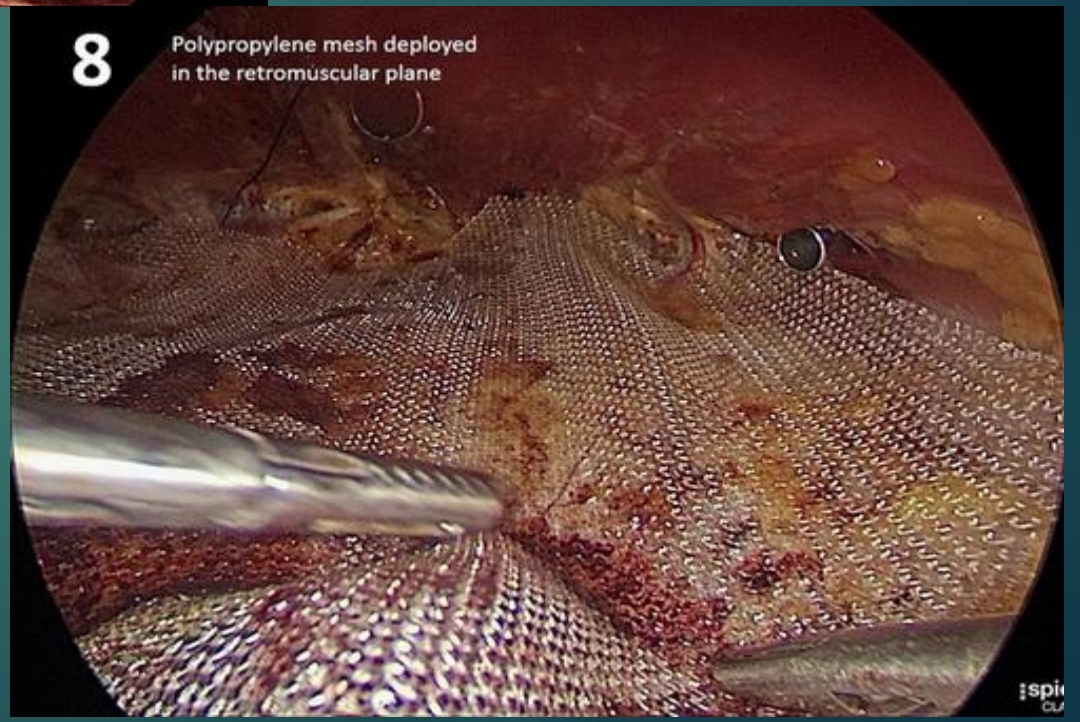
Laparoscopic Trans-Abdominal Retromuscular (TARM) Repair

- Following adhesiolysis and decrease of the hernial sac's contents, the defect was evaluated. A transverse incision of 6-8 cm was made on the peritoneum and posterior rectus sheath, which are beneath the rectus abdominis muscle, approximately 4-6 cm in front of the defect, using harmonic.

- A flap of the peritoneum-posterior rectus sheath was raised to create the retromuscular gap, 8 cm beyond the hernial defect. A running suture of No. 1 polydioxanone (PDS) was used for midline closure, going through the Linea Alba, anterior rectus sheath, and rectus abdominis muscles. In the retromuscular space, a medium-weight microporous PPM with a broad overlap was parked. Using No. 0 PDS, the hernial defect and first P-PRS incision were closed.


2
Retromuscular space
Linea Alba
Left Rectus Abdominis muscle
Right Rectus Abdominis muscle
Hernial defect
Linea Semilunaris
Peritoneum + Posterior Rectus sheath flap

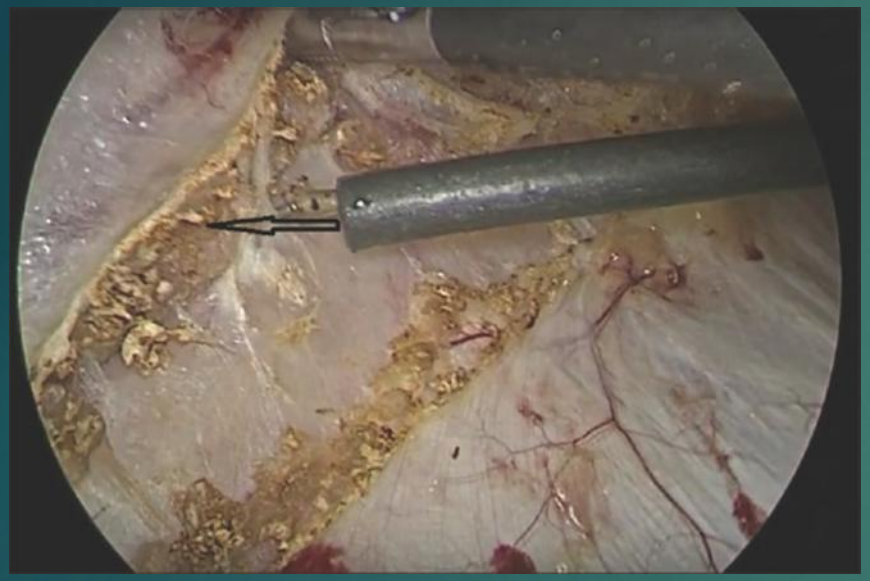

6
DEFECT + MIDLINE CLOSURE
Hernial sac
Left Rectus Abdominis muscle
Anterior Rectus Sheath
Right Rectus Abdominis muscle
Inferior epigastric artery


8
Polypropylene mesh deployed in the retromuscular plane

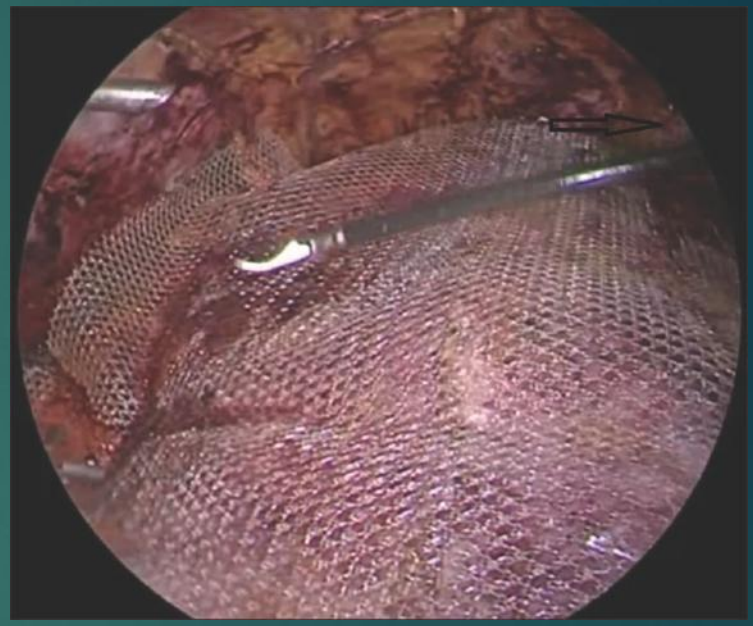
TAR-LAPAROSCOPIC TRANSVERSUS ABDOMINIS RELEASE

- For Bigger defects where the primary closure could not be obtained a TRANSVERSUS ABDOMINIS RELEASE is done as a extension of POSTERIOR COMPONENT SEPARATION.
- The retrorectus plane develops and the posterior rectus sheath is dissected. A wide plane that stretches from the central tendon of the diaphragm superiorly to the space of Retzius inferiorly and laterally to the retro-peritoneum is exposed by releasing the transversus abdominis medial to the linea semilunaris in a variation of the Rives-Stoppa procedure.

Extended Totally Extraperitoneal Repair (eTEP) WITH TAR



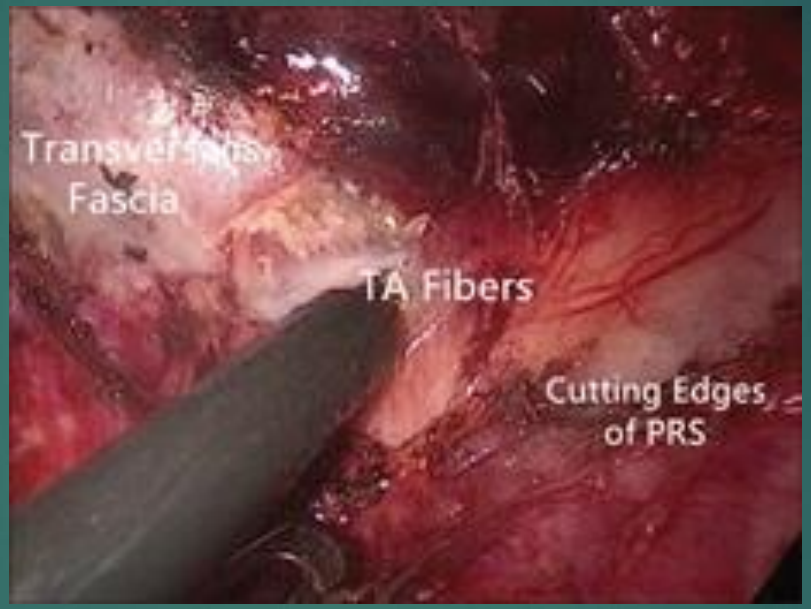
Transversus abdominis release. TA fibres are marked with black arrow



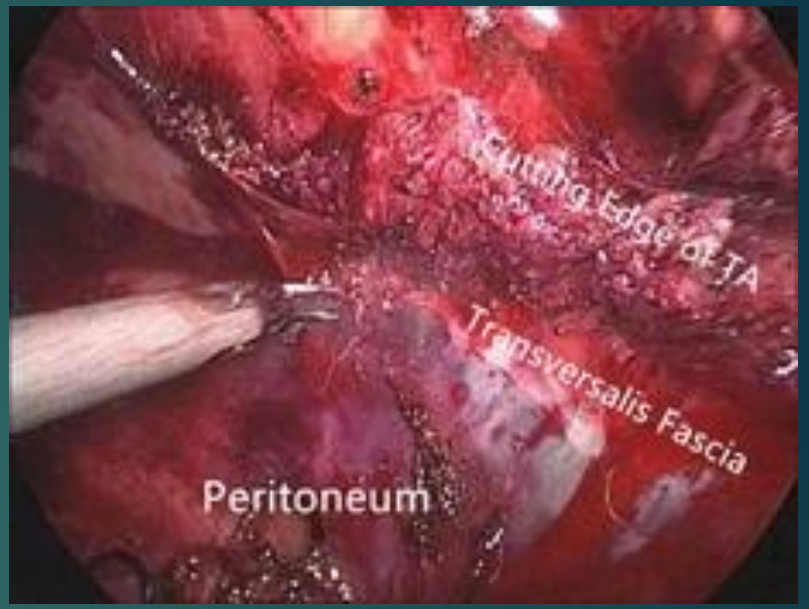
Mesh placement

TAR-LAPAROSCOPIC TRANSVERSUS ABDOMINIS RELEASE

Incision of the right posterior rectus sheath

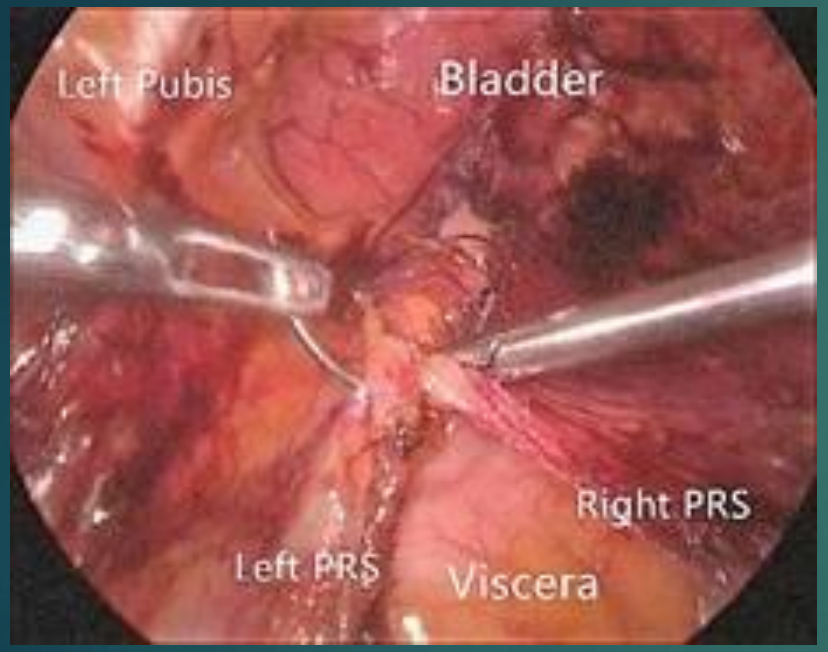


Transversus abdominis release manipulation

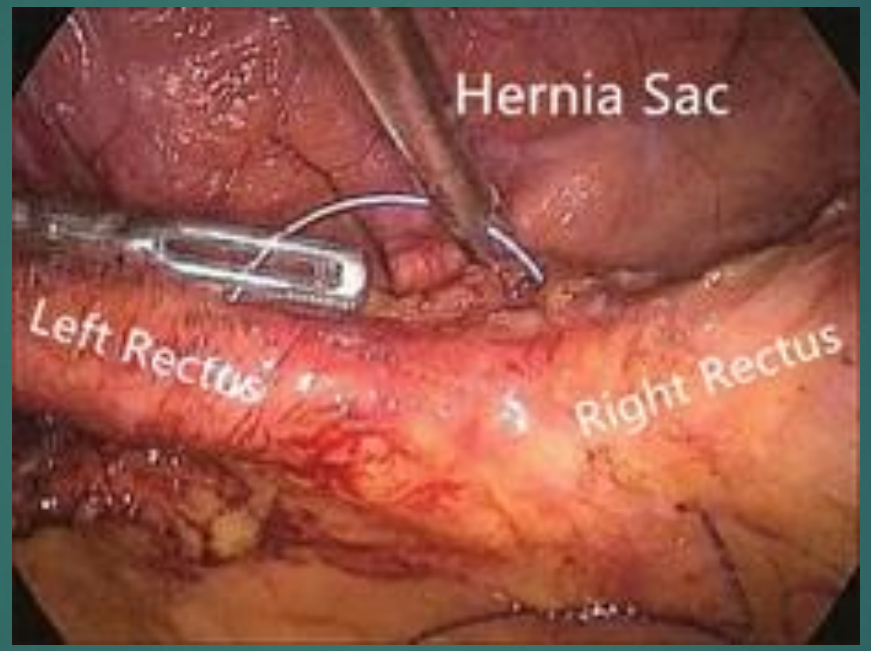


Development of the lateral preperitoneal space

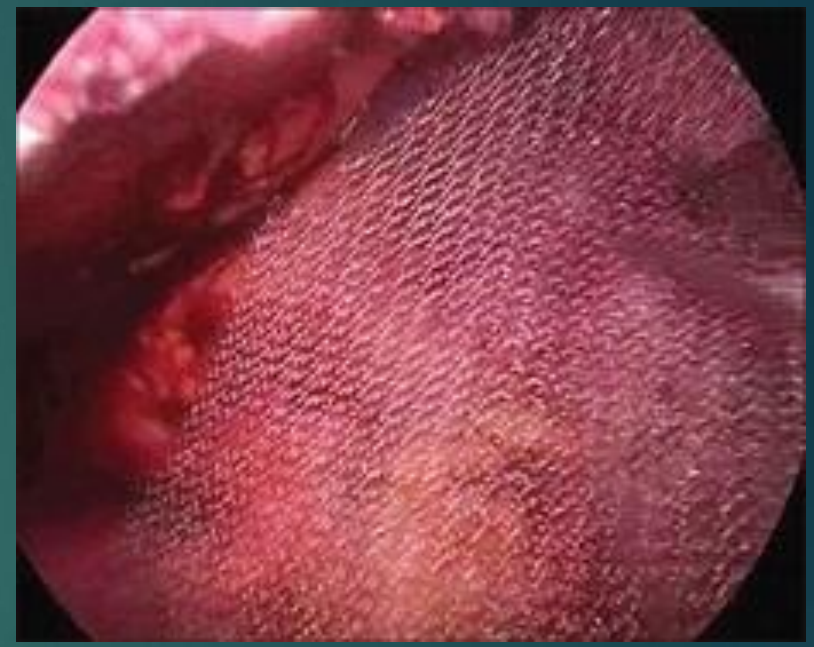
TAR-LAPAROSCOPIC TRANSVERSUS ABDOMINIS



Closure of the posterior rectus sheath



Closure of the anterior defect



Placement of the wide mesh

LENGTH ACHIEVED IN TAR TECHHNIQUE

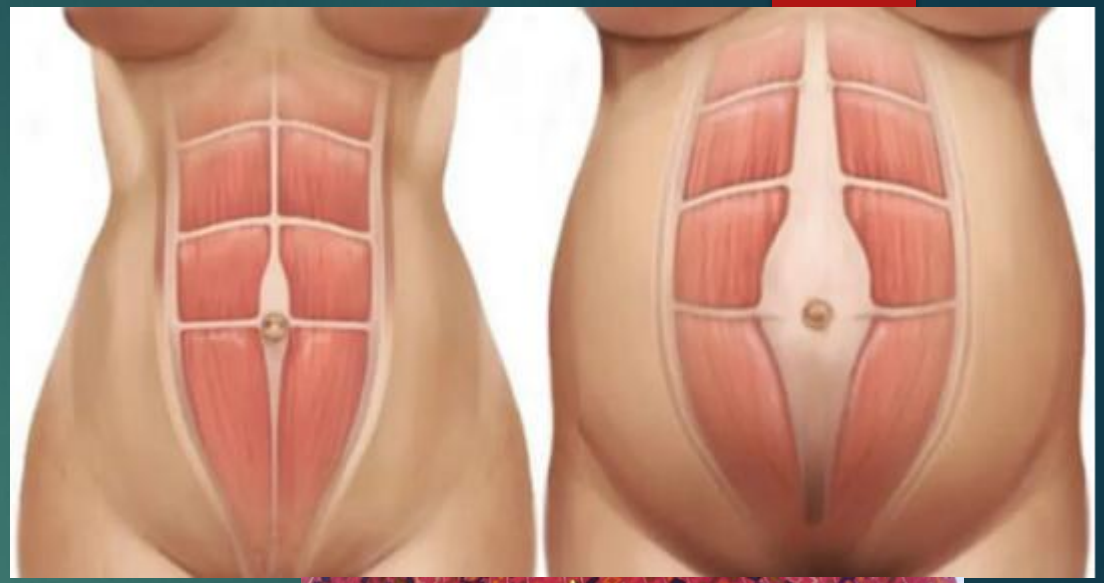
- General guidelines on the amount of extra length that can be achieved with the TAR technique:

- - Minimum extra length: 2-3 cm (0.8-1.2 inches) beyond the hernia defect
- - Recommended extra length: 4-6 cm (1.6-2.4 inches) beyond the hernia defect
- - Optimal extra length: 6-8 cm (2.4-3.2 inches) beyond the hernia defect

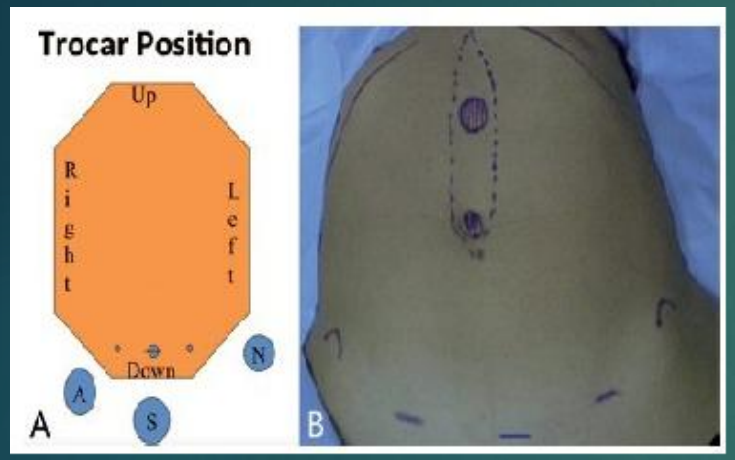
DIVARICATION OF RECTI

- Diastasis recti (also known as rectus divarication or abdominal separation) a gap (usually greater than 2.5cm) between the two sides of the rectus abdominis muscle.

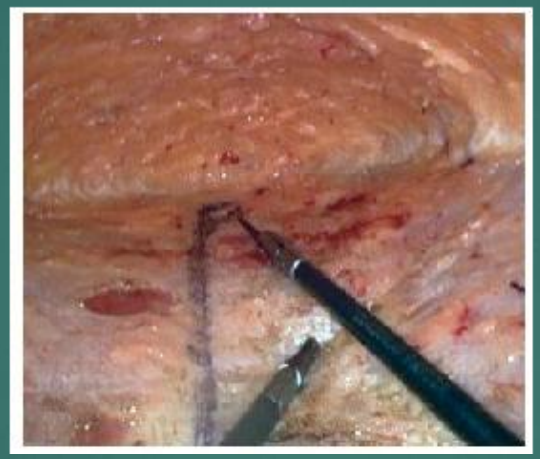
- The distance between the right and left rectus abdominis muscles is created by the stretching of the linea alba, a connective collagen sheath



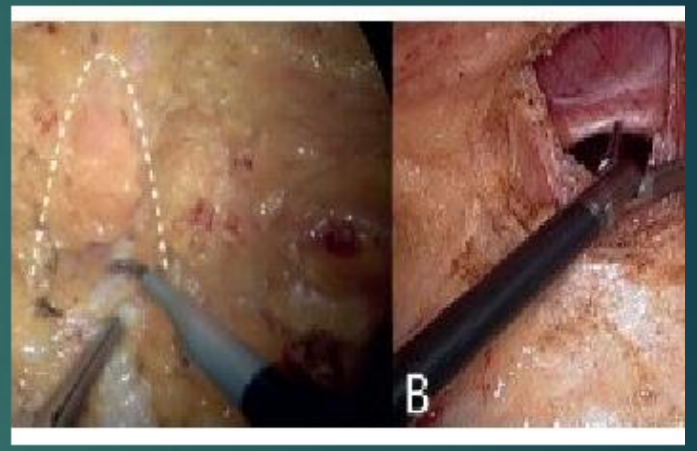
SUBCUTANEOUS ONLAY LAPAROSCOPIC APPROACH (SCOLA) RECTUS ABDOMINIS DIASTASIS



The positioning of the surgical team and positioning of the portals (S - surgeon; A - assistant); B) photo with a representative picture of the main hernial defects (umbilical and epigastric) and the DMRA and positioning of the portals

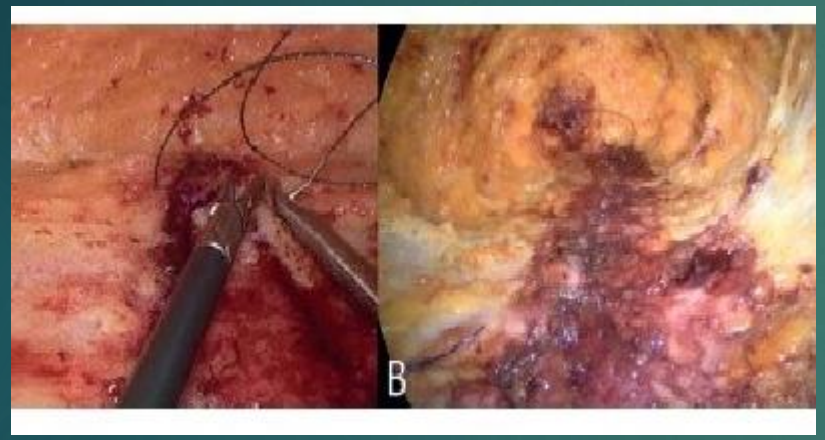


Superior dissection until subcostal region and lateral extension

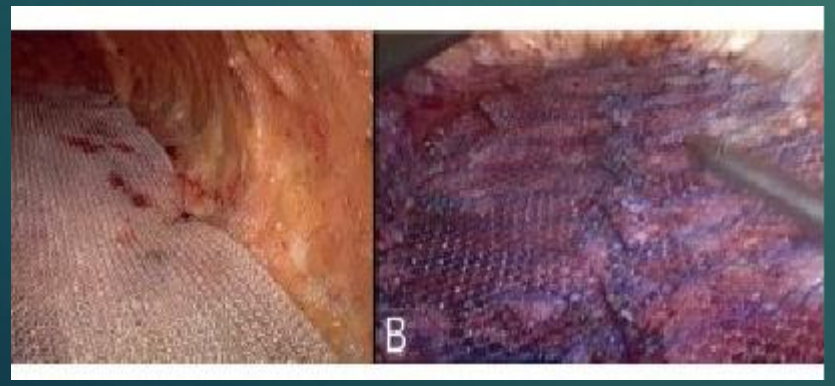


A) Hernia sac projection (dotted line); B) dissection/ressection of the hernia sac and its content

Full dissection; B) diastasis marking (blue) e ruler measurements



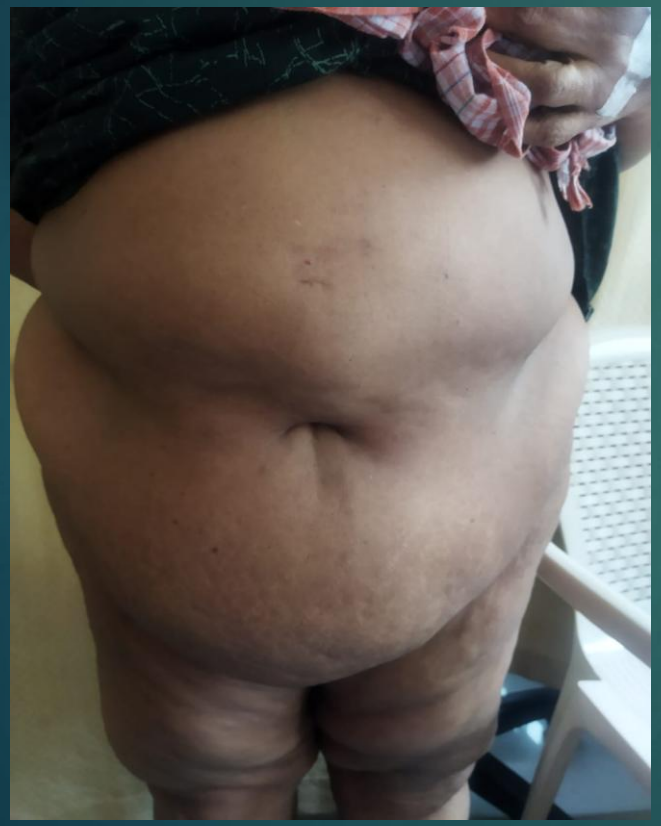
DMRA plication

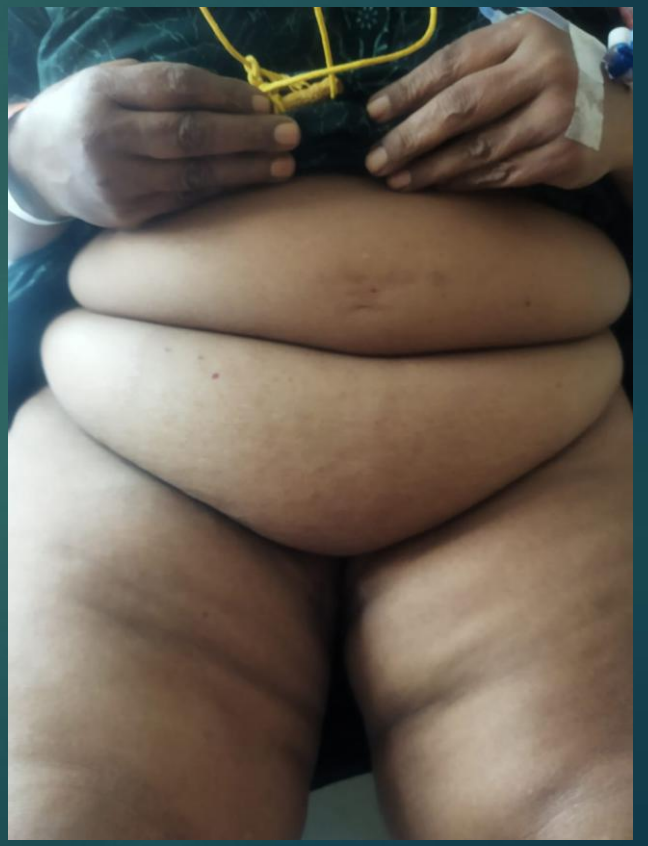


Mesh convering DMRA plication in a pre-aponerotic position (onlay)

PENDULOUS ABDOMEN

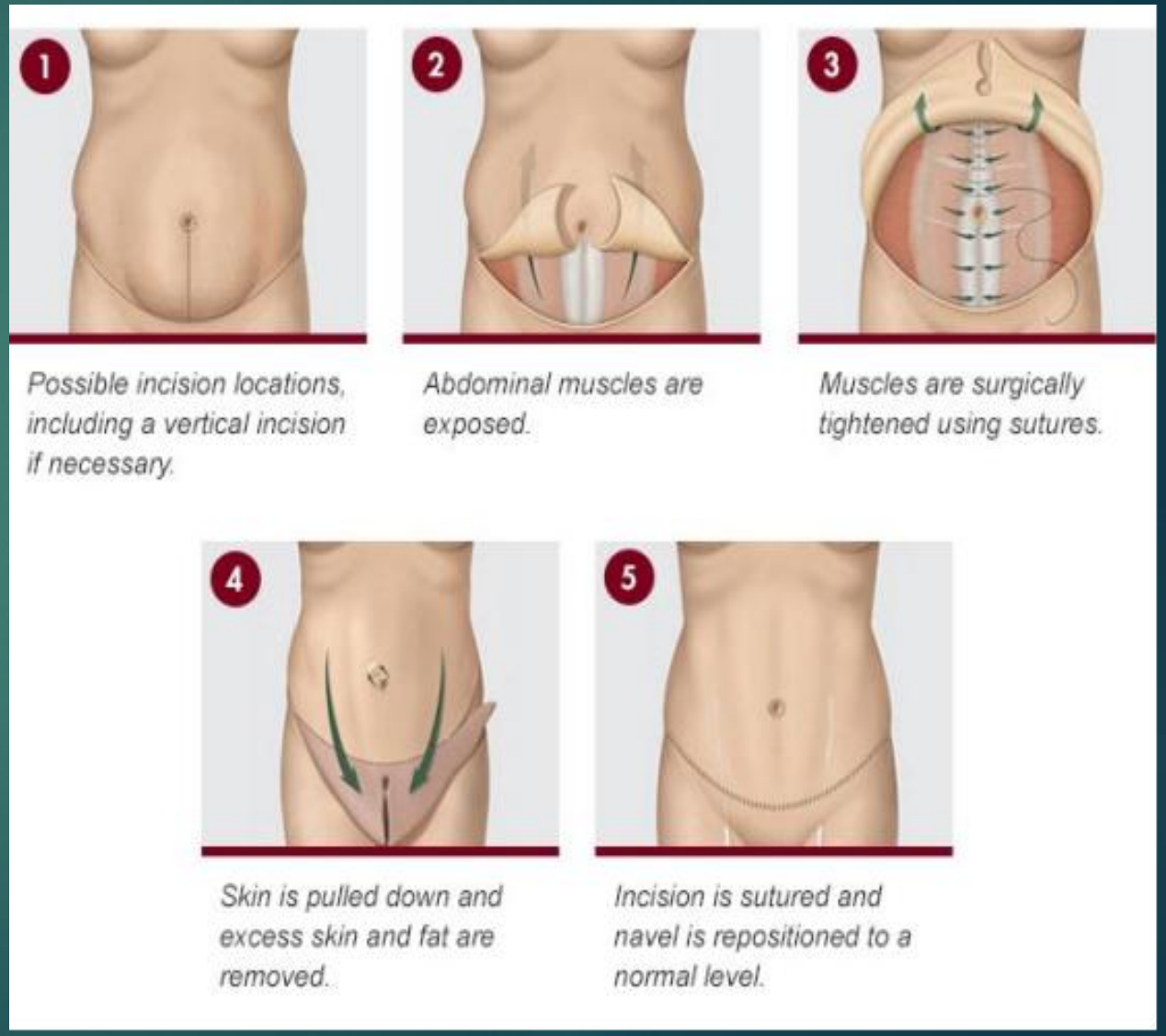
- Condition where the abnormally relaxed anterior wall of the abdomen hangs over the pubis.





ABDOMINOPLASTY

- Abdominoplasty or a 'tummy tuck' is cosmetic or reconstructive surgery. It is used to tighten muscles that have become loose or split following pregnancy, or to remove fat and extra loose skin from the abdomen after massive weight loss



BEFORE ABDOMINOPLASTY

AFTER ABDOMINOPLASTY

COMPLEX HERNIA

- Complex hernias occur when there's a large hole and the abdominal wall can't do its job. Organs or tissue spill out into the abdominal cavity causing a bulge resembling a pregnant belly in some people.

LOSS OF DOMAIN

- A hernia is said to be complex when operative repair or management of the issue is not easily attainable.

- A loss of domain occurs when the hernia is large enough (or the outpouching is severe enough) that it seems like there are more viscera or organs outside their boundaries than there are inside, i.e, the majority of the regional tissue/organs have out bulged from their usual area/compartment and thus their “domain” has been lost.

BOTOX

- BTX is a neurotoxin resulting in temporary flaccid muscle paralysis without systemic effects.
- Applying this neurotoxin to the lateral muscle complex (Internal

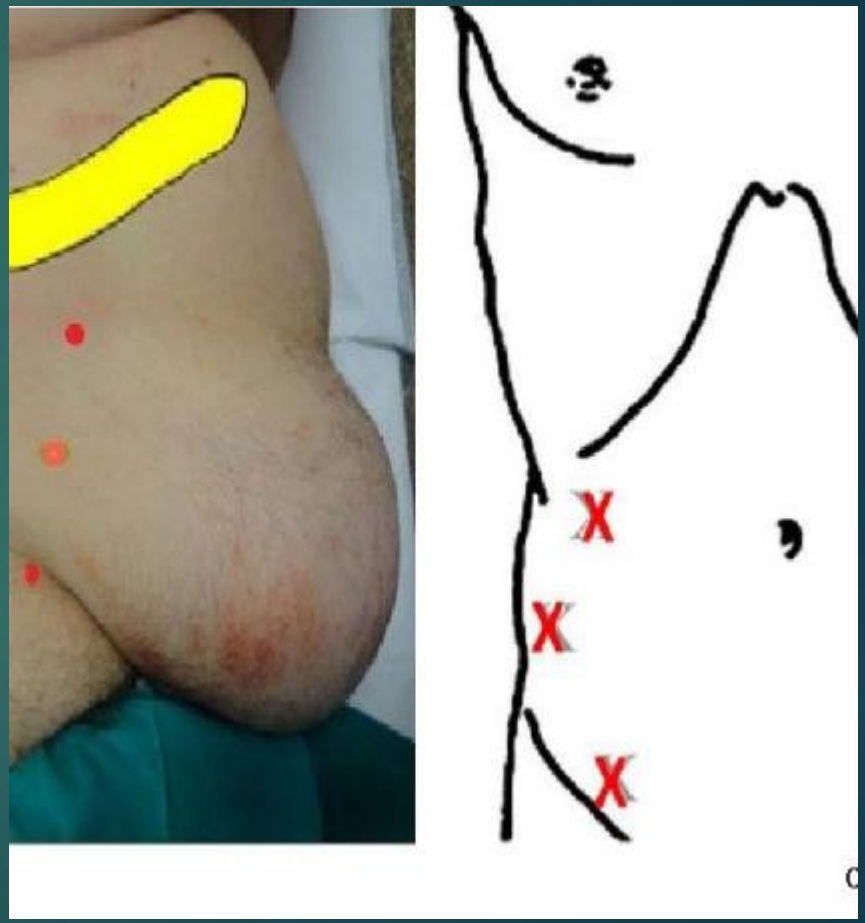
oblique, External oblique and Transversus Abdominus) can paralyse and subsequently elongate the muscle complex; facilitating medialisation of the rectus muscles and abdominal wall closure.

- DOSAGE- 200 TO 500 IU and it is equally divided in 3and 5 injection sites.
- TIMING- Maxmium effect is achieved around 3-4 weeks after injection.

SITES OF BOTOX

- 5 points of infiltration are defined:

- 2 on the axillary midline, at equidistant points between the rib edge and the iliac crest, as well as 3 more points on the anterior axillary and mid-clavicular line between the rib edge and superior iliac crest.



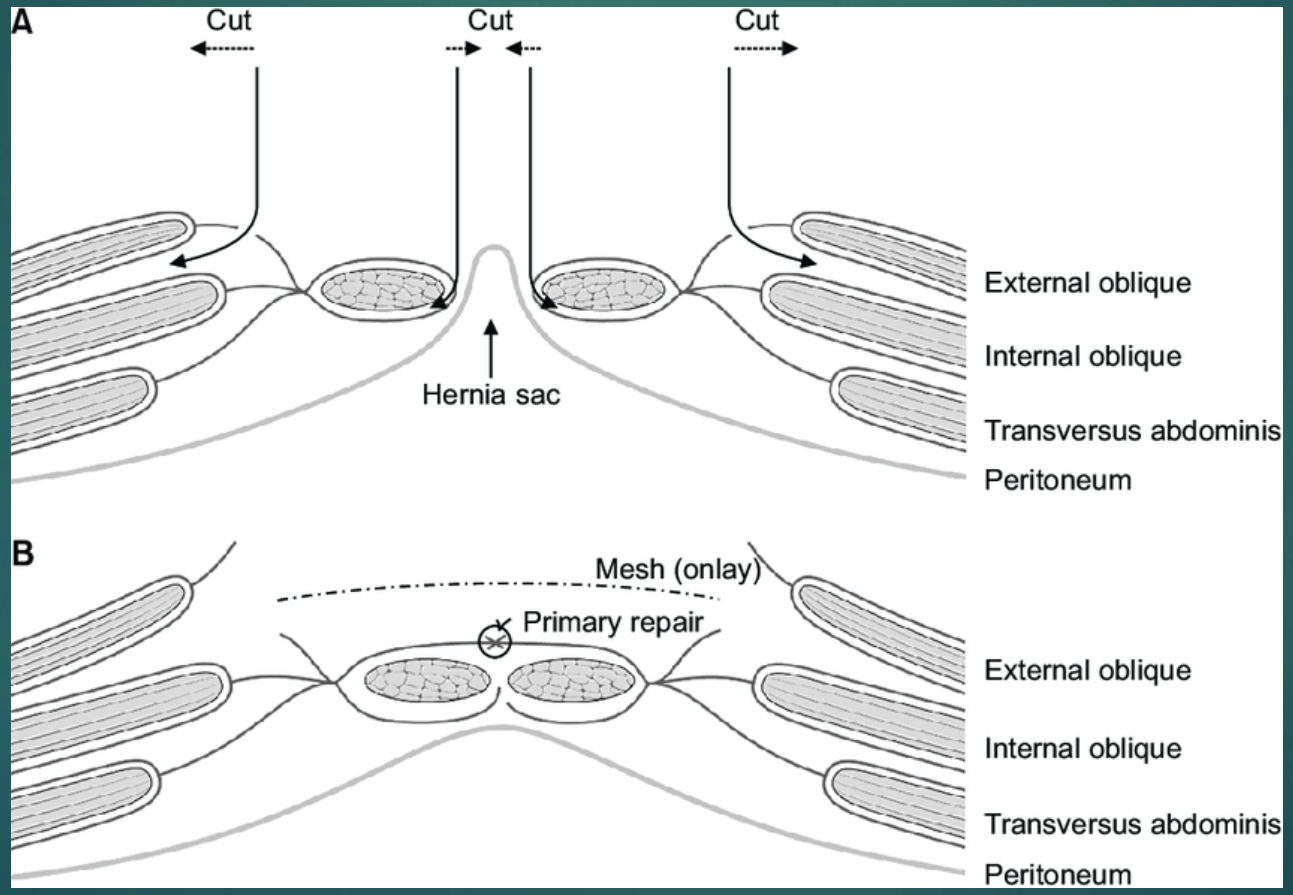
PREOPERATIVE PROGRESSIVE PNEUMOPERITONEUM

- Preoperative progressive pneumoperitoneum is a technique used to prepare patients for Laparoscopic or open Surgery,particularly for Hernia Repair or Peritoneal Reconstruction.
- PPP is typically performed in patients with complex hernia,multiple previous surgeries or significant peritoneal scarring.This technique allows surgeons to operate in a more controlled and safer environment,which can lead to better patient outcomes.
- Total volume -10-25L
- Maintaining the PPP ranges from 7 to 15 days in inguinal hernias and 11 to 30 days in ventral hernias.

COMPONENT SEPARATION

- Component separation is one method that can help with the management of the complicated hernias and facilitate their challenging repair.
- It is especially useful in cases when there is not enough muscle wall to bring the hernia back together during conventional surgery.
- The process of component separation entails extending and separating certain layers of the abdominal wall muscle in order to move the muscles on the right and left sides closer to the midline for adequate closure.

COMPONENT SEPARATION



ANTERIOR COMPONENT SEPARATION TECHNIQUE

- In order to be able to further medialize the rectus complex, they found it necessary to divide the external oblique fascia 2-cm lateral to the linea semilunaris from the costal margin to the inguinal ligament and then elevate the external oblique muscle off the internal oblique. Additionally, they released posterior rectus sheath. The technique avoids injury to the thoracoabdominal neurovascular bundles, which lie in the plane between the internal oblique and the transversus abdominis muscles. With this release, the rectus complex could be advanced 3-cm at the epigastrium, 5-cm in the middle and 2-cm inferiorly on each side, thereby allowing for bilateral medial migration of up to 10-cm in the midline. This technique gave surgeons the ability to achieve primary fascial closure in situations where bridged repair had been the only option. Furthermore, the repair is generally reinforced by the placement of mesh, often in the retrorectus plane.

POSTERIOR COMPONENT SEPARATION

- Posterior Component Separation (PCS) is another surgical technique used to repair complex ventral hernias, similar to Anterior Component Separation (ACS). However, instead of separating the abdominal muscles from the front (anteriorly), the surgeon separates the posterior (rear) components of the abdominal wall.
- In PCS, the surgeon:1. Enters the space between the posterior layer of the abdominal wall (transversalis fascia) and the peritoneum (a layer surrounding the abdominal organs)2. Separates the posterior components, including the transversus abdominis muscle and the peritoneum3. Repairs the hernia defect from the inside (intraperitoneally)4. Reinforces the abdominal wall with mesh, if necessary

POSTERIOR COMPONENT SEPARATION WITH TAR

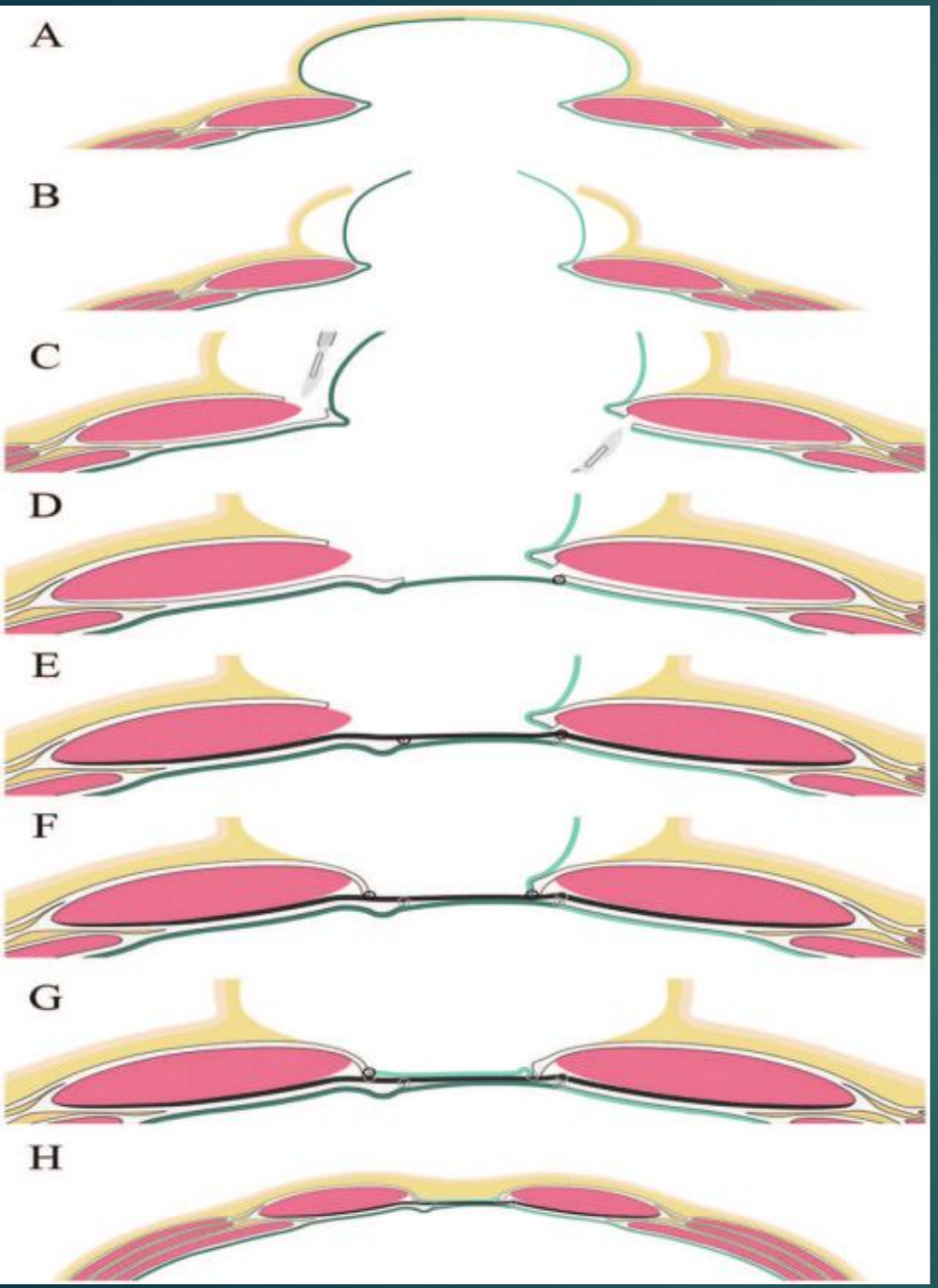
- The retrorectus plane develops and the posterior rectus sheath is dissected. A wide plane that stretches from the central tendon of the diaphragm superiorly to the space of Retzius inferiorly and laterally to the retro-peritoneum is exposed by releasing the transversus abdominis medial to the linea semilunaris in a variation of the Rives-Stoppa procedure.
- The neurovascular bundles that innervate the medial abdominal wall are preserved as a result. Above the posterior layer, mesh is positioned in a sublay manner. The vast majority of patients undergo reconstruction of the linea alba, resulting in a functioning abdominal wall reinforced with broad mesh placement.

PERITONEAL FLAP HERNIOPLASTY

- Peritoneal flap hernioplasty is a surgical technique used to repair hernias, particularly incisional hernias. It involves creating a flap of peritoneum (the lining of the abdominal cavity) to reinforce the hernia repair.

Peritoneal flap hernioplasty offers several benefits, including:

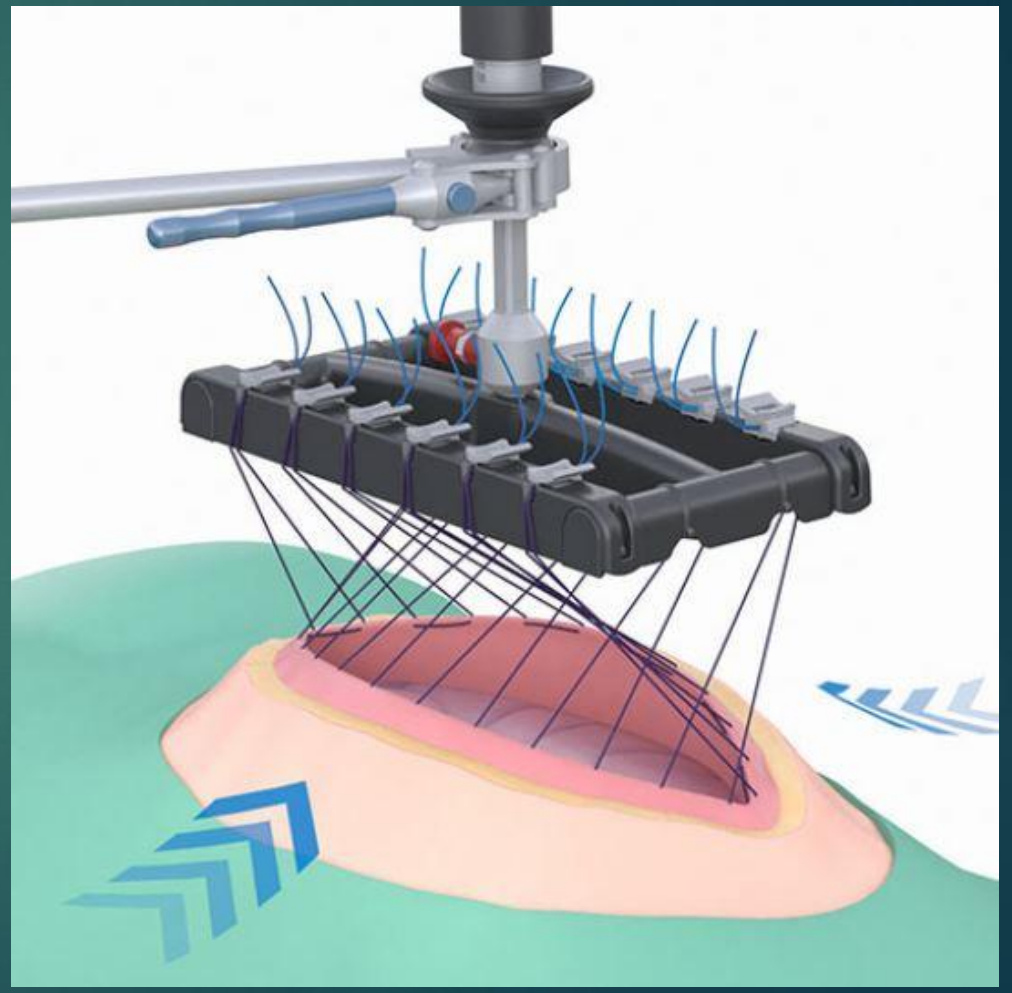
- - Reduced risk of mesh migration or displacement
- - Improved mesh integration and fixation
- - Enhanced abdominal wall reconstruction
- - Potential for lower recurrence rates



- (A) the initial incisional hernia (IH); peritoneum and the hernial sac is colored dark green (left side) and light green (right side), respectively;
- (B) the skin is incised, and the old scar and redundant skin is excised. The hernial sac is isolated and entered in the midline;
- (C) the retromuscular space is entered through the anterior fascial sheath on the left side, and through the posterior sheath on the right, creating one posterior and one anterior flap;
- (D) the abdominal cavity is closed by suturing the posterior flap to the posterior rectus fascia on the right side. Before this is made, the rectus muscles are approximated as much as possible;
- (E) the retromuscular mesh is positioned and fixated by suture to the fascial edge; (F) the anterior fascial edges are sutured to the mesh as close to the midline as possible;
- (G) the anterior flap is used to cover the mesh and sutured to the fascial edge on the left side; and (H) subcutaneous tissue and skin is closed.

FASCIOTENS

- The fasciotens abdomen and hernia (Fasciotens) devices are used for complex hernias or open abdomen treatment (laparotomy) in which the gut and other intraperitoneal organs are exposed. They use controlled vertical traction to aid abdominal wall closure. The technology prevents retraction of the fascia and abdominal wall during open abdomen treatment and allows the surgeon to 'stretch' the abdominal wall in a controlled way.



General guidelines on the amount of extra length that can be achieved with the **FASCIOTENS** technique:

- - Minimum extra length: 5-7 cm (2-3 inches) beyond the hernia defect
- - Recommended extra length: 8-10 cm (3.2-4 inches) beyond the hernia defect
- - Optimal extra length: 10-12 cm (4-4.8 inches) beyond the hernia defect

THANK YOU