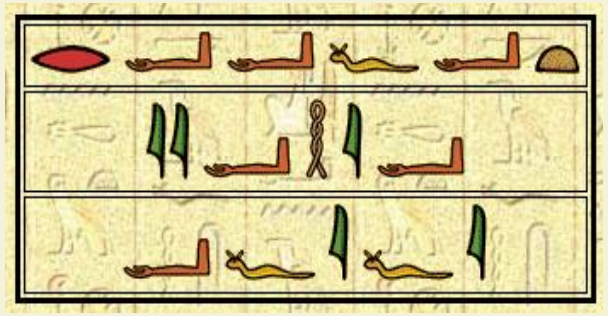
Complex ventral hernia repair

CST

Raafat Y. Afifi



Professor of Surgery

Faculty of Medicine, Cairo University

Objectives

- Introduction.
- Abdominal wall anatomy, biomechanics and philosophy of repair.
- Pattern of blood supply and preservation of skin flap viability.
- Component Separation Technique.
- Alternative for reduction of recurrence (ADMIR).
- Conclusion.

In 1951 **Albanese** et al. designed a model of component separation of the abdominal wall, later elegantly refined by Ramirez et al. in 1990 as part of a study on human cadavers.

Albanes et al. 1951 Rev Asoc Med Argent 65 (709-710):376 - 378.

Ramirez et al. 1990 Plast Reconstr Surg 86 (3):519 - 526.

- Anterior components separation (ACS) creates large lipo-cutaneous flaps to release the external oblique fascia often leading to major wound complications.

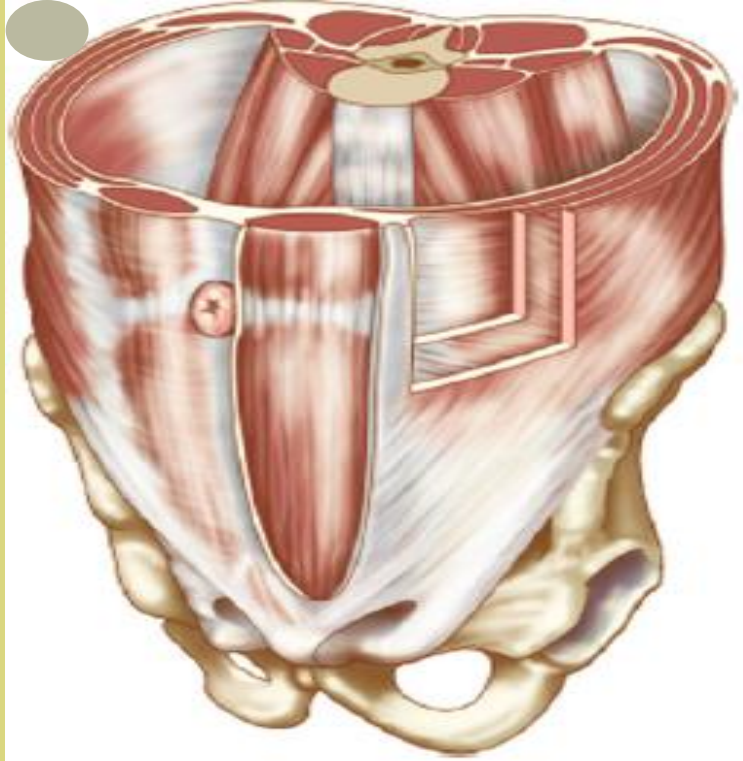
Ramirez et al. 1990 Plast Reconstr Surg 86 (3):519 - 526.

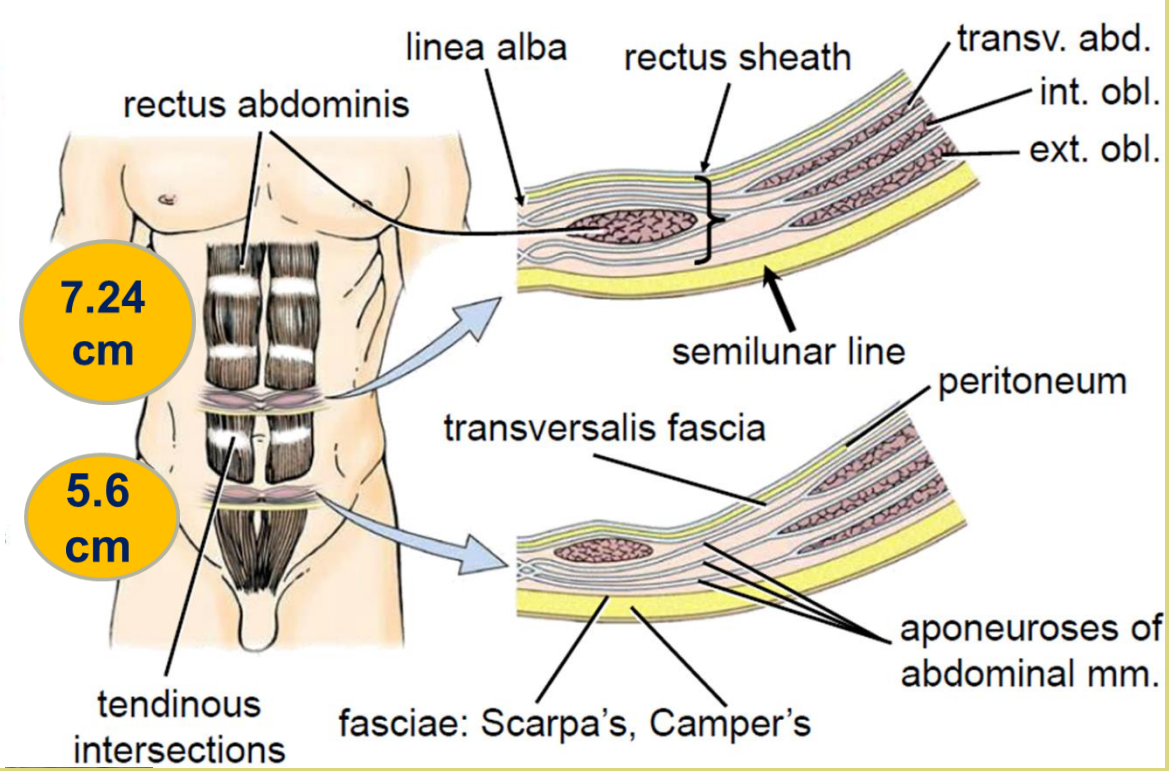
- Posterior components separation (PCS) involves the release of the posterior rectus sheath and transversus abdominis muscles.

Novitsky et al. 2012 Am J Surg 204 (5):709 - 716.

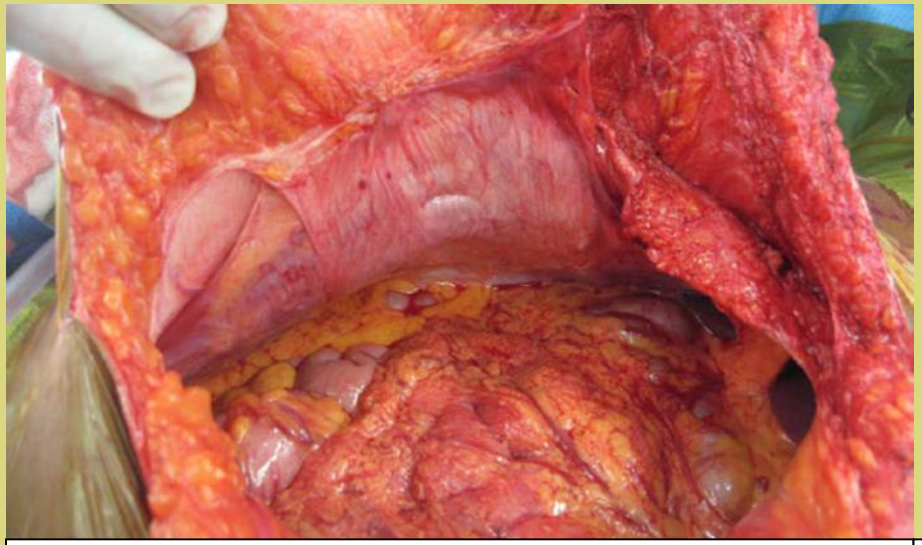
To date, the more common variations on the component separation theme are:

1. The open anterior approach (OAA),
2. The transversus abdominis release (TAR),
3. The laparoscopic anterior approach (LAA)
4. The open anterior perforator preserving approach (PPA)





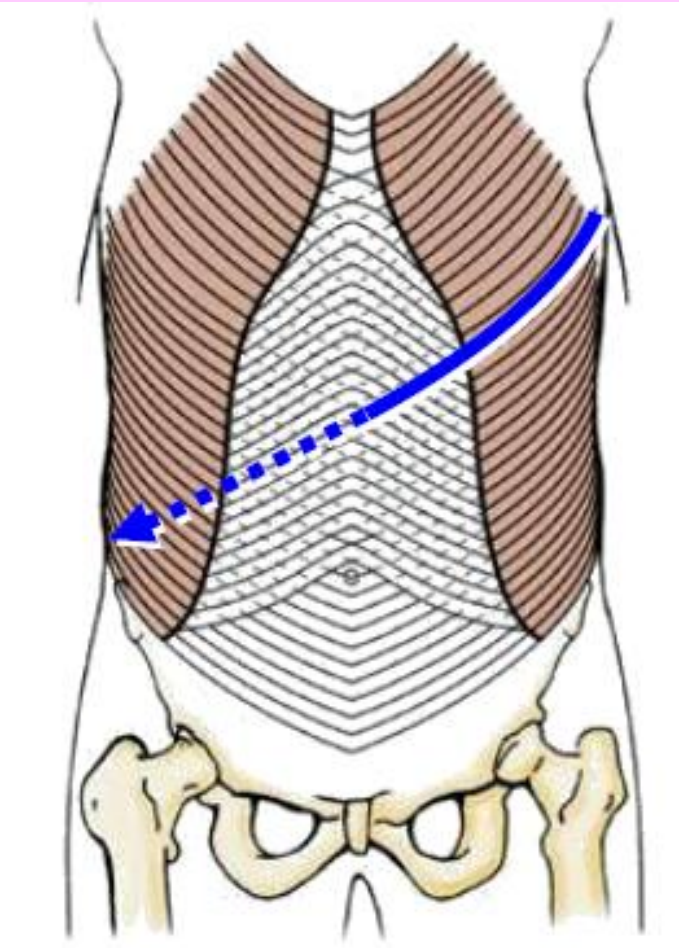
Rath AM et al (1997) Hernia; 1: 139 - 142

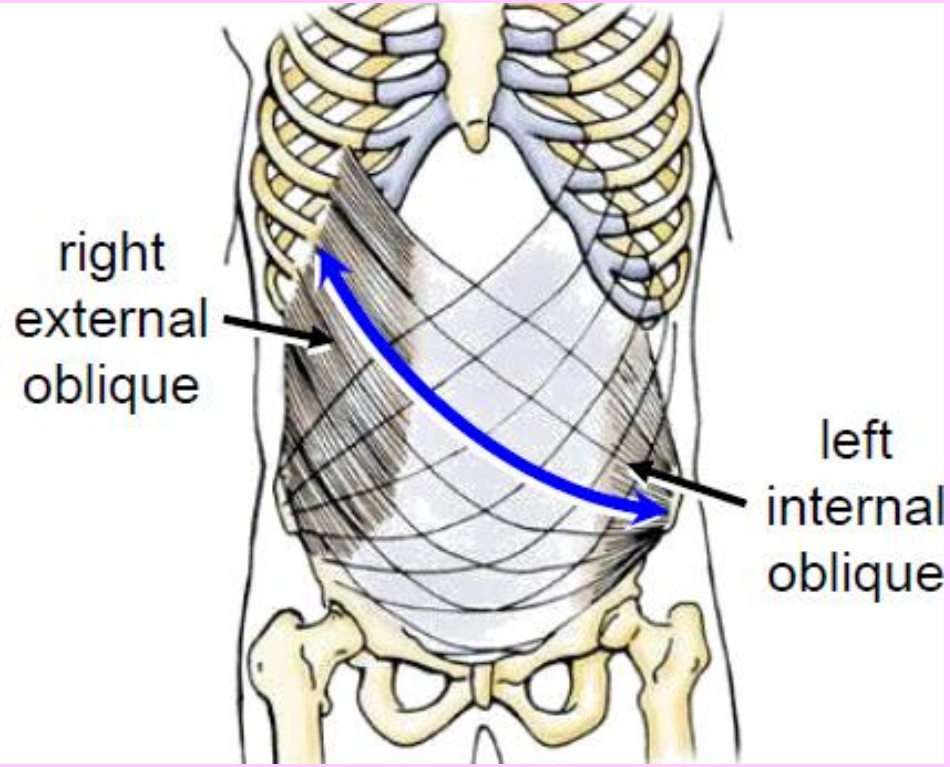


- The abdominal wall is a complex unit providing movement of the trunk and stabilizes the pelvis while walking.
- Provide protection of intra-peritoneal contents and contribution to vital functions including respiration, micturation, and defecation.

Johnson TG et al (2014) OA anatomy; 2: 1 - 7

Jensen KK et al (2014) Hernia; 18: 481 - 486

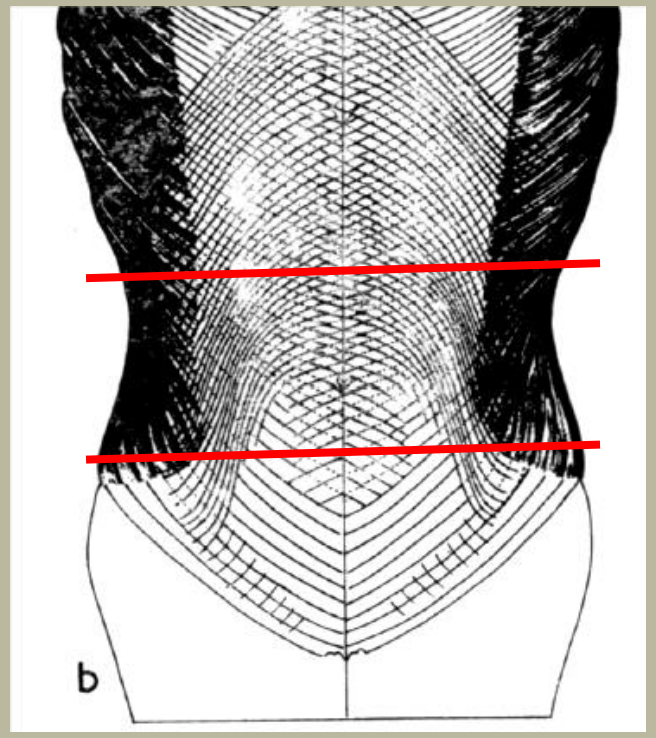


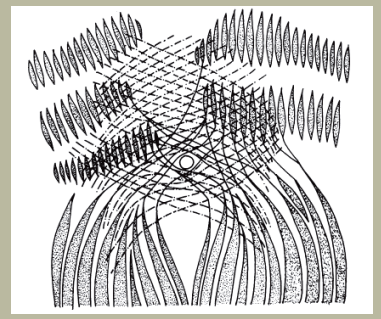


- The tendinous fibres of one side cross the median by passing through the midline aponeurotic linea alba.
- This digastric pattern of distribution ensures the perfectly harmonized function of the anterior abdominal wall musculature.

Omar M Askar (1979) Annals of Royal college of surgeons of England; 59: 313 – 321.

Epigastric Zone





The aponeurotic fibers take an oblique course, which allows stretch in the vertical direction and stretch in response to respiration (parachute).

Umbilical Zone

The aponeurotic fibers take an S shaped course, around the umbilical cord (**umbilical ring**) which allow stretch in transverse more than longitudinal direction.

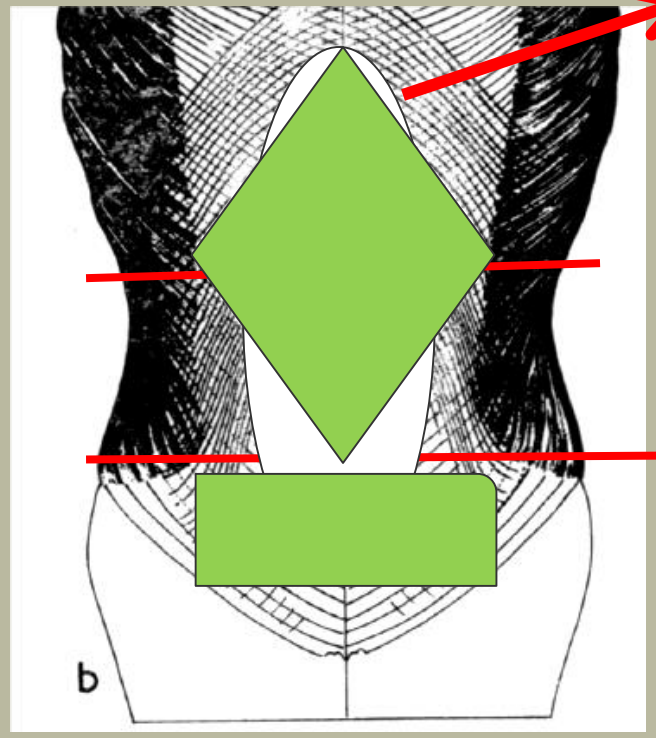
Hypogastric Zone

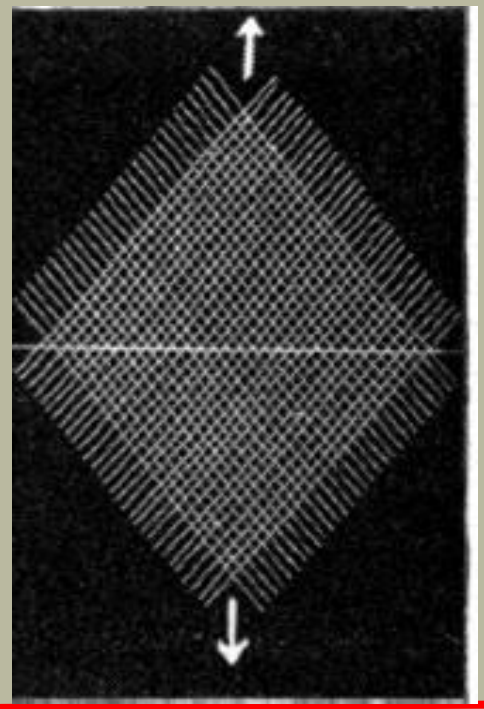
Most of the aponeurotic fibers escape forward and form the main constituent of the belly support mechanism.

Omar M Askar (1979) Annals of Royal college of surgeons of England; 59: 313 – 321.

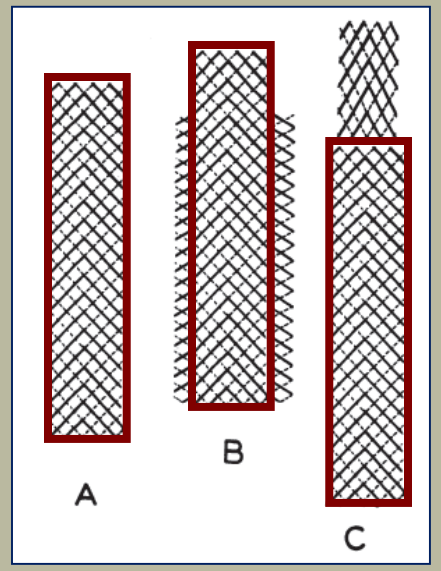
Epigastric Zone

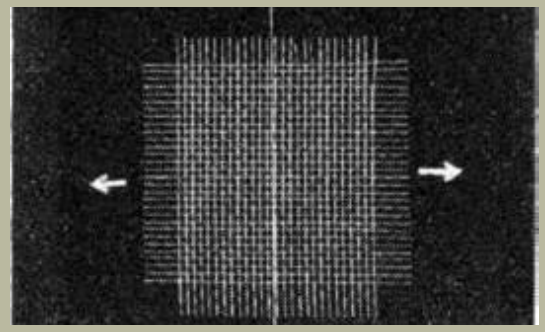
Aponeurotic Hernia





Umbilical Zone

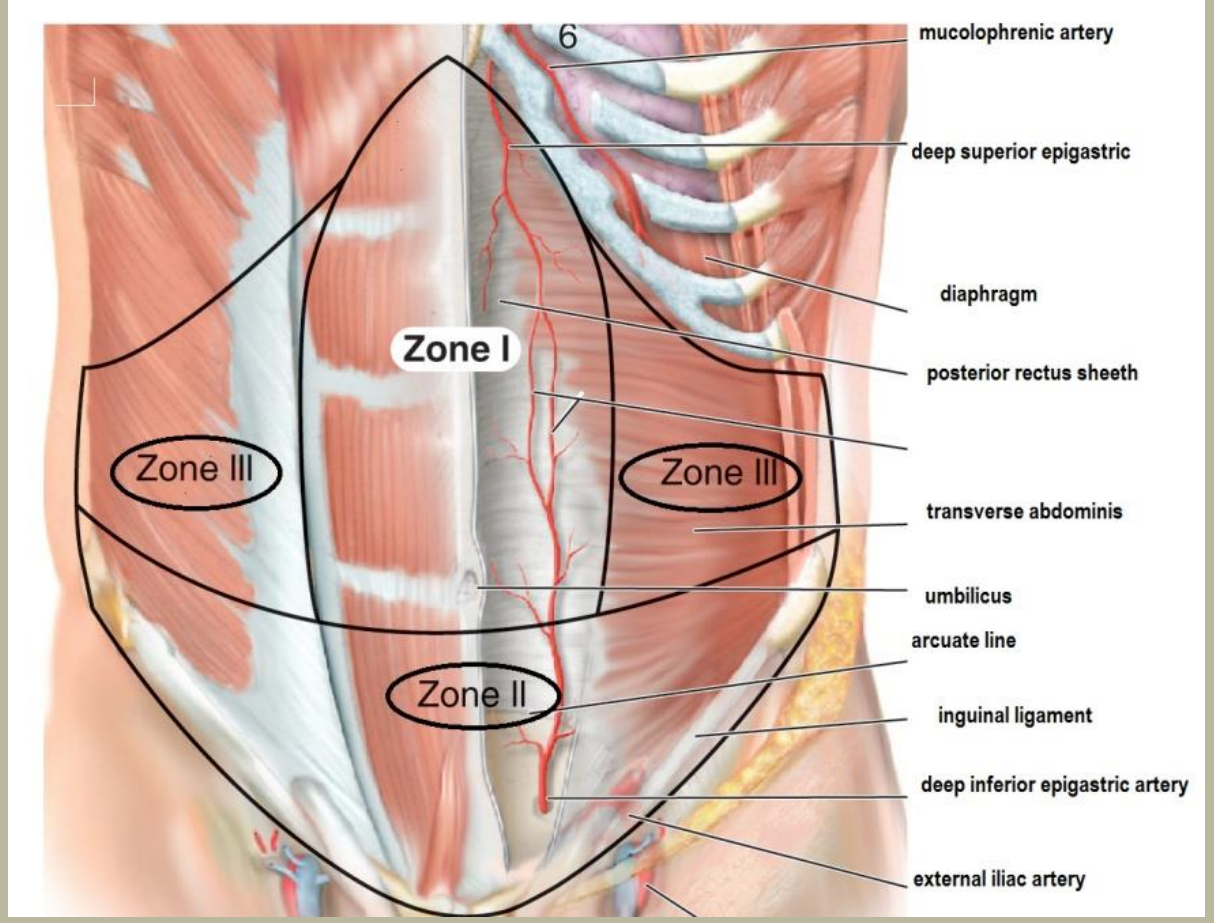




Hypogastric Zone

Omar M Askar (1979) Annals of Royal college of surgeons of England; 59: 313 – 321.

Blood Supply

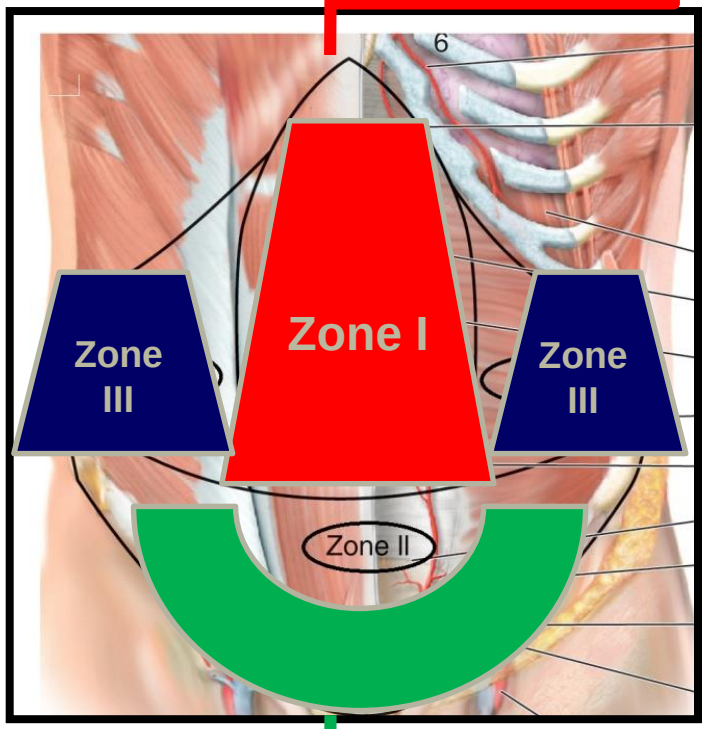


The anterolateral abdominal wall receives its blood supply from branches of the **subclavian**, **external iliac** and **femoral** arteries as well as intercostal and lumbar arteries directly from the **descending aorta**.

Johnson TG et al (2014) OA anatomy; 2: 1 - 7

Zone I

Bordered superiorly by the xiphoid process and medial costal margins, laterally by linea semilunaris and inferiorly by the inferior edge of the umbilicus

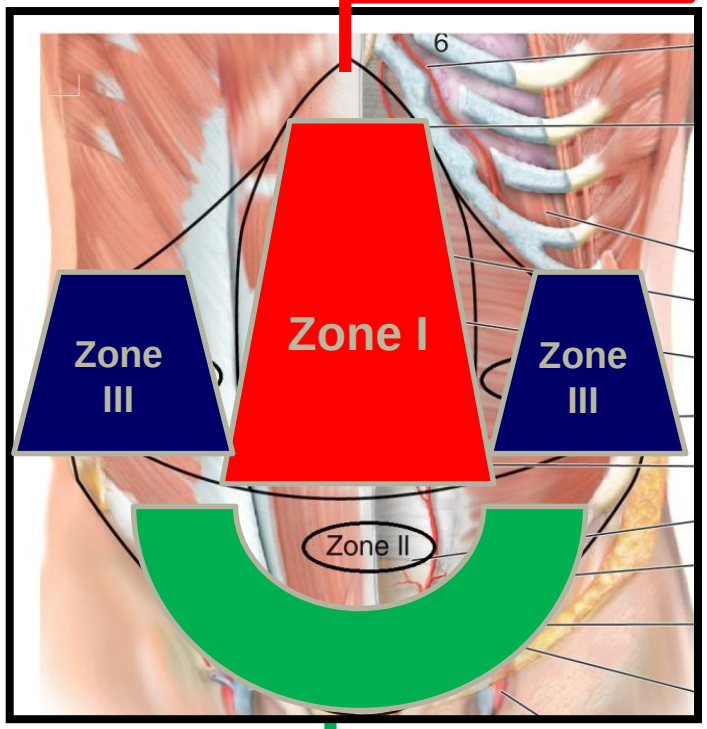


Zone III

Bordered superiorly by the costal margin, medially by the linea semilunaris and laterally by the mid-axillary line.

Zone II

Extends between the inferior border of the umbilicus to the mid-axillary line and down to the inferior edge of the abdominal cavity.



Zone I

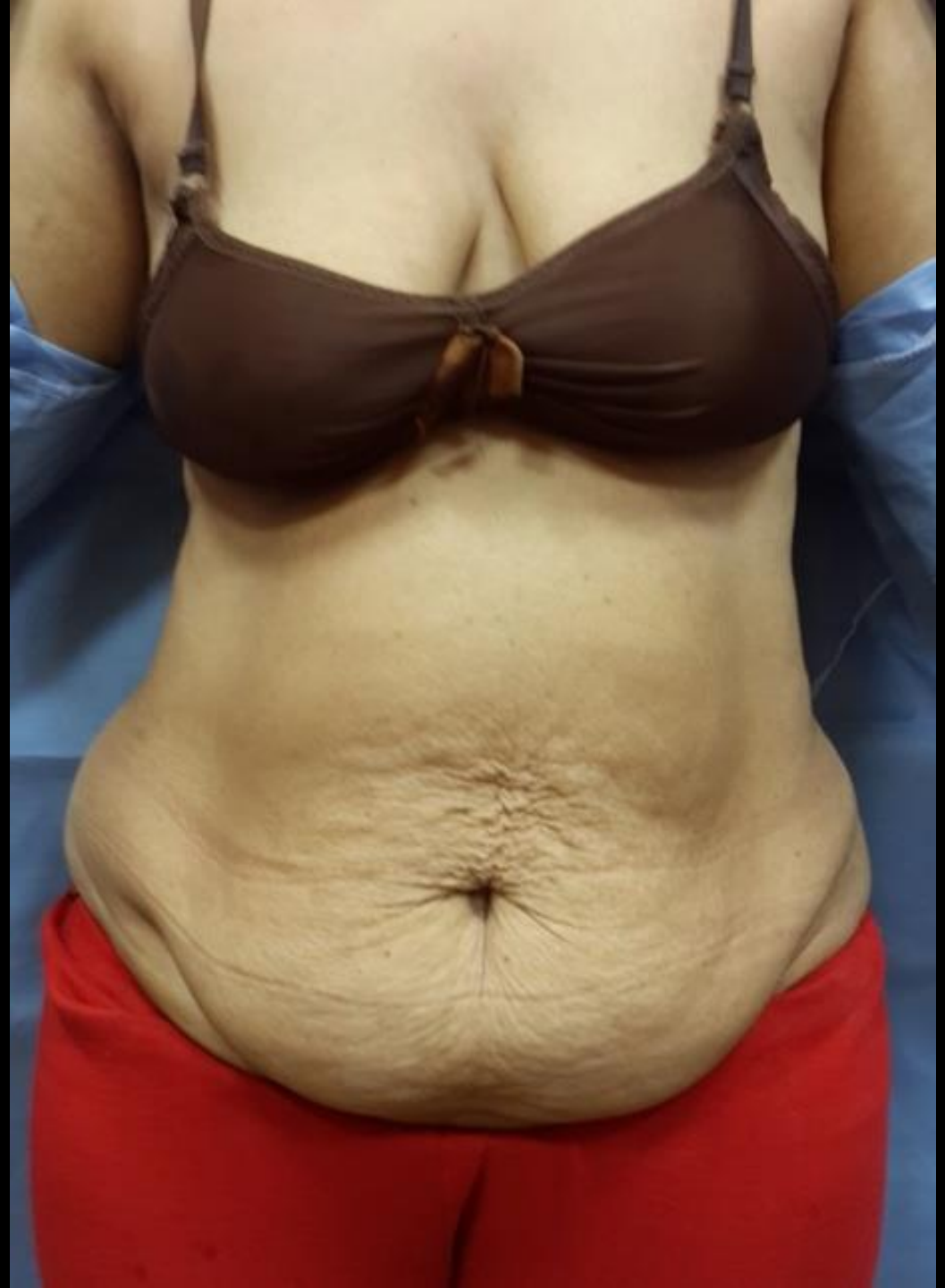
Deep superior epigastric artery.
Deep inferior epigastric artery.

Zone III

The musculophrenic artery.
Lumbar arteries.
Lower intercostal arteries.

Zone II

Superficial inferior epigastric a.
Superficial external pudendal a.
Superficial circumflex iliac a.







Complex Ventral Hernia

Ventral hernia

Develops anywhere in the anterior abdominal wall area and overlaps with umbilical and epigastric hernia.

1. *Divarication of the recti.*
2. *Fatty hernia of the linea alba.*
3. *Epigastric hernia.*
4. *Umbilical hernia.*
5. *Spigelian hernia.*
6. *Incisional hernia.*

Hernia (2014) 18:7–17
DOI 10.1007/s10029-013-1168-6

ORIGINAL ARTICLE

Criteria for definition of a complex abdominal wall hernia

N. J. Slater · A. Montgomery · F. Berrevoet · A. M. Carbonell · A. Chang · M. Franklin · K. W. Kercher · B. J. Lammers · E. Parra-Davilla · S. Roll · S. Towfigh · E. van Geffen · J. Conze · H. van Goor

Four criteria were created to define complex ventral hernia:

a) **The size and location** of hernia defect (above 10 cm in width with more than 20 % loss of domain).

b) **Contamination** and soft tissue condition.

c) Patient history and **risk factors** (recurrence and co-morbid conditions).

d) **Clinical scenario**, such as emergency operation with bowel resection.

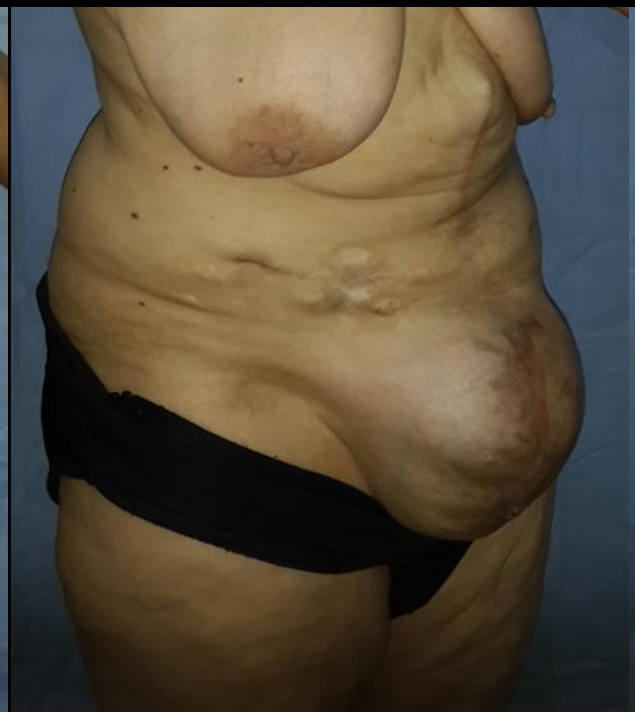
Slater N J et al (2014) Hernia; 18: 7 – 17.

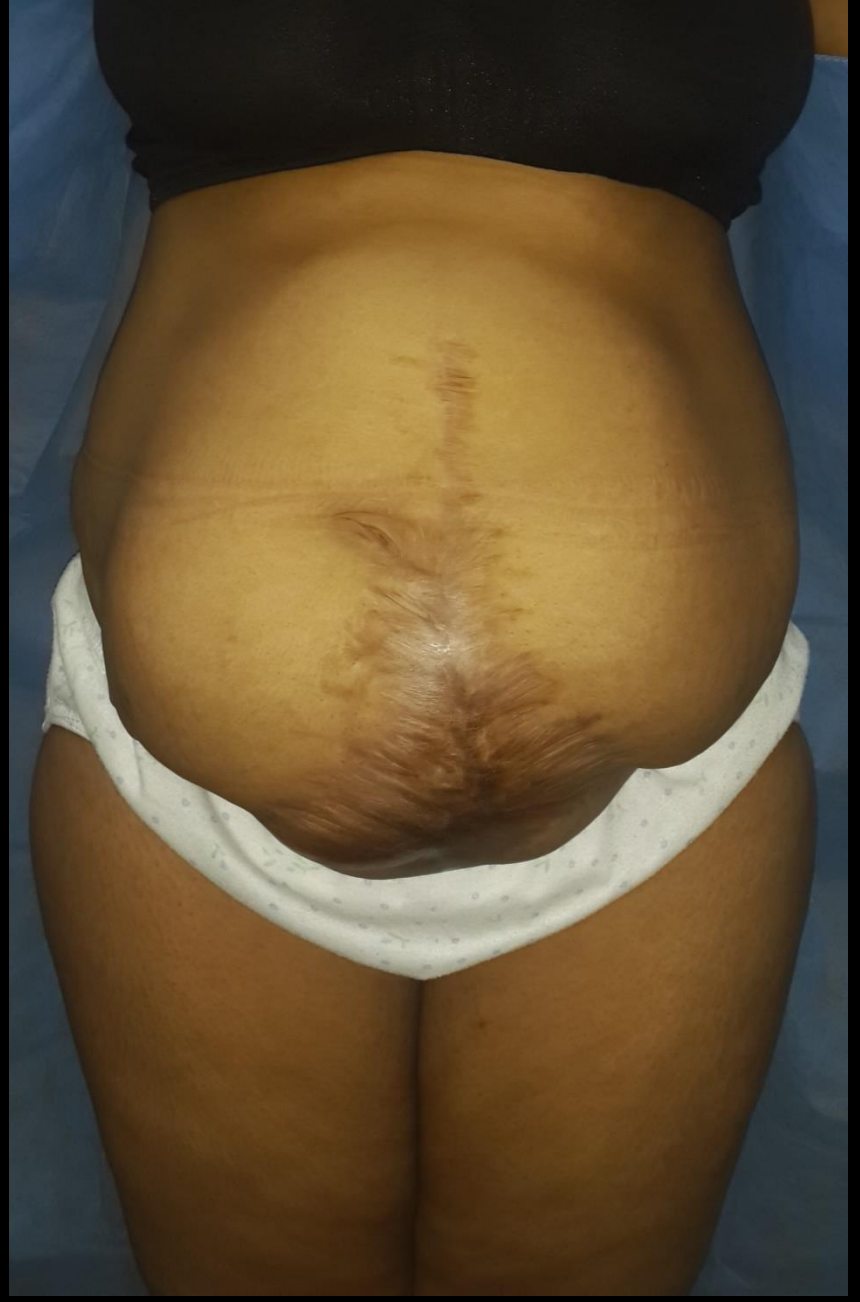




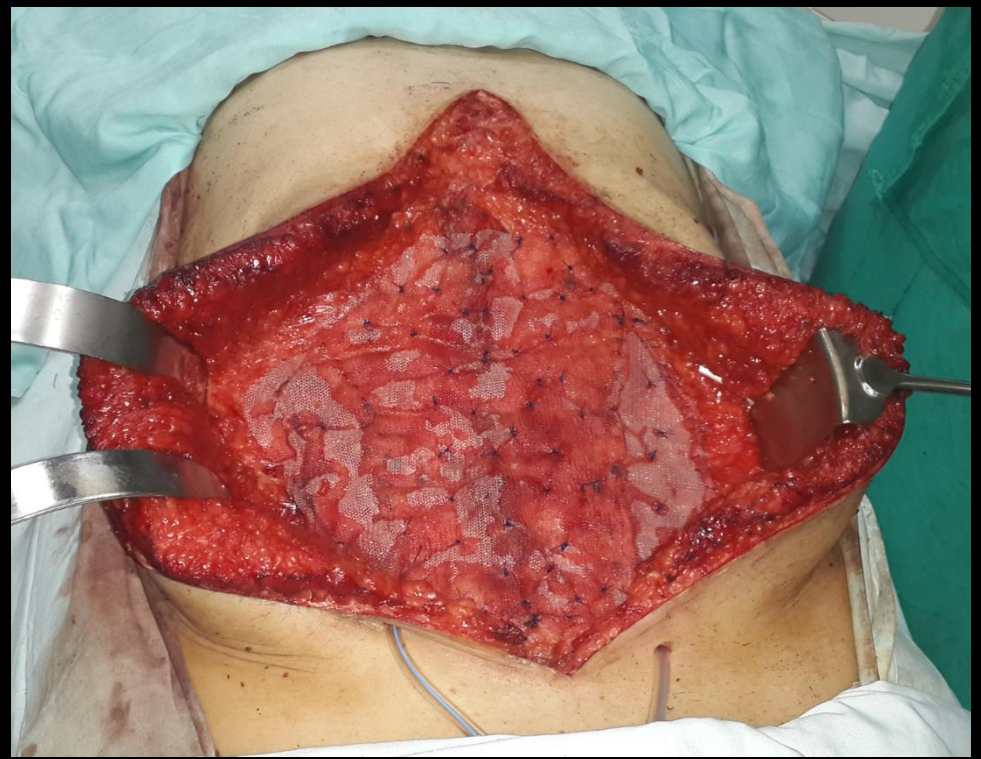




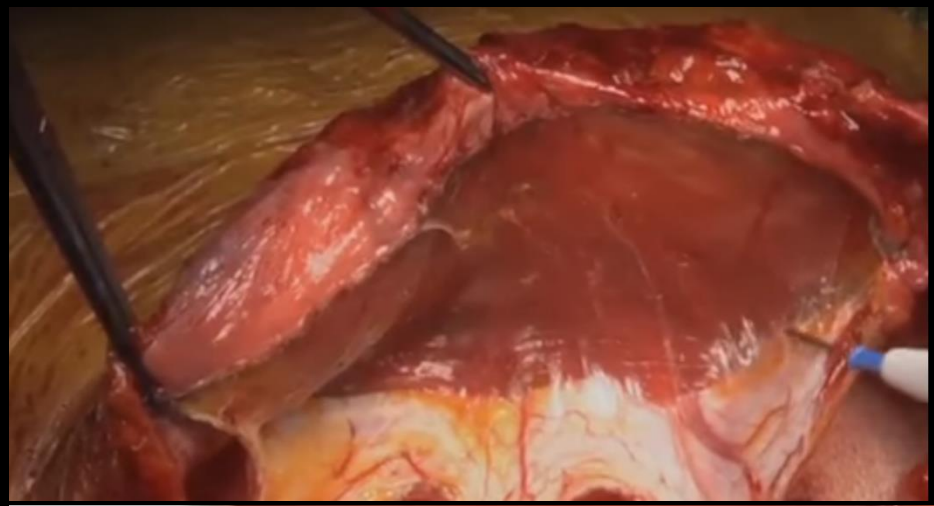



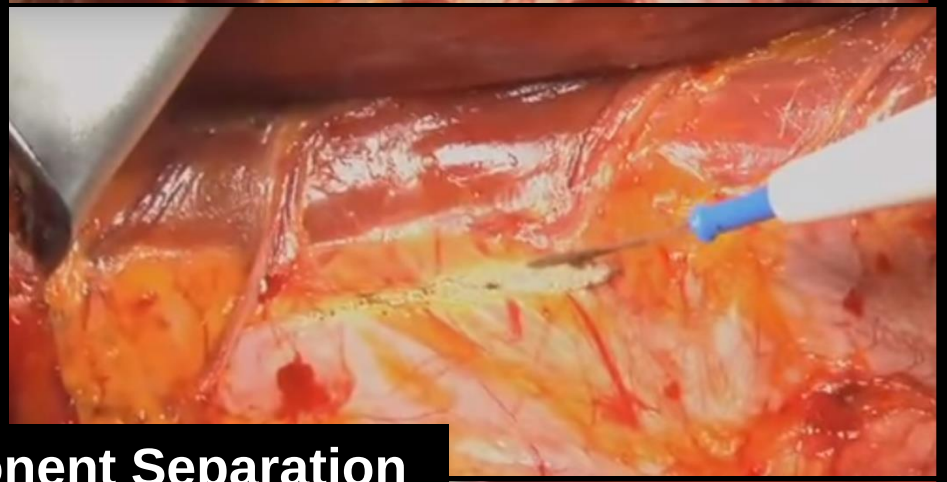



Component Separation Technique

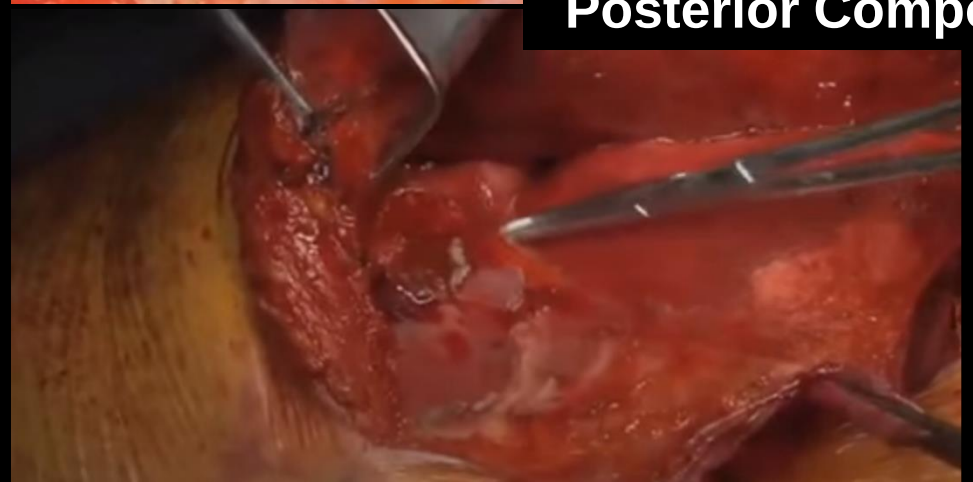
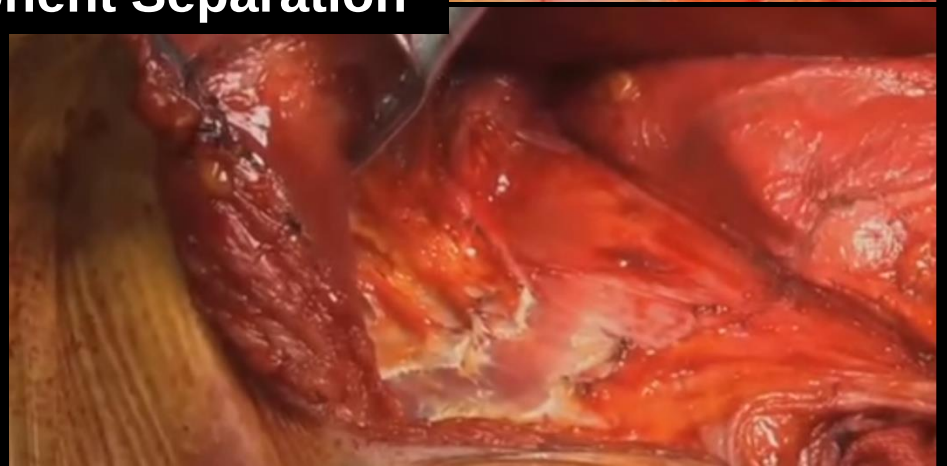


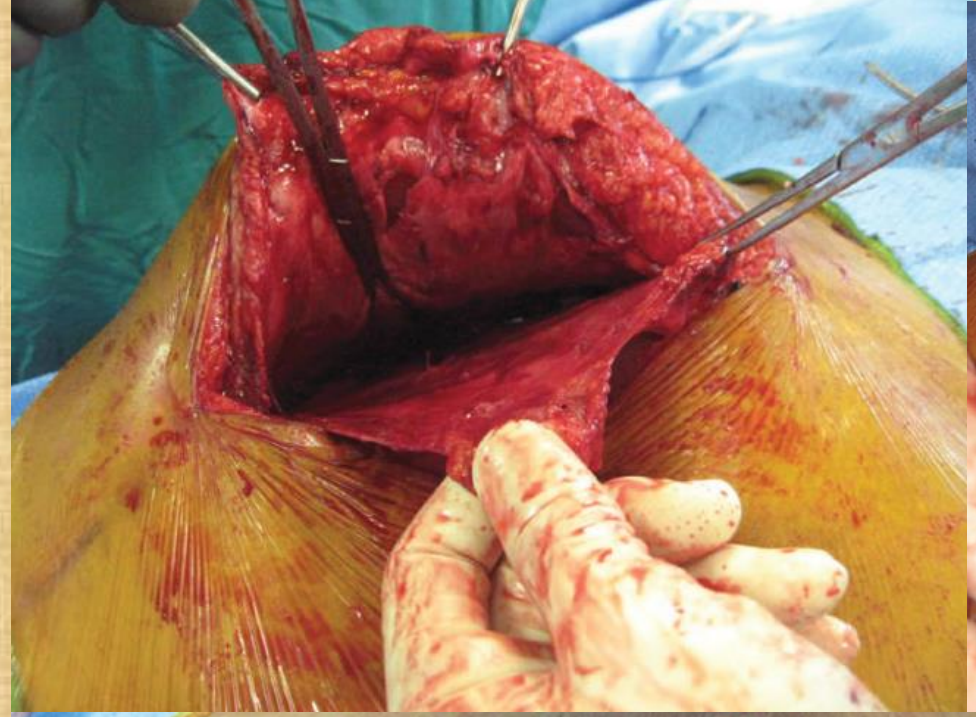
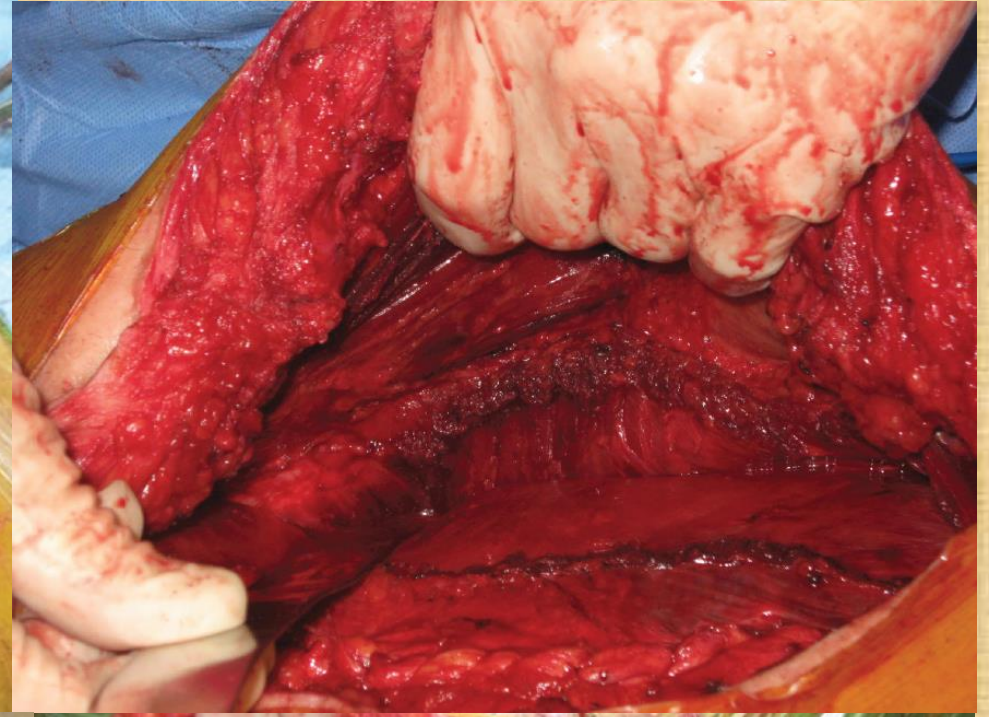
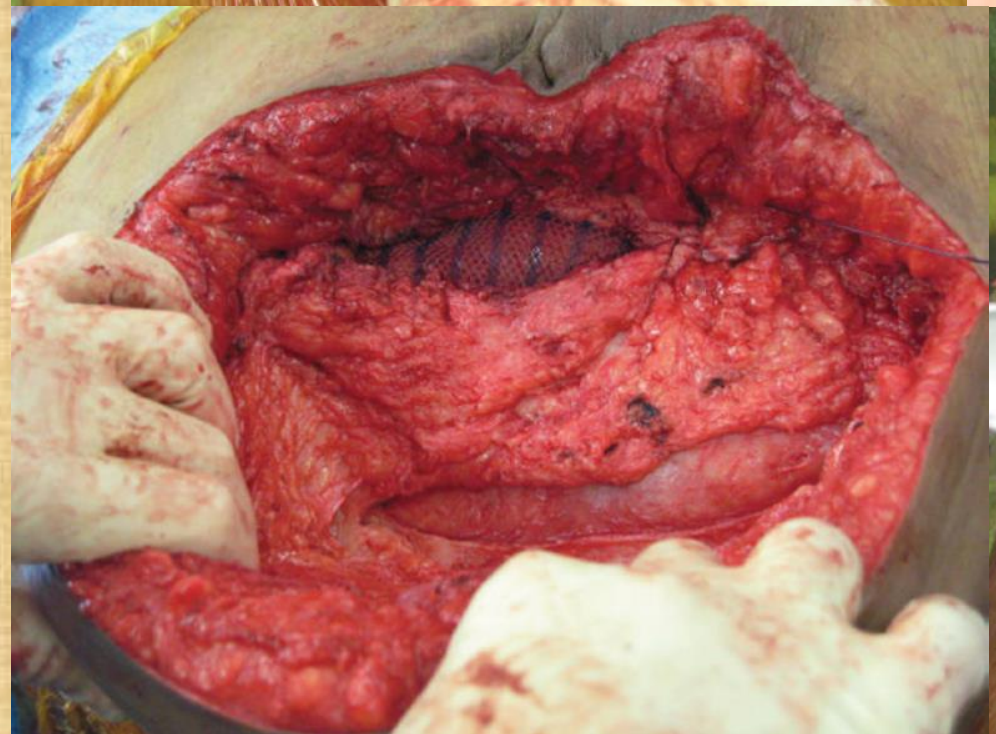
Anterior Component Separation

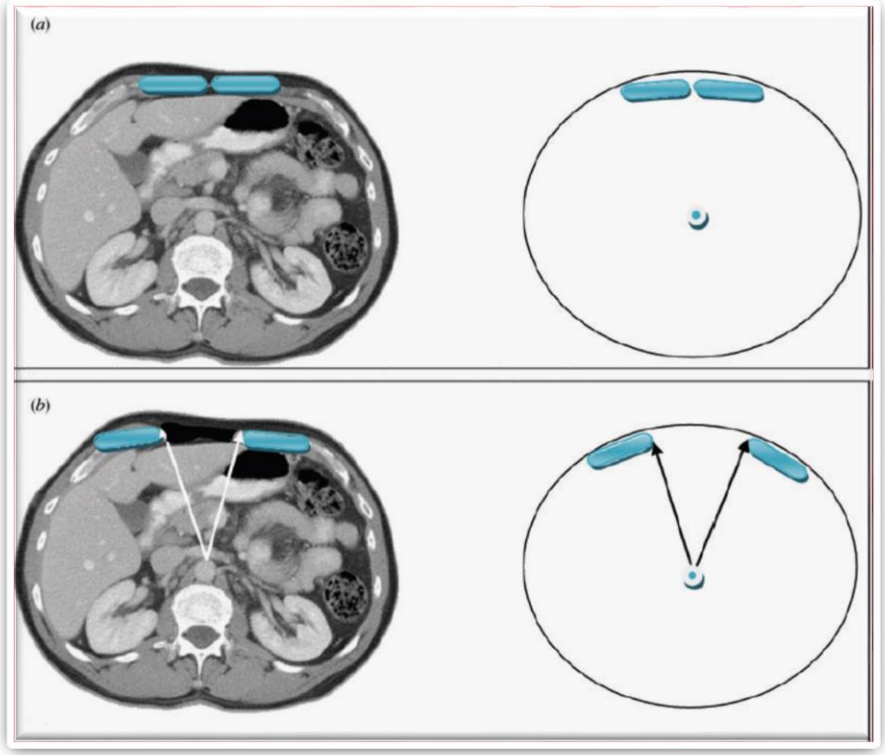


Posterior Component Separation


Component Separation Index

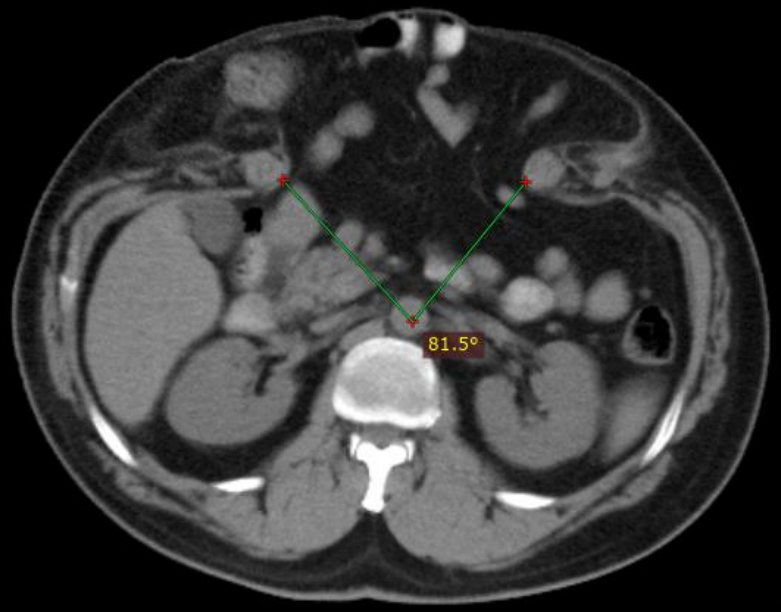


- CSI utilizes a value based on a preoperative CT scan of the abdomen with the *angle of diastasis* of the rectus musculature with the vertex based at the aorta.
- This is then placed as a comparator over 360◦.

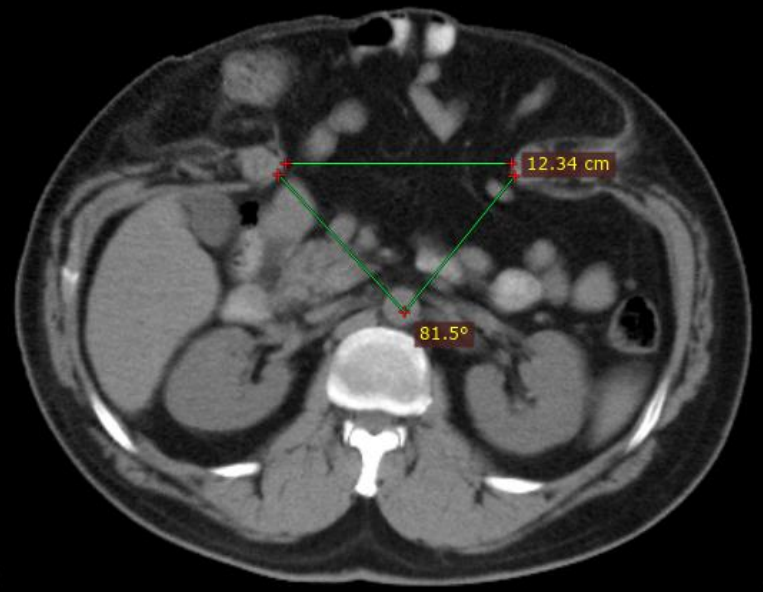
CSI = Angle of diastasis (AD) / 360

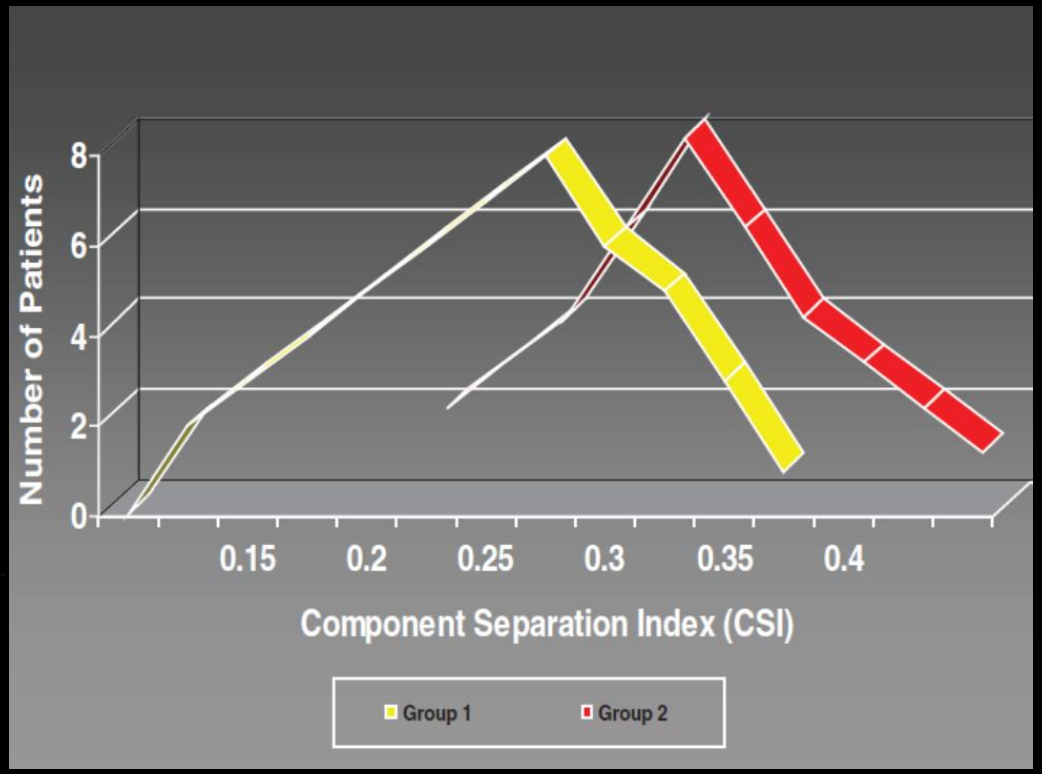
- The value of the angle of diastasis takes into account not only the transverse dimension of the hernia but also the AP dimension of the patients' unique body habitus providing an added dimension of the patients' biometric identity.

Christy M et al (2012) Eplasty; 12: 169 – 176.



CSI = 81.5 / 360 = 0.22





	Component Separation	Component Separation with interposition repair
CSI	0.11	0.21

Complex ventral hernia repair using CST.

1. Midline abdominal wall defect.
2. Reasonable abdominal wall musculature.
3. Defect width preferably 10 cm or less.
4. C.S.I. < 0.11.

CST with/without Mesh

Complex ventral hernia repair using CST without mesh results in a high recurrence rate.

- Published studies of CST without mesh for repair of large and complex abdominal wall defects show very low recurrence rates, with the majority lying between 0% and 10%.
- A potential flaw in determining long-term outcomes is the lack of rigorous and reliable follow-up, utilizing telephone and postcard questionnaires.

Slater N et al (2015) American Journal of Surgery; 209: 170 – 179

Complex ventral hernia repair using CST without mesh results in a high recurrence rate.

- The largest study reporting on CST without mesh provide a proper clinical follow-up in every patient, which importantly took place at least 1 year after surgery. This yielded a recurrence rate of **38.7%**. This rate is nearly 3 times higher and statistically differs from the recurrence rate yielded with literature meta-analysis.
- CST coincides with a high recurrence rate when clinical follow-up is longer than a year. Reported recurrence rates are probably underestimated because the method and duration of follow-up are inadequate.

Slater N et al (2015) American Journal of Surgery; 209: 170 – 179

CST versus CHRT

The American College of Surgeons National Surgical Quality Improvement Program (ACS-NSQIP).

- A total of **68,439** VHR cases were identified in the ACS-NSQIP PUF database from 2005 to 2012.
- **2245** VHR cases were identified where components separation was performed.
- **66,194** VHR cases were identified without components separation as a comparison.

The American College of Surgeons National Surgical Quality Improvement Program (ACS-NSQIP).

Primary outcome	VHR	CST	Difference	P value
Return to the OR	3.70%	5.90%		0.000*
Total hospital LOS	3.76 days	6.36 days	2.6 days	0.000*
Total surgical LOS	4.22 days	6.94 days	2.72 days	0.06
Operative duration	105.2 min.	187.8 min.	82.6 min.	0.000*
Estimated 30-day morbidity	7.6%	10.1%	2.5%	0.000*
Estimated 30-day mortality	0.3%	0.3%	0.1%	0.003*
Actual 30-day morbidity	11.09%	23.96%	12.87%	0.000*
Actual 30-day mortality	0.5%	0.8%	0.3%	0.255

Desai N et al (2016) Annals of Medicine and Surgery; 7: 14 – 19

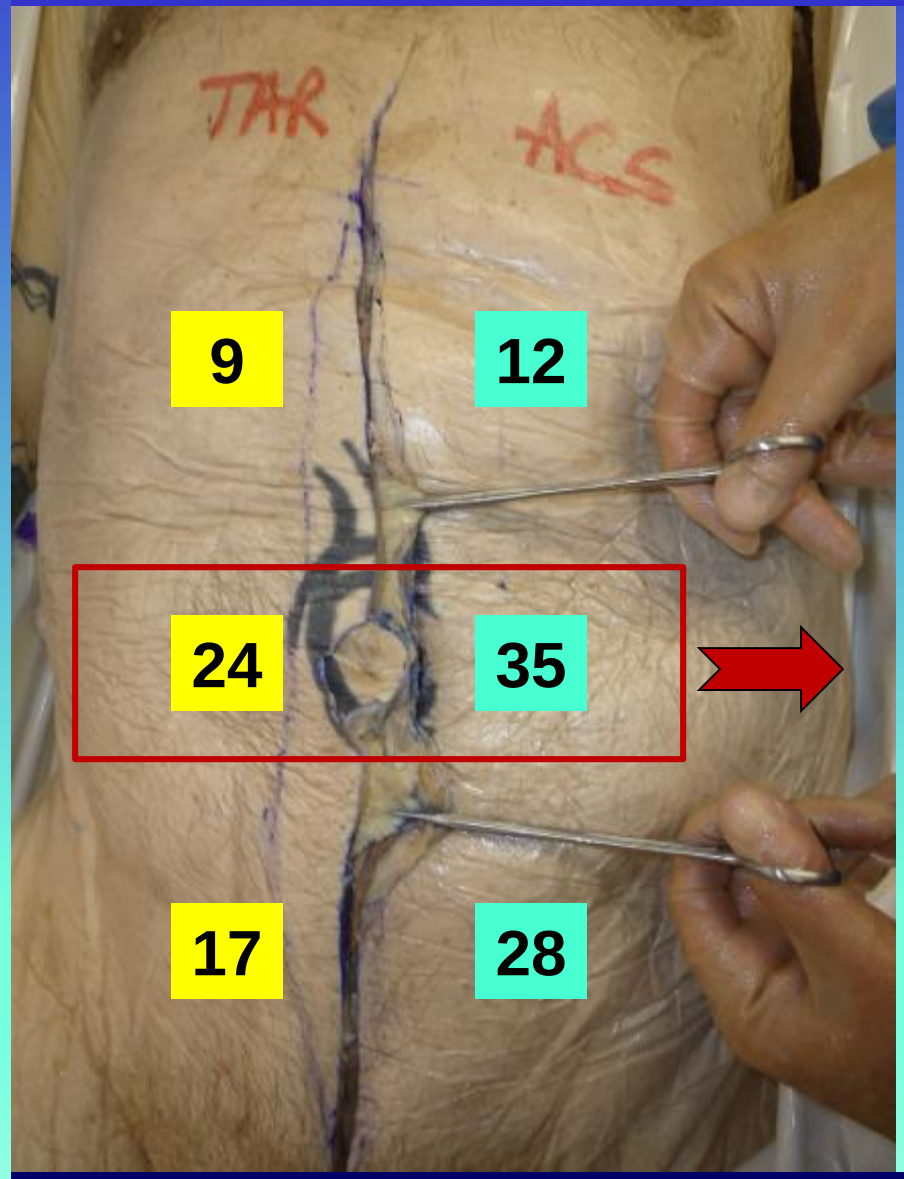
The American College of Surgeons National Surgical Quality Improvement Program (ACS-NSQIP).

- While components separation may offer long-term advantages in hernia repair, an analysis of propensity-score matched patients shows that use of this technique might **increase the cost and morbidity** when compared to more traditional ventral hernia repair.
- Innovative strategies should be investigated with continued use to guide the selection of abdominal wall hernia repair and improve both early and long-term patient outcomes.

Desai N et al (2016) Annals of Medicine and Surgery; 7: 14 – 19

ACST vs PCST

Transversus Abdominus Release (TAR) Vs Anterior Component Separation (ACS): A cadaveric study



- A greater degree of abdominal wall advancement was seen in the **ACS** technique compared to the **TAR**.
- The greatest advancement was seen in the umbilical area.

Charles Yuen Young Loh et al (2018) JPRAS; 11: 1 – 3.

- A comparative retrospective analysis of 111 patients with complex ventral hernia (**56 ACS, 55 PCS**).
- abdominal wall reconstruction with PCS had an equivalent fascial closure to ACS, indicating similar myofascial advancement with the 2 techniques.
- Posterior release was associated with a lower risk of wound morbidity, which is believed to be related to the preservation of the abdominal wall bloody supply by eliminating skin flaps needed for ACS.

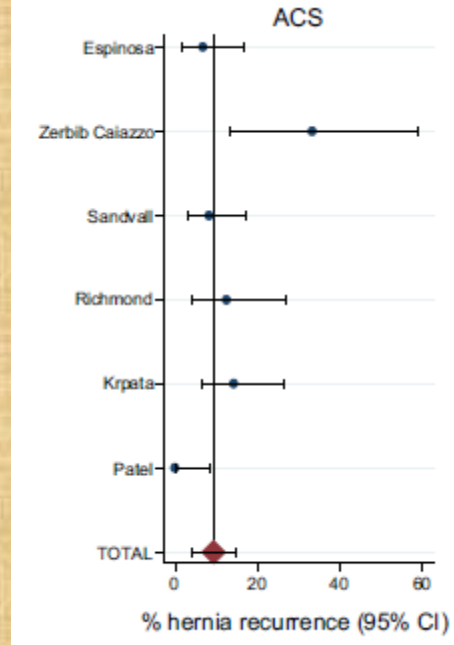
Krpata D et al (2012) American Journal of Surgery; 203: 318 – 322

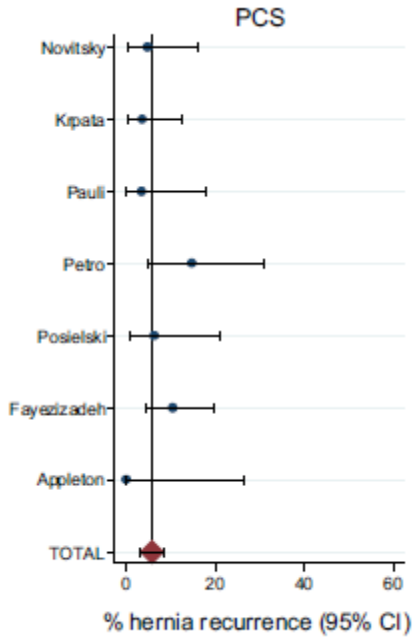
A meta-analysis comparing open ACS with PCS and transversus abdominis release in the repair of midline ventral hernias

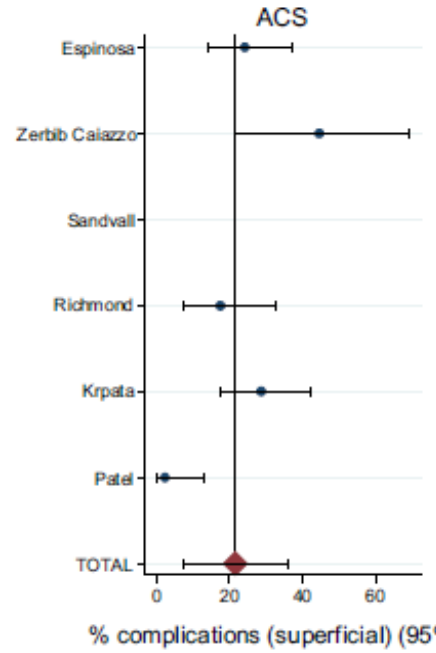
- Seven studies describing **281** cases of PCSTAR for midline incisional hernia using a retro-muscular mesh placement
- Six comparable studies describing **285** cases of OACS and retromuscular mesh placement

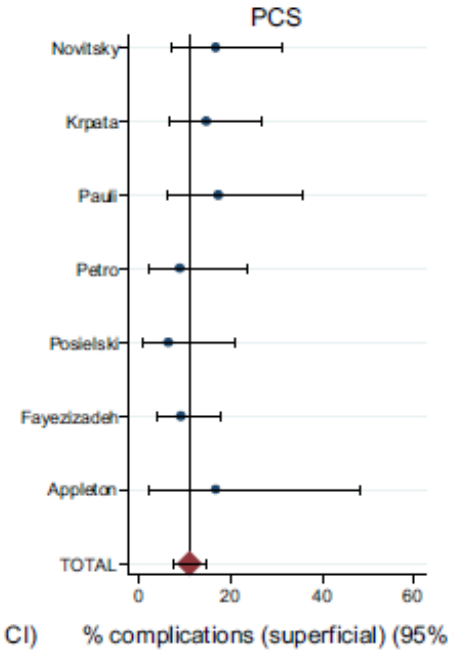
- **Posterior component separation with transversus abdominis release and open anterior component separation have comparable outcomes for complex abdominal wall reconstruction of midline ventral incisional hernias.**

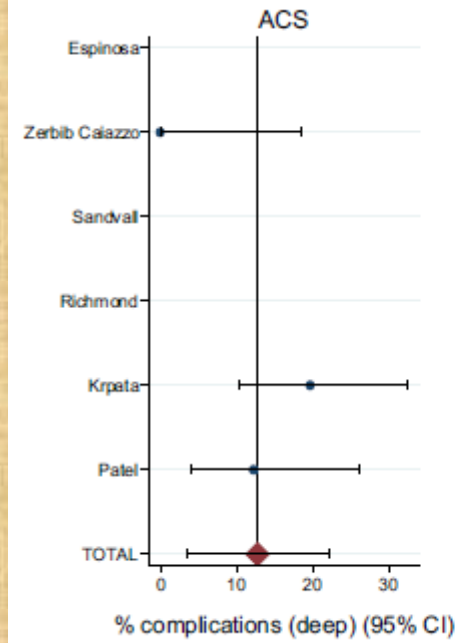
Hodgkinson J et al (2018) Hernia;
https://doi.org/10.1007/s10029-018-1757-5

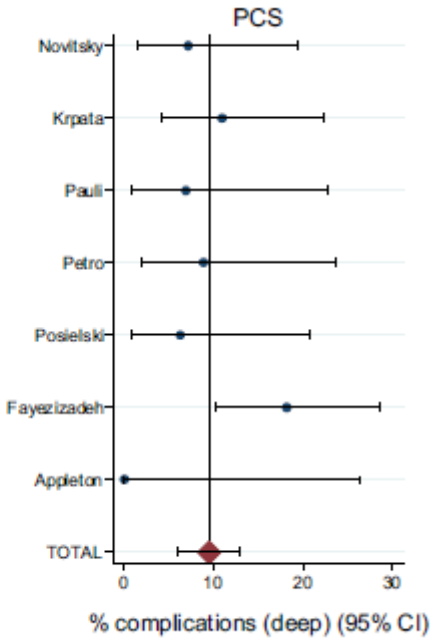


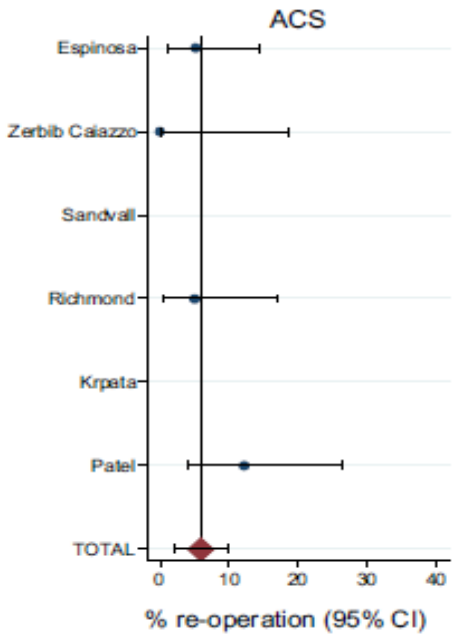


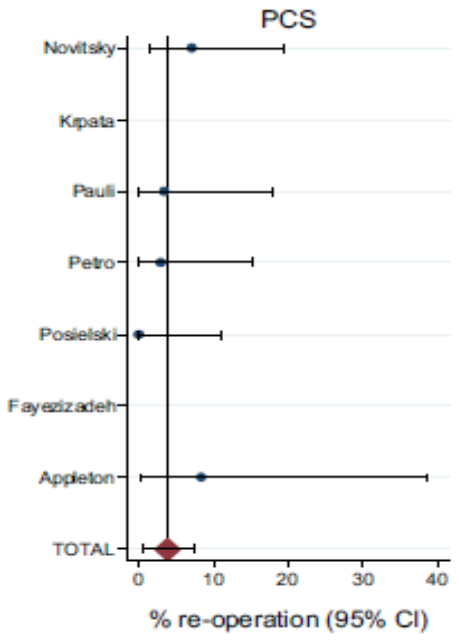












Hodgkinson J et al (2018) Hernia; https://doi.org/10.1007/s10029-018-1757-5

1. The open anterior approach (OAA),
2. The transversus abdominis release (TAR),
3. The laparoscopic anterior approach (LAA)
4. The open anterior perforator preserving approach (PPA)

- Based on the pooled results of 36 studies, the prevalence of SSO is comparable between the 4 techniques studied with an average of one in five patients having a complication.
- There is a trend towards fewer complications when using a perforator preserving approach.
- The calculated yearly incidence of recurrence ranges from 3.4 to 7.6% among the different techniques but its value is limited by an overall short follow-up period.

Cornette B et al (2018) American Journal of Surgery; 215: 719 – 726

1. The open anterior approach (OAA),
2. The transversus abdominis release (TAR),
3. The laparoscopic anterior approach (LAA)
4. The open anterior perforator preserving approach (PPA)

Because of the lack of appropriate randomized studies, heterogeneity in patient population, different surgical techniques, and non-standardized methods for measuring outcomes, **it is difficult to postulate exact indications when to use what type of component separation technique.**

Cornette B et al (2018) American Journal of Surgery; 215: 719 – 726



ADMIR

Hernia (2005) 9: 310–315
DOI 10.1007/s10029-005-0017-7

Hernia (2005) 9: 310–315
DOI 10.1007/s10029-005-0017-7

ORIGINAL ARTICLE

Raafat Y. Afifi

A prospective study between two different techniques for the repair of a large recurrent ventral hernia: a double mesh intraperitoneal repair versus onlay mesh repair

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Original Research

The outcome of A. Double mesh intraperitoneal repair for complex ventral hernia: A retrospective cohort study

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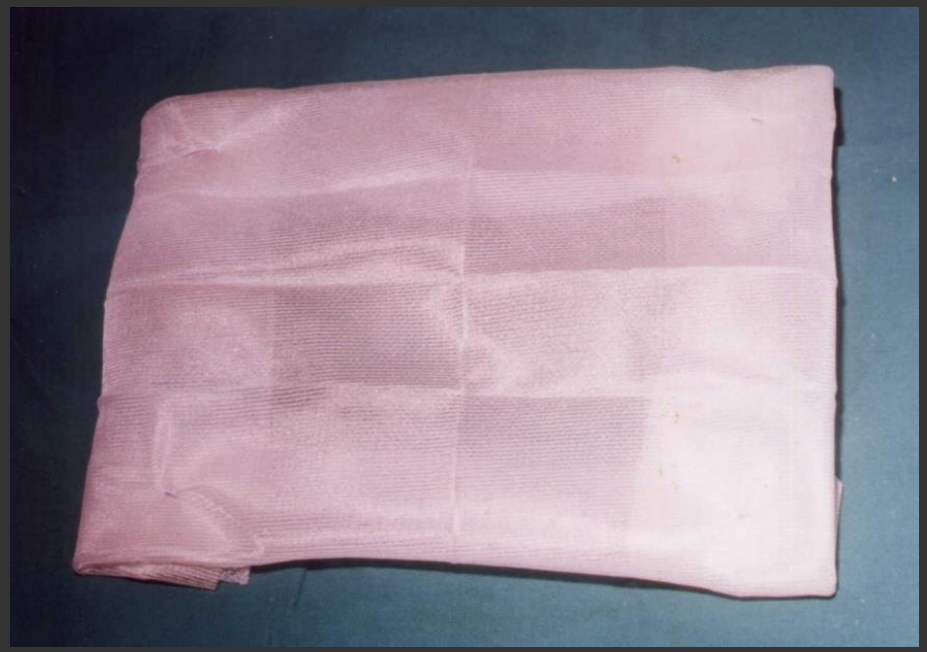
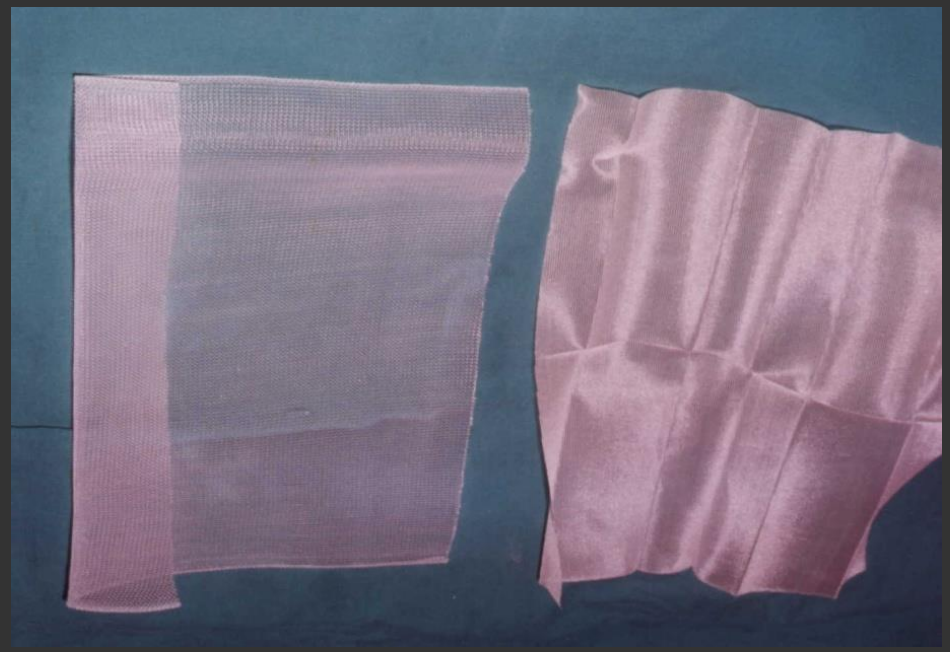
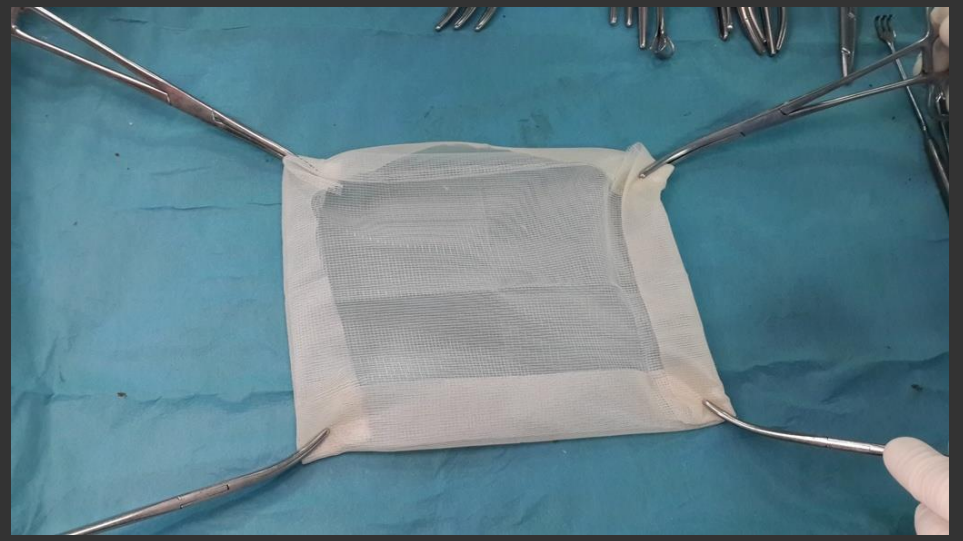
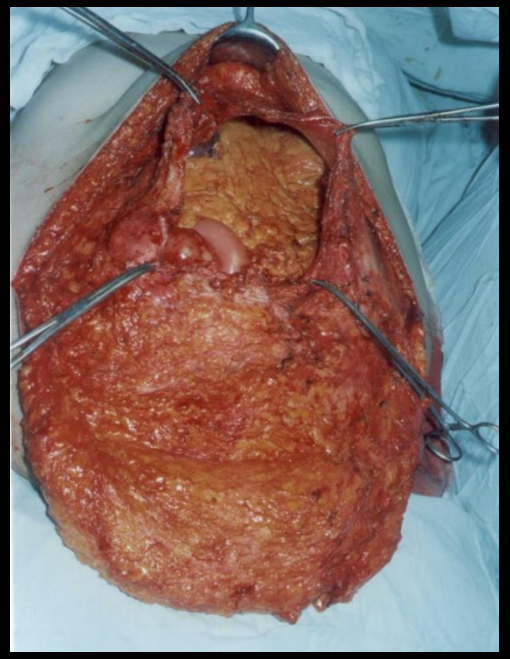
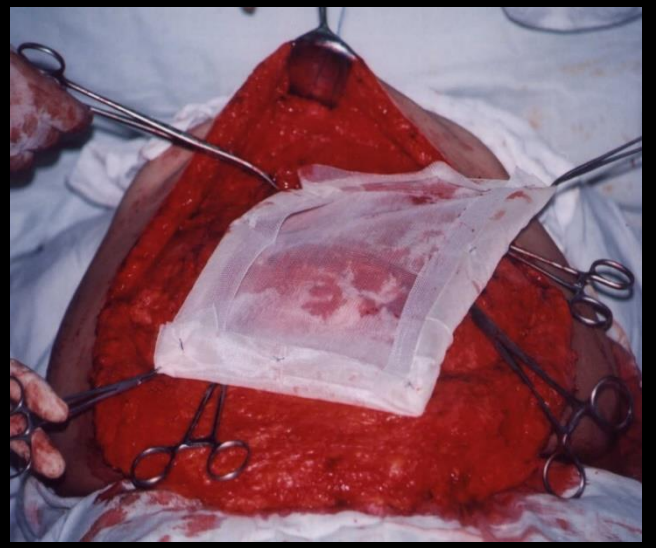
Afifi RY et al (2018) IJS; 53: 129 – 136.

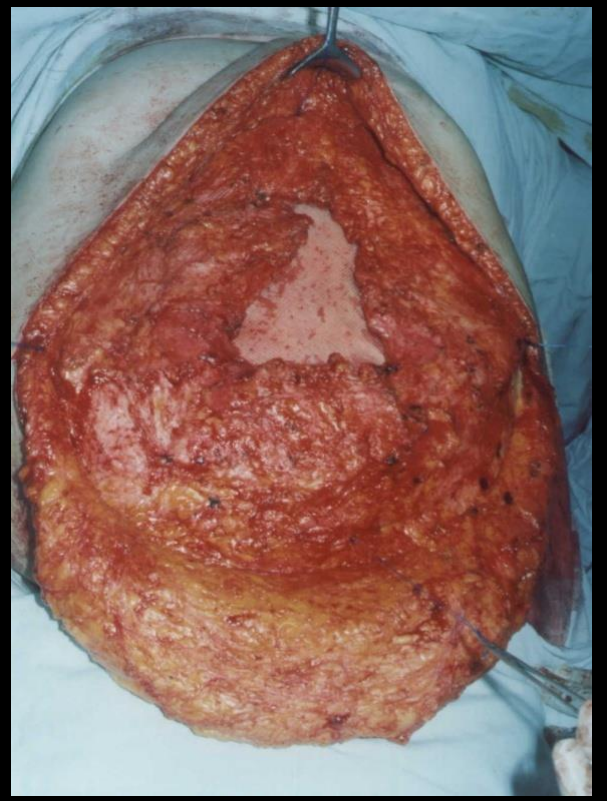


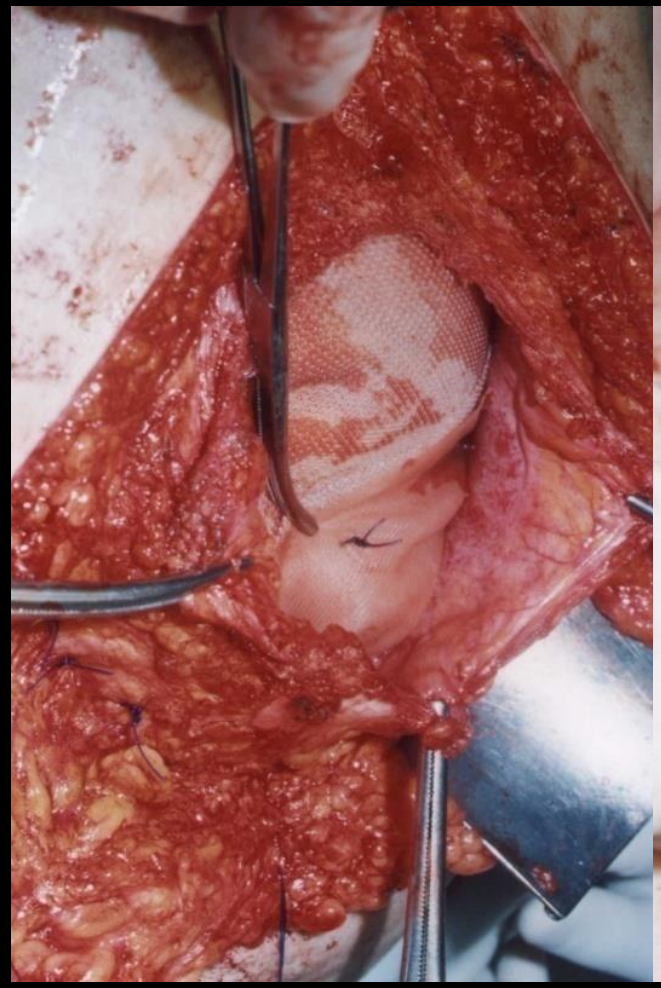
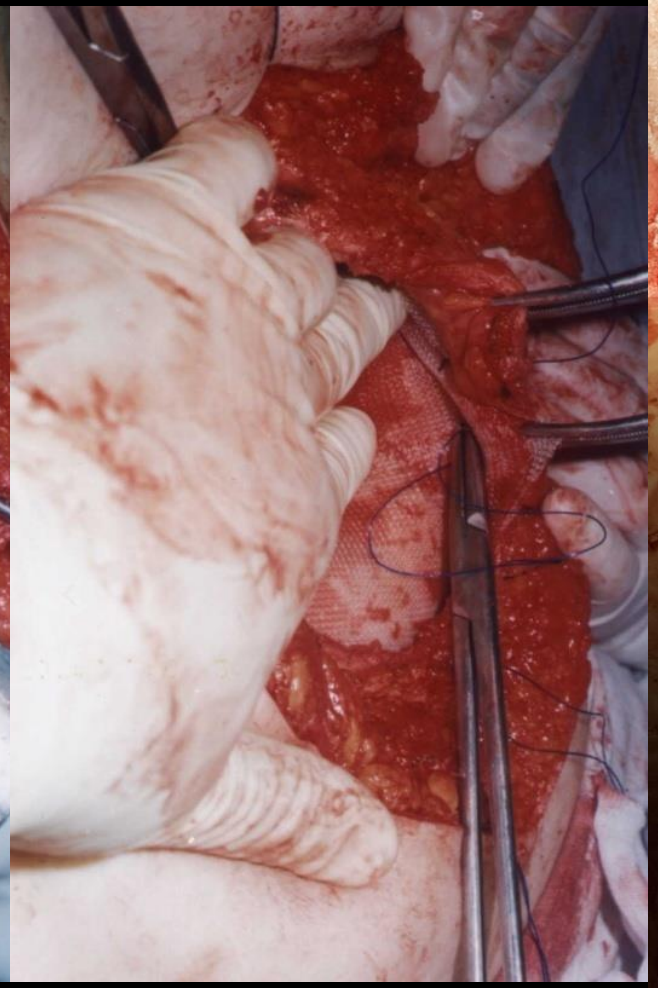
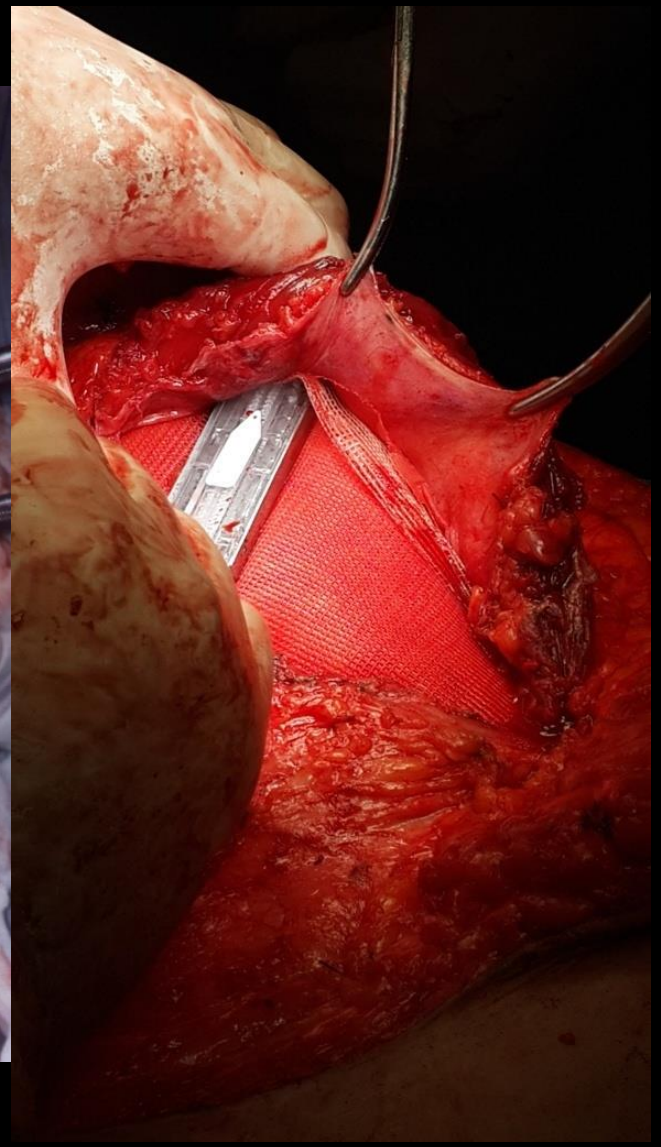


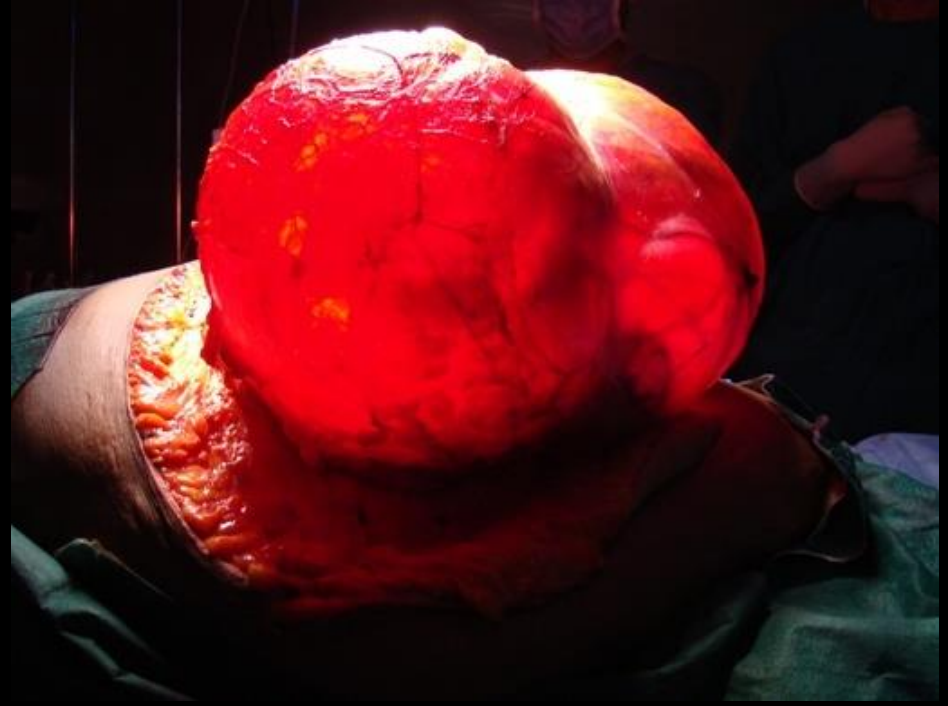


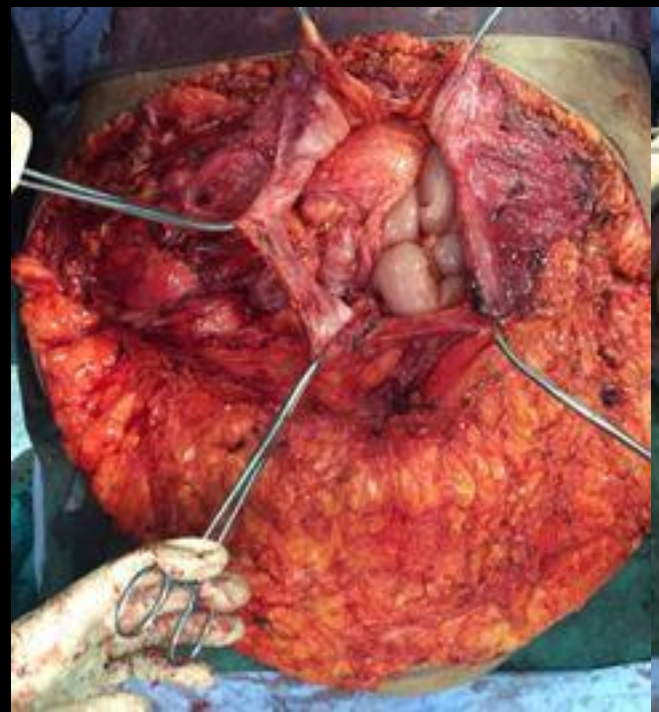


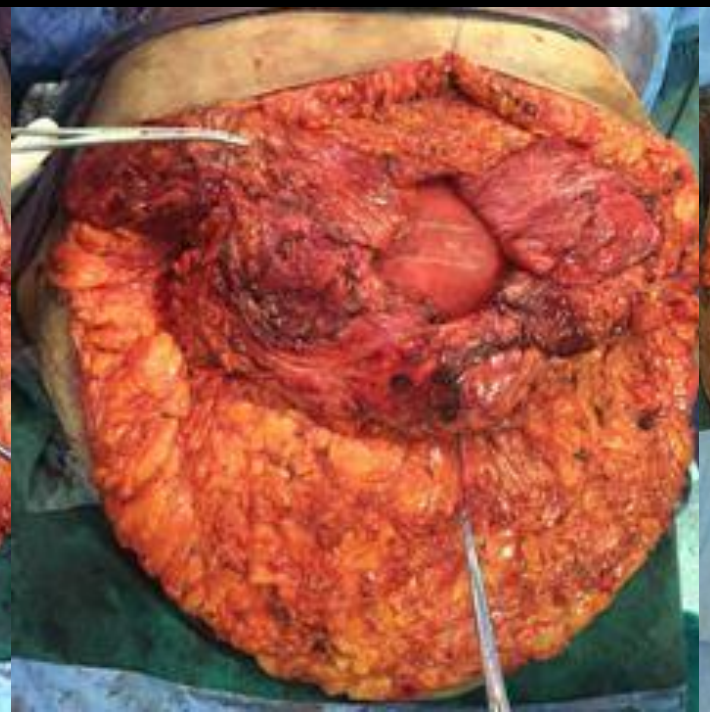


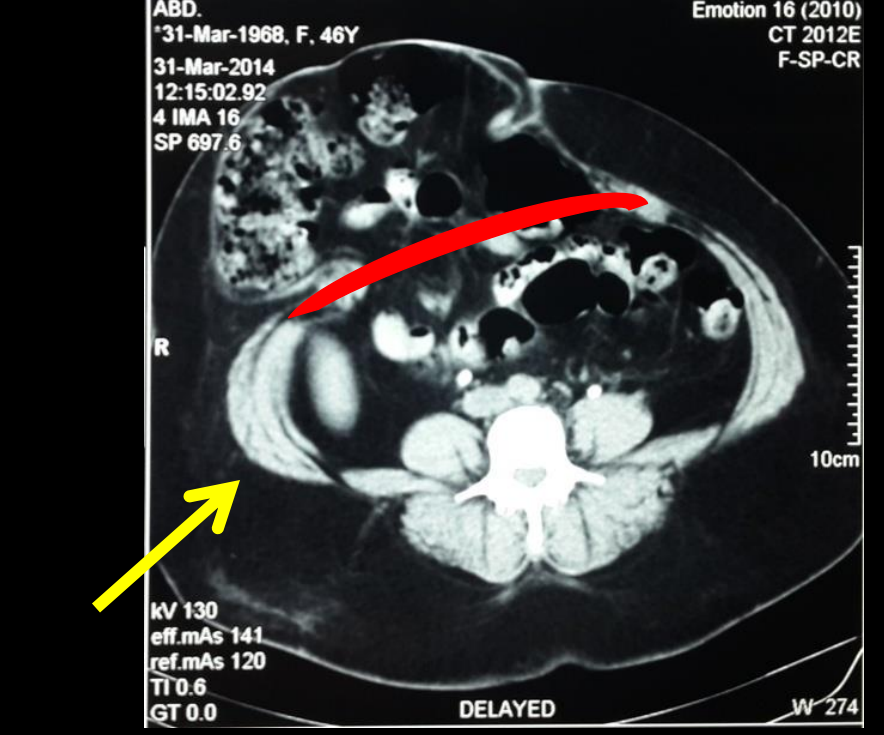






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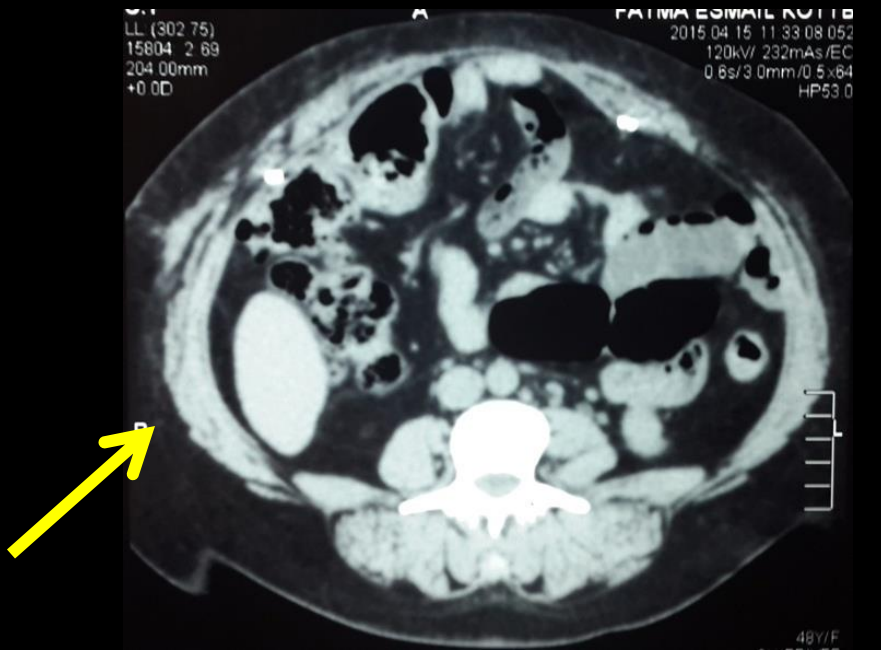
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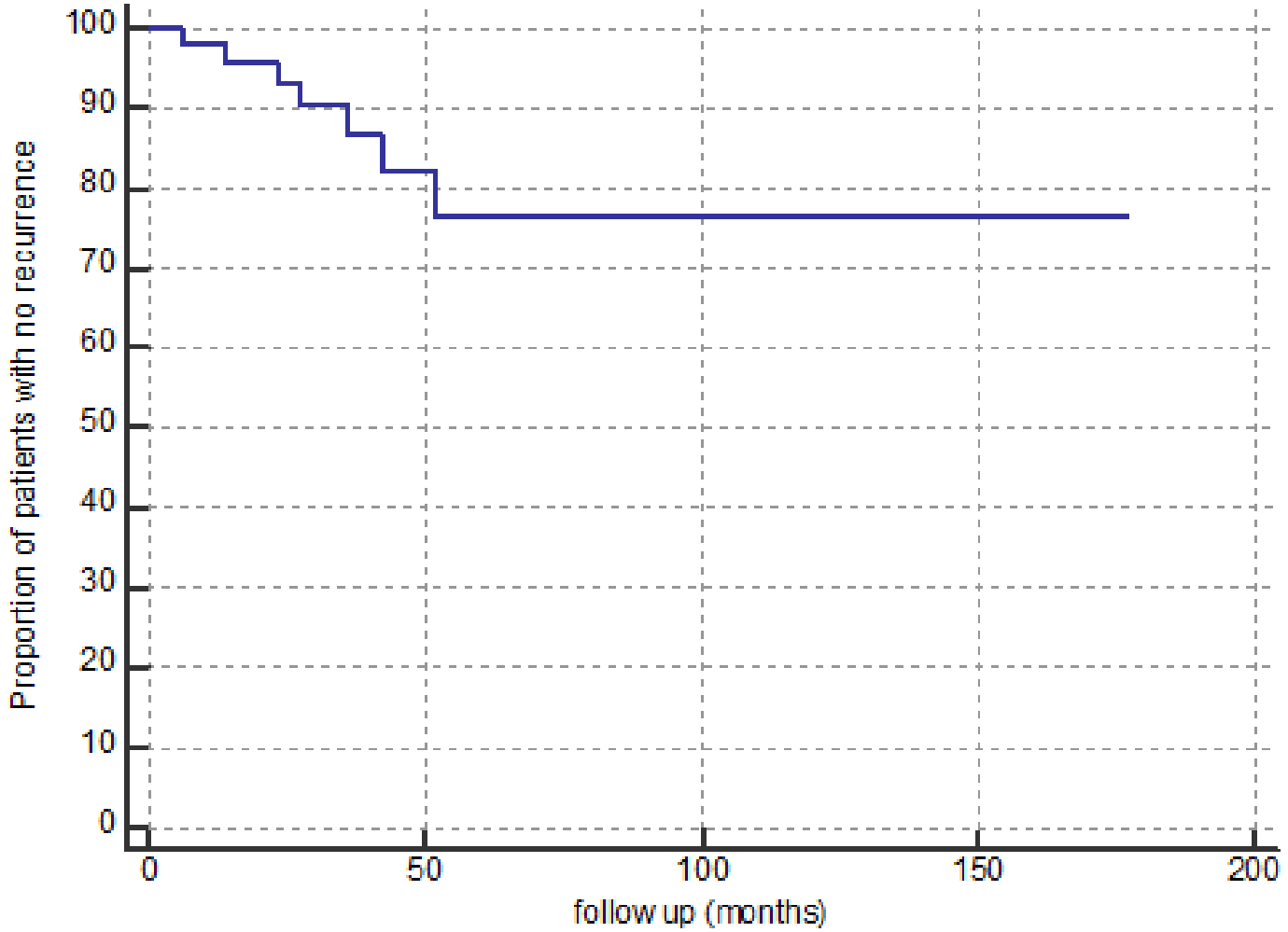
Postoperative complications

Complications	49 cases
ACS	2 (4.08%)
DVT	1 (2.04 %)
Surgical site infection	5 (10.2%)
Pain	8 (16.32 %)
Wound haematoma	1 (2.04 %)
Recurrence	2 (4.08 %)
Mesh removal	--
Seroma	--

Follow up 6 – 174 months (mean 142.91 - SE 11.91)



Kaplan and Meier survival analysis for proportion of patients with no recurrence.

Conclusions

- Complex abdominal wall defects not amenable to primary closure remains a challenging problem.
- The primary objectives of abdominal wall reconstructions are to protect abdominal contents and provide functional support.
- The front of the abdominal wall is a dynamic component, which function as one unit.
- At all times keep in mind the pattern of blood supply of the skin in order to avoid flap necrosis.

Conclusions

- Component Separation Technique is suitable for midline defect with good abdominal wall musculature.
- Anterior CST requires skin flap dissection, which may compromised its blood supply.
- Posterior CST is more difficult to perform and may compromise the neuro-vascular supply of the muscle complex.
- It is advisable to use mesh for reinforcement of the repair.
- There is no available data from RCT to determine patient selection for different techniques of component separation.

Conclusions

- A. Double Mesh Intraperitoneal repair (ADMIR) is successful for the repair of open abdomen, complex and recurrent ventral hernias.
- It is applicable to all sites of ventral hernias.
- The mesh is mostly hidden within the abdomen with relatively affordable pain allowing for early mobilization and prevents seroma formation.
- The complications rate is acceptable with 4 % recurrences rate reported so far after a long term follow with a mean of 142 months.


THANK YOU