Necrotizing Fasciitis and Reconstruction of the Abdominal wall

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Necrotizing Fasciitis

- An infectious process characterized by widespread and rapid necrosis initially in the deep fascia and then throughout the subcutis and skin and occasionally the muscle layers
- Accompanied by life threatening systemic illness with multi system failure
- Requires rapid recognition by the clinician, urgent surgical intervention and resuscitation, long term antibiotics and eventually reconstruction
- Fourniers gangrene ,synergistic gangrene, Meleney's gangrene all part of the spectrum

Microbiology

- Monomicrobial
- Group A beta haemolytic bacteria
- Staphylococcus Aureus
- Tend to affect the extremities 2/3 of the time and occasionally the face

Monomicrobial

Microbiology

- Polymicrobial
- More common than mono microbial 70%
- Streptococcus still predominant 63 percent
- E Coli, peptostreptococcus, Pseudomonas , Klebsiella, bacteroides, clostridia
- Synergism between the species plays a pivotal role
- Seem more likely following penetrating trauma or post surgical

Aetiology

- Mild or severe trauma especially penetrating but 20 percent have no identfiable source
- Septic source especially teeth, vulvovaginal or perianal disease
- Post visceral surgery
- Necrotic source
- Predisposed in *morbid obesity, diabetes, immunosuppression, Malignancy or liver failure and drug addicts*
- Some reports in SLE , use of NSAIDS

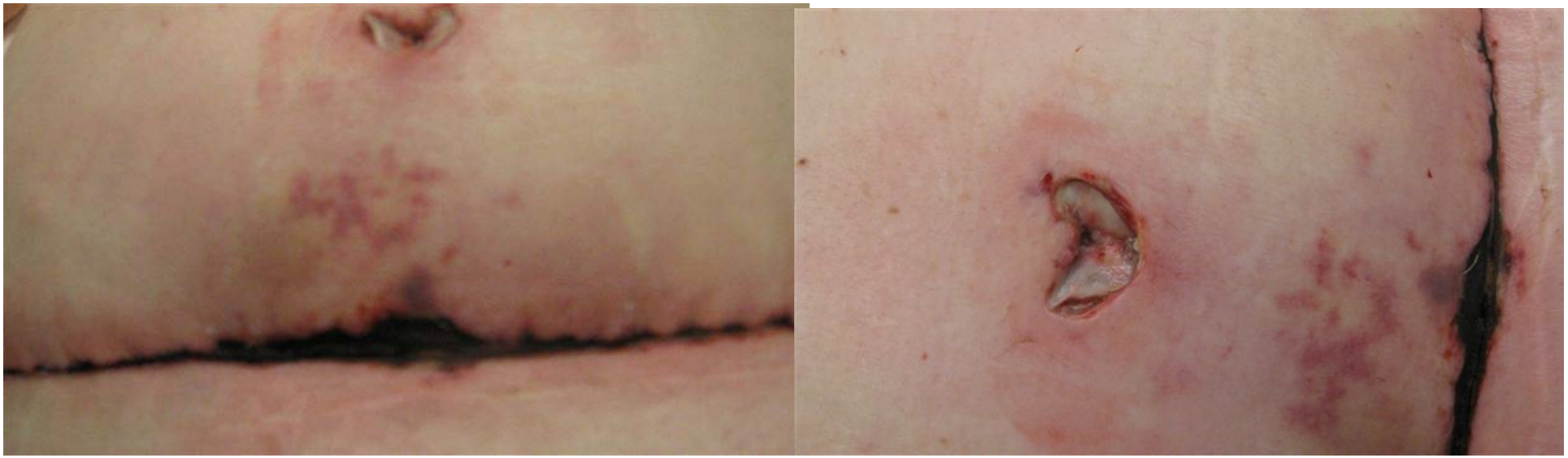
Diagnosis andTreatment

- Rapid and early diagnosis and intervention reduces mortality significantly
- Diagnosis is made on clinical suspicion
- Key feature : **symptoms outweigh the signs esp pain that seems out of proportion to findings**
- Often high temperature and lassitude

Clinical spectrum of presentation

- **Early**: pain erythema early blisters high temp but normal sensorium
- **Intermediate**: pain very high temp skin red with blisters lassitude
- **Late**: very high temperatures white cell count > 25000, skin oedematous with central fixed dark staining and frank necrosis usually unconscious and signs of multisystem failure
- *Transition time varies from hours to days*

Early Case of Necrotising Fasciitis



Diagnosis andTreatment

- Finger test
- Frozen section diagnosis
- Once diagnosis is made seek the earliest possible time for OT , start broad spectrum IV antibiotics and notify Intensive Care Unit and Anaesthetist
- Start IV fluid resuscitation
- **Nothing should delay surgical intervention as time is of the essence**

Antimicrobials

- Need broad cover to allow for polymicrobial infection
- Penicillin , aminoglycoside if renal function allows and Clindamycin
- This should cover Strep,Staph, Gram negative Bacilli and anaerobes
- Clindamycin seems to have some effect on the toxins released by Gram negative bacilli
- Given the multi organ failure early referral to Infectious disease seems appropriate

Surgical intervention

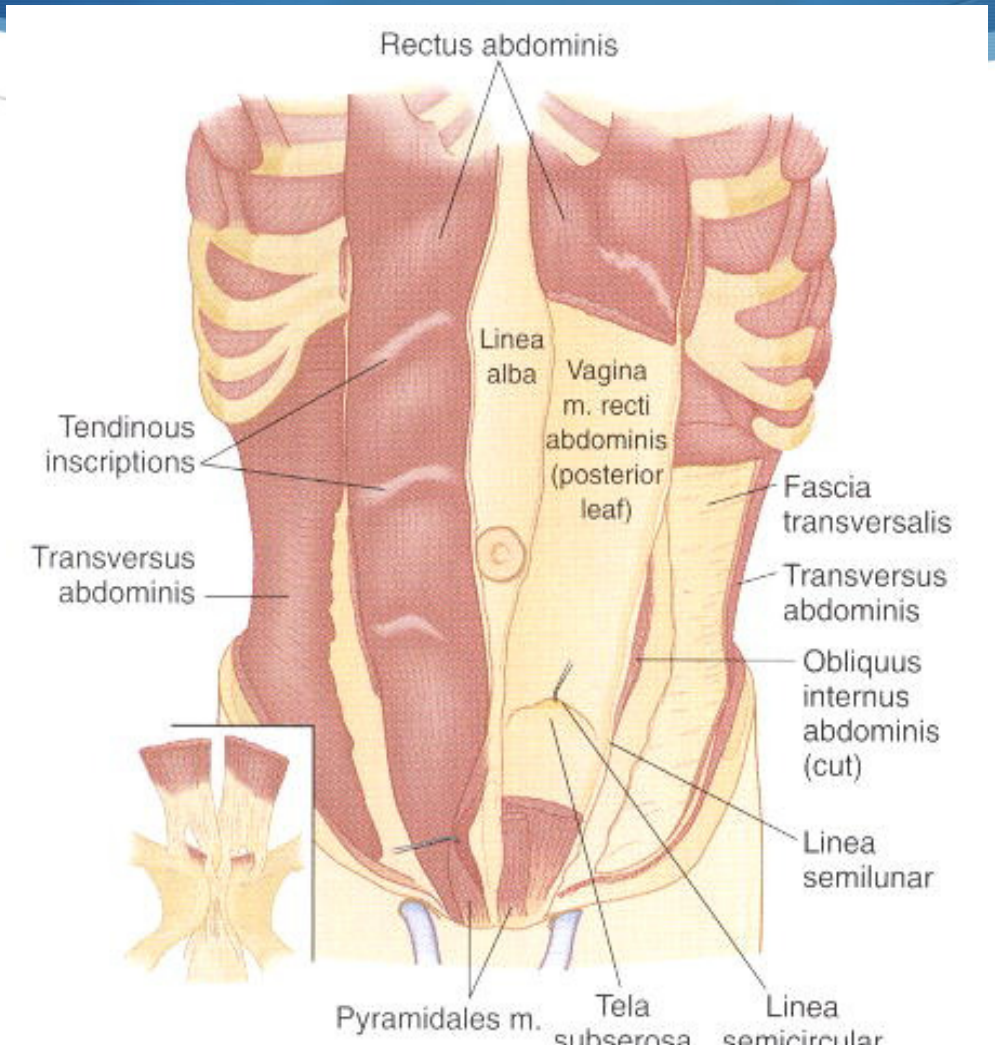
- Only intervention that can save the patients life
- Wide excision of the necrotic fascia and overlying skin and fat to bleeding viable tissue
- Return to theatre daily until this is achieved but aim to remove all of the necrotic tissue on the first visit
- ICU post operatively for systemic support and ventilation
- Dressings tend to be simplistic such as wet packs(vac dressings only appropriate when infection under control)

Rehabilitation

- Control multisystem failure
- Vac dressing until bed granulates
- Nutrition
- Reconstruction of defect- usually split skin grafting but full thickness abdo wall see following talk
- Long term care much the same as for burns injury ie compression and scar management

Reconstruction of the Abdominal Wall

Muscle and investing fascia



Aetiology

- Wound Infection
- Abdominal Compartment Syndrome
- Penetrating Trauma/ Crush injury
- Infected Mesh
- Incisional Hernia
- Multiple Re-operations through same wound
- Tumor resection
- Congenital (which I have not talked about today)
- Risk Factors: Obesity, Malnutrition, Sepsis, Immunosuppression, Diabetes, Malignancy

Goals of abdominal wall reconstruction

- Restoration of function and integrity of the abdominal wall
- Prevention of evisceration
- Dynamic muscle support
- Provide stable coverage

Principles of management

- Patient must be well nourished and suitable for general anaesthetic and infection free. In the obese attain a normal BMI
- Consider the effect of abdomen closure on respiratory function
- Plan reconstruction of 3 layers peritoneum, abdominal wall and skin and subcutis
- Tension free closure with well vascularised tissue is the key

Treatment Options

- Primary Repair / Abdominoplasty
- Use of VAC dressings
- Split skin grafting
- Prosthetic Mesh: Rives-Stoppa
- 3 Stage delayed repair
- “Components Separation”
- Local flaps v. Free tissue transfer
- Human Acellular Dermis (Alloderm)

Primary repair

- Limited to small defect (<5 cm in diameter)
- Highest recurrence rate (up to 27%)
- Patient selection is most important
- Excessive tension leads to ischemia and failure…avoided with mesh and flap
- Most wounds especially in the post partum female can have an abdominoplasty type procedure ie Pitanguay, Reverse or Fleur de lys to close the skin

Mesh closure

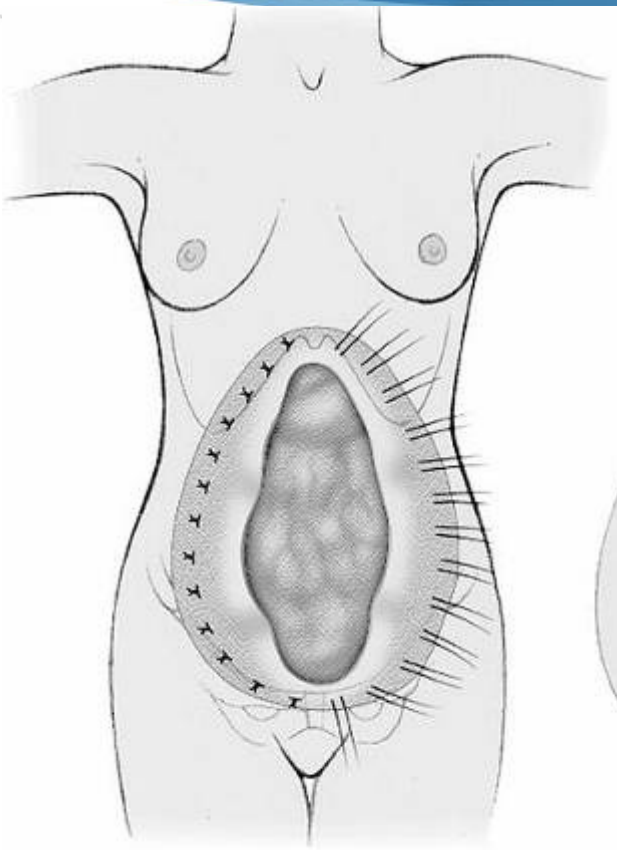
- Nonabsorbable preferred
- Polypropylene allows for ingrowth of tissue (as opposed to PTFE)
- Important to anchor mesh to well vascularized tissue without undue tension- usually on the anterior rectus sheath but more modernly on to the post sheath
- Have to consider adherence to underlying bowel (use of composite meshes)
- Complications:
  - Infection, fistula formation, erosion, & continued drainage

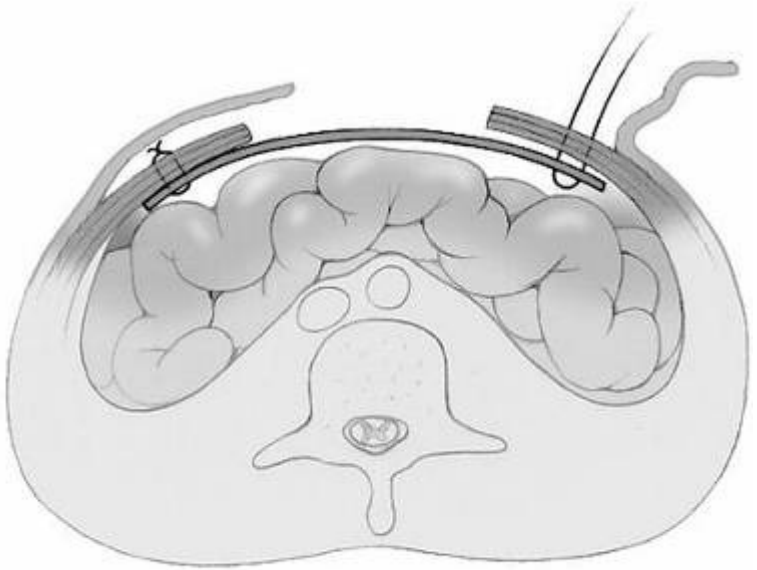
J.J. Bauer · M.T. Harris · S.R. Gorfine · I. Kreel

Rives-Stoppa procedure for repair of large incisional hernias: experience with 57 patients

- "Retro-rectus" mesh repair – ant to posterior fascia or pre-peritoneal space
- 57pts – 6 years
  - 26.4% prev incisional hernia repair
  - ePTFE: 8x8 to 20x28cm
  - Mean f/u 35 months
- 12.3% Seromas
- Two (3.5%) infected mesh – removed
- One hernia recurrence(removed prosthesis)

Mesh closure

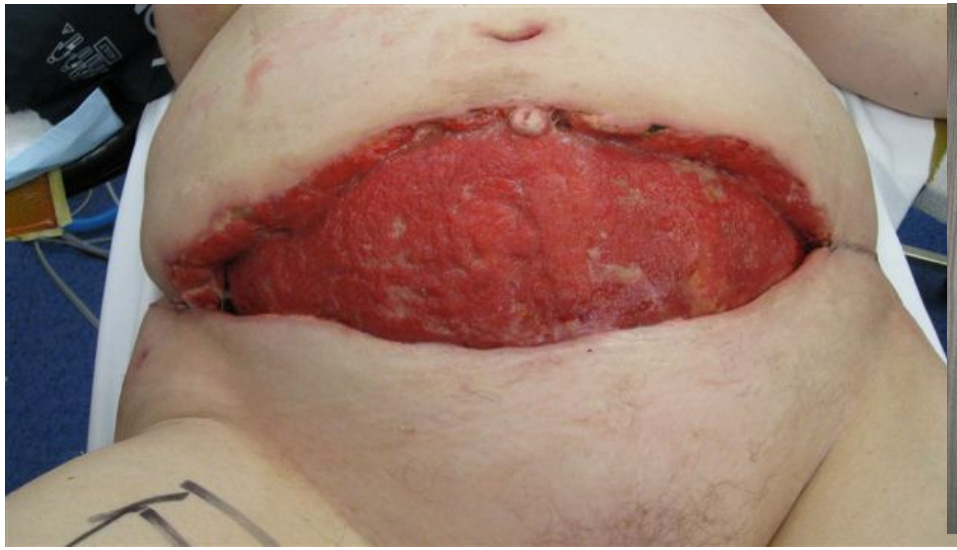




Three Staged Closure

- Commonly used for the very sick patient where you need to delay the reconstruction
- Stages:
  - Absorbable mesh / VAC or ssg directly on to peritoneum
  - STSG
  - Ventral hernia repair and coverage by whatever means or component separation

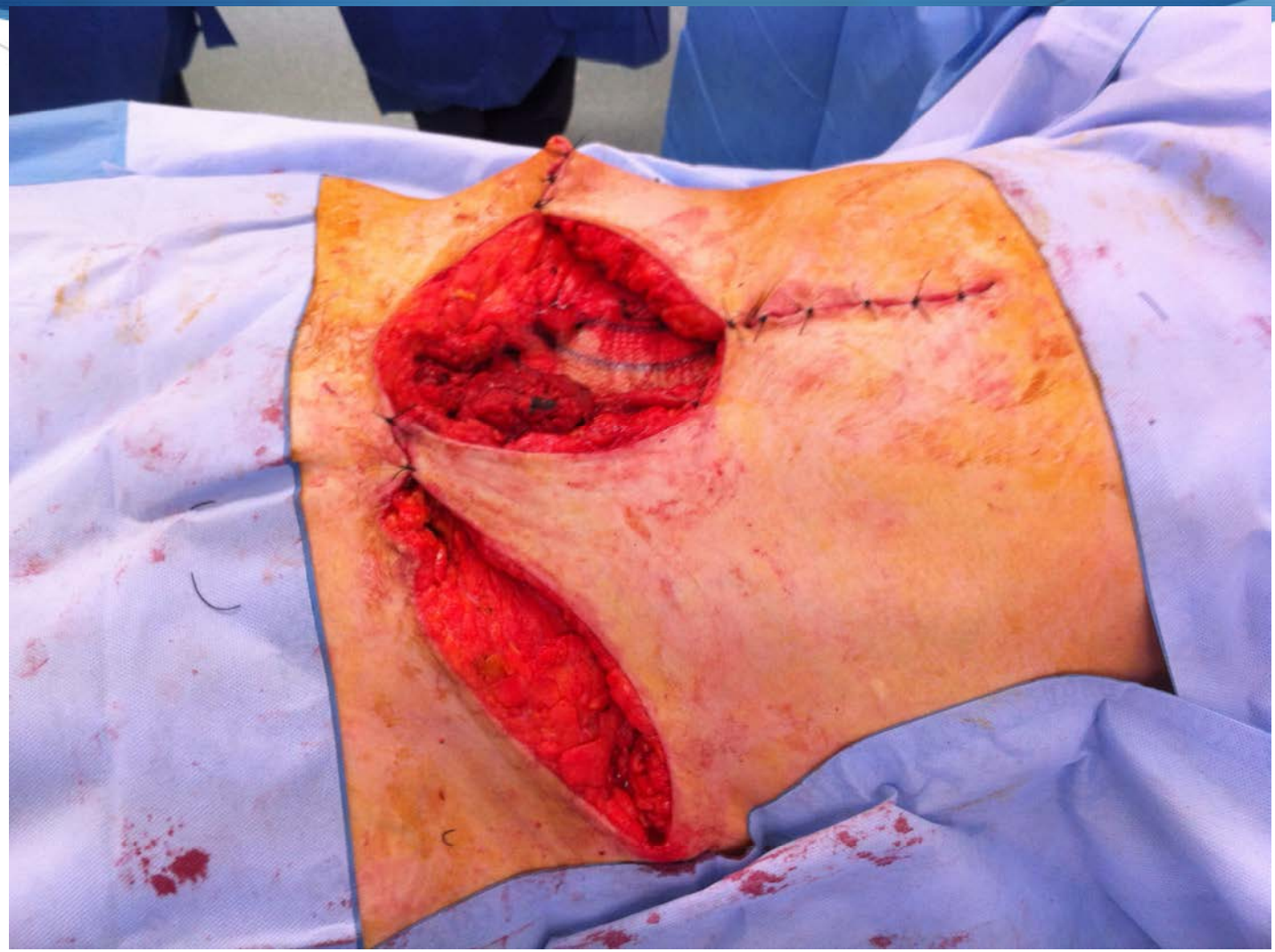
Post Nec Fac – Now closed with hernia repair



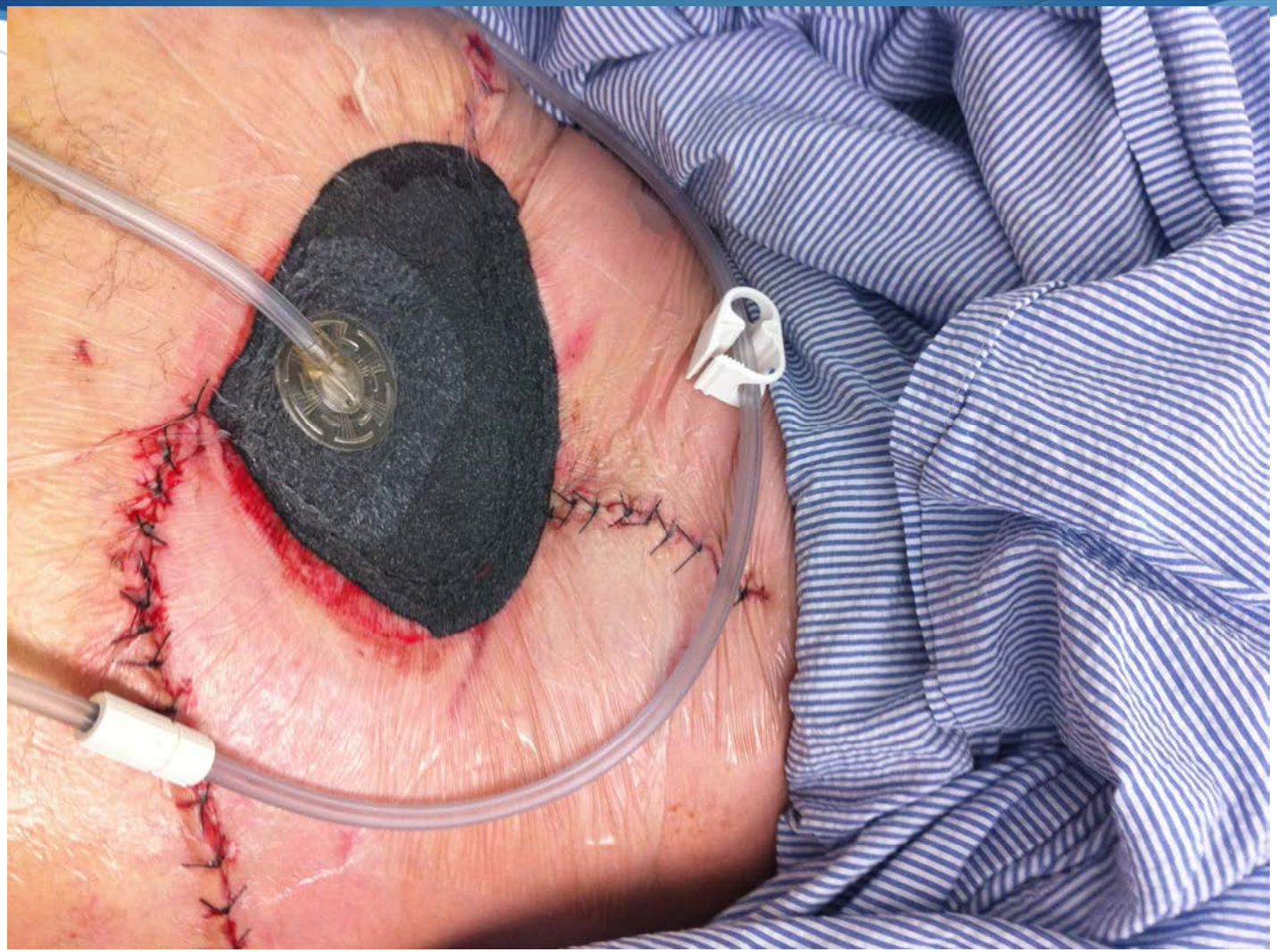
Necrotizing fasciitis

After debridement

Partial closure with mesh for anterior rectus sheath



Vac dressing applied



Pre closure

Closed

- Flaps mobilised and wound on the right lowered for symmetry
- Long term antibiotics
- May need lower body lift and formal umbilicus recon in the future

Components separation

- Oscar Ramirez (1990) describes technique
  - Cadaveric dissection
  - Incision 1cm lateral to linea semilunaris
  - Ext oblique (EO) easily separated from internal oblique (IO) in AVASCULAR plane
  - EO has limited advancement
  - Rectus w/ IO flap can be advanced
    - Unilateral - 5cm epigastrum/10cm middle/3cm suprapubic

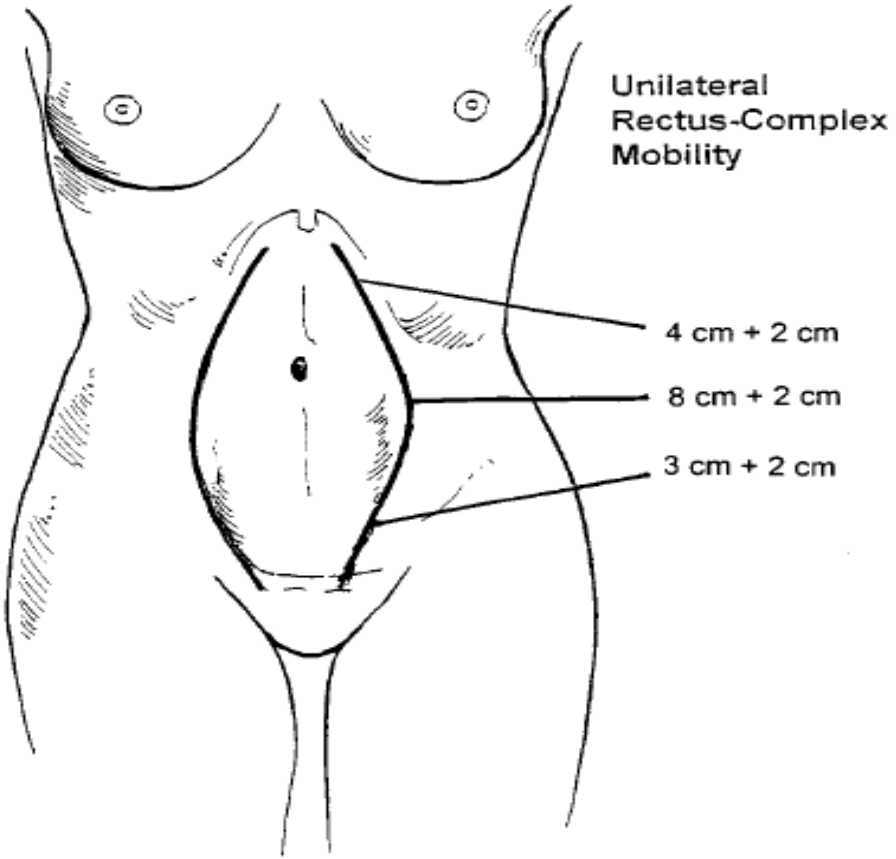
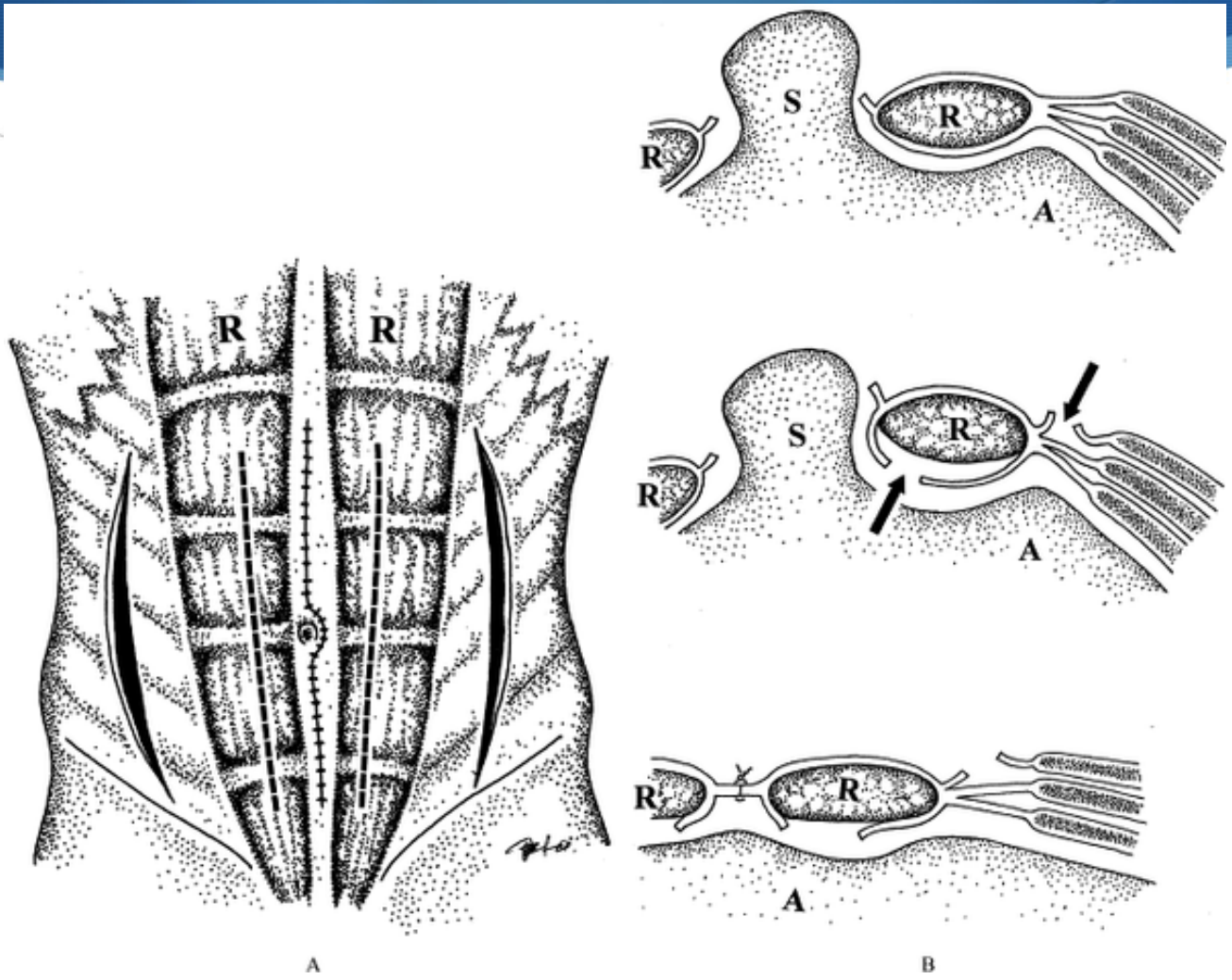


FIG. 1. Maximum defect dimension that can be reconstructed in upper, middle, and lower abdominal area by using bilateral muscle complex mobilization with surgical separation of the external and internal oblique muscles performed to the posterior axillary line. Note that separation of the rectus muscle off of the posterior rectus fascia above the arcuate line yields an additional 2 cm of medial muscle advancement at each level.

Component separation



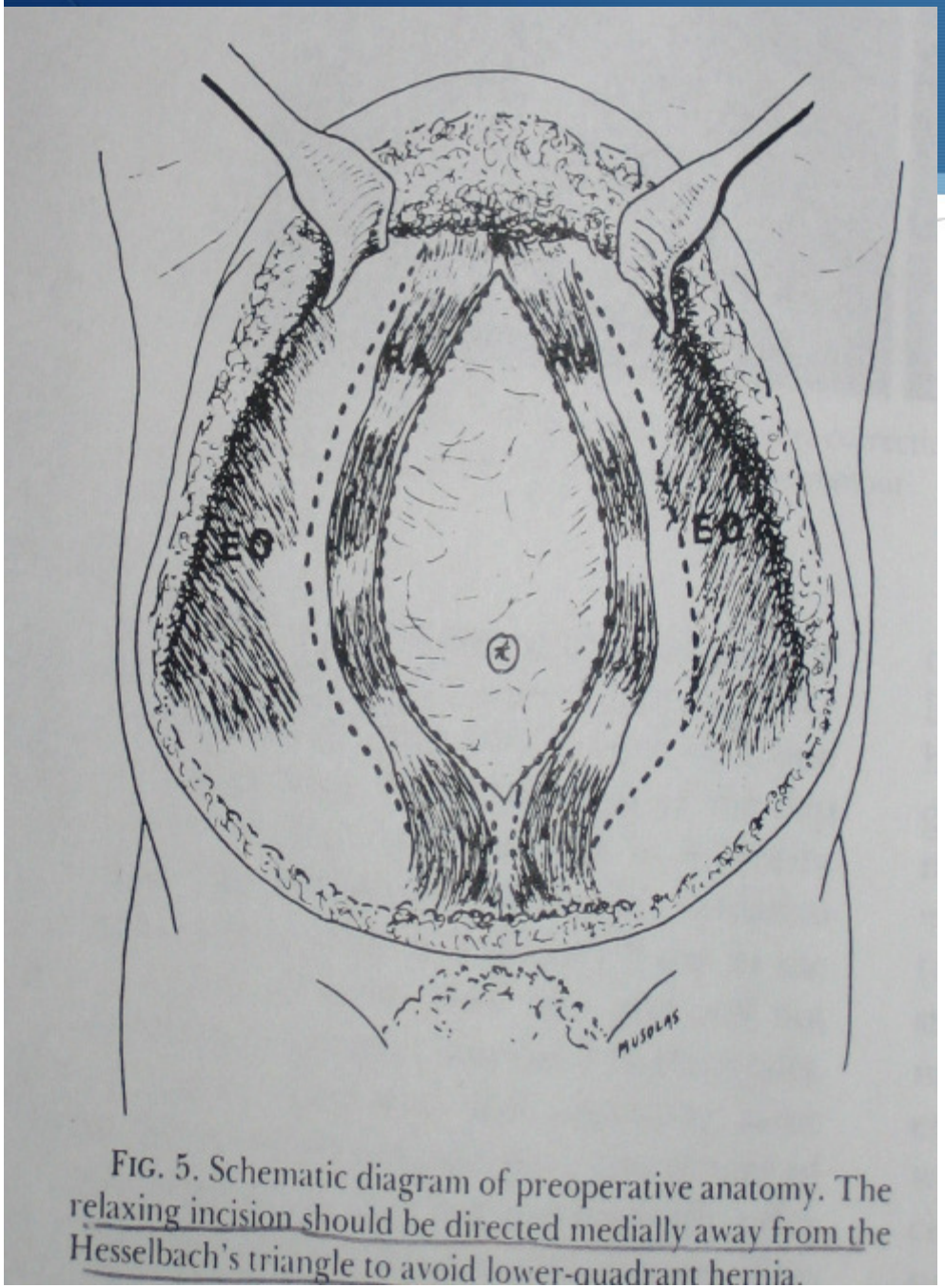


FIG. 5. Schematic diagram of preoperative anatomy. The relaxing incision should be directed medially away from the Hesselbach's triangle to avoid lower-quadrant hernia.

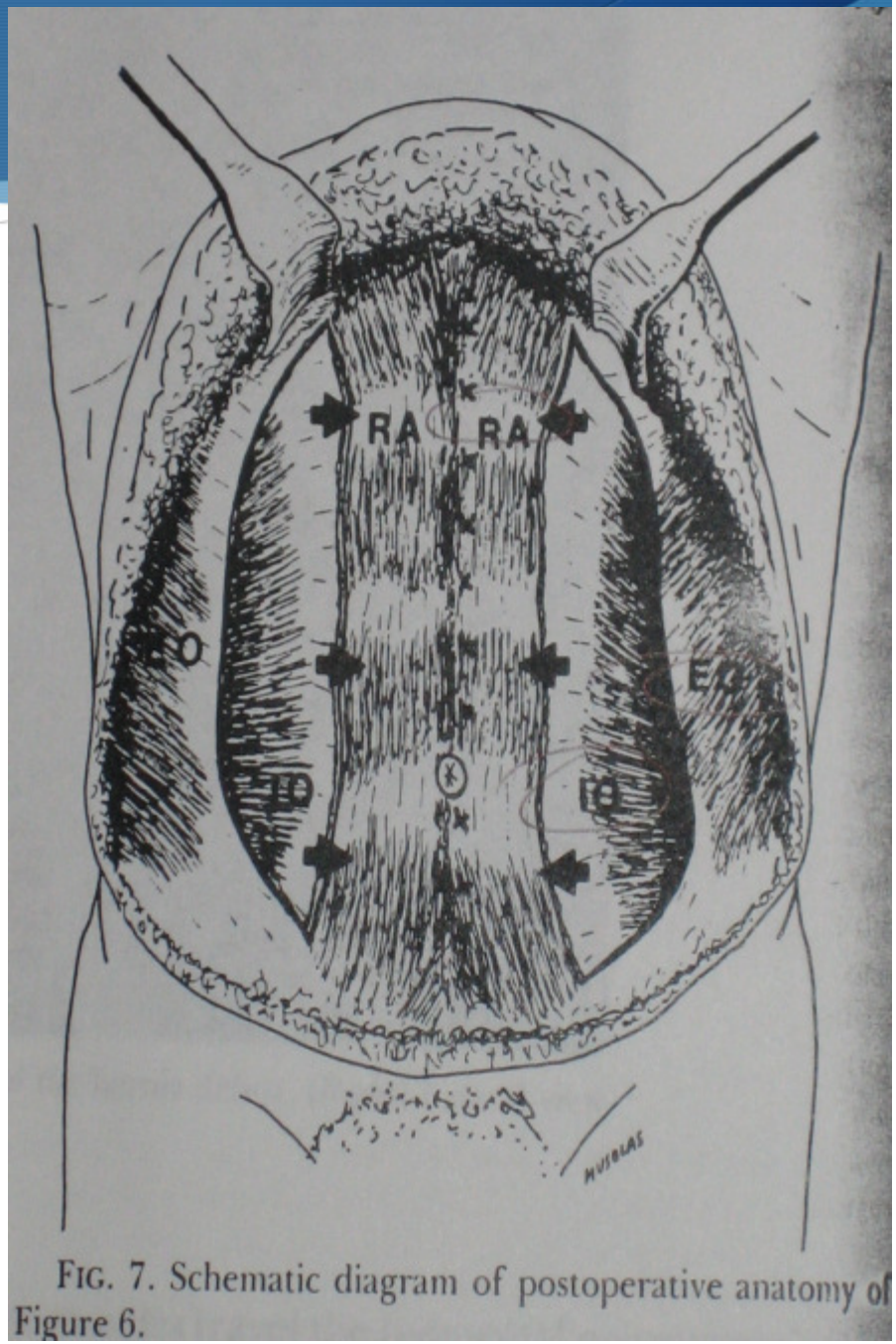


FIG. 7. Schematic diagram of postoperative anatomy of Figure 6.

The Separation of Anatomic Components Technique for the Reconstruction of Massive Midline Abdominal Wall Defects: Anatomy, Surgical Technique, Applications, and Limitations Revisited

Kenneth C. Shestak, M.D., Howard J. D. Edington, M.D., and Ronald R. Johnson, M.D.
Pittsburgh, Pa.

- 22 pt's / 4yr period
- Defects from 6x10 to 14x24cm
- Causes: removal infected mesh, removal of STSG, trauma; abd wall desmoid rsxn
- Complications: 2 wound infections, 1 seroma, 1 recurrent hernia

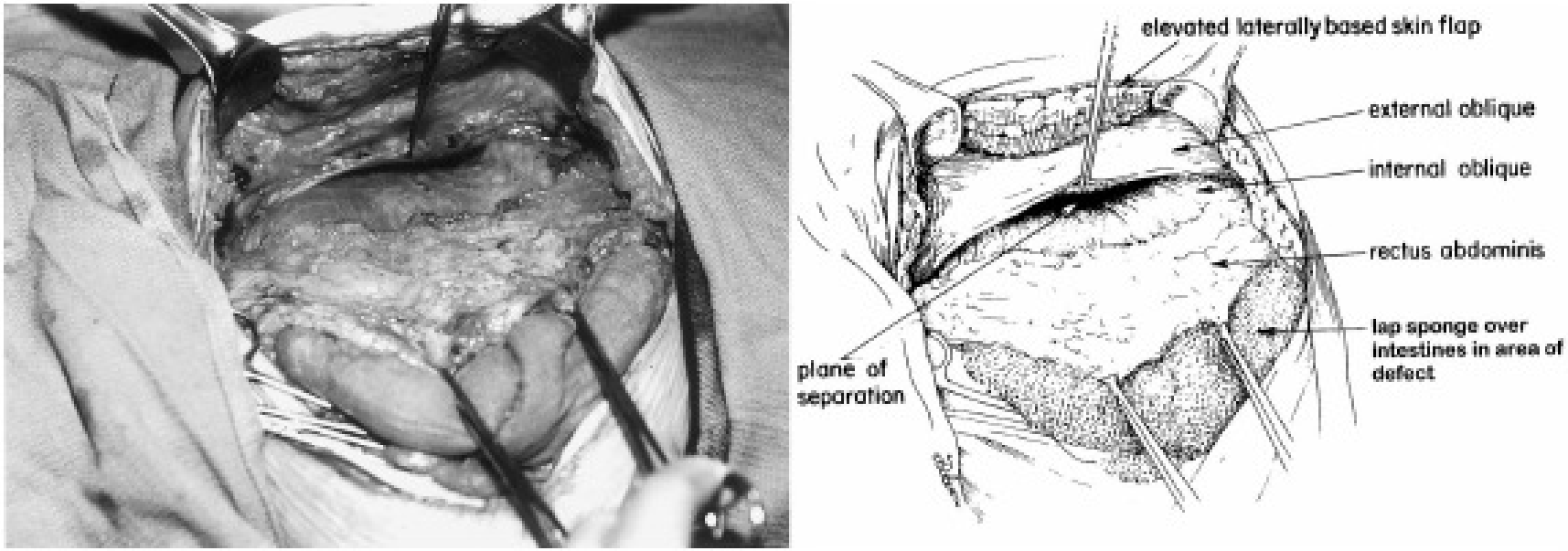


FIG. 2. (*Left*) Elevation of skin flaps and surgical field appearance of plane of dissection with separated external oblique and internal oblique muscles. (*Right*) Diagram illustrates various surgical planes corresponding to the operative photograph (*left*).

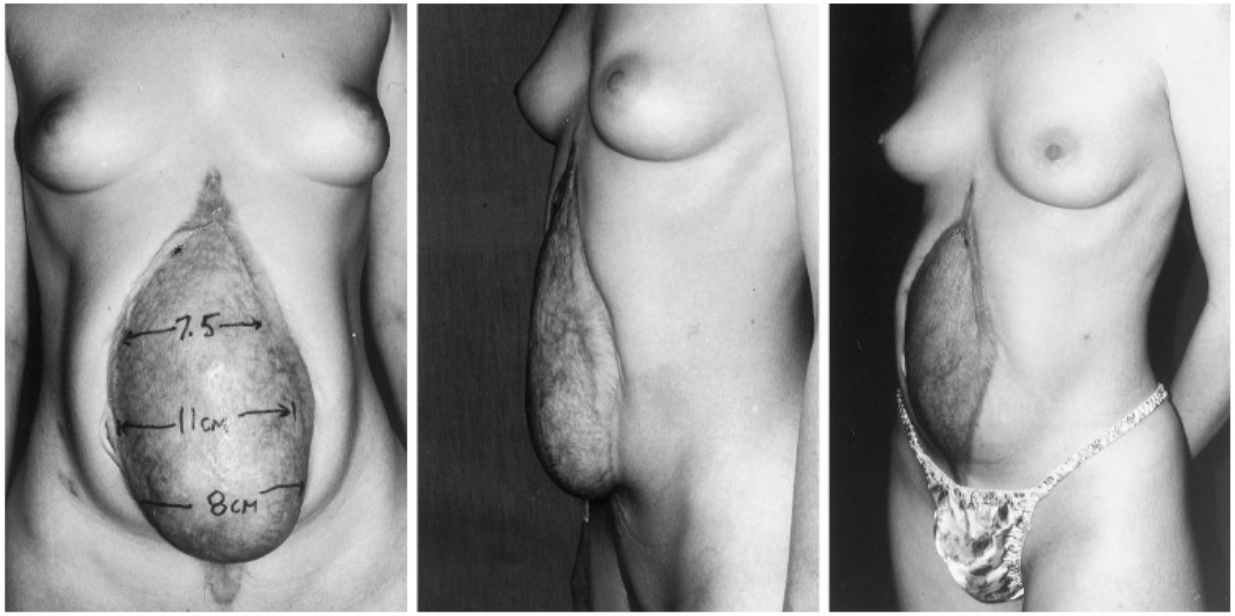


FIG. 4. Full-thickness 12 × 25 cm abdominal wall defect from an accidental gunshot wound and multiple surgical explorations. (*Left*) Frontal view, (*center*) lateral view, (*right*) oblique view.

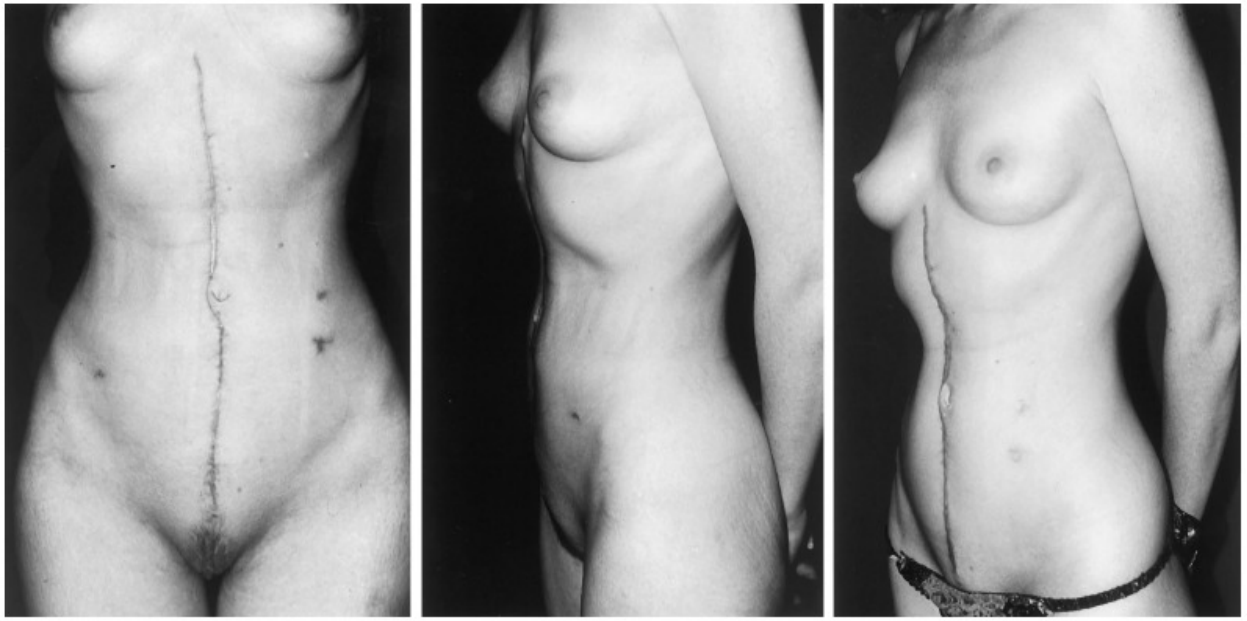


FIG. 5. (*Left*) After reconstruction by anatomic component separation, the 8-month postoperative view demonstrates a markedly improved abdominal appearance in frontal view. (*Center*) Profile view demonstrating excellent abdominal contour. (*Right*) Oblique view showing much improved contour and healing of abdominal tissue.

"Components Separation Technique" for the Repair of Large Abdominal Wall Hernias

Tammo S de Vries Reilingh, MD, Harry van Goor, MD, PhD, Camiel Rosman, MD, PhD, Marc HA Bemelmans, MD, PhD, Dick de Jong, MD, PhD, Ernst Jan van Nieuwenhoven, MD, Marina IA van Engeland, MD, Robert P Bleichrodt, MD, PhD

Table 1. Results of the Repair of Large Abdominal Wall Defects with the Component Separation Technique

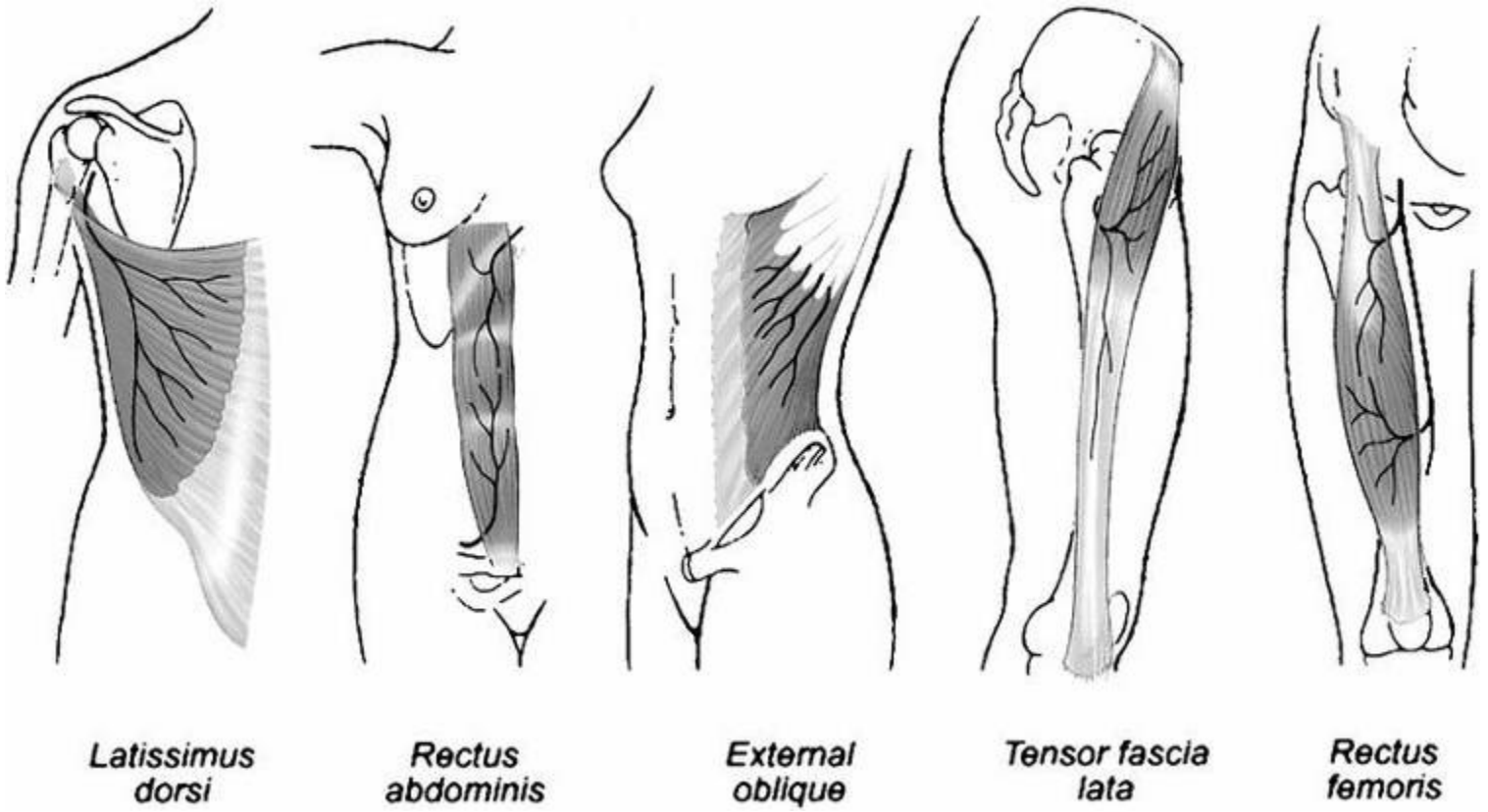
First author	Year	Patients	Clean/ contaminated	Complications (n)	Rehernia tion n (%)	Followup mean (range, mo)
Ramirez[3]	1990	11	8/3	0	0 (0.0)	? (4–42)
DiBello[9]	1996	35*	20/15	Wound infection (2) Hematoma (1) Seroma (1)	3 (8.6)	22 (1–43)
Girotto[10]	1999	33	30/3	Wound infection (8) Enterocutaneous fistula (1)	2 (6.1)	21 (6–57)
Shestak[11]	2000	22	?	Wound infection (2) Seroma (1) Death (1)	1 (5)	52 (8–84)
Lowe[12]	2000	30†	?	Wound infection (12) Skin ischemia (6) Skin dehiscence (13)	3 (10)	12
Cohen[13]	2001	24	15/9	Skin dehiscence (2) Seroma (1)	1 (4)	? (12–36)
Authors	2002	43	28/15	Wound infection (6) Hematoma (5) Seroma (2) Skin necrosis (1) Fascial dehiscence (1)	12 (30)	15.6 (12–30)

*In 15 patients, an onlay synthetic prosthesis was implanted as well.
†In 10 patients, an onlay polypropylene mesh was implanted as well.

Flap closure

- Flap selection based on location and arc of rotation
- High success rate when combine with mesh
- Delay of flaps will increase their reach
- Common options include Tensor fascia latae, anterolateral thigh flap, gracilis flap , contralateral rectus abdominus flaps

Common flaps used



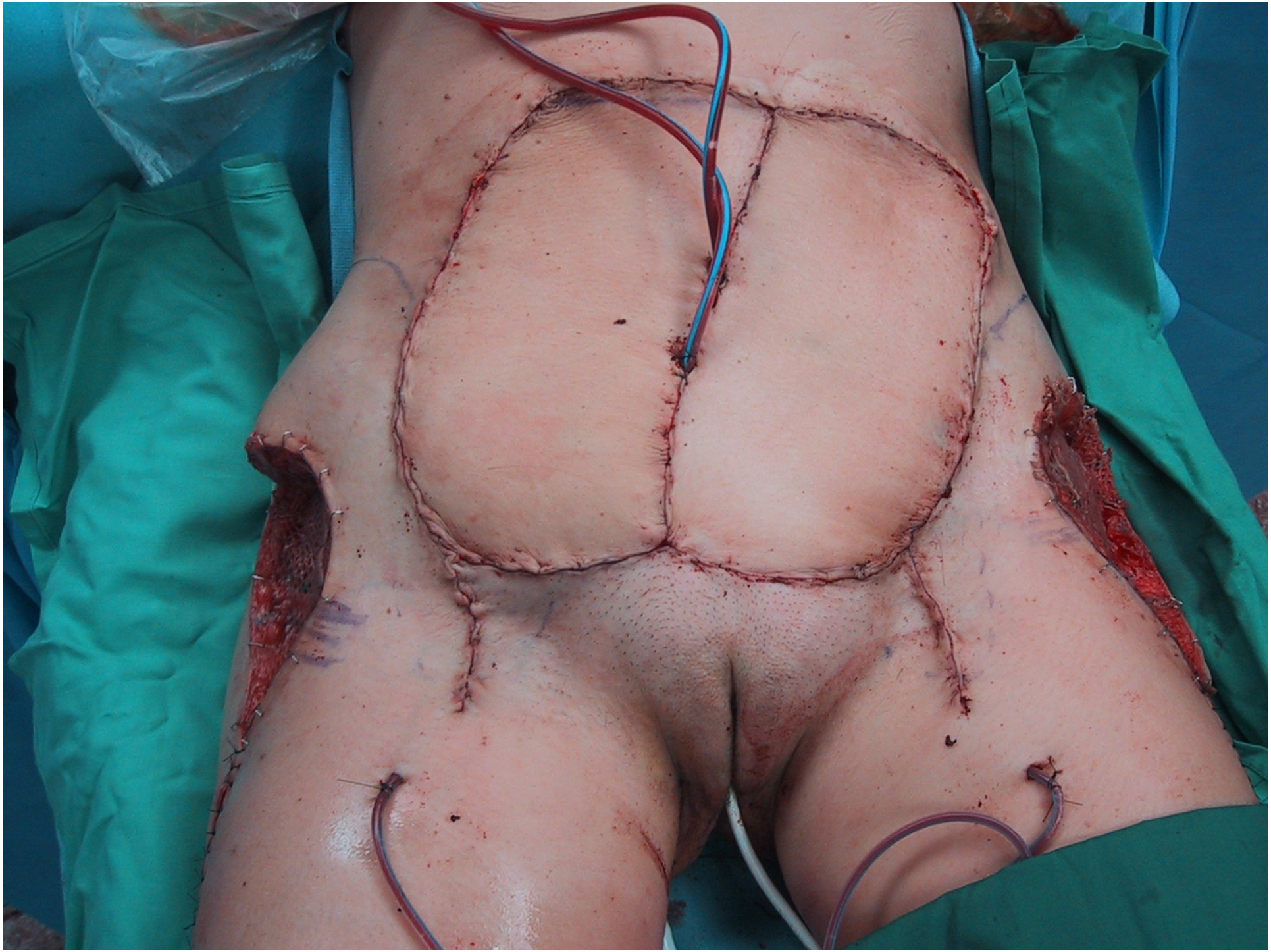
Anterolateral thigh flap

- Robust reliable flap with fascia included for repair
- Probably best used with mesh for hernia
- Excellent for lower abdo in any quadrant and will cross midline with ease
- Can reach epigastrium with delay and division of vessels to the rectus femorus

Anterolateral thigh flap

Free tissue transfer?

- Requires adequate recipient vessels- Deep inferior epigastic vessels , The Gastroepiploic vessels, DCIA Corlett loop from the femoral vessels using long saphenous vein
- Allows to transfer innervated muscle
- Technically more demanding
- Watch for the effect of ileus on a stretched pedicle



Other methods and the future

- Tissue expansion on the thigh
- Use of alloderm or sheath substitutes
- Transplantation??

Acellular Cadaveric Dermis (Alloderm)

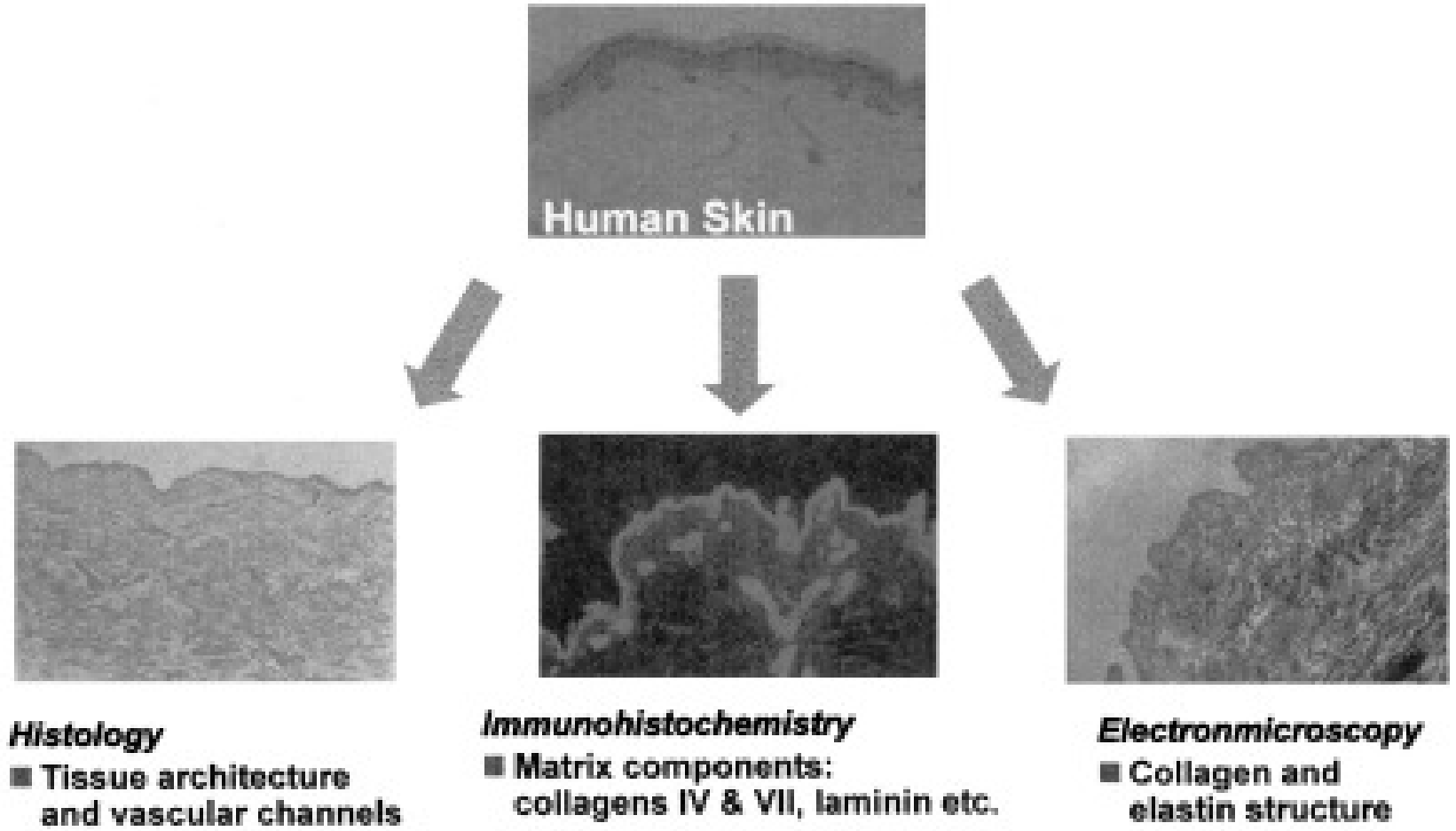


FIGURE 1. The process used to create AlloDerm retains the histologic, immunologic, and biochemical components necessary to reintegrate into human tissue.

Early One-Stage Closure in Patients with Abdominal Compartment Syndrome: Fascial Replacement with Human Acellular Dermis and Bipedicle Flaps

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From the Division of Trauma, Section of Surgical Sciences, Vanderbilt University, School of Medicine, Nashville, Tennessee

- Goal: 3 stage → single operation

- Bilateral bipedicle advancement flaps
  - Incisions @ anterior axillary lines-undermine @ junction of SQ fat & anterior fascia
    - Donor site w/ STSG
- 9 Pt's followed for mean 20 months
- Conclusion

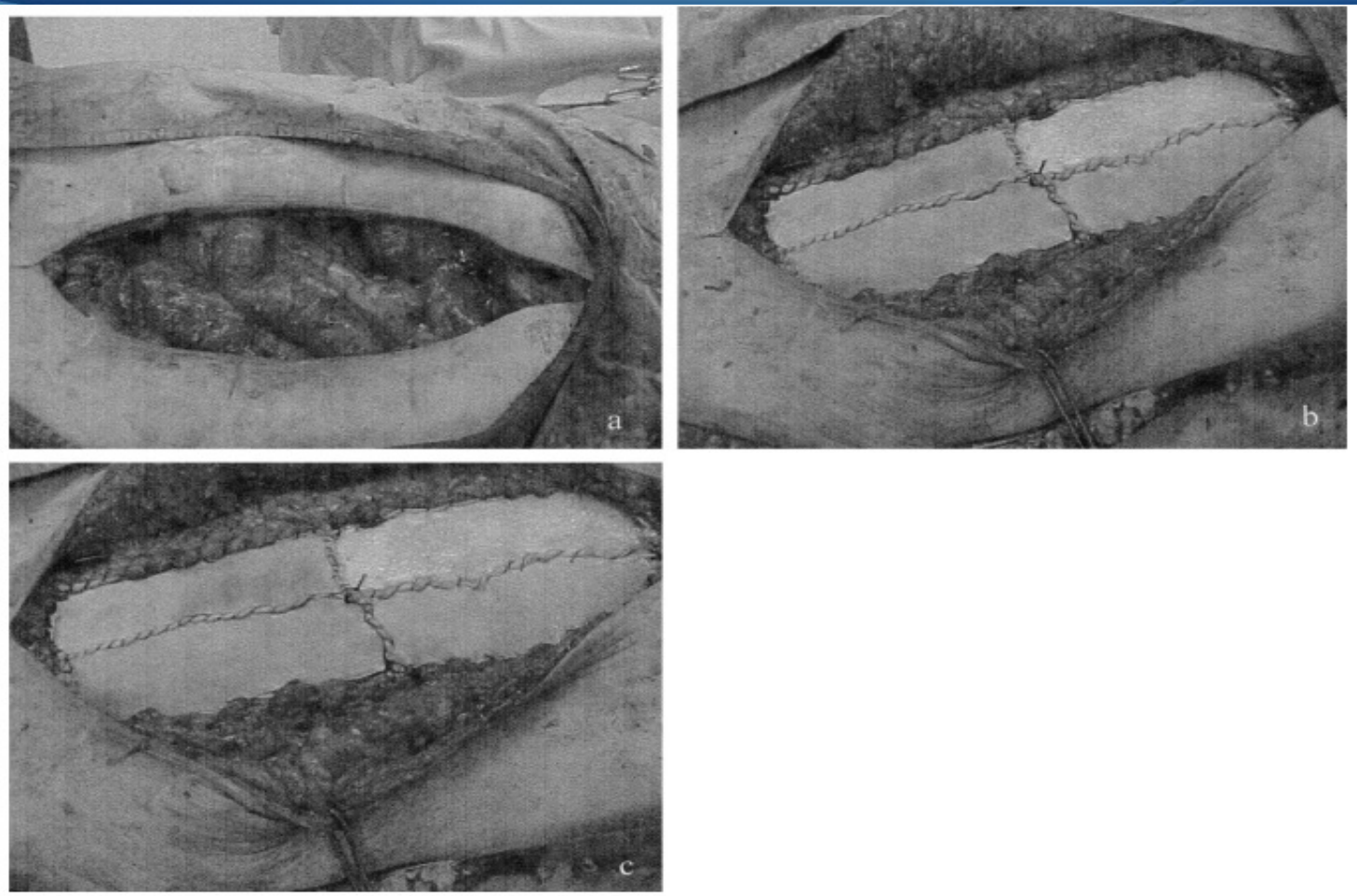


FIGURE 2. Surgical placement of AlloDerm for repair of a 91-cm^2 incisional ventral hernia. (**A**) The hernia defect has been prepared by excising all unstable skin, subcutaneous tissue, and fascia to allow for repair. (**B**) Tissue components were then dissected from each other to provide a clean fascial edge to allow for hernia repair. (**C**) Four pieces of 4 × 12cm AlloDerm were reconstituted and attached with 0 polypropylene suture to create a patch to repair the defect. This patch was then sewn in using running, interrupted 0 polypropylene suture.

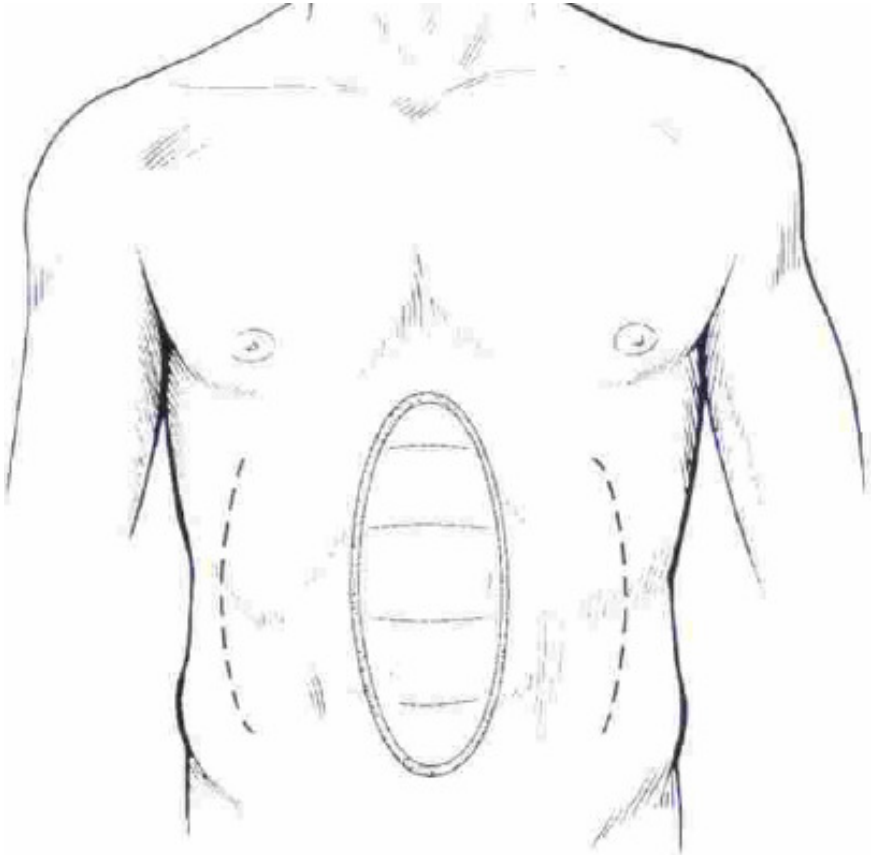


FIG. 1. Fascial substitution and placement of incisions for advancement flaps.

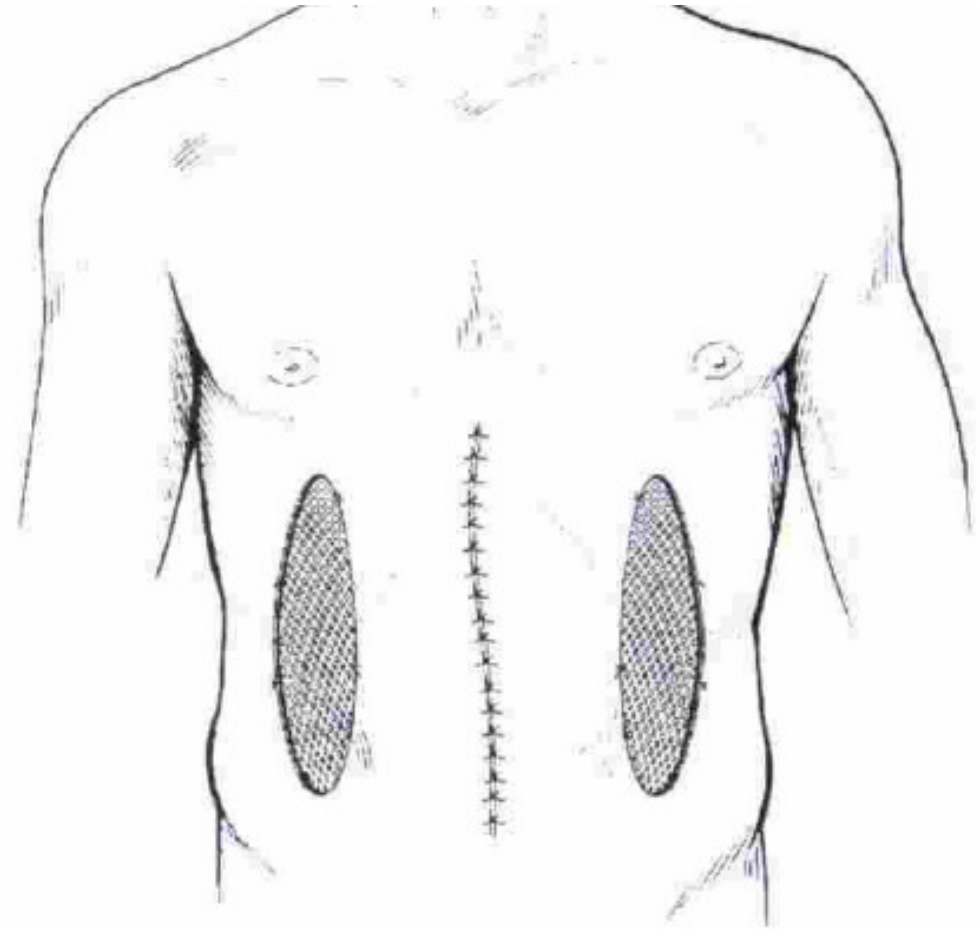
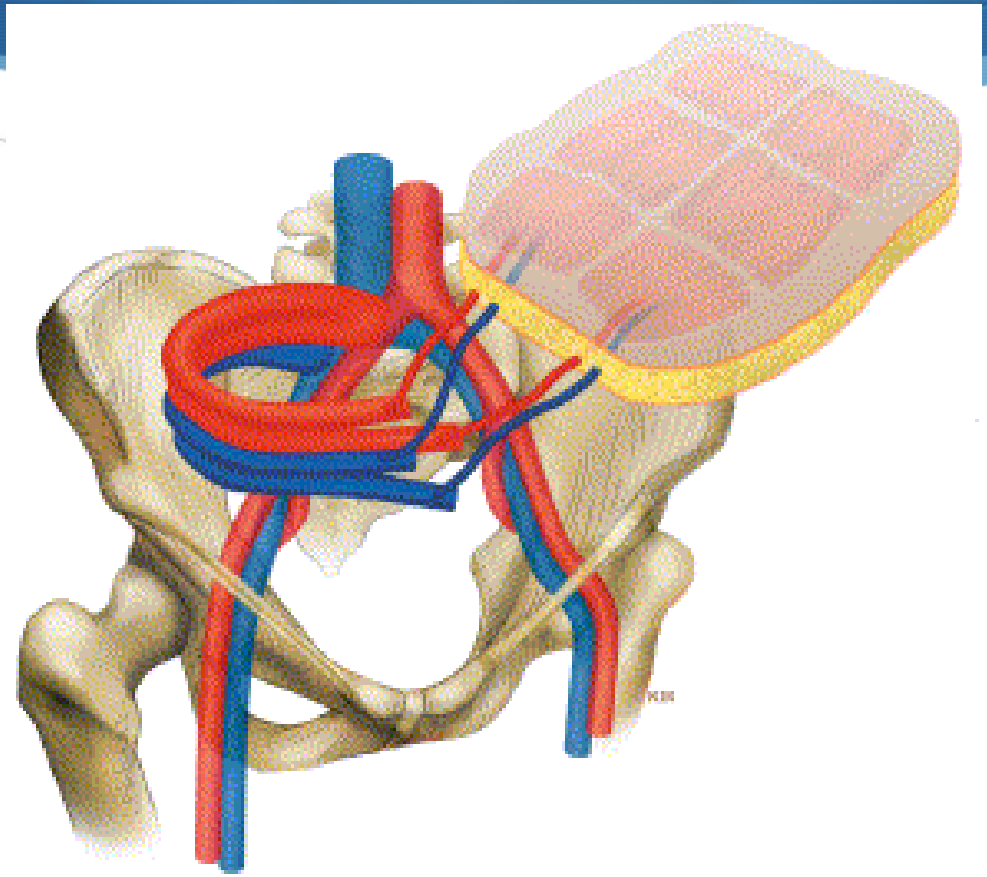


FIG. 2. Advancement of flaps and closure of donor sites with split-thickness skin grafts.

Transplantation of the abdominal wall



Summary

- Necrotizing fasciitis is a true surgical emergency, diagnose on suspicion early and operate early
- Abdominal wall recons are not uncommon
- Mainly midline and post surgical / trauma
- Best addressed as team approach
- Most fixed with delayed primary closure or abdominoplasty or components separation
- Larger defects with flap and mesh repair