Management of the Laparostome or Open Abdomen

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Annual Controversies Symposium 2015
Complications following common operations or procedures

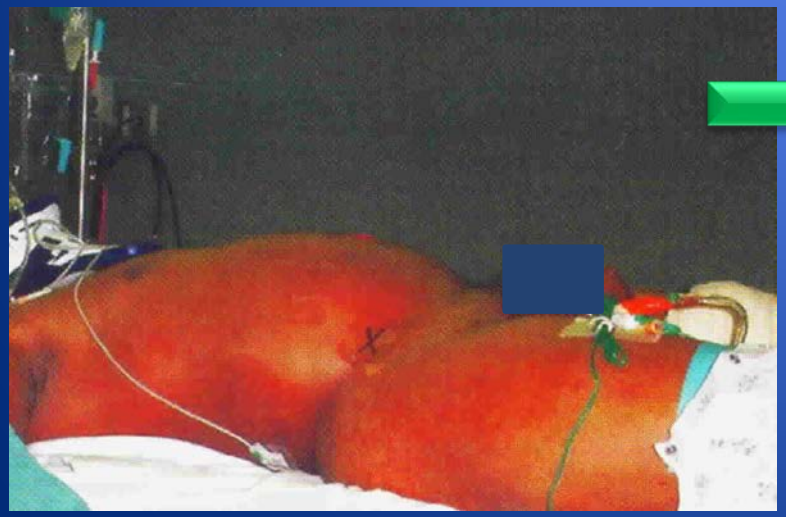
Conflict of interest

- Associated with KCI Medical SA (Pty) Ltd

Definition

<u>Laparostome</u> : a surgical treatment method in which the peritoneal cavity is opened anteriorly and left open hence called 'open abdomen'

(this excludes full-thickness abdominal wall defects due to partial excision due to tumour or nec. fasciitis.)



Reference: Leppaniemi, A.K., Laparostomy: why and when

The Story…….

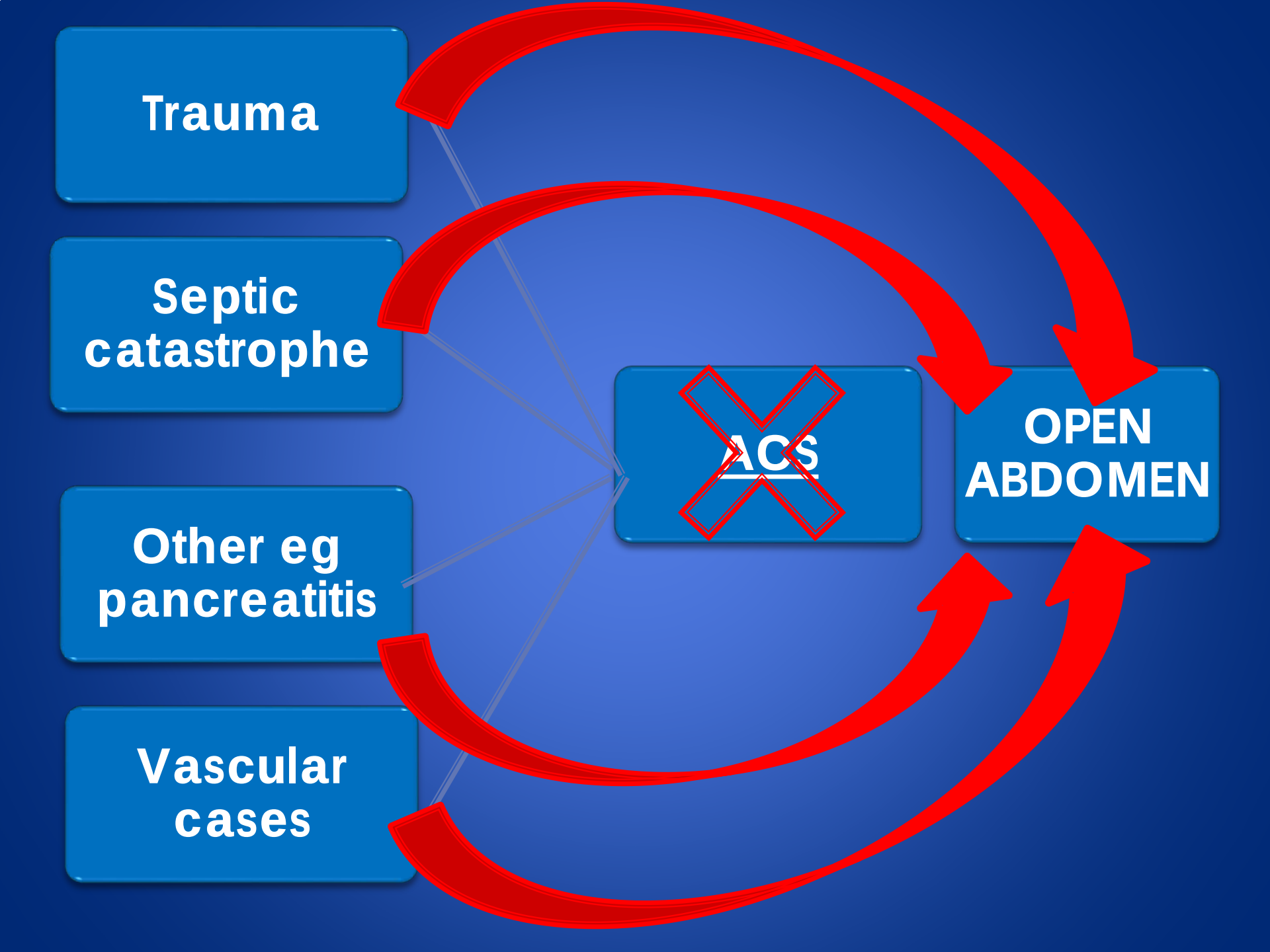
- Closing abdomens at all cost has complications and leads to preventable deaths
- An open abdomen (OA) is a challenge for surgeons, intensivists and nursing staff
- Open abdomens seen as suboptimal treatment because of the high complication rate :
  - bowel dessication,
  - Fistulation
  - Infection
  - Sepsis

The Story…….

- Dangers are perceived of long definitive operations after trauma
- Paradigm shift to damage control, eg of haemorrage
- Physiological stabilization followed by definitive surgery has become the standard
- Improvements in anaesthesia, aseptic techniques, blood banking and antibiotic therapy
- Better post operative support in ICU of
  - Cardiovascular function,
  - Respiratory function
  - Renal support

The Story…….and impact on Critical Care

- Realisation of the dangers of raised IAP and subsequent ACS in surgical and non-surgical acute abdomens
- Newer technologies improve the management and reduce the complication rate eg better control of the abdominal content in patients with an OA
- Development of the concept of TAC advanced care in CC
- Means to progress to definitive fascial closure available
- A rapidly evolving and innovative field which change over time


Trauma
Septic catastrophe
Other eg pancreatitis
Vascular cases
ACS
OPEN ABDOMEN

Also:

If medical management for IAH fails,

- Proceed to surgical management and open the abdomen to decompress

- Lately ? Subcutaneous linea alba fasciotomy. In a recent study it was found to reduce IAP and restore organ function but leaving skin and peritoneum intact for visceral protection [11]

Recommendations for Open Abdomen Management

Recommendation	Strength of Recommendation	Grade of Evidence	Evidence
• Laparotomy **incision** should extend from xiphoid to pubis	1	C	Expe…inion
• **Initial fascial closure** should begin at first "take-back" to the operating room	1	C	…pinion
• The use of **towel clips** for TAC is generally not recommended because of risk for ACS	2	C	Fabian, 2007[1] Expert opinion
• **Enteral feeding** should be initiated as soon as possible after complete Resuscitation; oral or nasal feeding Tubes are preferred	1	B	Bartlett et al.,1982[2] Collier et al., 2007[3] Moore and Jones, 1986[4] Moore et al., 1992[5] Dissanaike et al., 2008[6]
• The use of **permanent synthetic mes…** is not recommended for bridging o… fascial defects that cannot be … primarily		C	Leber et al., 1998[8] Brown et al., 1985[7] Expert opinion
• **Biologic repair ma…** …be appropriate for … …scial defects tha… …losed primarily	1	B	Scott et al., 2006[11] de Moya et al., 2008[14] ingh et al., 2008[13] Teixeira et al.,2008[12]
• **Full co… …ent separation** is generally not recommended to promote fascial closure in patients with an OA	2	C	Expert opinion
• **Skin closure over prosthetic** repair materials is strongly recommended	1	C	Expert opinion
• The use of **NPWT in open skin wounds** with biologic repair material is safe and effective	1	B	Scott et al., 2006[11] Expert opinion

No EBM……No Golden Standard for Treatment

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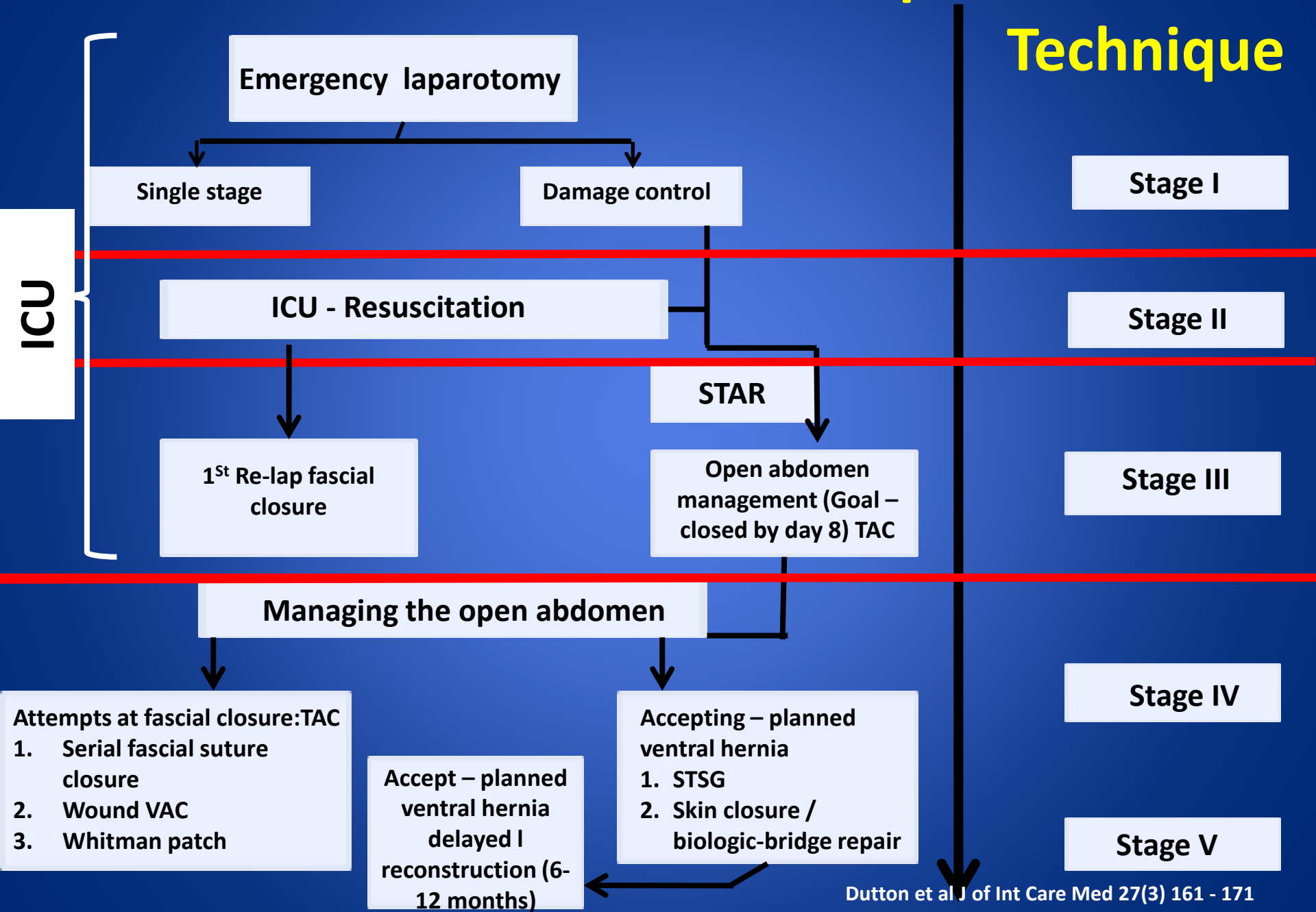
Overview of the Phases of the Open Abdomen Technique



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Phases in the management of the open abdomen: Stage I

1. Pre-emptive pre-ICU Critical Care
2. Dictated by patient's physiological reserve

   AIM = Rx *BEFORE reaching physiological exhaustion!*

   Triad of death: Temp<35*C, pH< 7.20, BE>-15, coagulopathy

   - Earliest possible (damage control) resuscitation
     - Cardiorespiratory
     - Metabolic (glucose, acidosis, lactate, pigment nephropathy)
   - Fluid balance approach "controlled drug therapy"
     - ***Do not run them dry – Run them right (Preload sensitivity)***
   - Blood and component therapy in 1:1:1 ratio
     - ROTEG (Thrombelastometry)
   - Emergency surgery = Source or damage control
     = Resuscitative or decompressive laparotomy

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Phases in the management of the open abdomen: Stage II

ICU Resuscitation/Management

- Continued resuscitation postoperatively
- Complications of Open Abdomen
  - Fluid loss
  - Protein loss and nutritional implications
  - Fistula formation
  - Loss of domain
- Bedside laparotomy or return to theatre
- Temporary abdominal closure (TAC) to facilitate:
  - Wound management
  - Foster primary fascial closure of wound
  - Protect skin and prevent pressure ulceration

Stage II - Immediate Postsurgical ICU Care - 1

- Selective sedation/monitor ventilation. Reserve deep sedation and neuromuscular blockade for ALI/ARDS
- Rewarm and/or maintain normal temperature (active and passive)
- Continue resuscitation as necessary - Monitor haemodynamics closely
- Correct coagulopathy and acidosis
- Use appropriate physiological and metabolic monitoring
- Monitor bladder pressure for IAH/ACS
- Feed patients with OA – it is safe if GIT is intact
- Combine EN and TPN when demand cannot be met with EN

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Stage II - Immediate Postsurgical ICU Care - 2

- Evaluate for on going haemorrhage
- Monitor serial laboratory measurements, including haemoglobin and haematocrit, ROTEG closely
- Consider adjunctive techniques for haemorrhage control (e.g., angiography with embolization, pelvic stabilization)
- Management of oedema, fluid and protein loss
- Management of exudate containing toxins and bacteria
- Culture collection (septic patients) Appropriate antibiotic therapy

D

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Phases in the management of the open abdomen: Stage III

1. Re-operation and staged closure or reconstruction(24-48h)
   - Monitoring intra abdominal pressure
   - Maintain adequate resuscitation (temp, pH, coagulopathy)
   - Volume replacement vs Transfusion
   - Nutrition
   - Antibiotics
   - Planned return to OR vs bedside laparotomy in ICU
     - Planned vs on demand laparotomy
     - Source control: haemostasis, devitalised tissue, sepsis
     - Anastomoses, stomas
   - Staged reducing and closing of the fascial defect
   - On going wound management

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Classification of the Open Abdomen

- **Grade 1a)** Clean abdomen ***without*** adherence of viscera to abd wall
  1b) Contaminated abdomen ***without*** adherence of viscera to abd wall

- **Grade 2a)** Clean abdomen ***with adherence***
  2b) Contaminated abdomen ***with adherence***

- **Grade 3)** With ***fistula*** formation

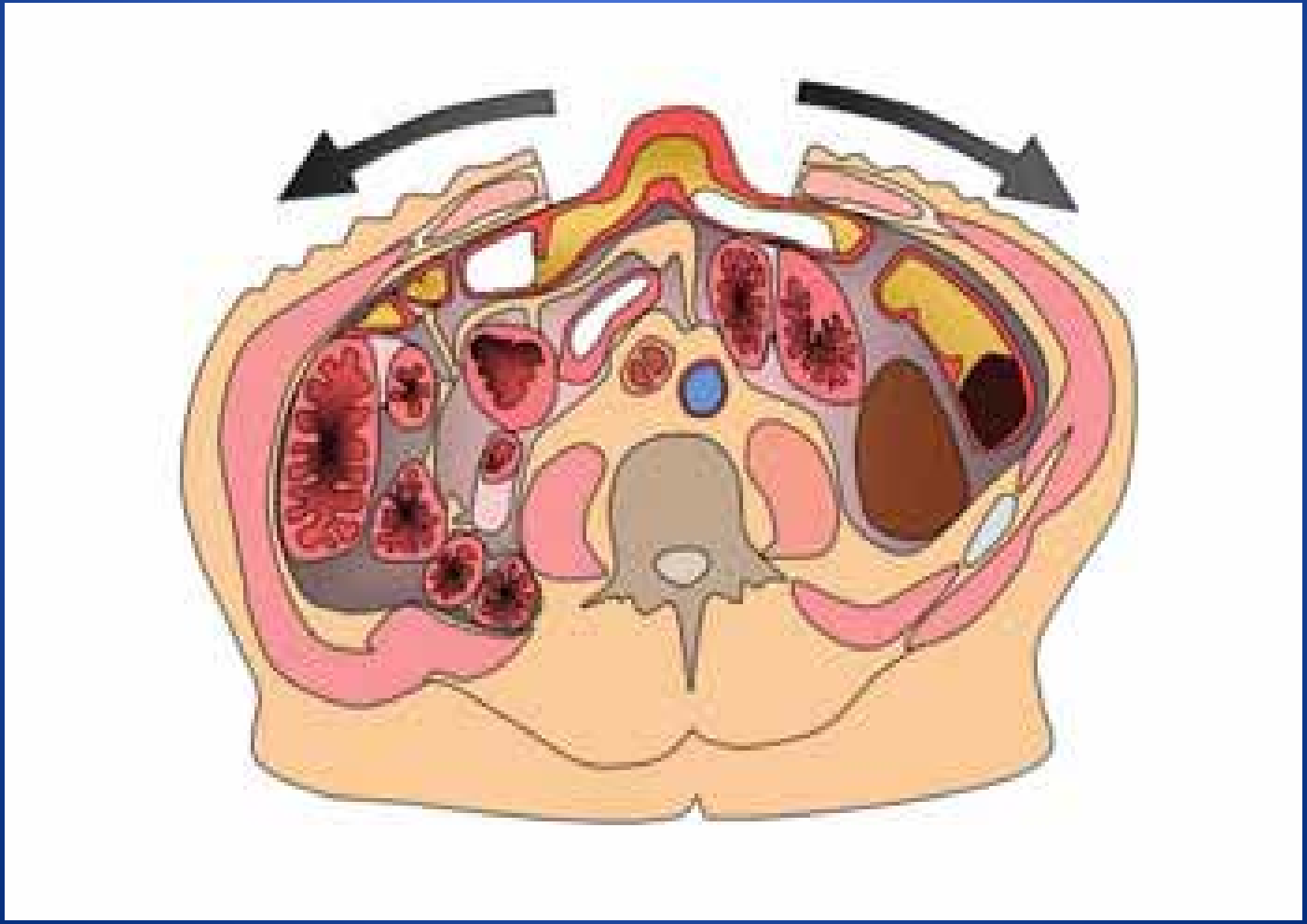
- **Grade 4)** ***Frozen*** abdomen

Challenges of the Open Abdomen

- Morbid procedure
- High risk for complications
- Expensive
- Resource intensive
- Many surgical revisions required
- Extensive nursing care
- Knowledge, experience, expertise

The Problem…..

loss of domain occurs as the unopposed forces of the oblique muscles pull the abdominal wall in a lateral direction.



Goals for Temporary Abdominal Closure (TAC)

- Cover and protect abdominal contents (*fistulation)*
- Prevent evisceration
- Prevent or treat recurrent ACS
- Help manage fluid loss and protein loss (*2grams per litre)*
- Prevent damage to fascia layer *(tension + recurrent sutures)*
- Minimize loss of domain
- Facilitate reoperation and abdominal exploration
- Keep patient hygienic, dry and intact
- Prevent adhesion formation – maintain mobility of abdominal wall – promote fascial and abdominal wall closure
- Remove infectious material, toxins, inflammatory mediators

Martin et al UpToDate 2013

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The ideal dressing

Should…

- Be easy to apply and remove
- Allow easy nursing care
- Not damage bowel, fascia or skin
- Be readily available and inexpensive
- Maintain abdominal domain (physiological environment)
- Allow easy access to abdominal cavity
- Have a high rate of subsequent closure
- Be compatible with temporary abdominal closure (TAC) techniques

Technologies and Options Used for Progressive Reduction of the Fascial Deficit

Category	Technique
• **Negative pressure** (37 - 100% fascial closure)	1. Barker technique – VAC pack 2. NPWT (VAC® Therapy; Kinetic Concepts, Inc., San Antonio, TX)
• **Synthetic repair material** (22 - 100% fascial closure)	1. Absorbable synthetic 2. Artificial burr (Wittmann Patch™; Starsurgical, Burlington, WI) 3. Permanent synthetic mesh
• **Mass closure devices** (61- 85% fascial closure)	1. Dynamic fascial closure (ABRA® Canica Design Inc., Almonte, Canada 2. Dynamic retention sutures
• **Silo techniques**	Bogotá bag (rarely used)
• **Skin techniques only** (Not recommended)	1. Towel clips 2. Skin sutures

Kaplan et al Wounds Oct 2005 Suppl

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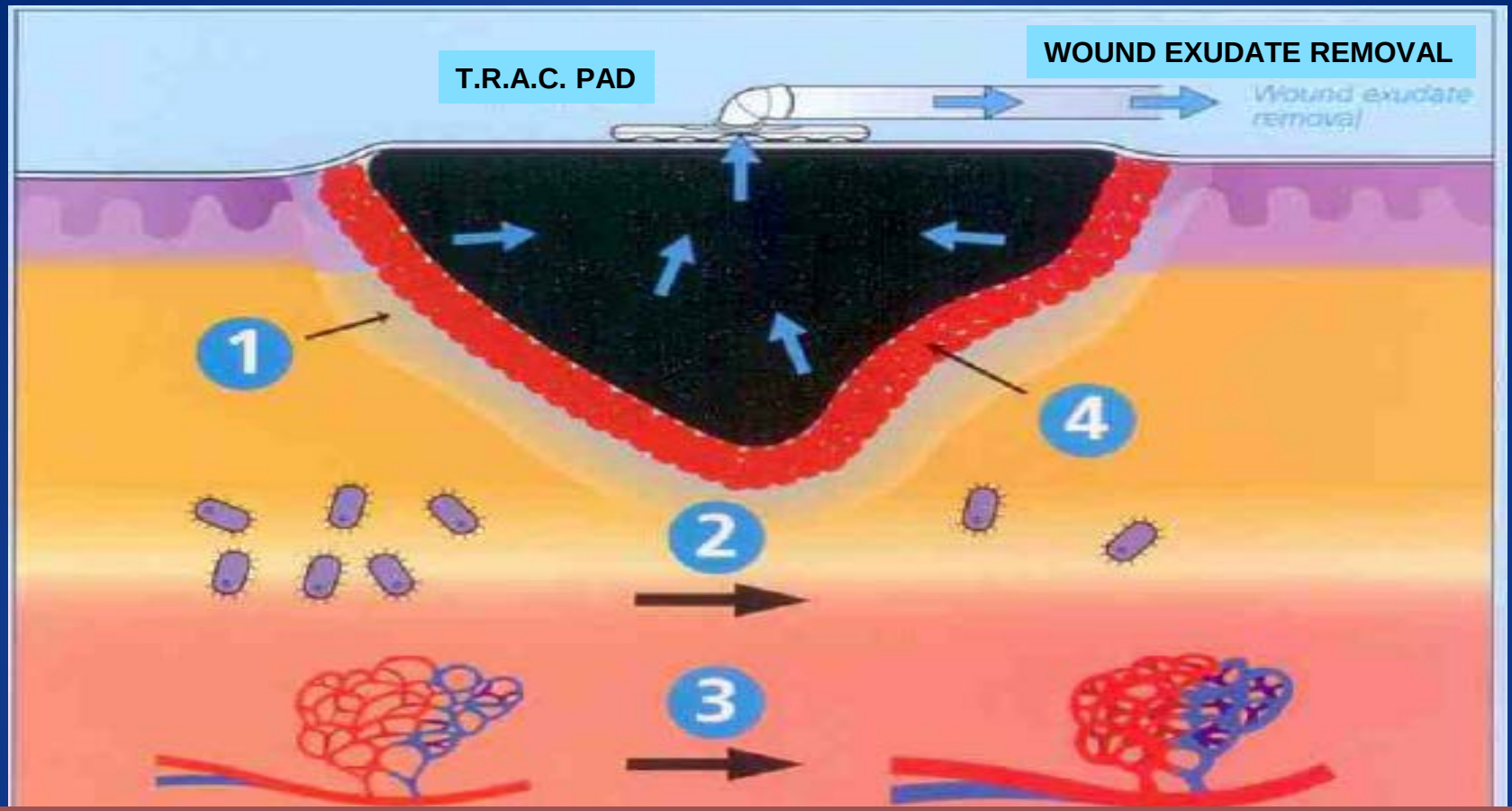
% Primary closure resulting from different TAC methods

VAC Assisted	100% [8]
ABRA retension sutures	60% [9]
Absorbable mesh	26% [3]
VAC pack	36% [3]
Wittmann Patch	78% [10]

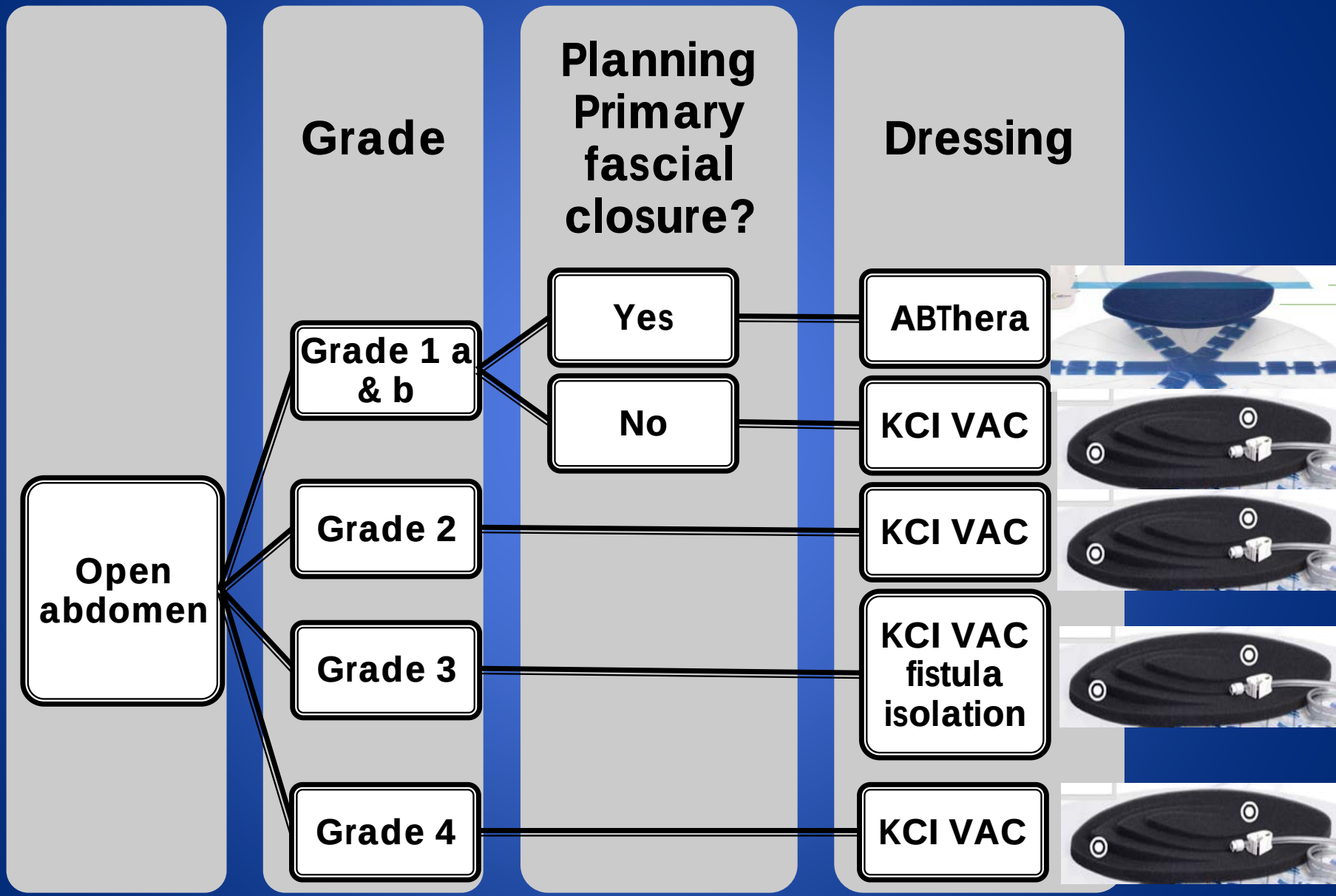
- 8. Cothren. One hundred percent fascial approximation with sequential abdominal closure of the open abdomen Am J Surg 192, 2006
- 9. Reimer Van J Surg June 2008
- 3. Bee et al Temporary abdominal closure techniques The journal of Trauma Aug 2008
- 10. Weinberg J Trauma Aug 2008



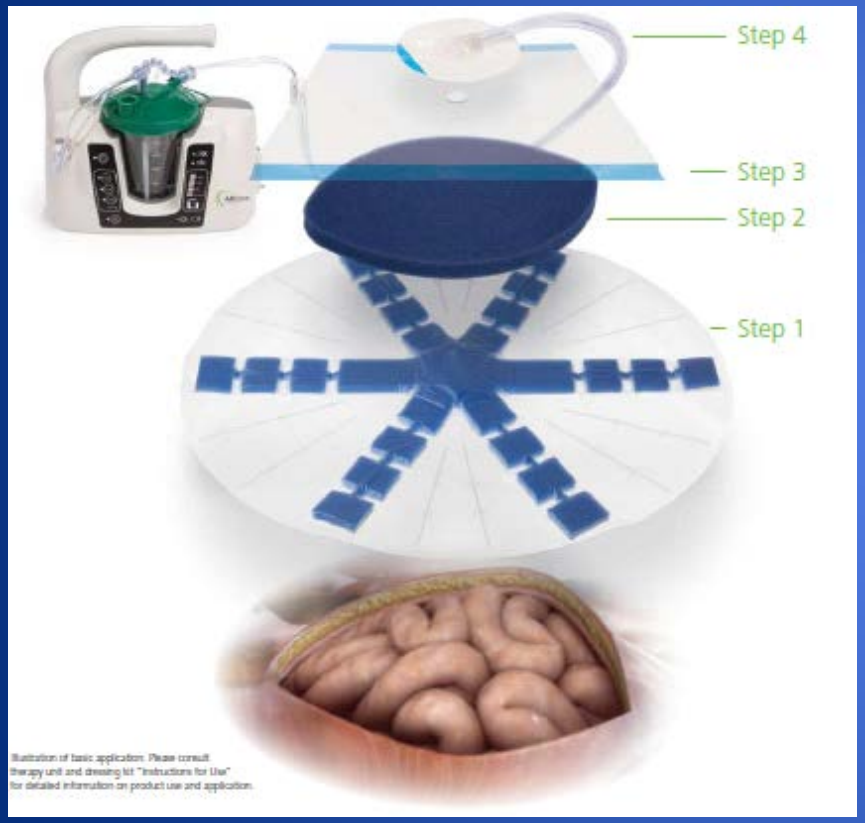
NPWT is NOT intended only to remove fluid from a wound

1. Remove interstitial fluid which can reduce oedema
2. Decrease in bacterial loading
3. Removes excess fluid that can inhibit wound healing
4. Stimulation of granulation tissue
5. Provides a closed, *moist wound healing* environment
6. Enhanced blood flow
7. Applies controlled, localised negative pressure to uniformly draw wound edges closer

Our Dressing Protocol



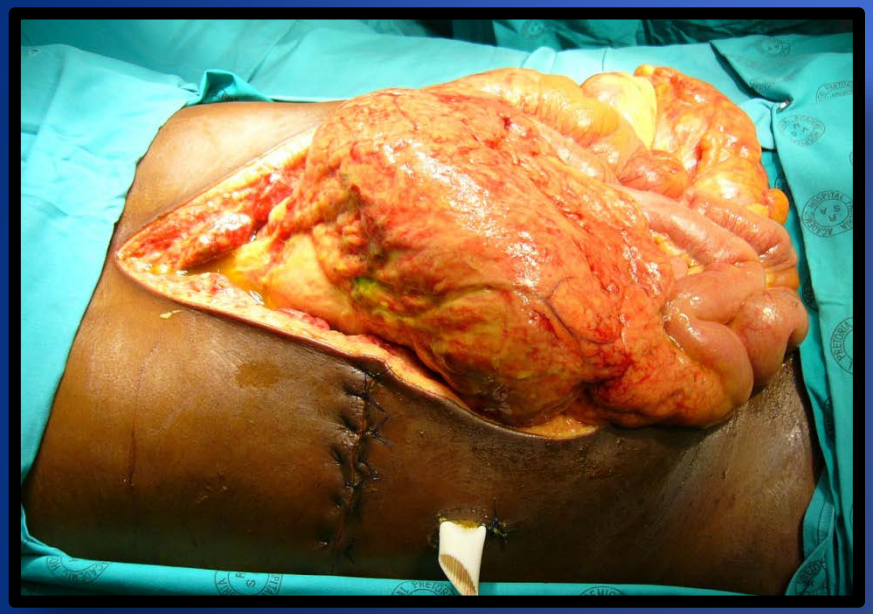
Dressing the Grade 1a & b abdomen



AIM WHEN DRESSING A GRADE 1 ABDOMEN

- Maintain paracolic gutters = prevent adherence = mobility
- Drain fluids
- Prevent fistulation
- Prepare abdominal domain for primary closure
- Prevent Sepsis

Ab-Thera technique – Grade 1a&b



Application process

Proprietary fenestrated visceral protective layer with foam extensions incorporated - “the spider”

Tear off distal sponge

Position into the paracolic gutters

Protective, non-adherent layer (Jelonet or adaptic)

The perforated foam and *large* adhesive drapes
Many hands!!!

Cut a small hole and stick the suction device on “Track Pad”

Final result = neat, lasting, comfortable dressing

*** Moist wound healing *but* keeps the patient *dry and clean***

Vacuum Assisted Wound Care

Practical tips

- No need for pencil drains as spider design acts as drains
- Do not cover colostomy bags with the adhesive drape – colostomy bags are put on *last*
- Any tubing for suction or drainage is difficult to use with the dressing. If it is a must, secure with ‘strip paste’
- Keep negative pressure around -125mmHg to avoid fistula formation

Practical tips (cont)

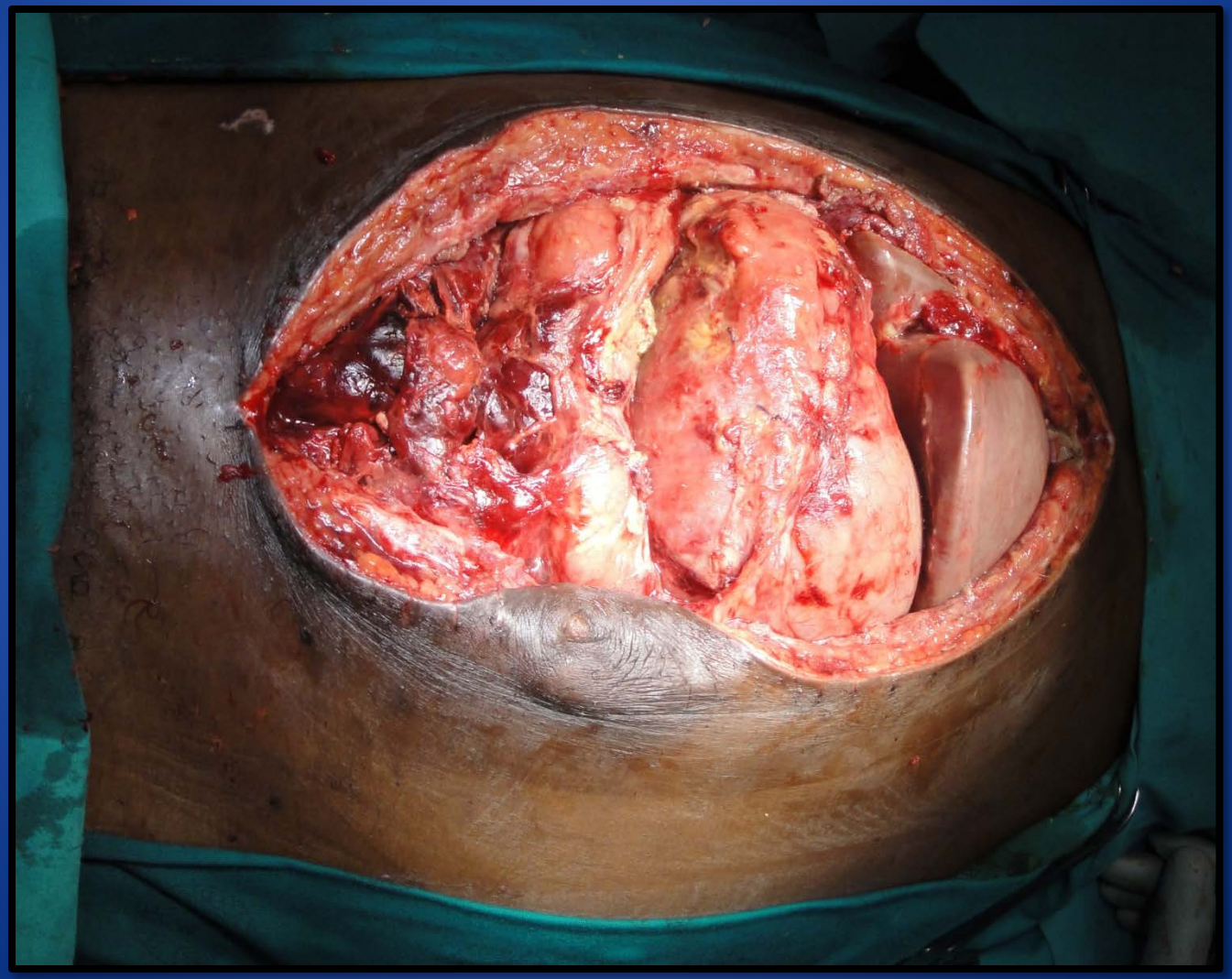
- The dressing can be changed as necessary - at >R3000/dressing, dress with great care for longest duration of use. (> 72 hours is achievable)
- The abdominal fascia should be closed as soon as possible
- It is good practice to plan your closure date at the outset and try to keep it as a goal. (Aim for less than 7 days)
- ***For first "7 days" to keep abdominal wall mobile ie sliding over viscera, when aiming for quick primary fascial closure.***

Dressing the Grade 2a & b abdomen

AIM WHEN DRESSING A GRADE 2 ABDOMEN

- Drain + collect fluids
- Prevent fistulation
- Promote granulation and wound bed preparation

“BLACK VAC” Dressing – Grade 2 open abdomen



Size the perforated foam
“the black sponge”

Have enough disciplined
hands available

FINAL RESULT –
Neat, effective, protective dressing:
Clean, dry, wound bed preparation

a

b

Fig. 5a-b The growth of granulation tissue over the abdominal contents in a case that staged closure was planned (5a). Skin graft was placed over granulation tissues in a patient who was treated with staged closure (5b)

Journal of the Medical Association of Tailand. 90(2): 384-90, 2007 Feb.


Ventral hernia

End result…

Dressing the Grade 3 Abdomen (= with entero-atmospheric fistula)

AIM WHEN DRESSING A GRADE 3 ABDOMEN

- E/A Fistula tract isolation
- Prevent further fistulation
- Collect + drain bowel content
- Promote granulation and wound bed preparation

Classification of Gastrointestinal Fistulae

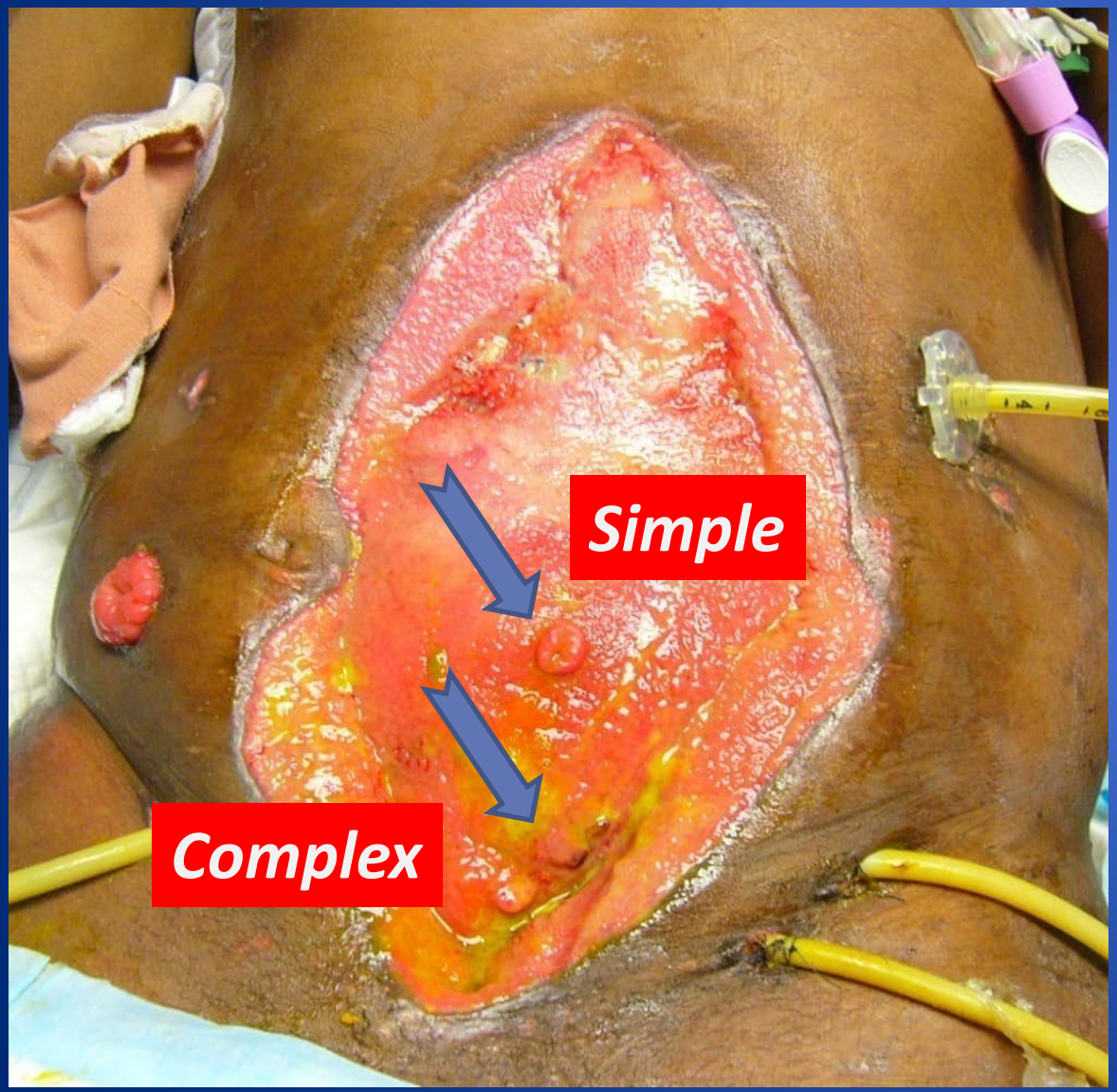
1. Entero-cutaneous fistulae

2. Entero-atmospheric fistulae
   - Low < 200ml/24hr
   - Moderate 200 – 500ml/24hr
   - High > 500ml/24hr

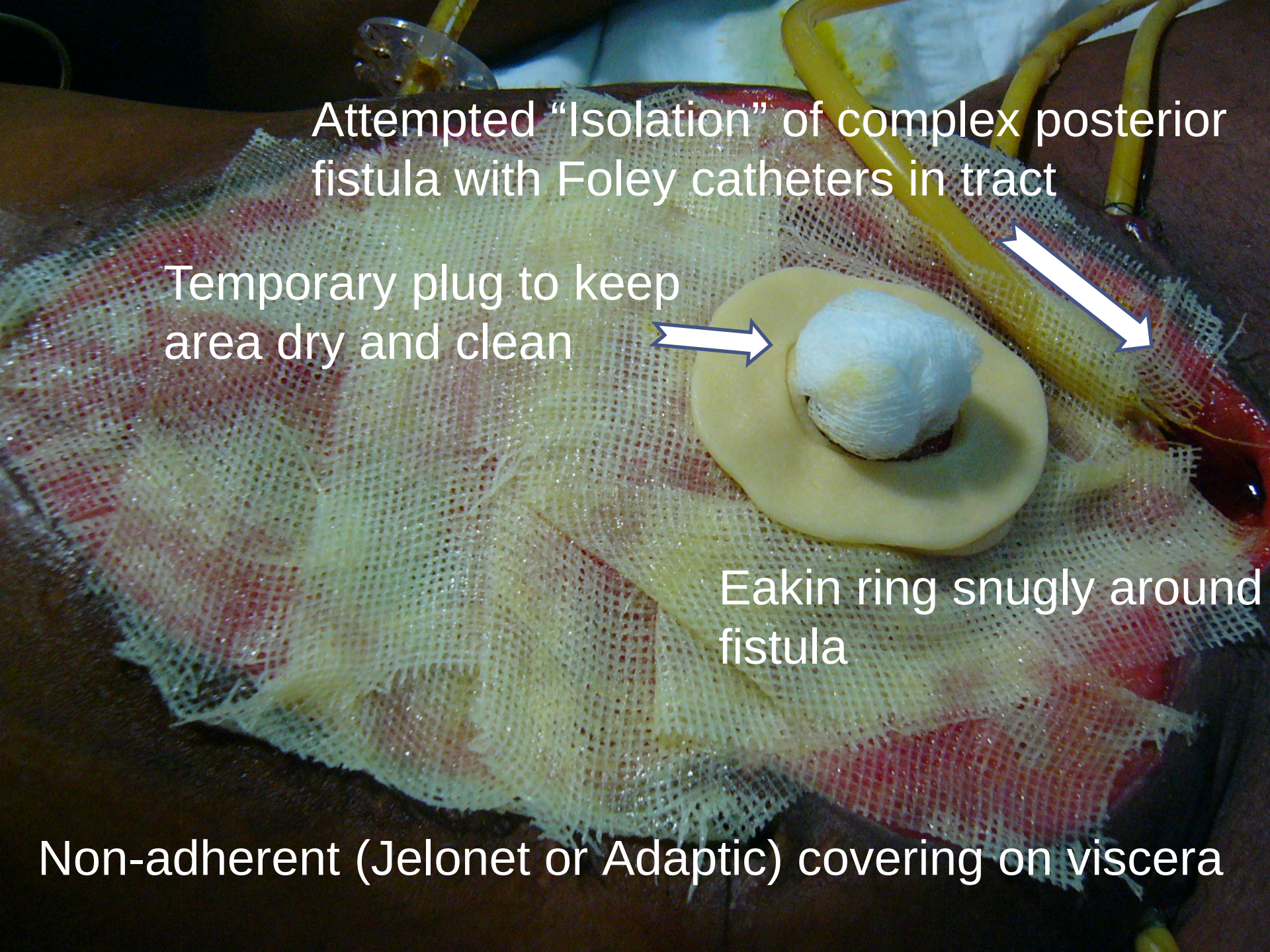
Simple (having a small, controllable, accessible opening on the wound surface)

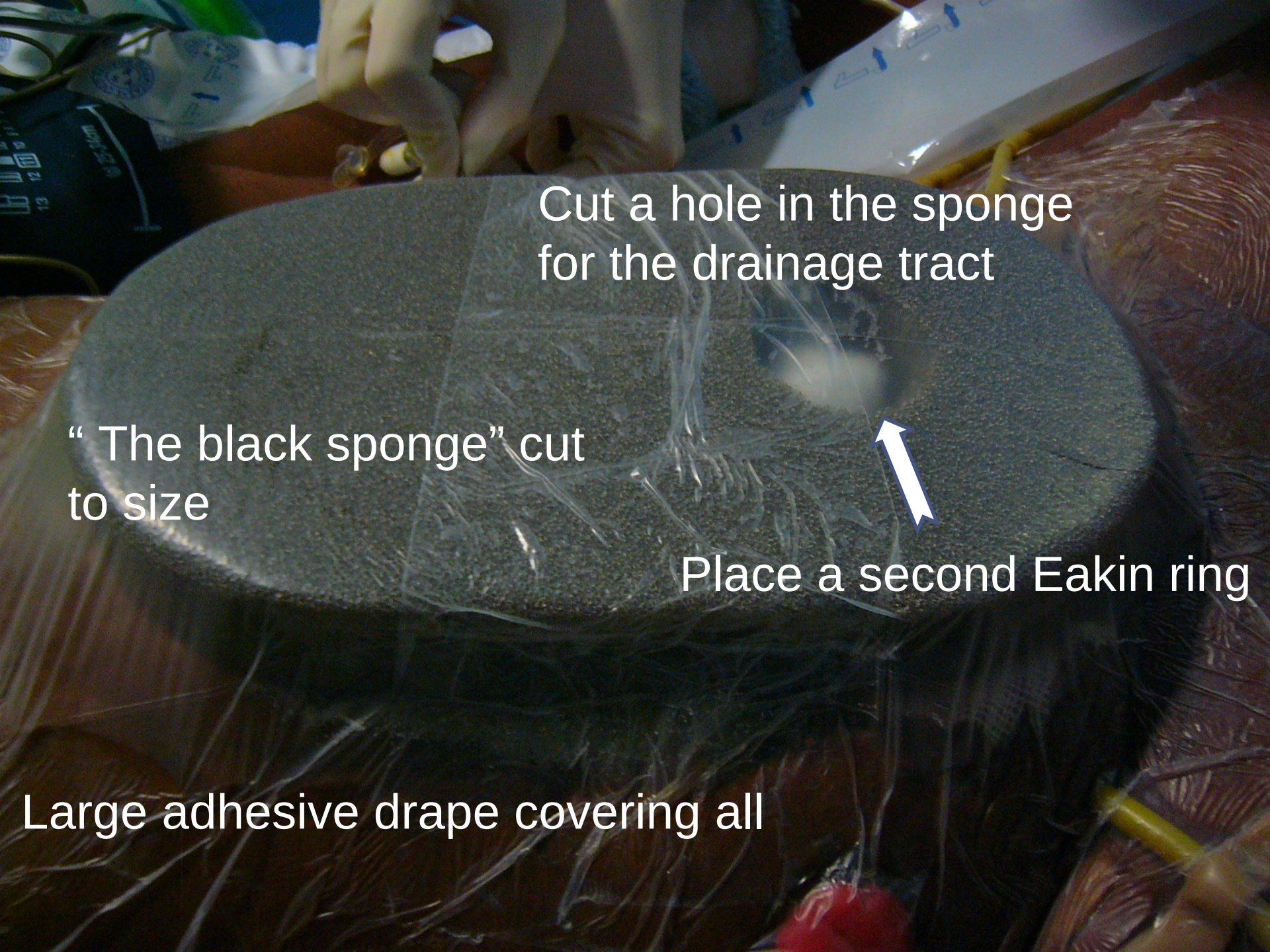
Complex (with drainage into the deep or posterior abdominal cavity, or underneath the laparostome wound edge)

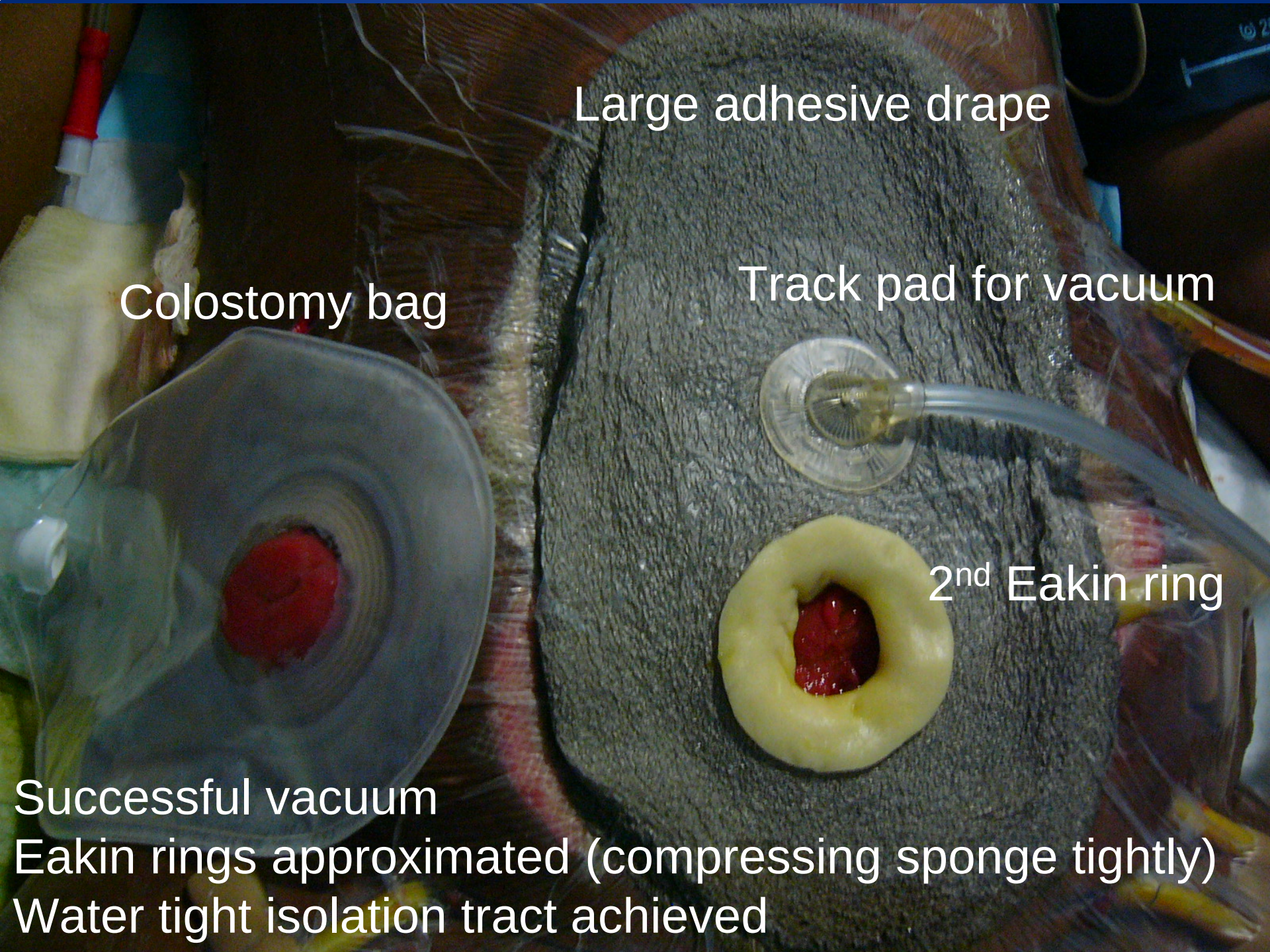
Dressing Entero-atmospheric fistula (Grade 3 OA)



- Overall incidence 5%
- Chronic OA's up to 15%
- ICU stay 3x longer
- Hospital stay 4x longer
- Hospital cost 4-5x more


Attempted “Isolation” of complex posterior fistula with Foley catheters in tract
Temporary plug to keep area dry and clean
Eakin ring snugly around fistula
Non-adherent (Jelonet or Adaptic) covering on viscera


Cut a hole in the sponge
for the drainage tract
“ The black sponge” cut
to size
Place a second Eakin ring
Large adhesive drape covering all



Successful vacuum
Eakin rings approximated (compressing sponge tightly)
Water tight isolation tract achieved

Summary

- Increasing incidence of OA necessitates management guidelines
- No gold standard – some advantage in NPWT
- IAH and ACS are partly iatrogenic – appropriate resuscitation protocols may minimize
- Do NOT use gauze to manage the OA
- Keep abdominal wall mobile – prevent adherence
- Controlled drainage of abdominal content
- Always place a nonadherent interface over exposed bowel for protection
- Regulate negative pressure to control vacuum at the wound site to prevent fistulation
- Always aim for primary fascial closure
- Skin cover over granulation tissue is better than STSG over granulation tissue
- NPWT may minimize complications in patients with OA
- NPWT seems to provide highest advantage + is applicable to most phases of OA Mx. Can be combined with other techniques.

Contents

- **KCI VAC (BLACK SPONGE)**
- Vacuum machine
- Vacuum pack (contains sponge, adhesive drape and suction pad)
- Canister

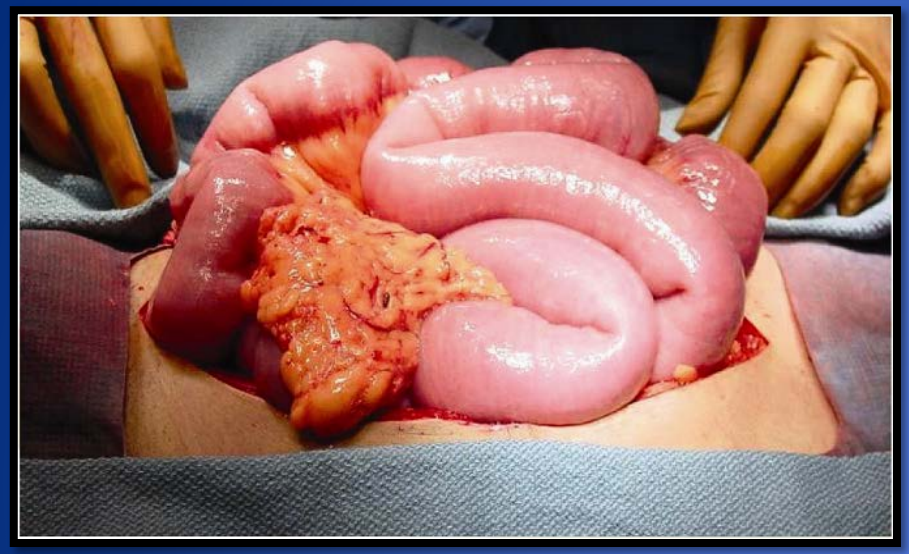
- **ABThera set(BLUE SPONGE)**
- Vacuum machine
- Vacuum pack (contains intra-abdominal spider drape, sponge, adhesive drape and suction pad)
- Canister

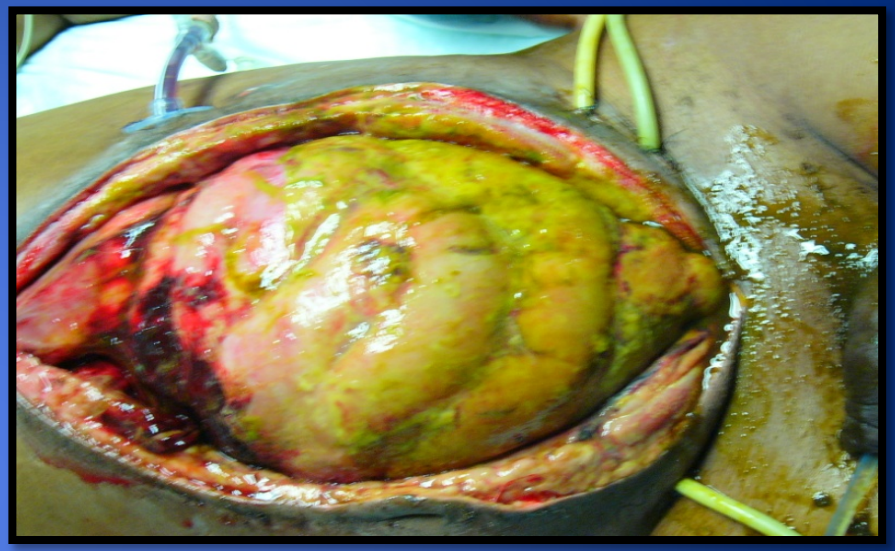
- **EZCARE SET**
- Machine and canister is kept with Stoma Care
- EZCARE pack (contains burn gauze, strip paste, adhesive drape, sterile water, suction catheter)

- **ADDITIONALS**
- Stomahesive paste
- Opsites (different sizes)
- Sterile water
- Skin protector
- Extra canisters
- Eakin rings
- Strip paste
- Gauze
- Adaptec


Thank you for your attention

Abdominal Catastrophies





[1] Swan and Banwell, 2003; Pictures from USA case study 29-D-229, 230, 253

Thank you for your attention!

Many Techniques Described for TAC

- Bogota bag
- Retention Sutures
- Wittman's patch (artificial burr)
- Vacuum pack
- Mesh closure

Phases in the management of the open abdomen: Stage I cont.

Aims of emergency surgery:

- In ACS (IAP>20mm Hg, APP <60mm Hg, new organ dysfx)
  - Improve CI
  - improve lung dynamic compliance
  - benefit raised ICP
- For Trauma (Hypothermia, acidosis, Tx >10 units PRBC)
  - decrease operative time
  - reduce transfusions
  - reduce oedema, infections, LOS,

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