ENTEROCUTANEOUS FISTULA

MANAGEMENT ISSUES IN CURRENT SURGICAL PRACTICE

B Singh
King Edward VIII Hospital
Nelson R Mandela School of Medicine

19TH ANNUAL CONTROVERSIES AND PROBLEMS IN SURGERY

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Chapman R, Foran R, Dunphy JE
Management of intestinal fistulas
Am J Surg 1964;108:157–164.

- MR 12% vs 55% if 3,000 kcal/day tolerated
- Management priorities evolved to the current phases of care

Chapman's priorities of care (1964) included
Phase 1: Management of dehydration, sepsis, and fistula effluent
Phase 2: Initiation of electrolyte replacement and IV nutrition
Phase 3: Placement of enteral feeding access + vigilance in the search for uncontrolled sepsis
Phase 4: Major surgical intervention

Schein M
What's new in postoperative enterocutaneous fistulas?
World J Surg 2008;32(3):336-8

Challenges of "enteroatmospheric fistula"

LANDSCAPE HAS BEEN CONSIDERABLY ALTERED IN CURRENT SURGICAL PRACTICE WITH THE WIDE USAGE OF OPEN ABDOMEN (OA) TECHNIQUES

"ENTERO-ATMOSPHERIC FISTULA" (EAF)

inappropriate because it does not have a fistula tract

- **ECF with intact abdominal wall have greater likelihood (50 – 80%) of spontaneous closure**

Sitges-Serra *Br J Surg 1982;69:147 -50*

La Berge *J Vas Interventional Surg 1992;3(2): 353 -7*

PRINCIPLES REMAIN SIMILAR

"ENTERO-ATMOSPHERIC FISTULA"

A FORMIDABLE CHALLENGE

Bjorck's classification of the open abdomen

Grade	Description
1A	Clean OA without adherence between bowel and abdominal wall or fixity (lateralization of the abdominal wall)
1B	Contaminated OA without adherence/fixity
2A	Clean OA developing adherence/fixity
2B	Contaminated OA developing adherence/fixity
3	**OA complicated by fistula formation**
4	Frozen OA with adherent/fixed bowel; unable to close surgically; with or without fistula

Bjorck et al. Classification—Important step to improve management of patients with an open abdomen. *World J Surg (2009) 33:1154–1157*

"ENTERO-ATMOSPHERIC FISTULA"

The challenges presented by EAF are considerable

- Fluid, electrolyte losses with acid–base derangement greater
- Sepsis source control much more challenging compared to ECF
- Results in an unremitting hypercatabolic state
- Difficulties in effective collection of enteric effluent
- Spillage of enteric contents of EAF on adjacent OA surface impairs its healing
- Absence of fistula tract precludes spontaneous closure of the "fistula"
- Spawned a range of VAC devices of untested value

NIGHTMARE FOR ALL ROLE PLAYERS - GREAT CHALLENGES

- Demanding on resources
- Formidable mortality
- A return to the early 1960's
- Surgery inevitable

IS THERE LIGHT AT THE END OF THE TUNNEL?

“Minimizing the use of crystalloids and DCL was associated with better outcomes and virtual elimination of ACS in trauma patients. With the adaption of new resuscitation strategies, goals for a trauma laparotomy should be definitive surgical care with abdominal closure.

ACS is a rare complication in the era of damage-control resuscitation and may have been iatrogenic”.

The conjoint effect of reduced crystalloid administration and decreased damage-control laparotomy use in the development of abdominal compartment syndrome

Joseph B, Zangbar B, Pandit V, Vercruysse G et al

J Trauma Acute Care Surg 2014;76(2):457-61

"ENTERO-ATMOSPHERIC FISTULA"

The principles of care for EAF are based on the tenets of ECF management that are sequential:

1. Initial resuscitation
2. Early recognition and management of sepsis
3. Nutritional support
4. Reducing the fistula output
5. **Wound care / controlling the fistula ***
6. Surgical intervention

*** Only addition to Chapman's priorities of care (1964)**

"ENTERO-ATMOSPHERIC FISTULA"

Nutritional support

- Invariably hypercatabolic - sepsis + starvation metabolism
- Metabolic needs estimated using the Harris-Benedict equations using modifiers for sepsis & postoperative states
- Rate of fistula output also affects nutritional needs
- **Caloric requirement**
  - low-output fistulas: 25 - 30 kcal/kg/d with a protein need 1.5 - 2 g/kg/d of protein
  - high-output fistulas: x 2 times daily requirement and 2-2.5 × baseline protein requirements to achieve a positive nitrogen balance
- daily SB secretions may contain up to 75 g protein, (12 g nitrogen) material that would ordinarily be reabsorbed
- Vitamins, Minerals, Trace Elements

PRICIPLES OF NUTRITIONAL SUPPORT – EAF & ECF

- **minimizing fistula discharge**
- **establishes a positive nitrogen balance**

Total parenteral nutrition (TPN)

- affords bowel rest
- rapid repletion of nutrition
- recommended during early phase of management
- decreases fistula volume

OFFERS A SIGNIFICANT IMPROVEMENT IN MORTALITY AND FISTULA CLOSURE RATES

PRICIPLES OF NUTRITIONAL SUPPORT – EAF & ECF

Enteral nutrition (TEN)

- Maintains gut mucosa & decreases fistula output
- Immunonutrition has failed to demonstrate improvement in MR
- Adequate absorption feasible with at least 1-1.5m functioning SB
- Commence cautiously - continuous, low volume delivered via soft post-pyloric feeding tube
- **TPN must be maintained while nutritional goals are sought**
- Gastric feeding - osmolality increased slowly to hyperosmolar targets, followed by volume targets
- SB feeding (via jejunostomy or post-pyloric feeding tube), volume tolerance needs to be achieved first; may be difficult in the high-output fistula $\longrightarrow$ can increase volume of fistula output

NO LONGER HALTS THE SLIDE – MAY PROMPT REVERSIBLE REVERSAL OF NUTRITIONAL DEFICIT

PRICIPLES OF NUTRITIONAL SUPPORT

Fistuloclysis

- Feeding into the efferent limb of a fistula
- Enteral formulas or chyme output from the proximal fistula
- Invaluable in resource depleted services
- Appeal of being undertaken at home with excellent outcome

ENTERO- CUTANEOUS & ATMOSPHERIC FISTULA

Fistula reducing strategies *

- keeping the patient *nil per os*
- effective drainage of the stomach via NGT
- TPN affords adequate bowel rest as well as reducing GI secretions
- **Use of drugs**
  - proton pump inhibitors
  - somatostatin or analogue (octreotide) - reduce enteric & pancreatic secretions (but little evidence to show effect on fistula closure)#
  - slow intestinal transit time (loperamide, diphenoxylate and opioids)

* No evidence that decreasing high output fistula to low output fistula increases spontaneous fistula closure rate Lloyd DA et al. *BJS 2006; 93(9); 1045-5*

 # Haffejee AA . *Current Opin Clin Nutr & Metab Care 2004; 7: 309-16*
Coughlin S et al. *World J Surg 2015;36:1016-29*

ENTERO- CUTANEOUS & ATMOSPHERIC FISTULA

- Methods to expedite closure include:
  - biological fibrin glue
  - fibrin glue via fistuloscopy
  - porcine small intestine submucosa
  - fast hardening amino acid solution
  - stenting via endoscopy, among other options
- Although first results seem encouraging, their efficacy has still yet to be proven

"ENTERO-ATMOSPHERIC FISTULA"

Wound care and fistula control

- central to the management of EAF and OA
- several methods available using the principle of negative pressure wound therapy
- "VAC (vacuum assisted closure) systems" shown to be effective in expediting the management of OA
  - "Floating stoma"
  - "Fistula VAC"
  - "Tube VAC"
  - "Nipple VAC"
  - "Ring and silo VAC", among other technique
- Malecot intubation of the EAF and tunnelling this through adjacent well vascularised tissue to convert an EAF to an ECF

"ENTERO-ATMOSPHERIC FISTULA"

Wound care and fistula control

- Anecdotal reports of spontaneous closure following conservative medical treatment & VAC application to OA
- Controversial
- Presence of factors that preclude spontaneous closure have to be considered when using VAC systems
- The value of VAC systems reside in its expediting healing of wound around the EAF
- Wound care & advances in critical care and surgical care → MR rates have decreased: 70% in the past decades to about 40%

ENTERO- CUTANEOUS & ATMOSPHERIC FISTULA

CONSERVATIVISM vs SURGICAL INTERVENTION

- **Timing of surgery remains controversial**
- **Classic advocacy:**
  - wait 4–6 weeks for spontaneous closure
  - with persistence, proceed with reconstructive surgery
- **Issues that need consideration:**
  - fistula closure can be achieved after this time period
  - may need longer period to obtain adequate clinical & nutritional condition in order to perform complex reconstructive surgery
  - infectious complications (line sepsis & pulmonary infection) may delay nutritional recovery
  - fistulas with factors known to prevent spontaneous closure or those persisting for >2 months are unlikely to close spontaneously
- **Despite best efforts 30–75% of patients require surgery for its definite repair**

ENTERO- CUTANEOUS & ATMOSPHERIC FISTULA

PERSEVERENCE OF CONSERVATIVISM

Progressive decrease in fistula output at 6 week
Return of bowel activity
Restitution of nutritional status

↓

Reasonable to pursue conservative treatment with expectation of spontaneous closure

However, a fistula persisting longer than 2 months is unlikely to close spontaneously!

Reber HA**.** *Ann Surg; 1978; 188:460-7*

Pursuit of conservative treatment should be individualised

ENTERO- CUTANEOUS & ATMOSPHERIC FISTULA

SURGICAL INTERVENTION

- Surgery is cornerstone of fistulas that have not closed spontaneously
- Definitive surgery for the closure of ECF or EAF is demanding:
  - in terms of the physiological reserves of the patient
  - surgical technical expertise
  - resources
- Dense, vascular adhesions most evident between 3 and 12 weeks; surgery during this period may predispose to fistula recurrence
- Prediction of “friendly” abdomen difficult
  - may be possible to attain as early as 1–2 months
  - others accomplish this target after 6–12 months or even after a 1-year
- “Pinch” test – when skin graft placed on open abdomen
- “Soft” abdomen with residual induration limited to peri-fistula area
- Prolapsing of the fistulated bowel

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SURGICAL INTERVENTION: PRINCIPLES

- Essential that surgeon be facile with surgical strategies and techniques that would ensure a safe and effective procedure
- Pre-op imaging of colon
- Be prepared for formidable surgery
- Meticulous technique
- Ensure high care, ventilation facilities available
- The surgical procedure involves three main steps:
  - access
  - intestinal treatment
  - abdominal wall closure
- In experienced hands re-fistulation rate 9 - 32.9% after definitive surgery reported

ENTERO- CUTANEOUS & ATMOSPHERIC FISTULA

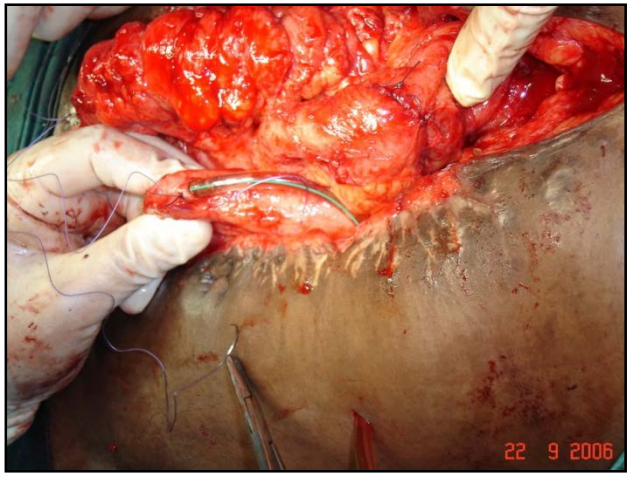
The principles of surgical intervention

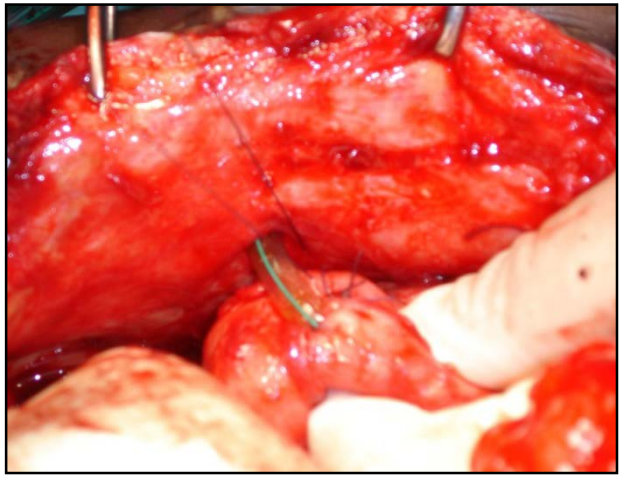
- Gain safe access at sub-xiphoid area
- Mobilize entire SB bowel from an area considered “hospitable”
- Resecting bowel segment bearing fistula vs direct suture closure has ensured a low rate of fistula recurrence
- Depending on extent of fistula opening, friability or intrinsic bowel disease (such as IBD), a wedge resection may be adequate.
- Thinned out SB vulnerable to injury by overzealous handling; use of bowel clamps is inadvisable
- Apply diligence in ensuring that no iatrogenic perforations are overlooked
- Repair all serosa tears - may predispose to spontaneous perforation in the context of postoperative ileus or intestinal obstruction
- Routine stenting of the SB has been recommended following repair of the fistula

ENTERO- CUTANEOUS & ATMOSPHERIC FISTULA

Intestinal stenting

- widespread dense adhesions
- evidence of kinking that may have predisposed to repair breakdown





Singh B, Haffejee AA, Moodley J, Allopi L. Surgery for high output enterocutaneous fistula. International Surgery 2009;94; 262-268

ENTERO- CUTANEOUS & ATMOSPHERIC FISTULA

Surgery for high output enterocutaneous fistula
King Edward VIII Hospital 1976 - 2006

- 602 patients - spontaneous closure rate 72.2%
- Overall MR 11.5%
- **282 (46.8%) had high output (>500mls/day) SBECF**
- 183 SBECF managed conservatively
  → 149 (81.4%) spontaneous closure; MR 34(18.6%)
- **99 SBECF (n=99) – definitive surgery**
- Mean time to surgery = 8.2 weeks (10 days – 22 weeks)
- **4 patients – definite surgery within 10 days**
- **Surgery effective in 93.9% (n=93)**
- **MR following surgery = 6% (n=6)**

Singh B, Haffejee AA, Moodley J, Allopi L. Surgery for high output enterocutaneous fistula. International Surgery 2009;94; 262-268

ENTEROCUTANEOUS FISTULA: CURRENT CHALLENGES

MANAGEMENT GUIDELINES LARGELY STRUCTURED ON:

- Non-controlled trials (apart from a few trials evaluating somatostatin)
- Mainly retrospective reviews
- Case series

CONSISTENTLY CHALLENGED FOR LACK OF ROBUST EVIDENCE

" … the randomized trial … has become the "gold standard" for judging whether a treatment does more good than harm.
However, some questions about therapy do not require randomized trials (successful interventions for otherwise fatal conditions) or cannot wait for the trials to be conducted…..

And if no randomized trial has been carried out for our patient's predicament, we must follow the trail to the next best external evidence and work from there"

Sackett's editorial - *BMJ 1996;312:71-75*

Evidence based medicine: what it is and what it isn't

Prevention is better than (an attempt) to cure

Desiderius Erasmus

A damage control resuscitation
No substitute for sound decision making
Expeditious surgical technique
"CONTROL THE DAMAGING SURGEON"

ENTERO- CUTANEOUS & ATMOSPHERIC FISTULA

ABDOMINAL WALL CLOSURE

- Inadequate abdominal closure may increase the risk of fistula recurrence
- Primary abdominal wall closure shown to be the best option, even with components separation techniques
- Absorbable or non-absorbable meshes developed to optimize repair of abdominal wall defects
- Non-absorbable mesh ensures durable abdominal wall prosthesis – but risk of infection in contaminated setting
- Currently the use of absorbable mesh achieves generally higher approval

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ABDOMINAL WALL CLOSURE

- Composite mesh - combined non-absorbable + absorbable
  - non-absorbable - provides biomechanic resistance
  - absorbable - provides non-adhesive barrier
- bioprosthetic prostheses (allografts or heterografts)
  - acts as framework for connective tissue infiltration
  - serves as a cover to prevent adhesions and intestinal fistulae
  - prompts regeneration & remodeling over inflammation and a foreign body response
  - however, application in contaminated OA limited and yielded mixed results
- Despite advances mesh application still prone to complications
  - formation of adhesions
  - small bowel obstruction
  - fistula recurrence

ENTERO- CUTANEOUS & ATMOSPHERIC FISTULA

ABDOMINAL WALL CLOSURE

Reconstructive surgery using musculocutaneous flaps

- suited for a stable coverage of the abdominal wall
- affords good local blood supply that provides protection against infections & development of fistula reopening
- Procedures complicated, long-lasting and associated with considerable morbidity (donor and recipient sites)
- a last resort method in patients, where prosthetic repair is contraindicated (e.g. infectious contamination)

Prevention is better than (an attempt) to cure

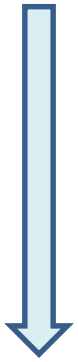
Desiderius Erasmus

No substitute for sound decision making
Expeditious surgical technique
A damage control resuscitation
"CONTROL THE DAMAGING SURGEON"

"PREVENTION IS NOT BETTER THAN CURE - IT THE BEST CURE"

Sachidananda Das

LANDSCAPE HAS BEEN CONSIDERABLY ALTERED IN CURRENT SURGICAL PRACTICE WITH THE WIDE USAGE OF OPEN ABDOMEN (OA) TECHNIQUES



"ENTERO-ATMOSPHERIC FISTULA" (EAF)

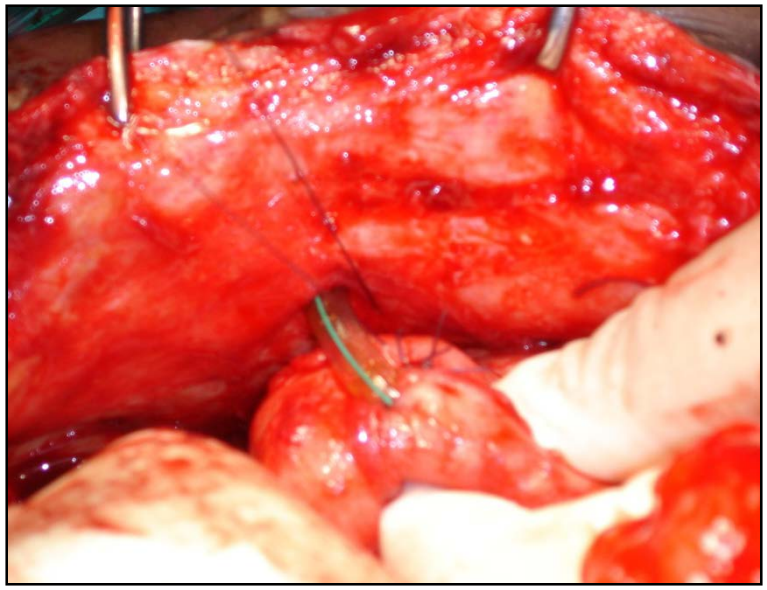
inappropriate because it does not have a fistula tract

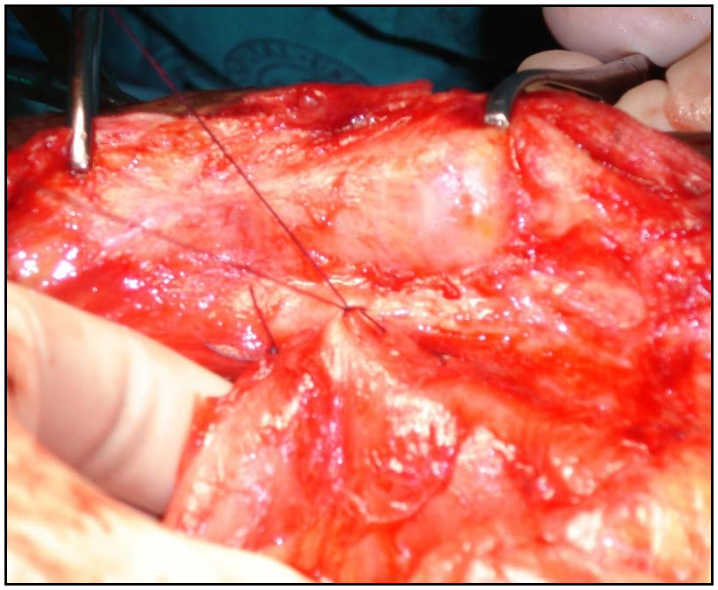
- Literature remains dominated by retrospective reviews, anecdotal reports & institutional bias
- Principles remain similar


SABAX SODIUM CHLORIDE 0.9%

ENTERO- CUTANEOUS & ATMOSPHERIC FISTULA

Jones Tube placement





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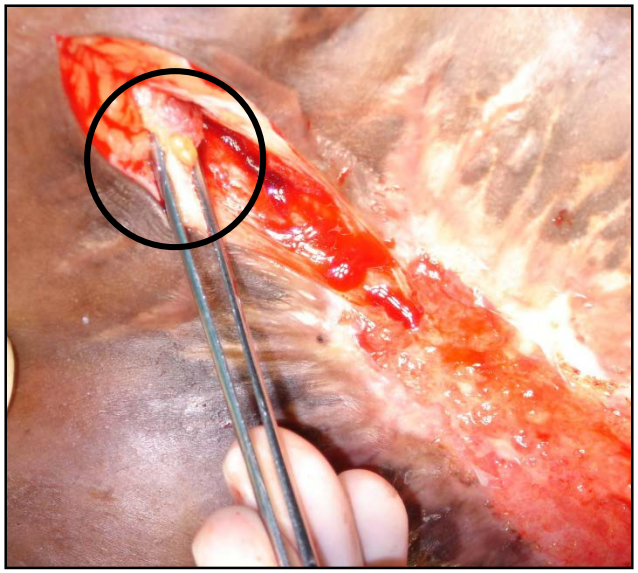
Aspects of technique



……. obtain access from xiphoid end

Heterotopic ossification

ENTERO- CUTANEOUS & ATMOSPHERIC FISTULA

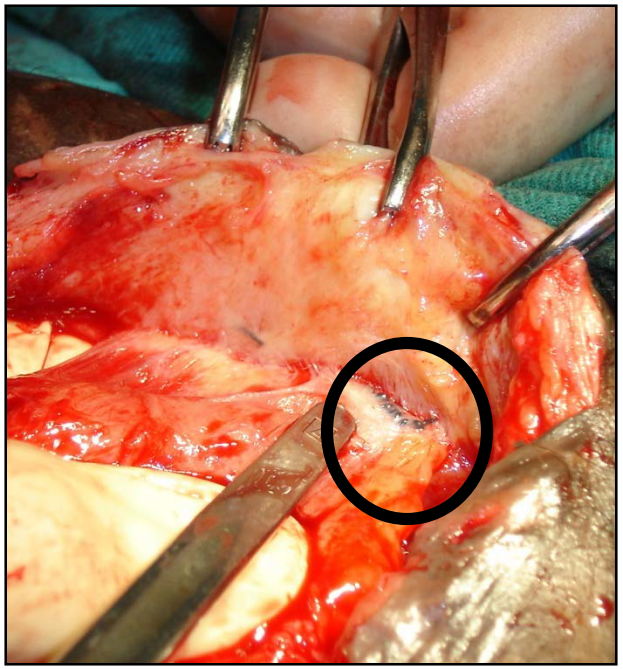
ASPECTS OF TECHNIQUE

- Obtain access from the xiphoid
- Mobilize from an area considered hospitable

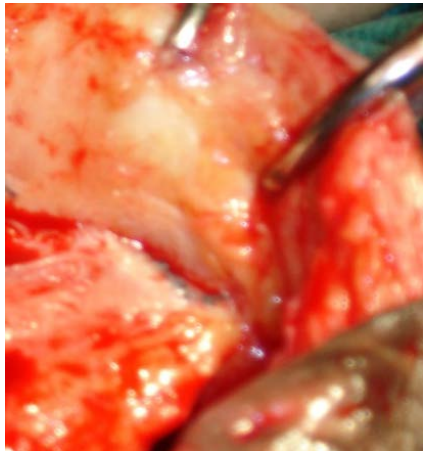
ENTERO- CUTANEOUS & ATMOSPHERIC FISTULA

Aspects of technique

- gentle sharp dissection
- avoid serosal tears
- repair all serosal tears
- no need to mobilise large bowel
- avoid clamps on bowel
- ***above all….. be patient!***



small bowel kinked to parietes distal to anastomosis



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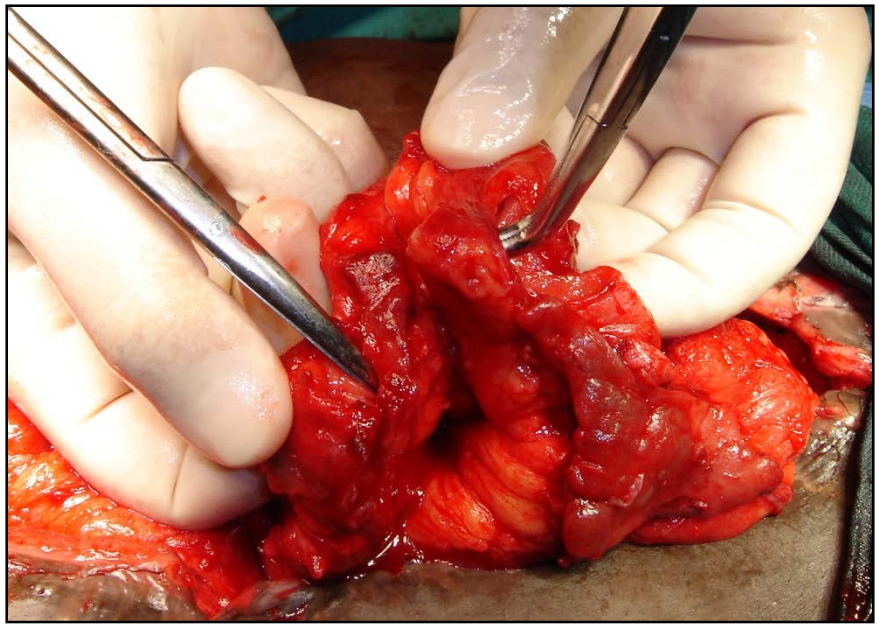

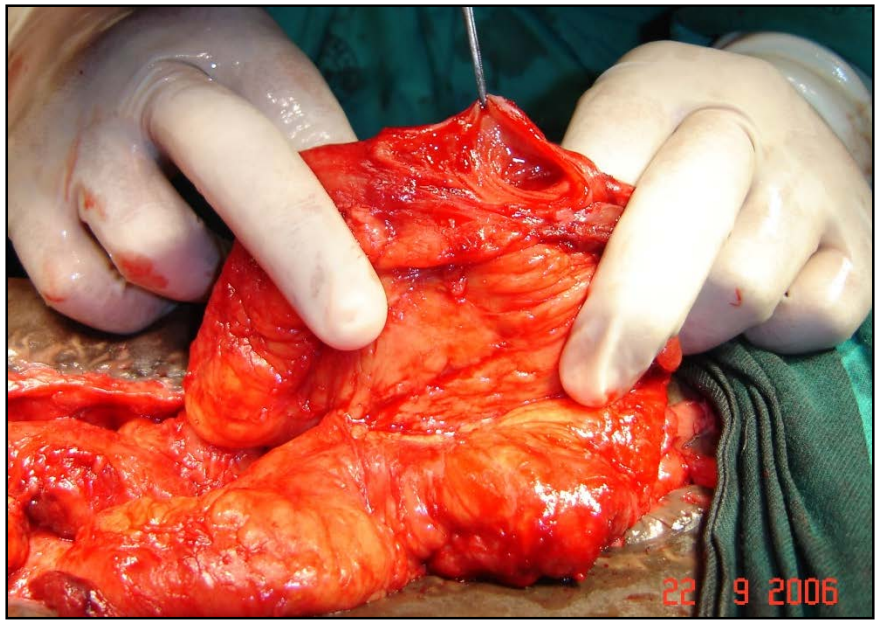

With widespread adhesions landmarks of small bowel valuable

i D-J flexure – inferior mesenteric vein

ii ileo-caecal junction – ileal “flange”