

“Enteroatmospheric” Fistula:
The Feared Complication of the
“Open Abdomen”

William Schechter, MD, FACS

Professor of Clinical Surgery

University of California, San Francisco

Chief of Surgery

San Francisco General Hospital

Definitions

- **Fistula:** Abnormal communication between two epithelialized surfaces
- **Enterocutaneous fistula:** Abnormal communication between the gastrointestinal tract and the skin
- **“Enteroatmospheric” fistula:** A hole in the gastrointestinal tract in an open abdomen without overlying soft tissue

Causes of Chronic Fistula

- Foreign body
- Radiation
- Inflammatory bowel disease/Infection
- Epithelialized tract
- Neoplasm
- Distal Obstruction
- Sepsis

Enterocutaneous Fistulas

- 75-85% iatrogenic post-operative
 - “Entero-atmospheric” Fistula always a post-operative problem
- 15-25% “spontaneous” in origin
 - Radiation
 - Inflammatory bowel disease
 - Diverticular disease
 - Malignancy
 - Tuberculosis

Principles of Fistula Management

- Resuscitation
 - Fluids and Electrolytes
 - Nutritional Support
 - Enteral
 - Parenteral
- Drain Local Abscess/Infection
- Define Anatomy of Fistula
- Rule out/Treat Distal Obstruction
- Resect chronic fistula if it fails to heal

Problem of “Entero-atmospheric” Fistula

- Absence of overlying soft tissue with good blood supply precludes spontaneous healing
- Exposed abdominal viscera predisposes to development of additional holes in the GI tract
- Complex Wound difficult to manage

Principles of Management Specific for “Entero-atmospheric” Fistula

- **PREVENTION**

- Protect exposed abdominal viscera during open abdomen management
- Limit access to the wound to one or two SENIOR people
- Attempt to seal leak when first recognized
- Protect adjacent viscera with biologic dressings to avoid additional holes
- Control fistula effluent
- Rotate flaps with good blood supply to cover fistula in selected cases
- Resect well established “entero-atmospheric” fistula only when patient fit and infection free

Principles of Management Specific for “Entero-atmospheric” Fistula

- The patient should be “adopted” by a senior surgeon who sees the patient and the family daily and dictates long term management goals
 - The patients are “psychological disasters”
 - Body image, odor and cleanliness are major issues
 - Intra-familial tensions are the norm

Principle 1: Prevention



Viscera Protection with Cadavre Skin
as a Biologic Dressing

Wound healed by Serial Abdominal Closure without Fistula



Complex ventral hernia following open abdomen therapy

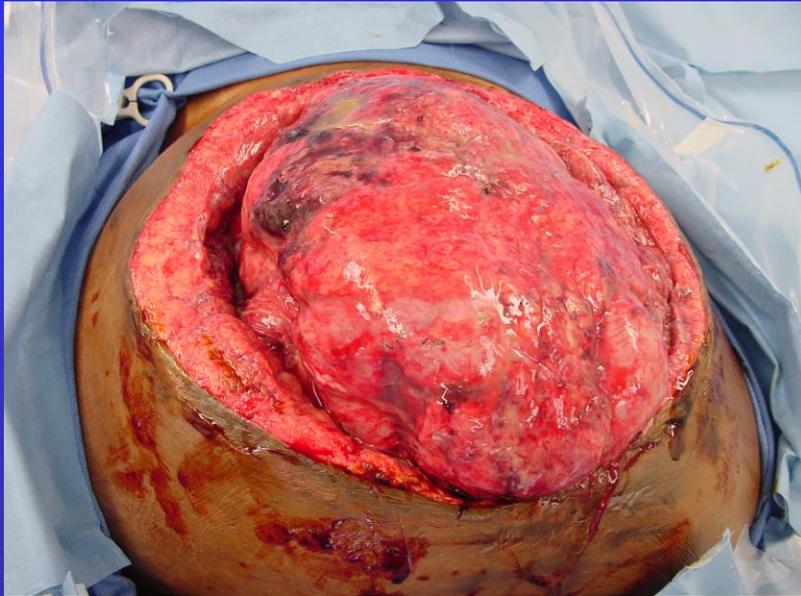


5 years s/p gsw to stomach and left adrenal gland. Following Initial operation developed bowel ischemia due to cocaine, Treated with open abdomen and skin graft closure of viscera

Completion of Herniorrhaphy



“Enteroatmospheric Fistula”



POD #3 – Tachycardia – to OR –ischemic
Right Colon – Right hemicolectomy



Open abdomen managed with wound VAC.
Did well for 5 days until n-g output suddenly
Increased over a 12 hour period

Principle 2: Attempt to Seal Leak

Principle 3: Protect Adjacent Viscera



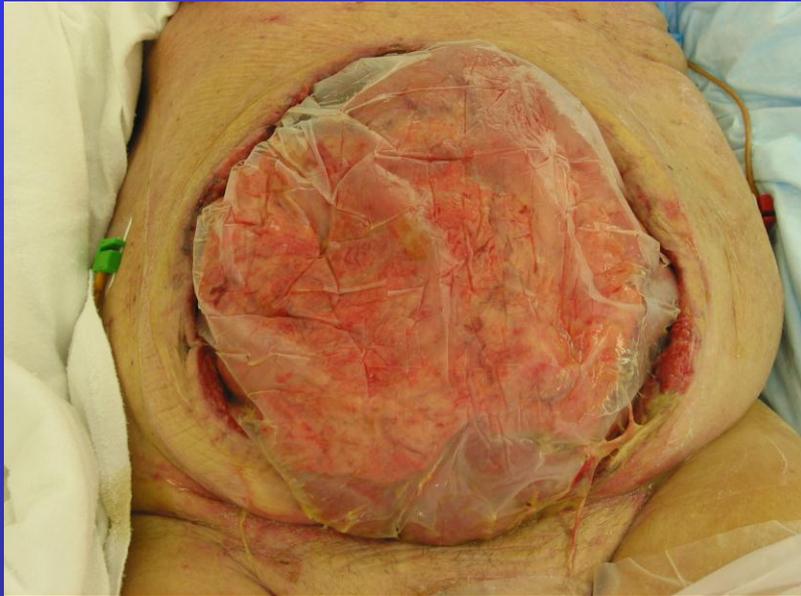
Small bowel “springs a leak” through small hole.
Hole covered with fibrin glue and Alloderm.



Fistula closed almost immediately-”a miracle”
Abdomen closed eventually with autograft

Girard S, Sideman M, Spain D. A Novel Approach to the problem of intestinal fistulization in Patients managed with open peritoneal cavities. *Am J Surg* 2002;184:166-7.

Ruptured Abdominal Aortic Aneurysm



Courtesy of Dr. Andre Campbell

Alloderm Closure of Facial Defect



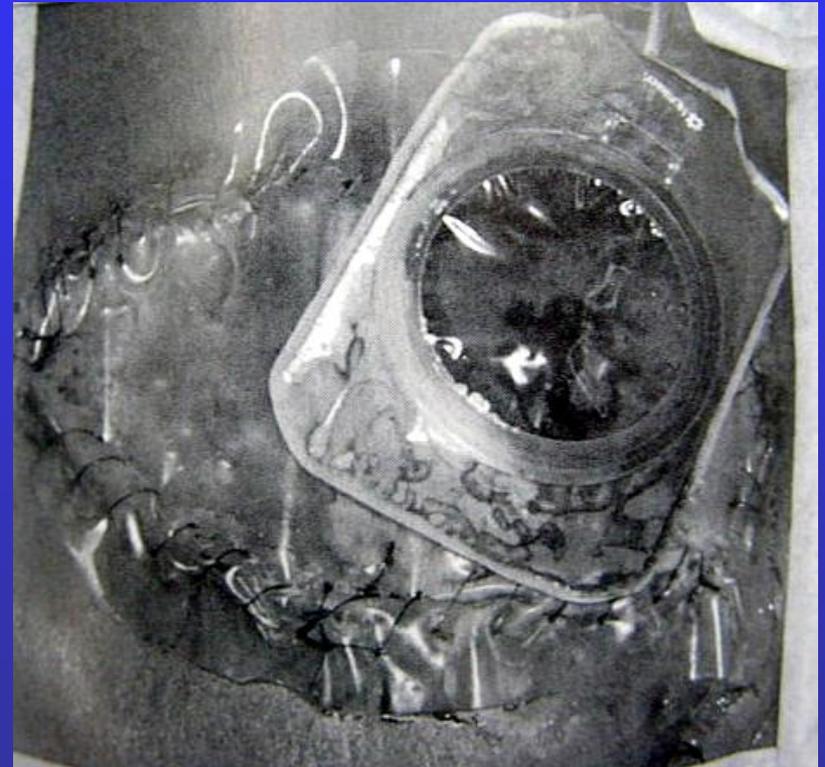
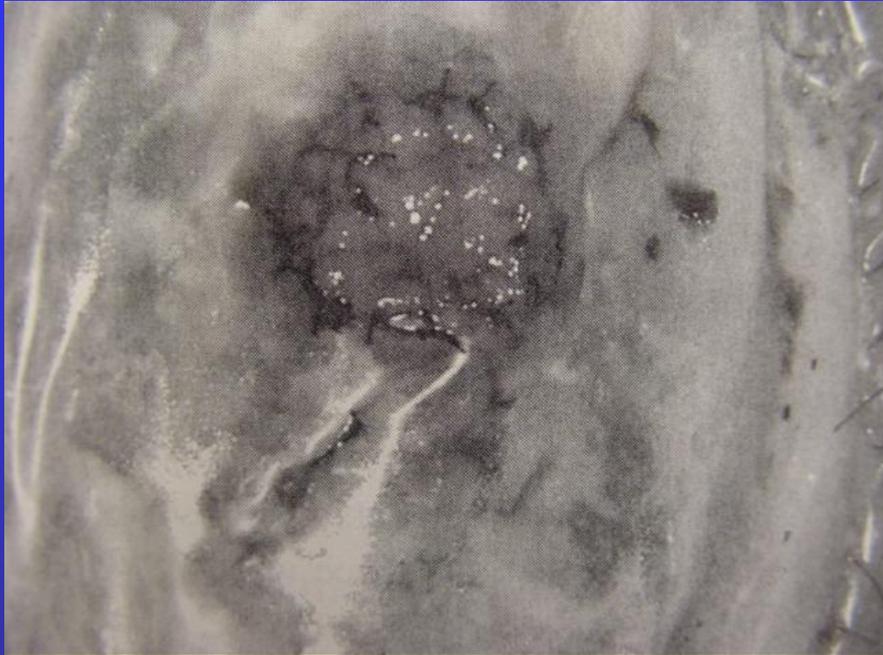
Courtesy of Dr. Andre Campbell

Principle 4

Control Fistula Effluent

- Free Peritoneal Cavity
 - Major problem is lack of source control causing peritonitis and SIRS
 - Exteriorize fistula if possible or divert proximally: **OFTEN IMPOSSIBLE IN AN OPEN ABDOMEN**
 - Consider “floating stoma” if exteriorization impossible

PICTURE OF FLOATING STOMA



Subramanian MH, Liscum KR, Hirshberg A. The Floating Stoma: A New Technique For Controlling Exposed Fistulae in Abdominal Trauma. *J Trauma*2002;53:386-8.

Principle 4

Control Fistula Effluent

- Fixed Visceral Block
 - Vacuum Assisted Wound Management System
 - Wound Drainage Bags
 - Requires expert enthusiastic nursing assistance
 - Creativity

1.Hyon SH, Martinez-Garbino JA, Benati ML, et al. Management of a high-output postoperative Enterocutaneous fistula with a vacuum sealing method and continuous enteral nutrition. *ASAIO J.* 2000;46:511-4.

2.Erdmann D, Drye C, Heller L et al. Abdominal wall defect and enterocutaneous fistula treatment With Vacuum –Assisted closure (V.A.C.) system. *Plast Reconstr Surg* 2001;108:2066-8

3.Alvarez AA, Maxwell GL, Rodriguez GC. Vacuum-assisted closure for cutaneous gastrointestinal Fistula management. *Gynecol Oncol* 2001;80:413-6.

4. Cro C, George KJ, Donnelly J, et al. Vacuum assisted closure in the management of enterocutaneous Fistulae. *Postgrad Med J.* 2002;78:364-5.

Principle 4

Control Fistula Effluent

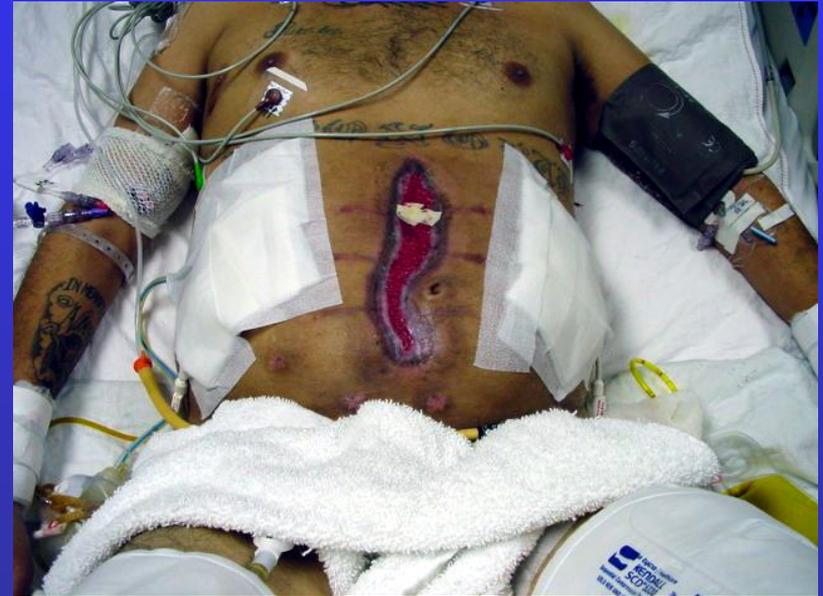
- DO NOT INTUBATE A FISTULA in the middle of a fixed visceral block open abdomen
 - You won't control the drainage
 - You will make the hole bigger
 - Risk of additional holes

Options for Soft Tissue Coverage

- Fascia
 - Progressive closure with Vacuum Assisted Wound Management
 - Temporary fascial tension devices to reduce lateral retraction combined with underlying visceral protection and Vacuum Assisted Wound Management
 - Use plastic sheet between visceral block and lateral abdominal walls to maintain abdominal wall mobility
 - “Separation of Parts” Technique

Gunshot wound to stomach and pancreas - damage control laparotomy

- 24 hours later-necrotizing pancreatitis-distal pancreatectomy, gastrojejunostomy, open abdomen
- Fistula x 2
- Serial closure of abdomen
- Final closure with separation of parts technique plus intubation of fistulae



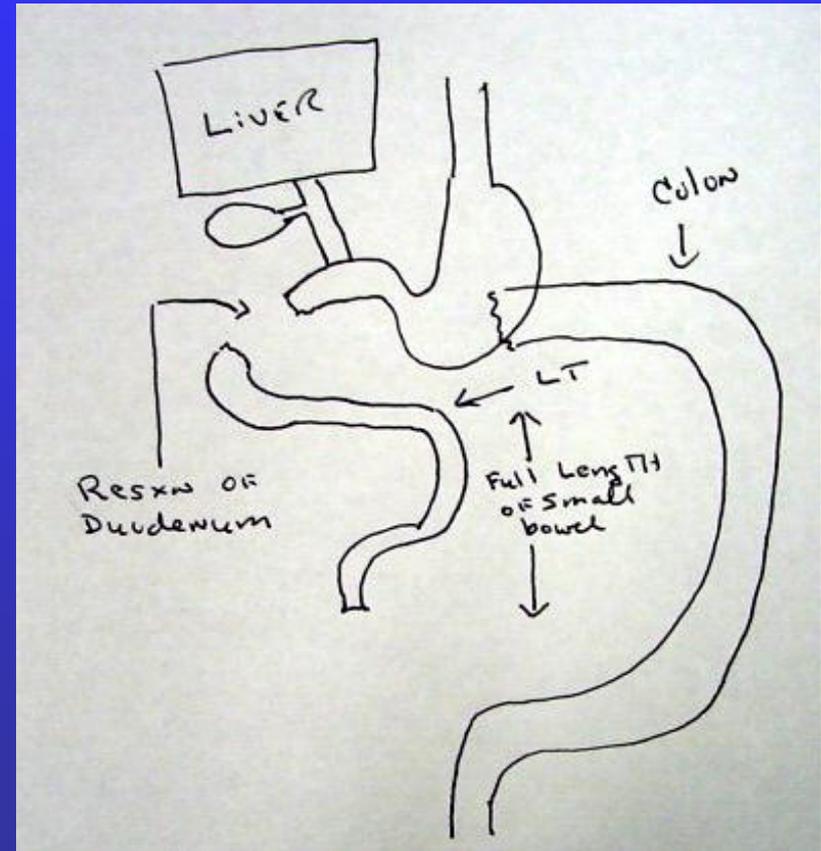
Courtesy of Dr. Robert Mackersie

Other Options for Soft Tissue Coverage

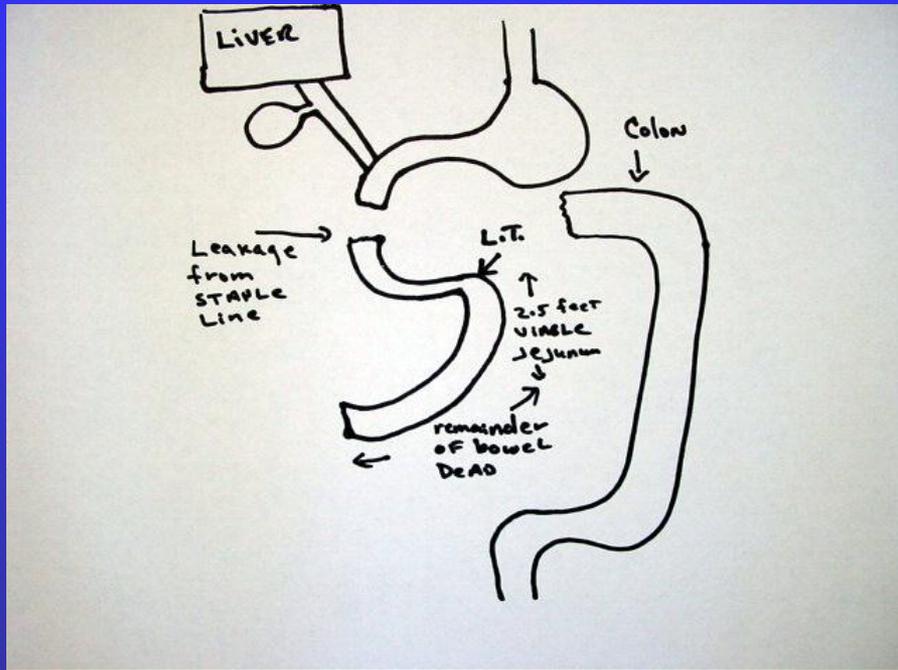
- Skin Flaps
- Dermal Matrix
- Rotation Muscle Flap
- Free Muscle Flap

22 year old man admitted in shock with GSW to abdomen

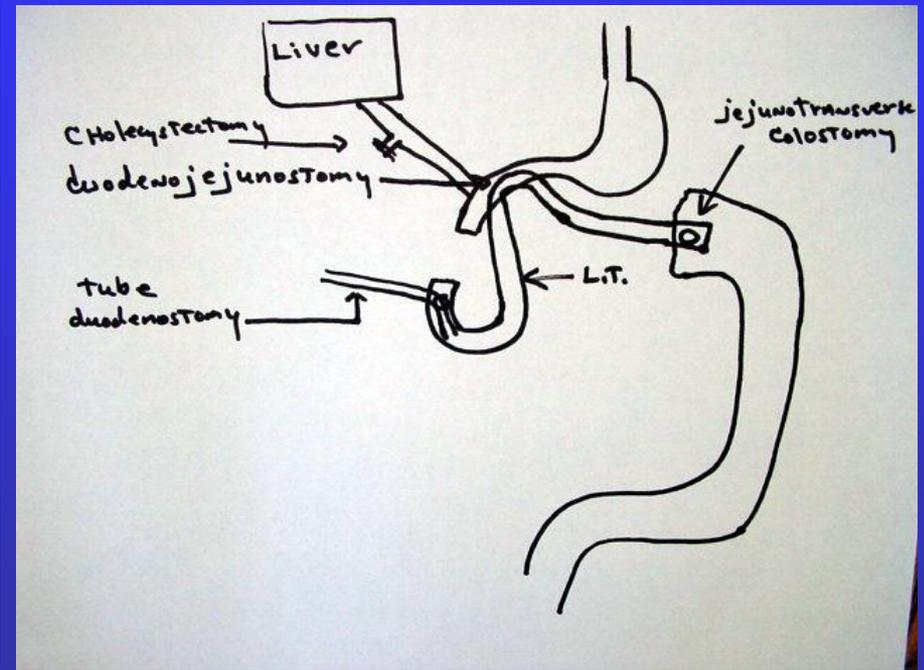
- GSW to IVC – repaired
- GSW to SMV – oversewn
- Complex injury to duodenum (2nd-3rd portion)- resected
- Right hemicolectomy
- Damage control laparotomy



Second Look Laparotomy



Findings



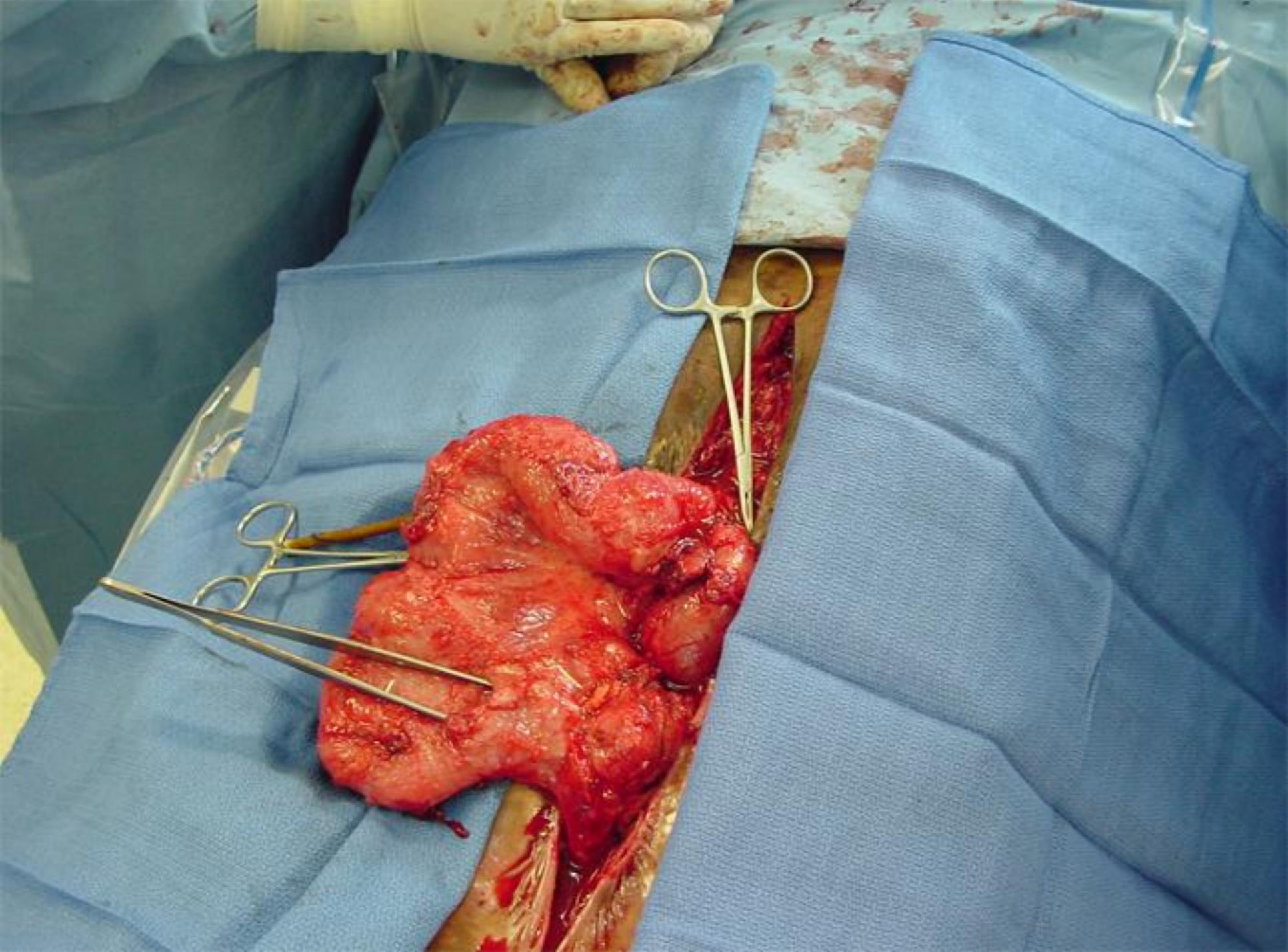
Reconstruction

Multiple small bowel fistulas following GSW to abdomen

- Now 1 ½ years after injury



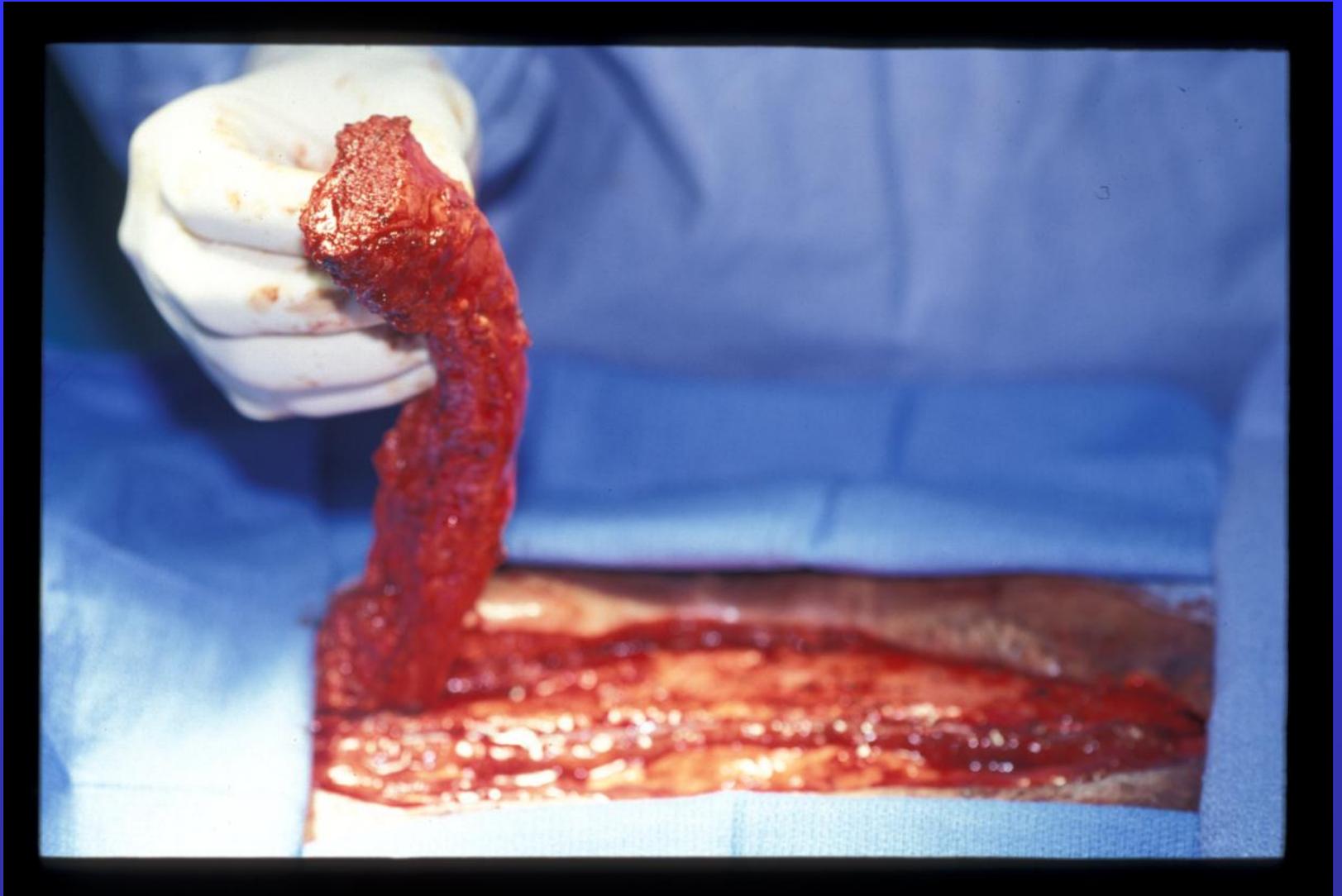
Multiple fistulas to remaining bowel



Fistulas closed, abdomen closed with separation of parts technique

Post operative Course

- Leak from small bowel
- Low output fistula
- Fascial necrosis requiring debridement
- Exposed viscera managed with fibrin glue and CSTSG (Principle 3)



Chang P, Chun JT, Bell JL. Complex Enterocutaneous Fistula: Closure with Rectus Abdominis Muscle Flap. *Southern Med J* 2000;93:599-602.

Intestinal Leak-Fascial Dehiscence

- Rectus abdominus transposition flap covers exposed bowel and fistula – Principle 5
- Fibrin glue used to limit fistula output – Principle 2



Fistula closed



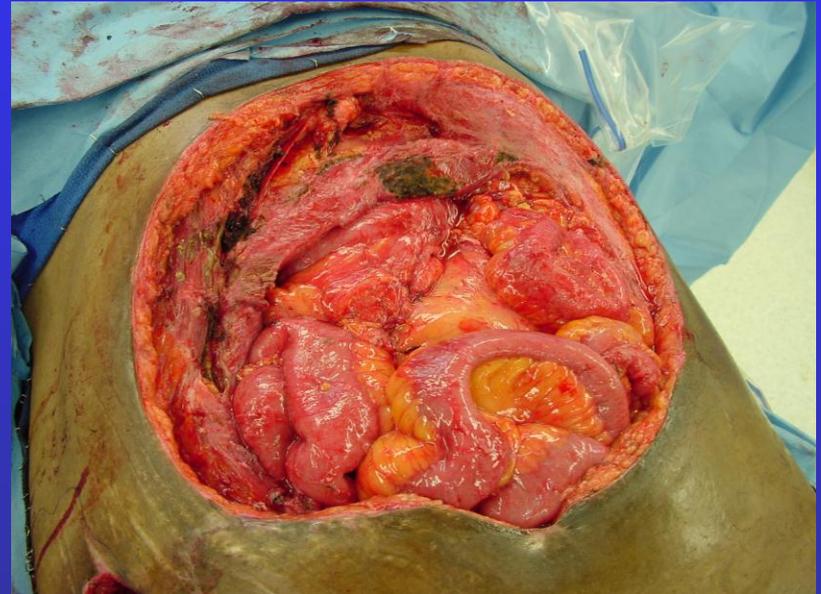
Kearney R, Payne W, Rosemurgy A. Extra-abdominal closure of enterocutaneous fistula. *Am Surg* 1997;63:406-9.

Healed Wound – Oral Nutrition

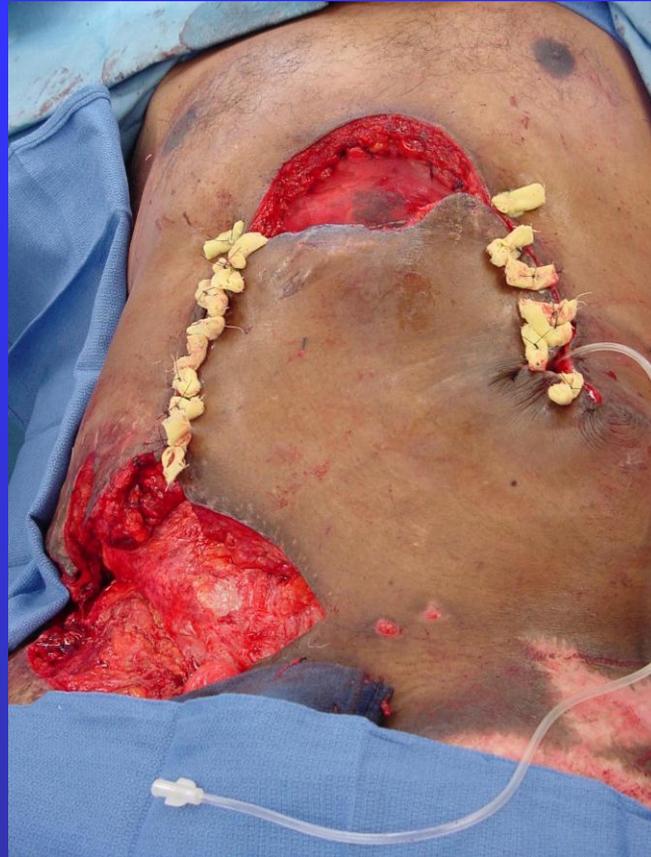


Principle 6

Resect Fistula when patient fit and infection free



**PLEASE: Do not cover open abdomens
with Marlex mesh!!!!**



Viscera covered with previously “delayed”
Rotation skin flap

Principle 7:

Daily Attention
by a Senior Surgeon

Principles of Management Specific for “Entero-atmospheric” Fistula

- **PREVENTION**

- Protect exposed abdominal viscera during open abdomen management
- Limit access to the wound to one or two SENIOR people
- Attempt to seal leak when first recognized
- Protect adjacent viscera with biologic dressings to avoid additional holes
- Control fistula effluent
- Rotate flaps with good blood supply to cover fistula in selected cases
- Resect well established “entero-atmospheric” fistula only when patient fit and infection free

Principles of Management Specific for “Entero-atmospheric” Fistula

- The patient should be “adopted” by a senior surgeon who sees the patient and the family daily and dictates long term management goals
 - The patients are “psychological disasters”
 - Body image, odor and cleanliness are major issues
 - Intra-familial tensions are the norm