What’s New in Abdominal Trauma

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Areas of Advance

- FAST examination
- Non-operative treatment of liver and spleen injuries
- Declining indications for colostomy
- Damage Control Laparotomy/Abdominal Compartment Syndrome
- Vascular Stents
- Diagnosis and treatment of pancreatic injury
Non-operative Management of Liver Injuries

• Non-operative management of “stable” liver injuries is treatment of choice
• Non-bleeding disruptions of the liver heal with time
• If you must operate and can control the bleeding with packs, stop!! Come back 48 hours later for a 2nd look
Non-operative Management of Splenic Injuries

- Non operative management of grade 1-3 splenic injuries is accepted practice
- Expect a 10-15% failure rate
- If patients has a vascular blush or pseudoaneurysm, A/G
- Timely exploration is essential if the patient is actively bleeding!!!
Non-operative Management

Caution

Consider the possibility of a missed hollow viscus injury if the patient requires an unexpectedly large volume of fluid

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Declining indications for colostomy after colorectal trauma

- Most patients with intraperitoneal colorectal injury can be treated by primary repair (including resection and primary anastomosis)
- Hemodynamic status of patient, degree of contamination and ISS determine risk of infection—not colostomy???
- Delay from time of injury is not in itself a contraindication to primary repair

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New Concept

Resuscitation is a 24-36 hour Experience
Goals of Damage Control Laparotomy

- Control of Hemorrhage
- Rapid Control of Intestinal Spillage
- Rapid Temporary Abdominal Closure
- Rapid Transfer to the ICU for continued resuscitation and restoration of physiologic homeostasis
- Delay of intestinal reconstruction until repeat laparotomy 24-48 hours later
Goals of ICU Care following Damage Control Procedure

- Attend to the “secondary resuscitation”
  - volume and hemodynamic monitoring
  - measure bladder pressures
  - ventilatory support
  - aggressive rewarming
• Additional Studies/Therapy
  – Diagnostic Imaging
  – Angiography/embolization

• End Points of Resuscitation
  – Restoration of perfusion?
  – Continued Bleeding?
  – Abdominal Compartment Syndrome?
Iatrogenic Consequences of Resuscitation

- Massive Edema
- Increased intra-abdominal, intra-thoracic, intracranial and subfascial pressures: *i.e.*

*Compartment Syndrome*
Physiologic Consequences of the Abdominal Compartment Syndrome

- Cardiovascular
  - Decreased Venous Return
  - Increased SVR
  - Hypotension
Physiologic Consequences of the Abdominal Compartment Syndrome

- Splanchnic Circulation
  - Decreased splanchnic flow
  - Decreased pH
  - Decreased hepatic artery and portal vein flow
  - Decreased Renal blood flow, GFR and Urine Output
Physiologic Consequences of the Abdominal Compartment Syndrome

- Pulmonary
  - Decreased Compliance
  - Increased PIP
  - Increased PA pressure
  - Increased Vd/Vt
  - Increased Qs/Qt
Physiologic Consequences of the Abdominal Compartment Syndrome

- Cerebral Circulation
  - Increased ICP
  - Decreased CPP
Indications for the Open Abdomen

• Damage Control for Trauma
• Abdominal Compartment Syndrome
  – Massive Resuscitation
  – Burn
  – Pancreatitis
• Severe Abdominal Infection
• Acute Mesenteric Ischemia
• Necrotizing Infection of the Abdominal Wall
Management of the Open Abdomen

• Goals
  – Atraumatic Containment of the abdominal viscera
  – Protection of the bowel
  – Fascial Sparing
  – Control of fluid losses
Management of the Open Abdomen

• Principles of Management
  – Cover the exposed viscera
    • The omentum is your friend
    • Use skin as a temporary closure if possible
  – Prevent Adhesions between the Abdominal Wall and the Visceral Block
  – Prevent Lateral Retraction of the Fascia
Open Abdomen

Viscera Protection with Cadavre Skin as a Biologic Dressing
Wound healed by Serial Abdominal Closure without Fistula
Ruptured Abdominal Aortic Aneurysm

Courtesy of Dr. Andre Campbell
Alloderm Closure of Facial Defect

Courtesy of Dr. Andre Campbell
Late sequelae of open abdomen

- Middle aged man 2 years following blunt abdominal trauma with mucormycosis infection of abdominal wall requiring extensive debridement.
- Right sided colostomy
- Infected Marlex
- Skin graft covering viscera
- Large “entero-atmospheric” fistula
Required twice daily
Flap debridement for
Several weeks

Developed intra-abdominal
Abscess with low output
Small bowel fistula
Fistula closed  Wound healed  Prolonged rehabilitation
Open Abdomen Management

Key Point: Avoid a Fistula

- Cover viscera with omentum if available
- Place fenestrated plastic drape between viscera and abdominal wall
- Use wound V.A.C.-have patience-closure can often be achieved
- Do not cover with Marlex in an attempt to avoid a ventral hernia
- Limit access of personnel to the wound!

Enterocutaneous Fistula

- Do not intubate fistulas—it only makes the hole bigger
- Consider some type of fibrin glue and biologic dressing to close the hole and protect the bowel
- Cover hole with local (or free) muscle flap if available and appropriate

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Management of the Open Abdomen after Trauma

- Thru and thru injury of transverse colon, SMV, infrarenal aorta, enterotomy and blast injury to aorta
- Initial damage control laparotomy
- Breakdown of colon repair--peritonitis
Mycotic Aneurysm of Infrarenal Aorta in Open Abdomen
Aortic Stent controlled hemorrhage
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Normal ERCP
Blunt trauma

Pancreatic and peripancreatic edema

Extravasation of contrast
From pancreatic duct
Rx- pancreatic sphincterotomy
Sphincterotomy

Pancreatic stent
Blunt Trauma

Mildly edematous pancreatic tail
Fluid in lesser sac

Extravasation of contrast at Tail of pancreas
Rx- Observation
2 cases of Blunt Trauma

Extravasation from Pancreatic tail
Rx-Sphincterotomy

Extravasation from head of Pancreas
Rx-IR perpancreatic drains
Blunt Trauma

Mild edema of body of pancreas

Extensive extravasation
Rx- distal pancreatectomy
Distal Pancreatectomy

Distal Pancreatectomy with Preservation of the Spleen
Lessons Learned

• Use ERCP to diagnose PDD after both blunt and penetrating trauma
• Treat PDD in selected cases by pancreatic sphincterotomy and/or pancreatic duct stent
• Early diagnosis of PDD can lead to prompt minimally invasive or resection therapy and minimize morbidity and mortality

Summary of Advances in Abdominal Trauma,

• FAST examination
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Multiple small bowel fistulas following GSW to abdomen

- 22 y.o. man with GSW to IVC, SMV, duodenum, small bowel
- 2nd look laparotomy-dead bowel-all small bowel and right hemicolon resected with duodeno-transverse colostomy
- Now 1 ½ years after injury

Multiple fistulas to remaining bowel
Intestinal Leak-Fascial Dehiscence

- Exposed viscera managed with fibrin glue and CSTSG
- Rectus abdominus transposition flap covers exposed bowel and fistula
- Fibrin glue used to limit fistula output
Fistula closed
Healed Wound-Oral Nutrition
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
Viscera mobilized, small bowel resection required
Abdomen closed

POD #3  HR 130 no peritoneal signs
To OR- dead right colon-Rt hemicolecctomy
Open abdomen management
Wound V.A.C. application
Wound V.A.C.

Patient developed high NG Output—then small bowel fistula
Fistula managed with Flowseal followed by Alloderm and CSTSG

Application of CSTSG
Before Wound V.A.C.

100% take of CSTSG
Fistula closed !!!
“Reefing the skin closed over the wound V.A.C.”
ERCP in Patients with Pancreatic Trauma

- 20 patients (ages 17-54)
- 6 patients (30%) normal ERCP
- 13 patients with partial or complete PDD
- 1 patient with biliary injury (Rx biliary stent)
- 15 patients Rxed expectantly after ERCP
- 7 patients sphincterotomy and/or pancreatic stent—none required surgery
- 2 patients-distal pancreatectomy