

Abdominal trauma: presentation, management & complications

Dr. Muhammad Shamim

FCPS (Pak), FACS (USA), FICS (USA), MHPE (NI & Eg)

Assistant Professor, Dept. of Surgery

College of Medicine, Prince Sattam bin Abdulaziz University

Email: surgeon.shamim@gmail.com

Web: surgeonshamim.com



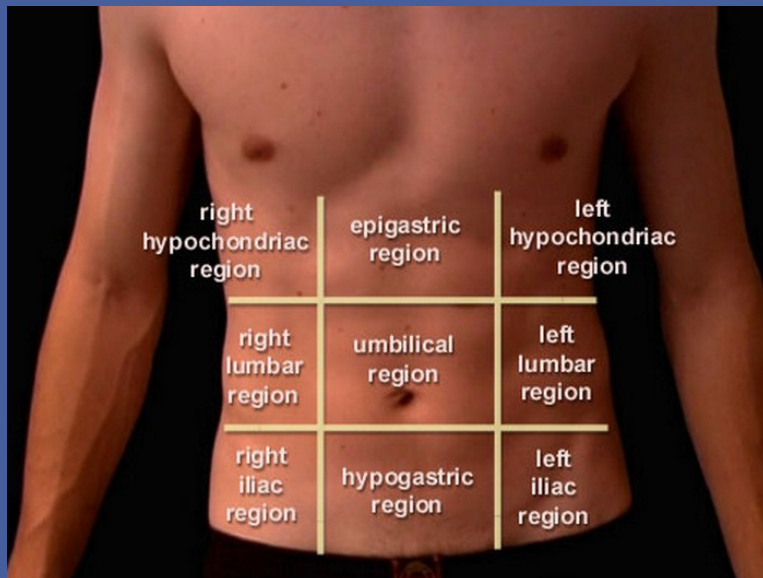
Epidemiology

- Blunt and penetrating abdominal trauma are major causes of morbidity and mortality.
 - Combination injuries from explosive devices are on the increase
- In **blunt abdominal trauma** the spleen and liver are the most commonly injured organs and contribute to a mortality of 8.5%.
 - 75% are due to RTA.
 - 2/3rd occur in males with a peak incidence in age 14 – 30 yrs.
- **Penetrating injury** has a higher mortality of up to 12% & accounts for 1/3rd of all abdominal trauma.
 - Gunshot and stab wounds account for 90% of penetrating trauma.

Abdomen: anatomic boundaries

- **External:**

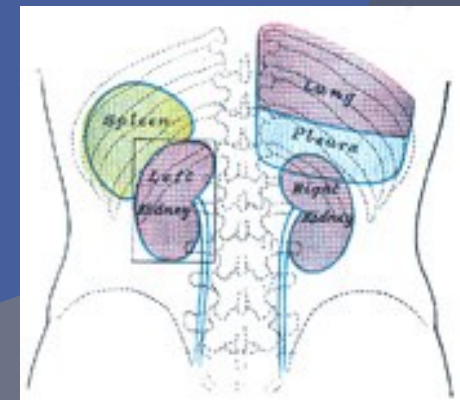
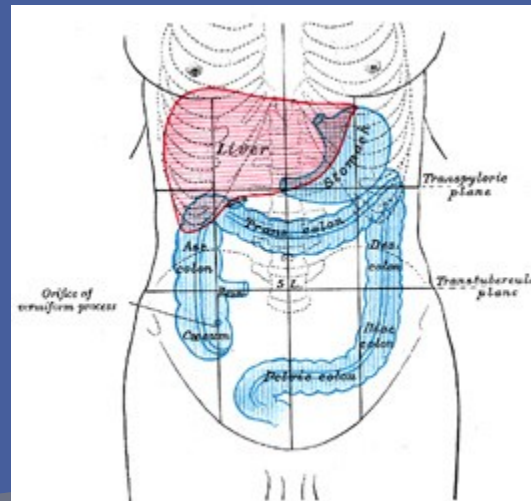
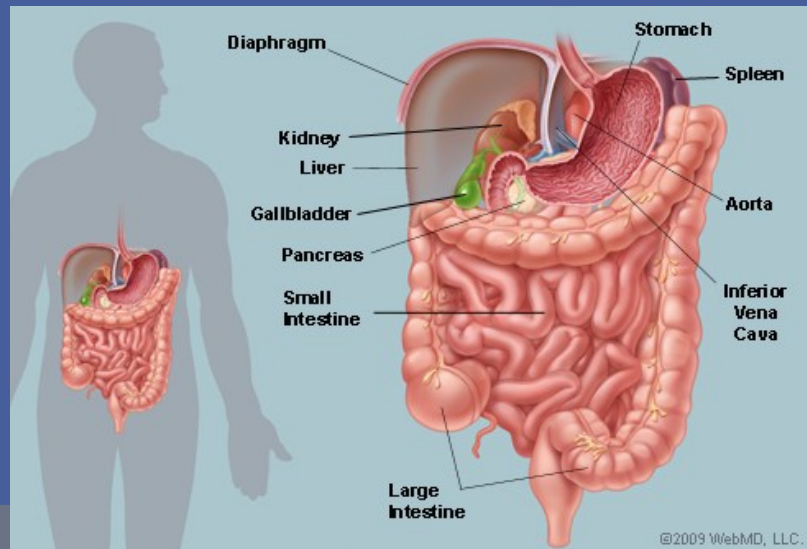
- **Anterior abdomen:** transnipple line superiorly, inguinal ligaments and symphysis pubis inferiorly, anterior axillary lines laterally.
- **Flank:** between anterior and posterior axillary lines from 6th intercostals space to iliac crest.
- **Back:** Posterior to posterior axillary lines, from tip of scapulae to iliac crests.



Abdomen: anatomic boundaries

- **Internal:**

- **Upper peritoneal cavity:** covered by lower aspect of bony thorax. Includes diaphragm, liver, spleen, stomach, transverse colon.
- **Lower peritoneal cavity:** small bowel, ascending and descending colon, sigmoid colon, and (in women) internal reproductive organs.
- **Pelvic cavity:** contains rectum, bladder, iliac vessels, and (in women) internal reproductive organs.
- **Retroperitoneal space:** posterior to peritoneal lining of abdomen. Abdominal aorta, IVC, most of duodenum, pancreas kidneys, ureters, and posterior aspects of ascending and descending colon.



Mechanisms of injury

- ◉ **Compression, crush, or sheer injury** to abdominal viscera
→ deformation of solid or hollow organs, rupture (e.g. small bowel, gravid uterus)
- ◉ **Deceleration injuries**: differential movements of fixed and nonfixed structures (e.g. liver and spleen at sites of supporting ligaments)
- ◉ **Penetrating injury**: occurs directly from the object causing the injury or from kinetic energy released by the object.



Restraining devices in MVC

- **Lap seat belt**

- Mesenteric tear or avulsion
- Rupture of small bowel or colon
- Iliac artery or abdominal aorta thrombosis
- Chance fracture of lumbar vertebrae (hyperflexion)



- **Shoulder Harness**

- Rupture of upper abdominal viscera
- Intimal tear or thrombosis in innominate, carotid, subclavian, or vertebral arteries
- Fracture or dislocation of C-spine
- Rib fractures
- Pulmonary contusion

- **Air Bag**

- Corneal abrasions, keratitis
- Abrasions of face, neck, chest
- Cardiac rupture
- C or T-spine fracture





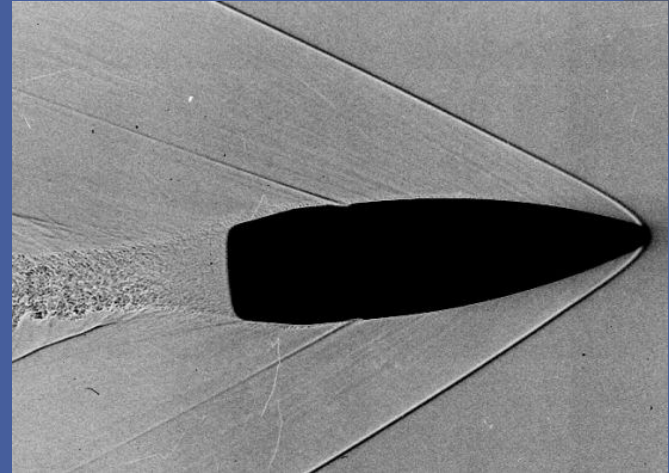
Mechanism of Injury: Penetrating

- **Stab**

- Low energy, lacerations

- **Gunshot**

- Kinetic energy transfer
 - Cavitation, tumble
 - Fragments



Common injury patterns

- In blunt trauma, most frequently injured organs are **spleen** (40-55%), **liver** (35-45%), and **small bowel** (5-10%).
- **Solid organ injury**
 - Laceration to liver, spleen, or kidney
 - Injury to one of these three + **hemodynamic instability**: considered indication for urgent laparotomy
 - Isolated solid organ injury in **hemodynamically stable** patient: can often be managed nonoperatively.
- **Small bowel injury:**
 - Generally from sudden deceleration with subsequent tearing near fixed points of attachment.
 - Often associated with seat belt sign, lumbar distraction fracture (Chance fracture)

● **Duodenum:**

- Classically, frontal-impact MVC with unrestrained driver; or direct blow to abdomen.
- Bloody gastric aspirate, retroperitoneal air on XR or CT

● **Pancreas:**

- Direct epigastric blow compressing pancreas against vertebral column.
- Early normal serum amylase does NOT exclude major pancreatic trauma.
- CT with PO/IV contrast – NOT particularly sensitive in immediate post-injury period.

● **Diaphragm:**

- Most commonly, 5-10 cm rupture occur involving posterolateral hemidiaphragm.
- Noted on CXR: blurred or elevated hemidiaphragm, hemothorax, NGT in chest

● **Genitourinary:**

- Anterior injuries (below UG diaphragm): usually from straddle impact.
- Posterior injuries (above UG diaphragm): in patient with multisystem injuries and pelvic fractures.

● **Pelvic fractures:**

- Suggest major force applied to patient.
- Usually auto-ped, MVC, or motorcycle
- Significant association with intraperitoneal and retroperitoneal organs and vascular structures.

Management

Initial assessment and resuscitation

- ⦿ Principles of **ABC** should be applied ie adequate airway, breathing and treating hypovolemia.
- ⦿ Establish that an **abdominal injury** exists rather than emphasis on exact diagnosis.
- ⦿ **Rule out** other injuries.
- ⦿ Insert wide bore **IV cannula**.

- ② Continuous **monitoring** of BP, pulse rate, oxygen saturation.
- ② Initial **fluid resuscitation**;
 - rapid infusion of 2 litres of crystalloid solution followed by colloids if necessary.
- ② Transient responders and non-responders needs immediate laparotomy.

Secondary survey

- ⦿ History of incident.
- ⦿ Physical examination of the exposed patient.
- ⦿ Examination of anterior and posterior abdomen.
 - Palpate for tenderness & guarding.
 - Percussion and auscultation.
 - Rectal examination.
 - Perineal examination.
- ⦿ **Insert NG tube and urethral catheter.**

Assessment: History

- AMPLE
- Mechanism

- **A:** allergies
- **M:** medication
- **P:** past medical history
- **L:** last mealtime
- **E:** events surrounding the incident

- **MVC:**
 - Speed
 - Type of collision (frontal, lateral, sideswipe, rear, rollover)
 - Vehicle intrusion into passenger compartment
 - Types of restraints
 - Deployment of air bag
 - Patient's position in vehicle

Assessment: Physical Exam

- Inspection, auscultation, percussion, palpation
 - **Inspection:** abrasions, contusions, lacerations, deformity
 - ✦ Grey-Turner, Cullen, Kehr.
 - **Auscultation**
 - **Percussion:** subtle signs of peritonitis; tympany in gastric dilatation or free air; dullness with hemoperitoneum; Balance's sign
 - **Palpation:** elicit superficial, deep tenderness; involuntary muscle guarding

Physical Exam: Eponyms

- **Grey-Turner sign:**

- Bluish discoloration of lower flanks, lower back; associated with retroperitoneal bleeding of pancreas, kidney, or pelvic fracture.

- **Cullen sign:**

- Bluish discoloration around umbilicus, indicates peritoneal bleeding, often pancreatic hemorrhage.

- **Kehr sign:**

- L shoulder pain while supine; caused by diaphragmatic irritation (splenic injury, free air, intra-abd bleeding)

- **Balance sign:**

- Dull percussion in LUQ. Sign of splenic injury; blood accumulating in subcapsular or extracapsular spleen.

Abdominal Injury

Factors that Compromise the Exam

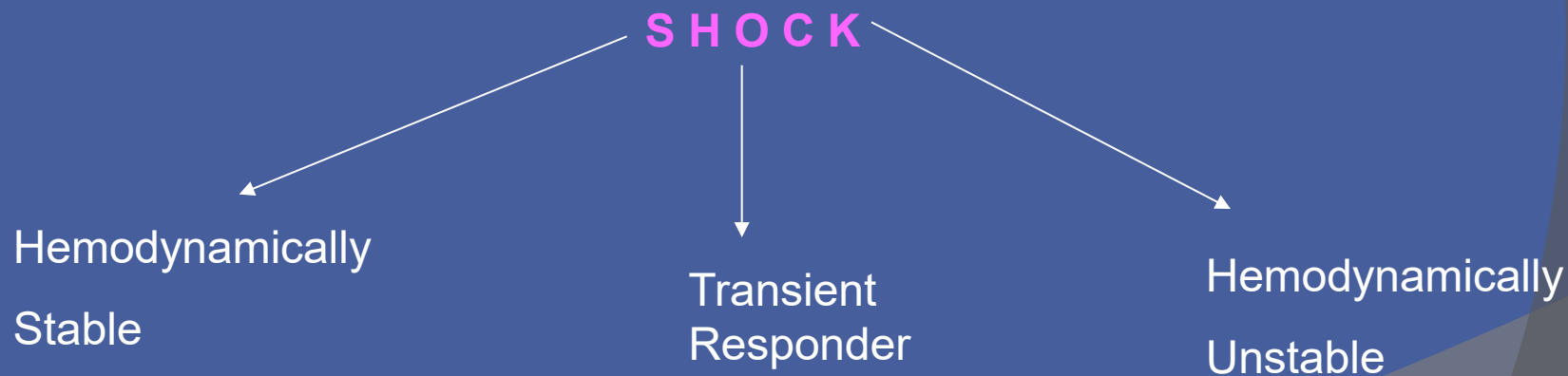
- Alcohol and other drugs
- Injury to brain, spinal cord
- Injury to ribs, spine, pelvis



A missed abdominal injury can cause a preventable death.

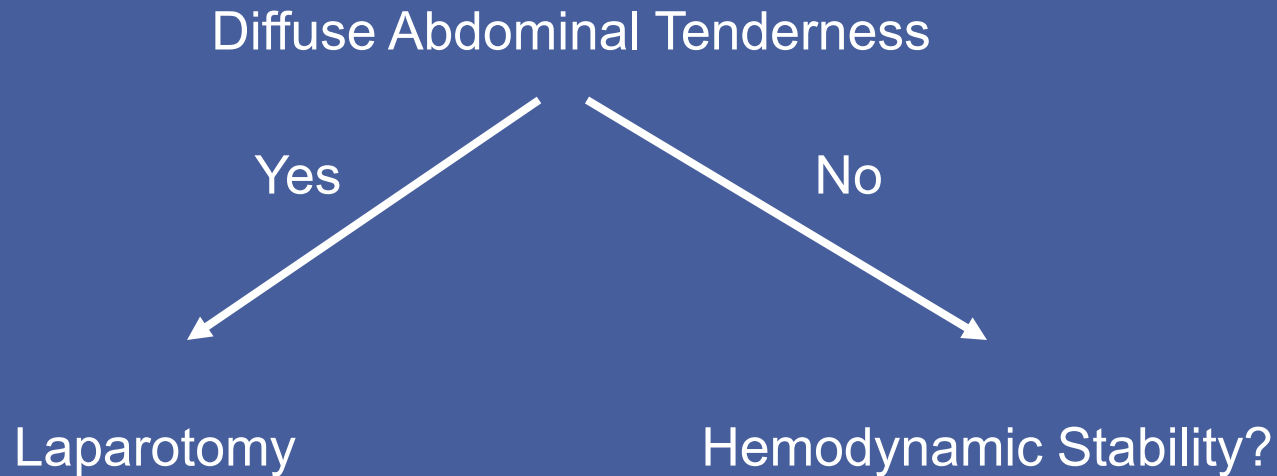
Decision Making

- Airway
- Breathing
- Circulation



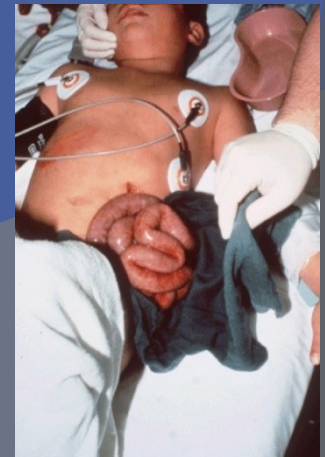
How are you going to assess?

Options for Management



Indications for Laparotomy – Penetrating Trauma

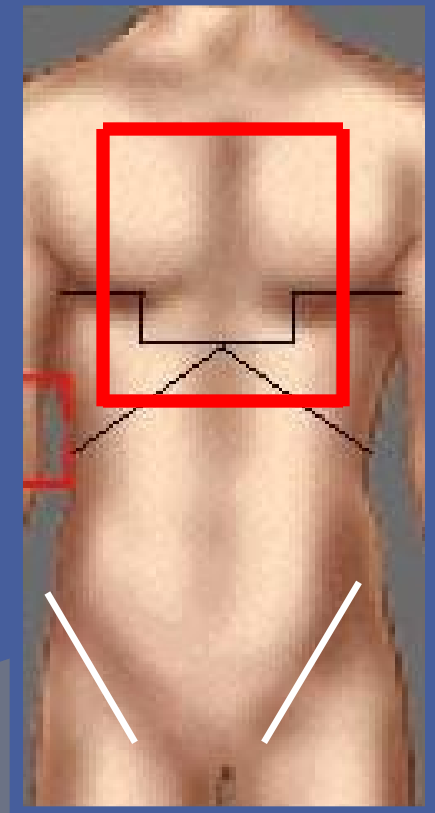
- Hemodynamically abnormal
- Peritonitis
- Evisceration
- Positive DPL, FAST, or CT
- Violation of peritoneum



Options for Management

● Hemodynamically stable penetrating injury

- Serial Observation
- Ultrasound/echo – cardiac box
- Wound Exploration
- DPL
- CT scan +/- Contrast
- Laparoscopy
- Laparotomy

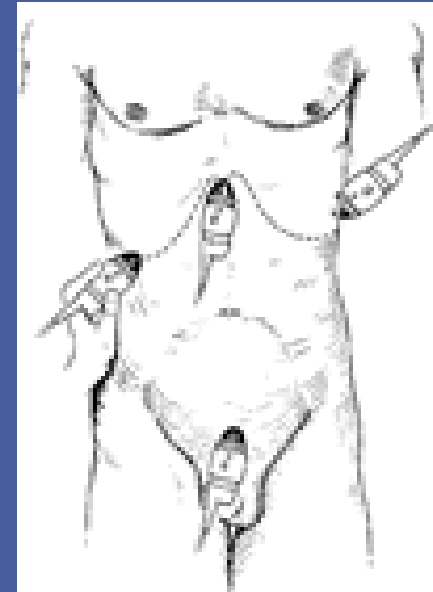


Diagnostic adjuncts

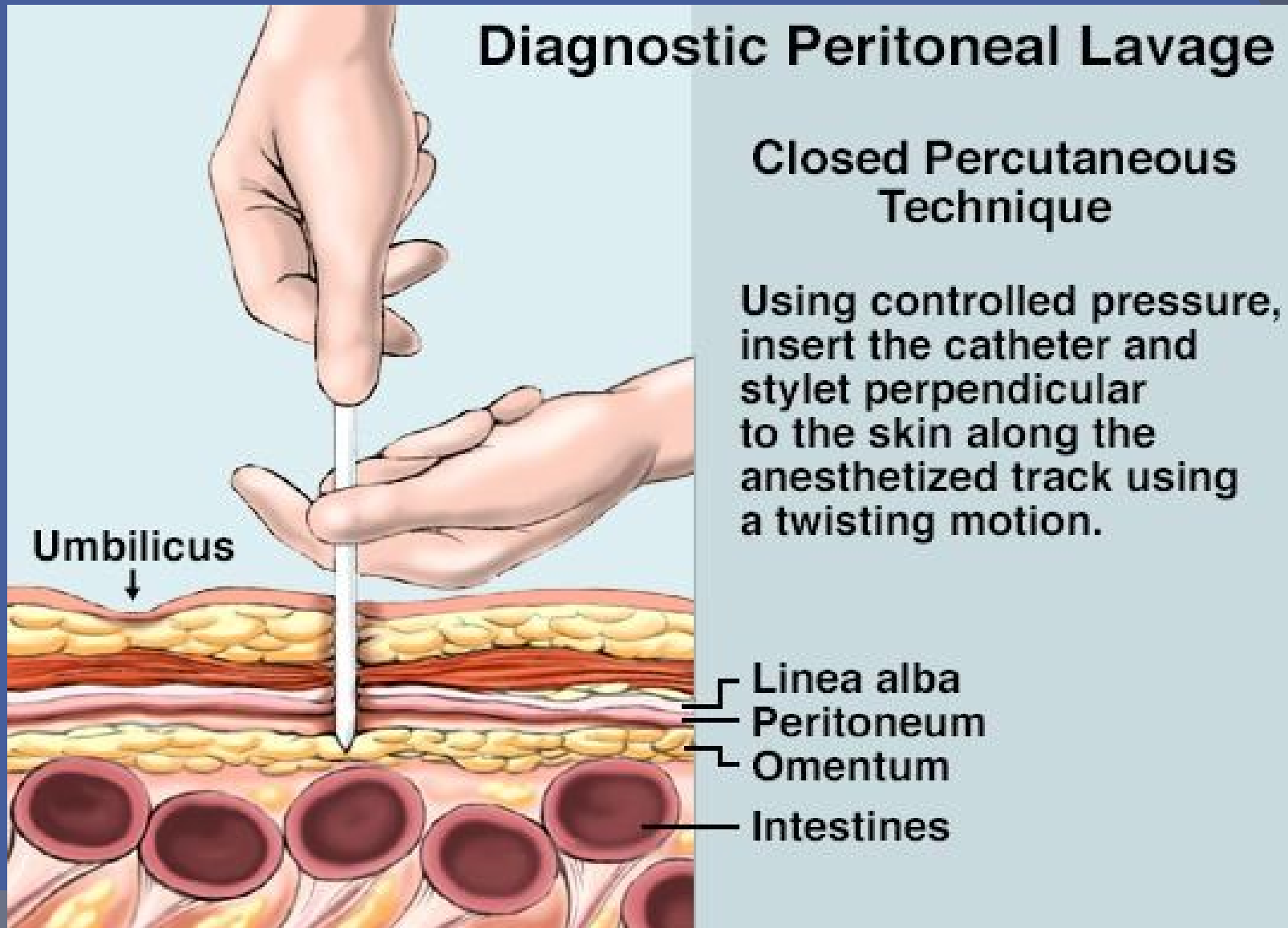
- Labs: CBC, coags, b-HCG, amy/lip, tox screen
- Plain films: CXR, pelvis;
 - abd films generally lower priority
- DPL
- FAST
- CT

Focused Abdominal Sonography for Trauma (FAST)

- Demonstrate presence of free intraperitoneal fluid
- Evaluate solid organ hematoma
- ◎ **Four View Technique:**
 - Morrison's pouch (hepatorenal)
 - Douglas pouch (pelvic)
 - Left upper quadrant (splenic view)
 - Epigastric (pericardium)

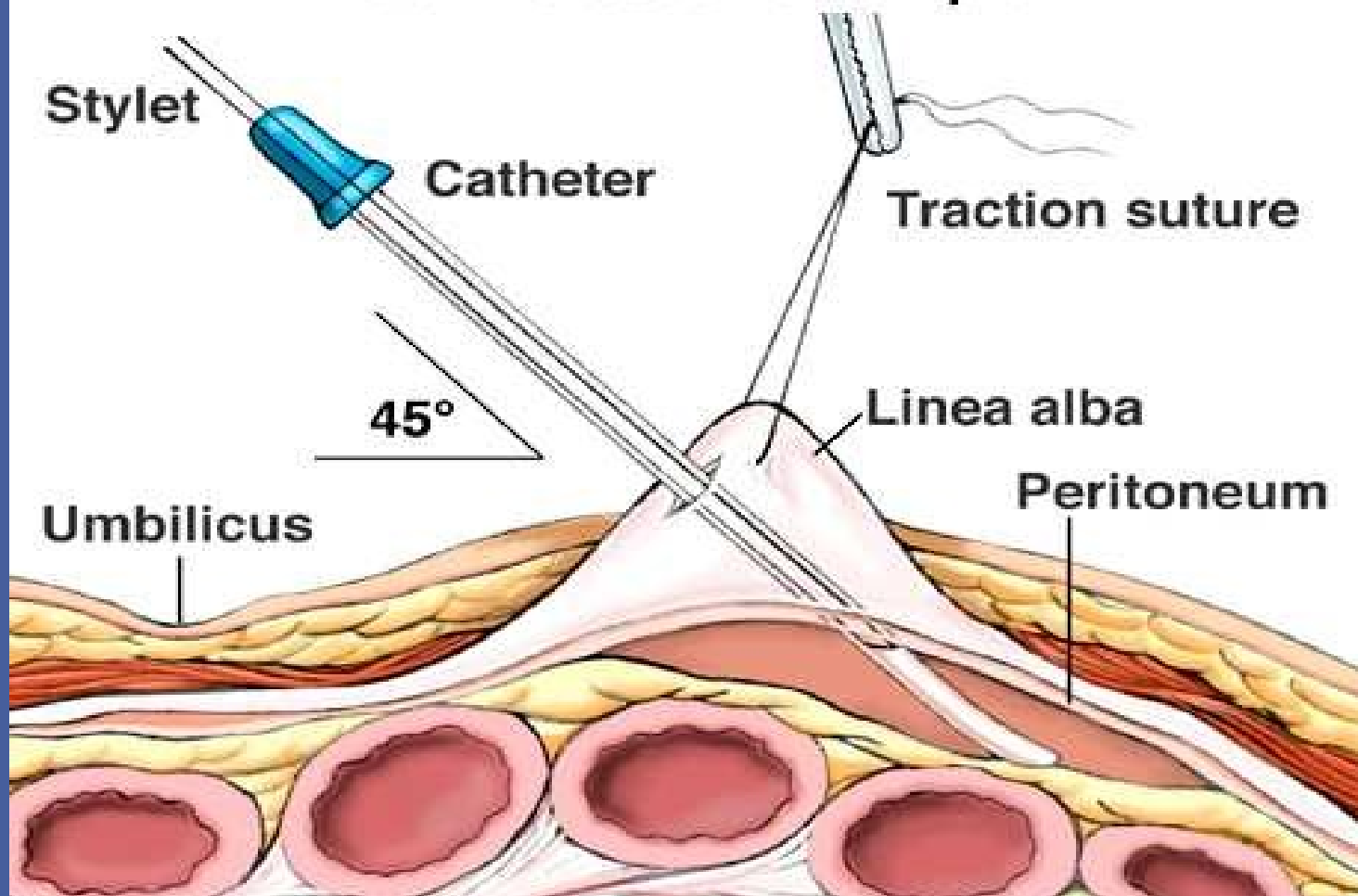


Diagnostic peritoneal lavage



Diagnostic Peritoneal Lavage

Semi-Closed Technique



- *sole absolute contraindication to DPL is the established need for laparotomy.*

Relative contraindications:

- *prior abdominal surgery*
- *Infections*
- *Coagulopathy*
- *obesity*
- *second- or third-trimester pregnancy.*

Objective criteria for assessing DPL

⊙ **Positive criteria;**

- > 10 mls blood on opening abdomen.
- RBC count >100,000/ul.
- WBC count > 500/ul.
- Amylase > 175U/ml.
- presence of fecal matter or bile.

⊙ **Equivocal criteria;**

- RBC count 50,000 -100,000(in penetrating trauma 25,000 – 50,000).
- WBC count 100 -500/ul.
- Amylase 75 – 175 U/ml.

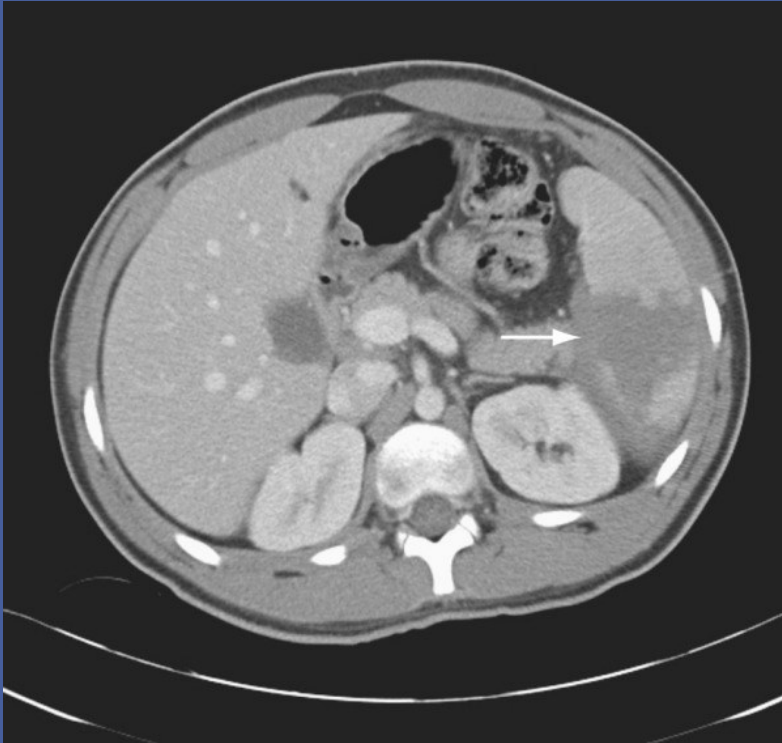
CT Scan

- ⦿ Replacing DPL.
- ⦿ 98% sensitive in detecting intraperitoneal bleeding.
- ⦿ Contrast enhanced CT Scan gives useful anatomical and functional information on organs.
- ⦿ Can identify organ injuries and be used to determine which injuries can be managed conservatively in stable patients.

Grade 1 SPLENIC INJURY



Grade 3 injury



Laparoscopy

- ⦿ Increasingly used in assessing trauma.
- ⦿ Useful in determining peritoneal penetration and identifying diaphragmatic injuries.
- ⦿ Also can be used for treating certain injuries.

Management

Principles of management are;

- ⦿ **Stop haemorrhage.**
- ⦿ **Debride devitalised tissues.**
- ⦿ **Repair injured bowel by suturing or resection.**
- ⦿ **Eliminate foreign bodies/contamination and intestinal contents.**

Preoperative preparation

- Broad spectrum antibiotics to cover both aerobic and anaerobic organisms.
- Crossed-matched blood

Management cont'd

Blunt abdominal trauma

- ⦿ Initial assessment and resuscitation;
 - Haemodynamically stable or unstable.
- ⦿ **Haemodynamically stable** and no peritonitis, negative DPL, negative FAST, Negative CT Scan – observation and serial examinations.
- ⦿ **Haemodynamically unstable**, positive DPL, intra-peritoneal fluid seen on FAST, positive CT –Laparotomy.

Damage Control

1. Initial resuscitation
2. Control of hemorrhage and contamination
 1. Control injured vasculature, bleeding solid organs
 2. Abdominal packing
3. Back to the ICU for resuscitation
 - Correction of hypothermia, acidosis, coagulopathy
4. Definitive repair of injuries
5. Definitive closure of the abdomen

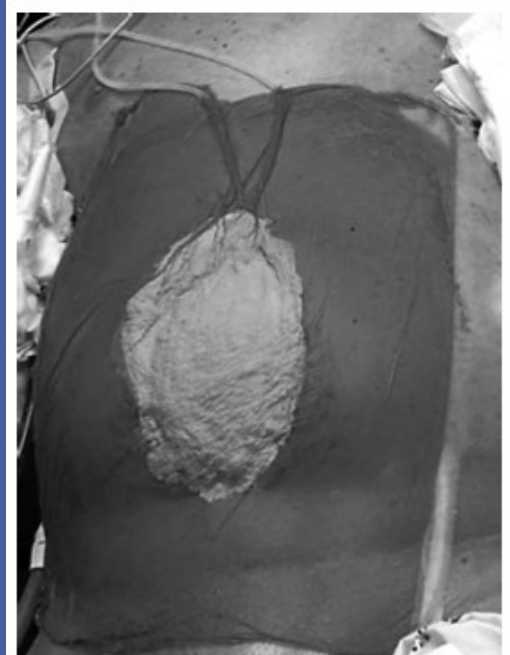


Figure 2. Vacuum pack abdominal dressing (Barker technique abdominal dressing).

R2

⦿ *Criteria for a +ve DPL include all of the following except:*

**initial aspiration of at least 50ml gross blood*

**>100,000 RBC in blunt trauma*

**35000 RBC in gunshot or penetrating low chest wound.*

**presence of bile, bacteria or meat/vegetable fibers*

R2

⦿ ***Criteria for a +ve DPL include all of the following except:***

★ *initial aspiration of at least 50ml gross blood*

**>100,000 RBC in blunt trauma*

**35000 RBC in gunshot or penetrating low chest wound.*

**presence of bile, bacteria or meat/vegetable fibers*

R3

During the evaluation of a trauma patient, an upright CXR showed gastric bubble shifted to the rt .

No free air is present. What is the main concern?

**bowel perforation*

**gastric injury*

**retroperitoneal hematoma*

**splenic injury*

R3

During the evaluation of a trauma patient, an upright CXR showed gastric bubble shifted to the rt .

No free air is present. What is the main concern?

**bowel perforation*

**gastric injury*

**retroperitoneal hematoma*

**splenic injury*



R4

- ***All of the following are clinical indicators' for urgent laprotomy in pt presenting with abdominal stab wounds except which one?***
- **bowel protrusion or evisceration*
- **evidence of diaphragmatic injury*
- **indeterminate local wound exploration*
- *Peritoneal irritation on physical examination*
- *Significant GI bleeding*

R4

○ *All of the following are clinical indicators' for urgent laprotomy in pt presenting with abdominal stab wounds except which one?*

- **bowel protrusion or evisceration*
- ★ **evidence of diaphragmatic injury*
- **indeterminate local wound exploration*
- *Peritoneal irritation on physical examination*
- *Significant GI bleeding*

R5

- ***A 25 yr old male presents with a stab wound to the upper abdomen. Vital signs are stable. The abdomen is not distended, soft, non-tender. Bowel sounds are present. Upright CXR does not demonstrate a Penumothorax or free air under diaphragm. What should the next step be?***

**evaluation of the peritoneal entry by local wound exploration*

**performing DPL*

**Proceeding directly to Laprotomy*

**suturing of the wound and discharging the pt with clear instruction.*

R5

- ⦿ *A 25 yr old male presents with a stab wound to the upper abdomen. Vital signs are stable. The abdomen is not distended, soft, non-tender. Bowel sounds are present. Upright CXR does not demonstrate a Penumothorax or free air under diaphragm. What should the next step be?*

- ★ **evaluation of the peritoneal entry by local wound exploration*
- *performing DPL*
- *Proceeding directly to Laprotomy*
- *suturing of the wound and discharging the pt with clear instruction.*

The End!