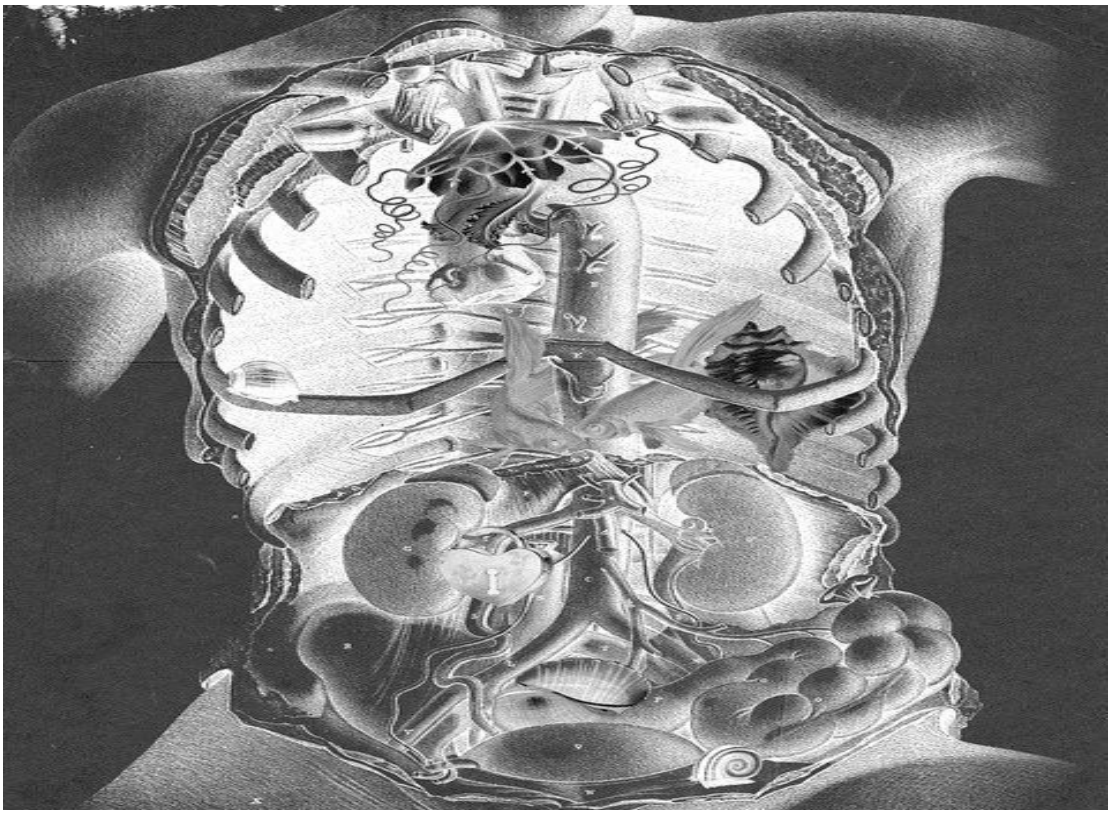

# Specific Organ Trauma

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**Color Index:**
-Slides -Important -Doctor's Notes -Davidson's Notes -Surgery Recall
Females slides -Extra-

Correction File

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# ANATOMICAL REGIONS OF THE ABDOMEN

## Peritoneum

Intrathoracic abdomen

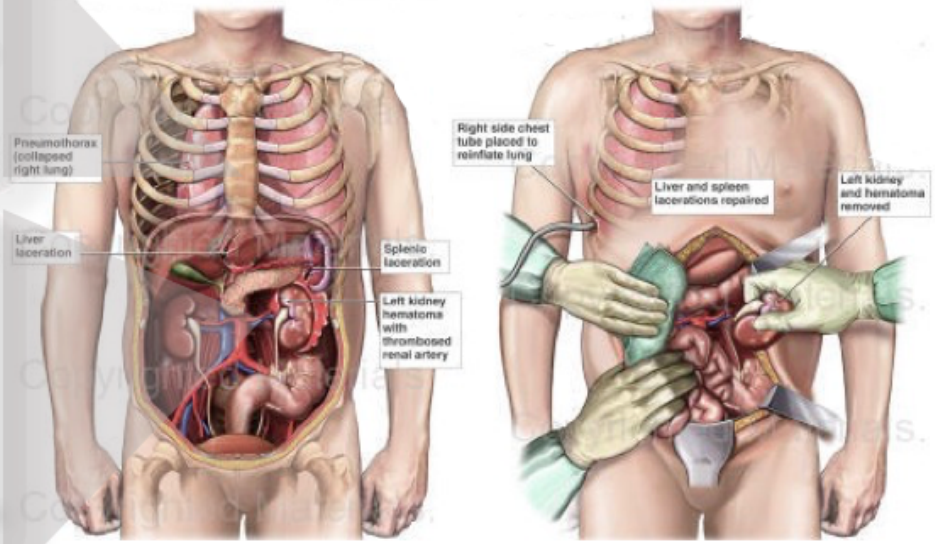
- It is under the costal margin. Contains liver ,spleen , and stomach, pancreas.
- It is hard to examine it.

True abdomen

It can be clinically examined.

## Retroperitoneum

- Pancreas & Duodenum
- Bowel
- Vascular( IVC , aorta )
- Kidneys, ureter
- Pelvic abdomen: bladder, female genital system
- Not accessible during physical examination, investigations are needed.




- Abdomen for trauma purposes is everything below the nipple line , inferior to pubic line.

# Overview:

- Trauma remains major cause of death after IHD and malignancy
- Major cause of disability and death in people aged 1-35 years
- Trauma care account up to 7% of all hospital care (economic burden!)

## Road Traffic Accident

Good example of trauma is RTA so how to reduce trauma due to RTA?!

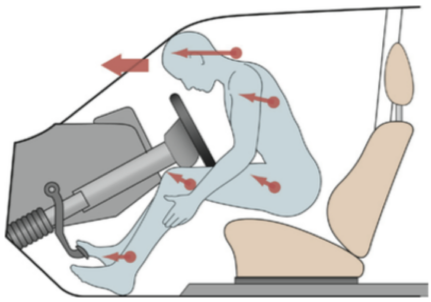


Fig. 7.3 Impact sites in an unrestrained head-on collision.

## Remember:

When you are confronted with a patient you don't necessarily know which organ is injured however, you can **recognize whether it is penetrating or nonpenetrating trauma which is important for treatment, diagnosis and workup therapy. There is no specific organ trauma , so abdominal trauma comes with multiple traumas.**

# Types of the abdominal trauma

**Blunt abdominal injury**

-The majority (90%)

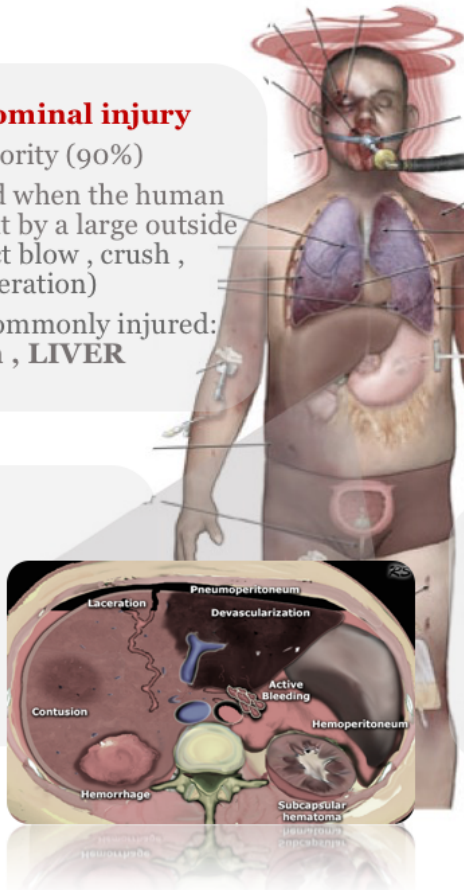
-injury incurred when the human body hits or is hit by a large outside object (direct blow , crush , deceleration)

-Organ most commonly injured: **Spleen , LIVER**

**Penetrating abdominal injury**

-Any Penetration (GSW, Stab wound_

-Organ most commonly injured : **LIVER** ( since it is superficial and covers large area of the abdomen)



**Burns**




**Blast**

injury caused by the explosion of a bomb (especially in enclosed spaces)

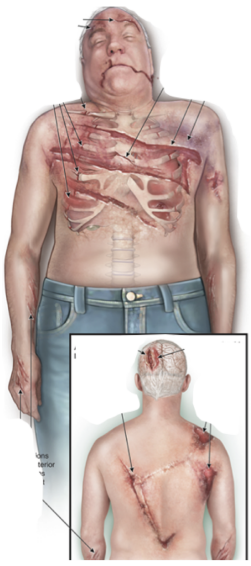
# MANAGEMENT OF TRAUMA PATIENTS :

★ ***The primary management of abdominal trauma is determination that an intra abdominal injury EXISTS and operative intervention is required.***
*Because* findings might not be as obvious as hemorrhage sometimes patient might come to ER walking with subtle findings so .. always maintain high degree of suspicion Reevaluate , reevaluate , reevaluate! **and never discharge before 6 hours and as a rule : any patient with trauma needs surgery.**

★ ***The failure to manage the abdominal injuries accounts for majority of preventable death following multiple injuries.***

## INITIAL ASSESSMENT in ER :

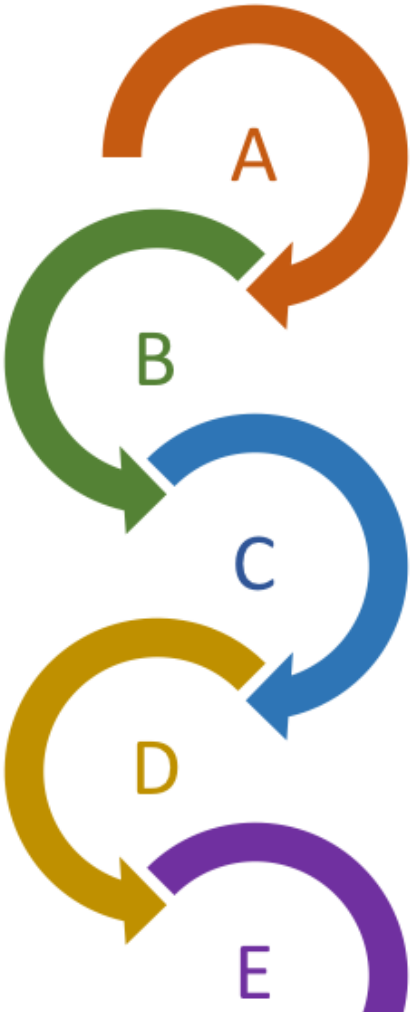
**Ok, suppose that you had a patient that was brought to ER following an RTA with BP of 80/60,conscious, oriented. Urinary catheterisation revealed frank hematuria. The abdomen was distended. Guarding, rigidity and diffuse tenderness were present over the entire abdomen.what are the sequences of priorities in assessing your patient ?!!**



## 1)Primary survey: evaluates physiology !

The resuscitation & Management priorities of patient with major abdominal trauma are:

## A) The ABCDE of EMERGENCY (must be done to all trauma patients!!)




**Airway:** intubation if the airway is damaged. and protecting the spinal cord.

**Breathing:** if breath sounds were absent, insert a chest tube immediately. No O2 for 15 minutes will cause a disability

**Circulation:** If there was bleeding (hemorrhage), control should be initiated. Give IV fluids (usually crystalloids and normal saline) and control the bleeding.

**Disabilities**

**Exposure:** cut the clothes.

## A) The Adjuncts to primary survey:

- ABGs, Vitals signs, ECG ,Pulse oximeter and CO2
- Usage of Nasogastric tube. It is contraindicated if there was bleeding from the nose or mouth.
- Usage of urinary catheter to monitor the output and input. It is contraindicated If there was bleeding from the urethra.

**And now that you have resuscitated and stabilized your patient you start your second survey where you take history,examine and go on with further investigation or just skip all that and operate directly..all depends on the case!**

# 2)Secondary survey: evaluates Anatomy !

- **HISTORY:**
  - **Blunt abdominal trauma:**
  - **Penetrating abdominal trauma ,AS A RULE FOR THE USMLE :**
    - **GSWs** always penetrates the peritoneum / retroperitoneum so they will receive **Exploratory laparotomy**
    - **Stab wounds** If there are peritoneal signs, heavy bleeding, shock, perform exploratory laparotomy; otherwise, many surgeons either observe the asymptomatic stab wound patient closely, use local wound exploration to rule out fascial penetration, or use DPL

- **PHYSICAL EXAMINATION:**

**General physical,Abdominal (Inspection, Palpation, Percussion, Auscultation,Rectal and Vaginal Examination)**

# Diagnostic modalities:

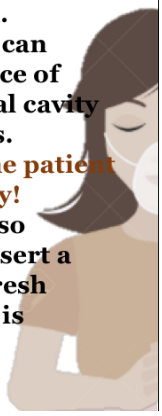
RAUMA STUDIES Depends on the case you choose which to order and most importantly the patient stability! (patient is considered unstable= even if we stabilize him after resuscitation)

**If the patient is hemodynamically stable:**

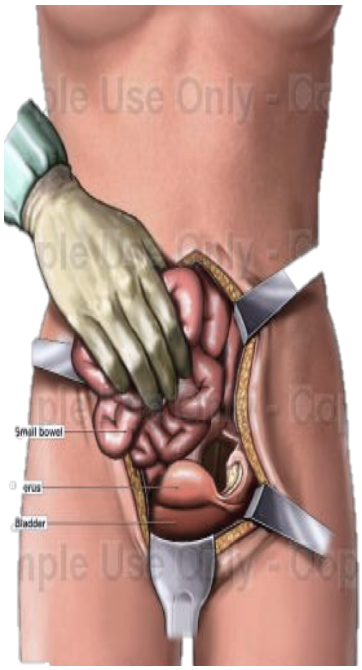
- **CT of abdomen:** if there is absolute indication for exploratory laparotomy then don't waste time with CT,YOU DON'T WANT THEM DYING WHILE THEY ARE BEING IMAGED!
- **Peritoneoscopy (diagnostic laparoscopy)**

**If the patient is hemodynamically Unstable:**

- **Diagnostic Peritoneal Lavage (DPL):**
  - Indicated when the patient is in a shock or suffering from abdominal distention.
  - Extremely reliable; it can determine the presence of blood in the peritoneal cavity up to 98% of the cases.
  - When positive take the patient to the OR immediately!
  - If the results weren't so accurate and clear, insert a liter of saline and if fresh blood appears then it is positive.
- **FAST**



- **Blood Tests.**
- **Radiological Studies:** (Plain abdominal X-ray , CXR) : to determine the presence and location of bullets or other foreign bodies **in hemodynamically stable patients.**




# When should we do laparotomy?

**INDICATION:**

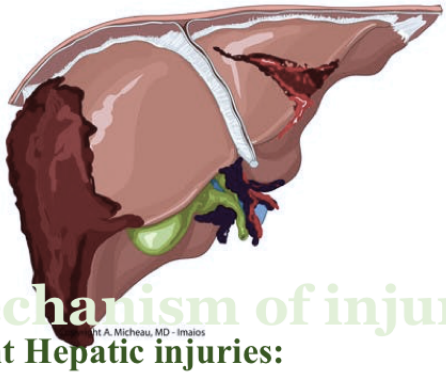
- **Signs of peritoneal injury** (tenderness, distention, guarding, bruising)
- **Unexplained shock** (you give a lot of fluid but your patient is still in a shock).
- **Evisceration of viscous** (If the bowel was out).
- **Positive diagnostic DPL**
- **Determination of finding: During routine follow up on investigations.**

★ **All patients undergoing laparotomy for trauma should be explored through midline incision (**a vertical incision which follows the linea alba from xiphisternum to pubis" around the umbilicus go up or down) **because you do not know where is the lesion.**

# Specific Organs Trauma:

## Liver Trauma

**Most commonly injured organs in all patients with abdominal Trauma specially penetrating.**



### Mechanism of injury

**Blunt Hepatic injuries:**
Direct blows, compression between the lower ribs on right side and the spine or shearing at fixed points secondary to deceleration.

**Penetrating Hepatic injuries:** Gunshot, stab or shotgun wound below the right nipple on right upper quadrant of the abdomen is also likely to cause a hepatic injury.

### CLINICAL MANIFESTATIONS

Diagnosis of hepatic injury is often made at laparotomy in patients presenting with:

- **Penetrating injuries** requiring immediate Surgery
- Those **sustaining blunt Trauma** who remain in shock or **present with abdominal rigidity.**

- **Investigation :** Adjuvant diagnostic tests are necessary in the decision making process to determine whether or not laparotomy is necessary:
- **CT Scan:** Providing anatomic detail and accurate grading of injury
- **DPL**

# Management:

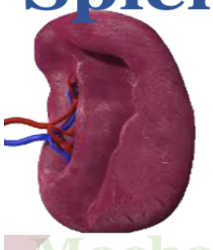
- **When patient arrived to ER the initial management of the patient should be uniform regardless of organs system injuries. Resuscitation is performed (ABCDE) in the standard fashion.**
- **Non operative approach: The hepatic injury diagnosed by CT in stable patient is now non operative approach practiced in many centers.**
- **CT Criteria for non operative management:**
  - **Simple hepatic laceration Or intra hepatic hematoma**
  - **No evidence of active bleeding**
  - **Intra peritoneal blood loss less than 250 ml**
  - **Absence of other Intra peritoneal**
  - **injuries required surgery**
- **OPERATIVE APPROACH: Persistent hypotension, despite adequate volume replacement, suggests ongoing blood loss and mandates immediate operative intervention.**

| Grade | Injury Classification | MANAGEMENT |
|---|---|---|
| 1 | Simple injuries – non bleeding. | Conservative treatment if no bleeding or other injuries. Simple injuries can be managed by any one of variety of methods (simple suture, electrocautery or Topical Hemostatic Agents) .Does not require drainage! |
| 2 | Simple injuries managed by superficial suture alone if you open the patient. | |
| 3 | Major intraparenchymal injury with active bleeding but not requiring inflow occlusion (Pringle maneuver) to control haemorrhage.Some of the patients go for conservative treatment others go for OR | Major intraparenchymal injuries with active bleeding can best be managed by Finger Fracturing the hepatic parenchyma and ligating or repairing lacerated blood vessels & bile ducts under direct vision. |
| 4 | Extensive intraparenchymal injury with major active bleeding requiring inflow occlusion for hemostatic control . Needs operation and do Pringle manoeuvre. | Extensive intra parenchymal injuries with major rapid blood loss require occlusion of portal trial to control hemorrhage. It might need liver resection, lobe resection, and ligation of intrahepatic artery. It is rarely saved. |
| 5 | Juxta Hepatic venous injury (injuries to retrohepatic cava or main hepatic veins) portal vein injury. Patients in this grade are less likely to survive | |

## COMPLICATIONS & MORTALITY!!

| | |
|---|---|
| -Recurrent bleeding | 2-Coagulopathy (because of a lot of blood transfusion. |
| -Hematobilia (blood will go to the bile uct and the patient will bleed per rectum.) | 4-Intrahepatic Haematoma |
| -Perihepatic abscess then Biliary Fistula ter on. | 6-Biliary Fistula |
| -Pulmonary Complications | 8-Hypoglycemia |

# Splenic Trauma



### Mechanism of injury

- commonly injured in patients with blunt abdominal trauma because of its mobility.
- Most civilian stab wounds and gunshot wounds cause simple lacerations or through and through injuries.
- It is of interest 2% of patient who are undergoing surgery LUQ of the abdomen can injured the spleen

### DIAGNOSIS (EVALUATION)

**History**
**Physical examination: Sign & symptom: if you find any of these, you presume spleen and kidney injury:**

- LUQ bruising or abrasion
- Left lower ribs fracture on CXR
- Kehri's sign : shoulder tip pain (L shoulder)
- Balance's sign : LUQ mass(hematoma)

**Radiological:**
**-CXR** " very important in case of spleen injury "
**-Plain abdominal X-Ray**
**-CT Scan:** it is the most important investigation in spleen injury. (Done if the patient is stable)
**-Angiography:** it is very important for grading. It can be used for diagnosis and a therapeutically. Done if the patient is stable.

The spleen remains the most commonly injured organ in patients who have suffered blunt abdominal trauma and is involved frequently in penetrating wounds of the left lower chest and upper abdomen.

- Management of the injured spleen has changed radically over the past decade.
- Now recognized as an important immunologic factory as well as reticuloendothelial filter. Although the risk of overwhelming postsplenectomy sepsis (OPSS) is greatest in child less than 2 yrs recognition of OPSS has stimulated efforts to (Conserve spleen) by splenorrhaphy.

## PATHOPHYSIOLOGY & CLASSIFICATION

**The Magnitude of splenic disruption depend on patient age, injury mechanism and presence of underlying disease splenic injury have been classified according to their pathologic anatomy as such**

**Grade 1: Subcapsular hematoma**

**Grade 2: Subsegmental parenchymal injury**

**Grade 3: Segmental devitalization (part of it)**

**Grade 4: Polar disruption (complete pole)**

**Grade 5: Shattered or devascularized organ (autosplenectomy), Patient is in a shock but he can survive because of the blood supply.**

# TREATMENT

- ***Initial Management (Resuscitation) ABCDE***
- **Non operative approach:**
  - **Widely practiced in pediatric trauma**
  - **The criteria for nonoperative approach**
    - **Hemodynamically stable children / adult**
    - **Those patient without peritoneal finding at anytime (no rigidity, no tenderness, just bruising).**
    - **Those who did not require greater than two unit of blood (more than 2 go to OR)**
- **Operative approach: Decision to perform splenectomy or splenorrhaphy is usually made after assessment & grading the splenic injury**

## Contraindications for splenic salvage: (perform splenectomy)

- **The patient has protracted hypotension (Everything is done but there is no response and the patient is still bleeding)**
- **Undue delay is anticipated in attempting repair the spleen (if we put a needle patient will bleed)**
- **The patient has other severe injury (in the liver, bowel, or bladder)**

# Post splenectomy and splenorrhaphy complications!!

## Early Complications

- **Bleeding**
- **Acute gastric distention**
- **Gastric necrosis** (short gastric vessels are close to each other so when you ligate them, it might lead to necrosis.)
- **Recurrent splenic bed bleeding**
- **Pancreatitis** (since the tail of pancreas ends at the pelvis of the spleen)
- **Subphrenic abscess**

## Late Complications

- **Thrombocytosis**
- **OPSS (1 – 6 Week)**
- **DVT**

# Renal Trauma

## Mechanism of injury

- The commonest organ prone to injury in the urinary system.
- If contusion occurs, it can be treated by conservative therapy.
- If hematuria is present, it means there is a poor indicator of severe renal
- injury (complete or partial kidney damage)

## DIAGNOSIS

**Symptoms and signs ( 3 Fs) :**

**1- Flank abrasion**
**2- Fracture of the ribs**
**3- Fracture vertebral transverse process**

**Investigation :**
**Intravenous urography ( IVU ) + CT scan**

## Management

**Minor injuries >> US scan , percutanous drainage , antibiotic usage**

**Severe injuries >> partial nephroctomy or total nephroctomy**

# Surgical Recall

## What is the protocol used in trauma care?

**Advance trauma life support ATLS**

| | |
|---|---|
| **What are its main 3 elements** | 1- primary survey \ resuscitation<br>2-secondary survey<br>3- definitive care |
| **ALTS history** | AMPLE<br>Allergies<br>medication<br>Past medical history<br>Last meal<br>Events (the trauma) |
| **What is primary survey ?** | ABCDEs and spinal immobilization and securing |
| **A=Airway** | check airway (ask to speak if alert ) if not established<br>Do maneuvers<br>Chin lift than jaw thrust not established endotracheal intubation<br>No results cricothyroidotomy than adequate ventilation 100% O2 |
| **B=Breathing:** | Check Breathing by Respiratory examination ( check for pneumothorax and broken ribs “flail chest and cardiac tamponade) |
| **C=Circulation:** | Check : pulses , blood pressure ,capillary refill, urinary output , mental status , skin<br>If abnormal : give 2 bolus of I.V lactate ringer<br>Also if urinary output is absent insert foley cath.<br>Gastric decompensated : insert NG tube |
| **Disability :** | Check neurological disability by checking (mental status “Glasgow coma scale” ,pupils ,motor\sensory)<br>Exposure and environment :keep warm , inspect all patient for checking |
| **Secondary survey : check for all systems** | |

| Abdominal trauma | |
|---|---|
| What is the most common intra-abdominal organ to injuried with penetrating trauma ? | small bowel |
| What intraabdominal injuries associated with seatbelt ? | Small bowel , L2 fracture ,pancreatic injury |
| What is the treatment of penetrating injury to colon ? | Patient In shock :resection & colostomy<br>Patient is Stable: primary anastomosis and repair |
| What is the treatment of small bowel injury? | Primary closure or resection and primary anastomosis |
| What is the treatment of minor pancreatic injury? | Draniage |
| What is the most commonly injured abdominal organ with blunt trauma? | Liver |
| What is the treatment of significant duodenal injury ? | Close duodenal injury -stap off pylorus -gastrojejunostomy |
| What is the treatment for massive tail of pancreas injury? | Distal pancreatectomy with splenectomy if involved |

| • **What studies are available to evaluate for intra-abdominal injury?** | |
|---|---|
| **1-CT** | |
| What is the indication for abdominal CT scan in blunt trauma? | Normal vital signs with abdominal pain/ tenderness/mechanism |
| What injuries does CT scan miss ? | Small bowel injuries and diaphragm injuries |
| **2-Diagnostic Peritoneal Lavage (DPL)** | |

| | |
|---|---|
| What injuries does DPL miss? | Retroperitoneal injuries |
| What must be in place before a DPL is performed? | NG tube and Foley catheter (to remove the stomach and bladder from the line of fire!) |
| What is the indication for DPL or FAST in blunt trauma? | Unstable vital signs (hypotension) |
| **3-Focused Assessment with Sonography for Trauma (FAST)** | |
| **4-USG abdomen** | |
| It is Best of choice for evaluation of the unstable patient with blunt abdominal trauma. | |
| What does the FAST exam look for? | Blood in the peritoneal cavity looking at Morison's pouch, bladder, spleen, and pericardial sac |
| **5-Peritoneoscopy** | |

**Cases:**

**1-A 10-year-old boy was the backseat belted passenger in a high-speed motor vehicle collision. On presentation to the ER, he is awake, alert, and hemodynamically stable. He is complaining of abdominal pain and has an ecchymosis on his anterior abdominal wall where the seatbelt was located. Which of the following is the best next step in his management?**

a. Discharge him home without any other workup
b. Discharge him home if his amylase level is normal.
c. Discharge him home if his abdominal plain films are negative for the presence of free air.
d. Discharge him home if an abdominal computed tomography (CT) scan is negative.
e. Observe him regardless of negative test results

**2-36-year-old man who was hit by a car presents to the ER with hypotension. On examination, he has tenderness and bruising over his left lateral chest below the nipple. An ultrasound examination is performed and reveals free fluid in the abdomen. What is the most likely organ to have been injured in this patient ?**

a. Liver
b. Kidney
c. Spleen
d. Intestine
e. Pancreas

**3-A 27-year-old construction worker falls about 30 ft from a scaffold. At the**

**scene, he complains of inability to move his lower extremities. On arrival in the ER, he has a heart rate of 45 beats per minute and a blood pressure of 78/39 mm Hg. His extremities are warm and pink. His blood pressure improves with 1 L of crystalloid. A central venous catheter is placed for further resuscitation and his central venous pressure is 2 mm Hg. Which of the following is the best initial treatment strategy for improving his blood pressure?**

a. Immediate celiotomy
b. Fluid resuscitation with crystalloids
c. Administration of O-negative blood
d. Administration of a peripheral vasoconstrictor
e. Administration of intravenous corticosteroids

**4-A 56-year-old woman sustains blunt abdominal trauma from an assault. Her blood pressure is 107/56 mm Hg and her pulse is 92. She complains of abdominal pain. She undergoes CT scanning of the abdomen and pelvis, which demonstrates a splenic injury. Which of the following would preclude an attempt at nonoperative management of the patient?**

a. Presence of a subcapsular hematoma involving more than 25% of the surface area of the spleen
b. Presence of a subcapsular hematoma involving more than 50% of the surface area of the spleen
c. Evidence of a blush on CT scan
d. A red blood cell (RBC) count of 120,000/μL on diagnostic peritoneal lavage
e. Peritoneal signs on abdominal examination

**Answers:** E,C,B,E

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