Approach to patient with abdominal trauma (General Approach)

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Abdominal trauma

General approach

- The word trauma implies that a physical force exerted on a person has led to a physical injury.
- 3rd leading cause of traumatic death after head and chest injuries
- 25% require surgical intervention
- Peak incidence 15-30 yrs
- Causes immediate death by hemorrhage mostly and delayed mortality by sepsis

TORSO TRAUMA

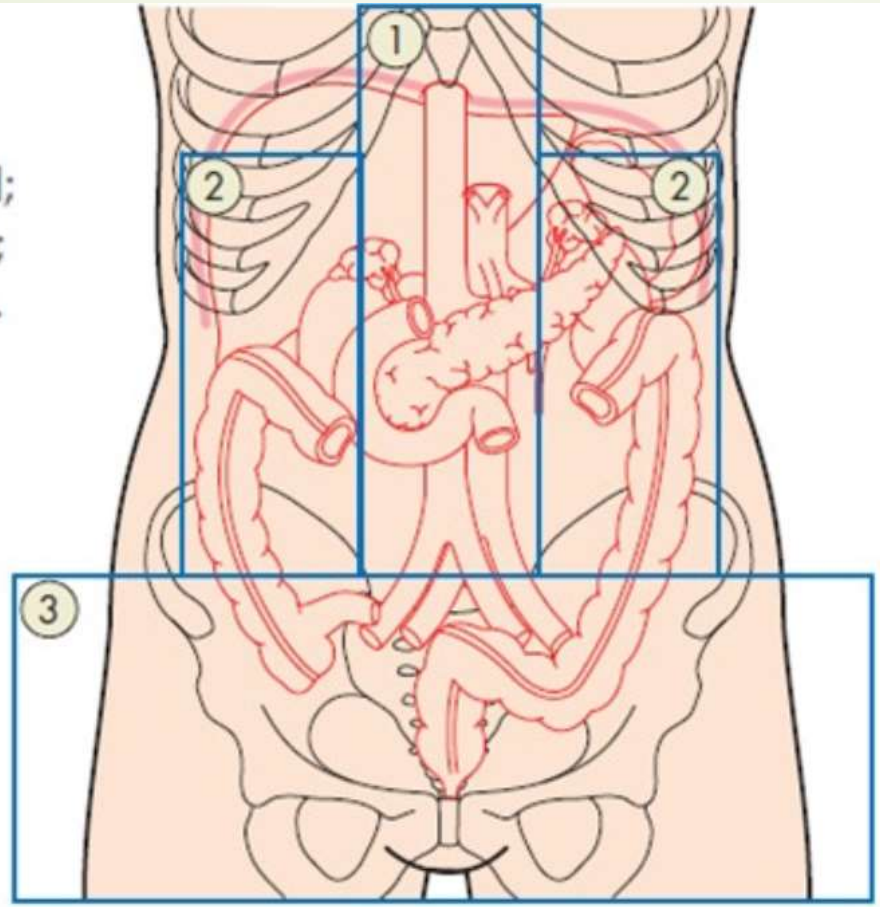
- The torso is generally regarded as the main part of the human body, primarily made up of the chest, abdomen and pelvis, not including the head, neck, arms and legs. This is the largest area of the body and is commonly injured.

Injury often traverses different anatomical zones of the body, affecting structures on both sides of traditional anatomical zones.
These zones are known as ‘junctional zones’.

Junctional zones:

- the root of the Neck between the neck and the thorax
- Mediastinum
- Diaphragm between the thorax and the abdomen
- Groin between the abdomen, the pelvic structures and the groin.
- Retroperitoneum

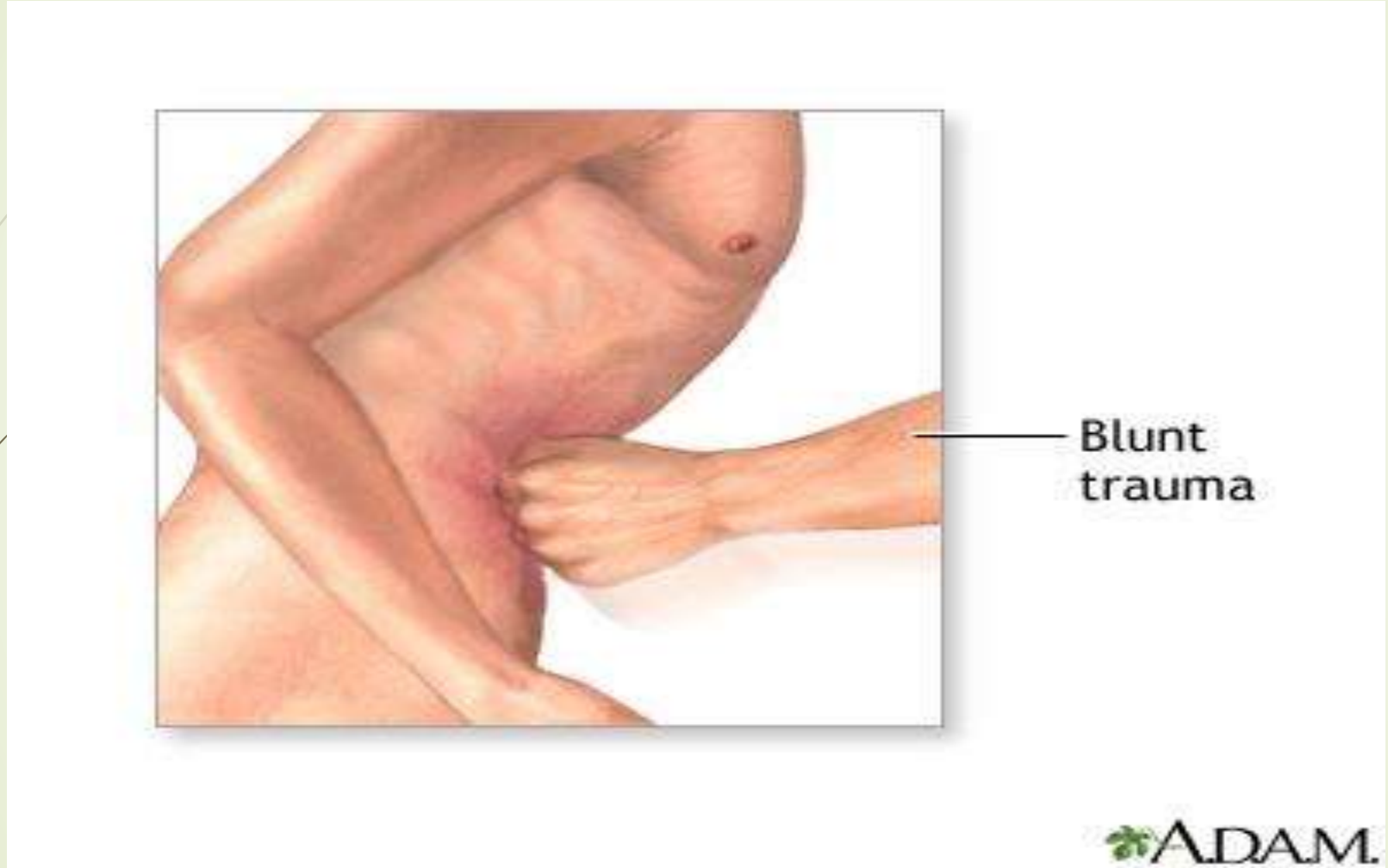
Zone 1: central;
Zone 2: lateral;
Zone 3: pelvic.



The zones of the retroperitoneum.

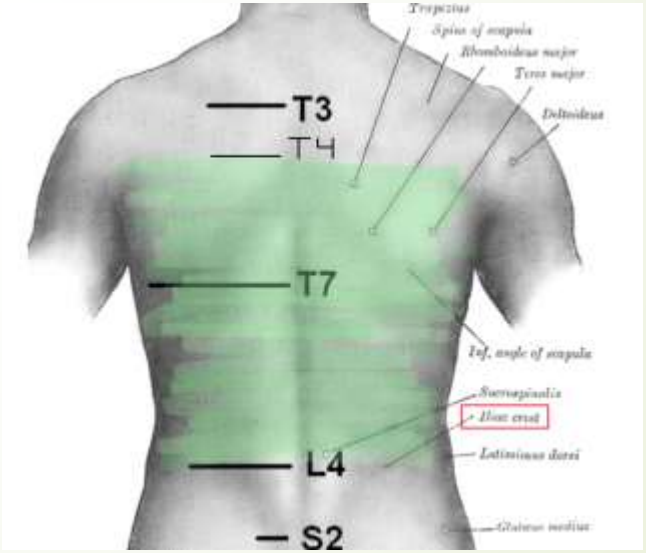
Abdominal Injury

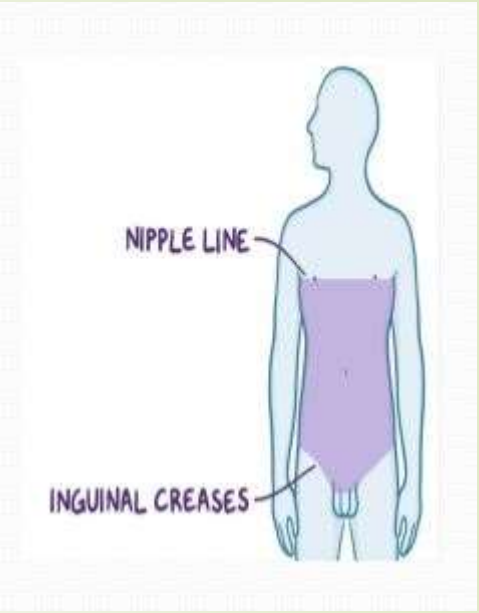
- Blunt injury: **A direct blow, such as in a motor vehicle crash or a fall , it can cause compression and crushing injuries to abdominal viscera and pelvis. Such forces deform solid and hollow organs and can cause rupture, with secondary hemorrhage, contamination by visceral contents, and associated peritonitis.**
- blunt abdominal injuries often managed conservatively, though interventional radiology and surgery are indicated for severe injuries
- Common mechanisms include road traffic crashes, falls, sports injuries and assaults
- organs most affected are : spleen > liver > small and large intestine


Blunt
trauma
A.D.A.M.

Abdominal injury

- Penetrating injury:
- Such as a stab wound or a gunshot.
- **Liver, bowel, and diaphragm most commonly injured**
- Any wound between the nipple line (T4) and the groin creases anteriorly, and from T4 to the curves of the iliac crests posteriorly is potentially a penetrating abdominal injury





Pentrating -stab

PENETRATING-GUN SHOT

Trauma care

PREHOSPITAL CARE:

1. assessment of the injury scene
2. Call for help
3. stabilization and monitoring of injured patients
4. securing an airway, providing adequate ventilation, assessing and supporting circulation, and stabilizing the spine
5. safe and rapid transportation of critically ill patients to the appropriate trauma center.

2. INITIAL HOSPITAL CARE

A. Primary survey : Use a coordinated team-based systematic approach aimed at identifying, prioritizing and treating immediate and delayed life-threats

following the ABCDE algorithm

Airway and spine stabilization

Breathing

Circulation

Disability

Exposure and **E**valuation

Emergency Care

- IV fluids
- Control external bleeding
- Dressing of wounds
- Protect eviscerated organs with a sterile dressing
- Stabilize an impaled object in place
- Give high flow oxygen
- Immobilize the patient with a fractured pelvis
- Keep the patient warm
- Analgesics

2. **Secondary Survey**

It is a complete head-to-toe examination of the patient designed to find all injuries an not to miss any.

A. Head. (Glasgow Coma Score (GCS))

B. The face should be inspected for lacerations, hematomas, asymmetry, and deformities

C. The neck should be inspected and palpated to exclude cervical spine, vascular injury

TABLE 1

Glasgow Coma Scale and Score (NICE 2003)

Feature	Response	Score
Best eye response	Open spontaneously	4
	Open to verbal command	3
	Open to pain	2
	No eye opening	1
Best verbal response	Orientated	5
	Confused	4
	Inappropriate words	3
	Incomprehensible sounds	2
	No verbal response	1
Best motor response	Obeys commands	6
	Localising pain	5
	Withdrawal from pain	4
	Flexion to pain	3
	Extension to pain	2
	No motor response	1

D. Thorax. Significant pulmonary, cardiac, or great-vessel injury may result from both penetrating and blunt trauma

E. The abdomen examining the abdomen to determine the presence of an intra-abdominal injury

F. The pelvis should be assessed for stability by palpating (not rocking) the iliac wings

G. The back should be inspected for wounds and hematomas

H. The genitalia and perineum should be inspected closely for blood, hematoma, and lacerations.

I. The extremities should be inspected and palpated to exclude the presence of soft tissue and orthopedic, vascular, or neurologic injury.

History taking

- Initially, evaluation and resuscitation of a trauma patient occur simultaneously.
- In general, do not obtain a detailed history until life-threatening injuries have been identified and therapy has been initiated.
- The initial assessment begins at the scene of the injury, with information provided by the patient, family, bystanders, or paramedics, or police

Historical features traditionally associated with significant injury following blunt trauma include those listed here

- ●Fatality at the scene
- ●Vehicle type and velocity
- ●Whether the vehicle rolled over (roll-over mechanism is associated with increased risk of serious injury)
- ●Patient's location within the vehicle
- ●Extent of damage to the vehicle
- ●Steering wheel deformity
- ●Whether seatbelts were used
- ●Whether front or side air bags were deployed

Important elements of the history

- Allergies
- Medications
- PMH
- Last meal
- Events lead to incident
- Immunization state
- SH (drugs abuse..)

History of penetrating abdominal trauma:

- The **anatomic location** of injury and **type of weapon**(gun, knife) direct the diagnostic process.
- the **number of gunshots heard or the number of times the patient was stabbed** , and **patient position at the time of injury** help describe the trajectory and pathway of the injury object.
- **blood loss** at the scene should be quantified as accurately as possible from EMS personal, however it's difficult! And the character of bleeding may help in determine whether major vascular injury has occurred.
- the **initial level of consciousness** , the presence of any sign of life at the scene(i.e: pupillary response, respiratory efforts..) is vital to determine the prognosis and to guide resuscitative efforts.

Physical examination

In most circumstances, the patient must be **fully undressed** to allow for a thorough inspection.

-In a secondary survey we do a general **complete head-to-toe examination** to the patient to find all possible injuries and not miss anything.

Inspection

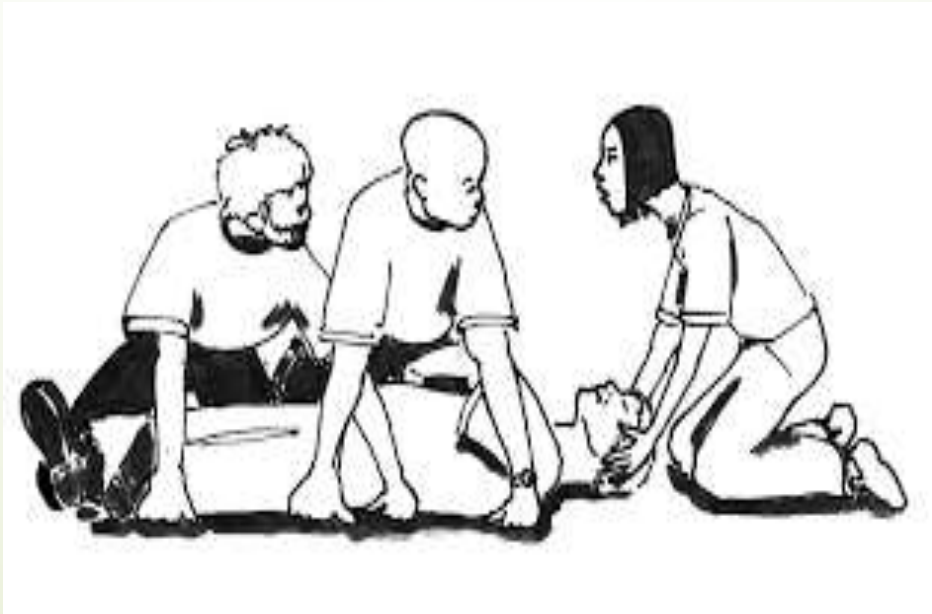
Inspect for

- abrasions, contusions from restraint devices, lacerations, penetrating wounds, impaled foreign bodies, evisceration of omentum or small bowel, and the pregnant state.
- Any bleeding(as the abdomen is one of main sours of bleeding).
- entrance and exit wound in penetrating trauma
- distension can occur as a result of pneumoperitoneum, gastric dilation, or ileus produced by peritoneal irritation.

- special signs that indicate to underlying organ injuries

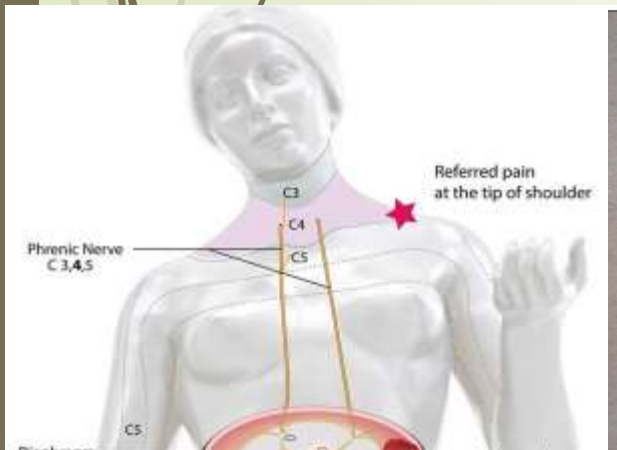
-The patient should be cautiously log rolled to facilitate a complete examination.

The flank, scrotum, and perianal area should be inspected quickly for blood at the urethral meatus; swelling or bruising; or laceration of the perineum, vagina, rectum, or buttocks, which is suggestive of an open pelvic fracture.



The special signs

- **Kehr's sign**: shoulder pain while supine; caused by diaphragmatic irritation (splenic injury, free air, intra- abdominal bleeding).
- **Cullen sign**: Bluish discoloration around umbilicus, indicates peritoneal bleeding, often pancreatic hemorrhage.
- **Grey-Turner sign**: Bluish discoloration of lower flanks, lower back; associated with retroperitoneal bleeding of pancreas, kidney, or pelvic fracture
- **seat belt sign:** contusion or abrasion across the lower abdomen, highly correlated with intraperitoneal injury.



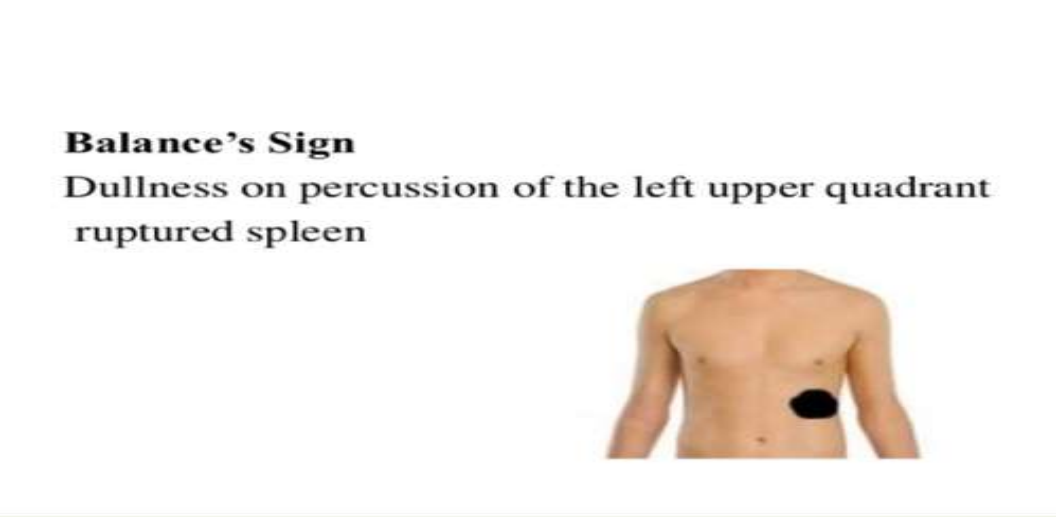
Palpation

- superficial (abdominal wall) and deep **tenderness**.
- The presence of a **pregnant** uterus, as well as estimation of fetal age
- Palpation of a high-riding prostate gland is a sign of a significant **pelvic fracture**.
- **guarding**, **rigidity**, or **rebound tenderness,** which suggest peritoneal injury.
- **Fullness** and doughy consistency on palpation may indicate intra-abdominal hemorrhage.
- **Crepitation** or instability of the lower thoracic cage indicates the potential splenic or hepatic injury with lower rib fracture.

Percussion

Percussion causes slight movement of the peritoneum and may elicit signs of peritoneal irritation. When present, no additional evidence of rebound tenderness should be sought, as it may cause the patient further unnecessary pain. #Tenderness on percussion constitutes a peritoneal sign#

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



Auscultation

- **Note:** Auscultation of the abdomen may be difficult in a noisy emergency department, but it can be used to confirm the presence or absence of bowel sounds.
- Auscultation of bowel sounds in the thorax may indicate the presence of a diaphragmatic injury.
- Abdominal bruit may indicate underlying vascular disease or traumatic arteriovenous fistula.

-**DRE:** for blood or subcutaneous emphysema.

Other purposes: rectal examination should be done to search for evidence of bony penetration resulting from a pelvic fracture, and the stool should be evaluated for gross or occult blood.

-**at the conclusion of rapid physical exam,** the pt should be covered with warmed blankets to help prevent hypothermia. Hypothermia contributes to coagulopathy and ongoing bleeding.

Laboratory tests

- Routine laboratory tests are generally of limited value.
- Clinicians should consider laboratory tests as part of diagnosis and not substitutes for clinical assessmen

1. Hematocrit
2. Leukocyte count
3. Panceatic enzymes
4. Liver function test
5. Urinalysis

Diagnosis- cont.

- Plain x-ray chest, abdomen, and pelvis.
- CT scan.
- FAST.
- Diagnostic peritoneal lavage (DPL).
- Diagnostic Laparoscopy(DL).

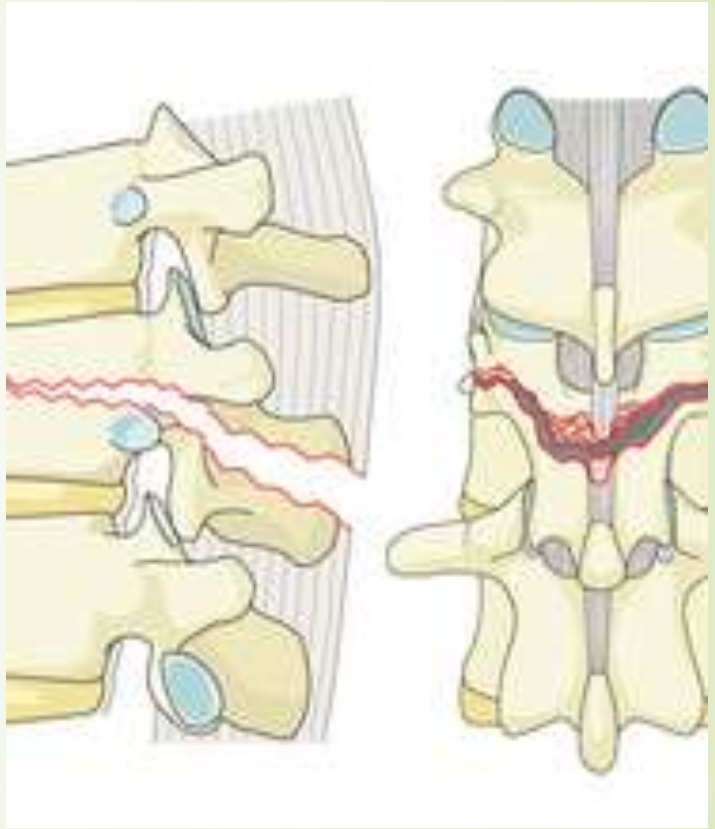
Plain X-ray chest & abdomen

- Pneumothorax, Haemothorax
- Free air under the diaphragm (pneumoperitoneum)
- Bowel loops, NG tube in the chest
- Elevation of the both or single diaphragm
- Fracture in ribs especially lower ribs which may cause injury to liver and spleen.
- Fractures of the vertebral bodies (i.e., Chance fractures) suggest a higher likelihood of blunt injuries to the bowel.
- Obliteration of Psoas shadow – retroperitoneal bleeding.
- Ground glass appearance – massive hemoperitoneum.

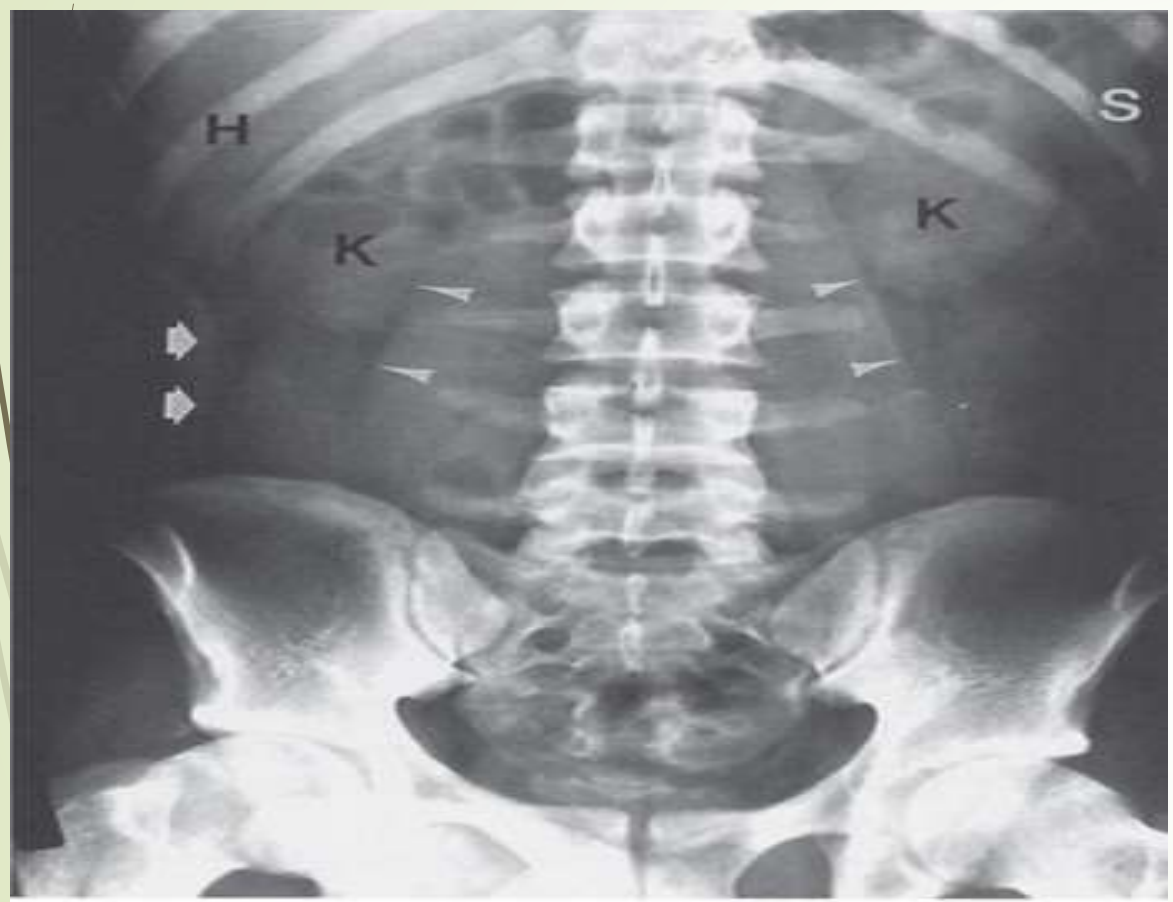
Pneumoperitoneum- suspect rupture of hollow viscus

NG tube in the chest

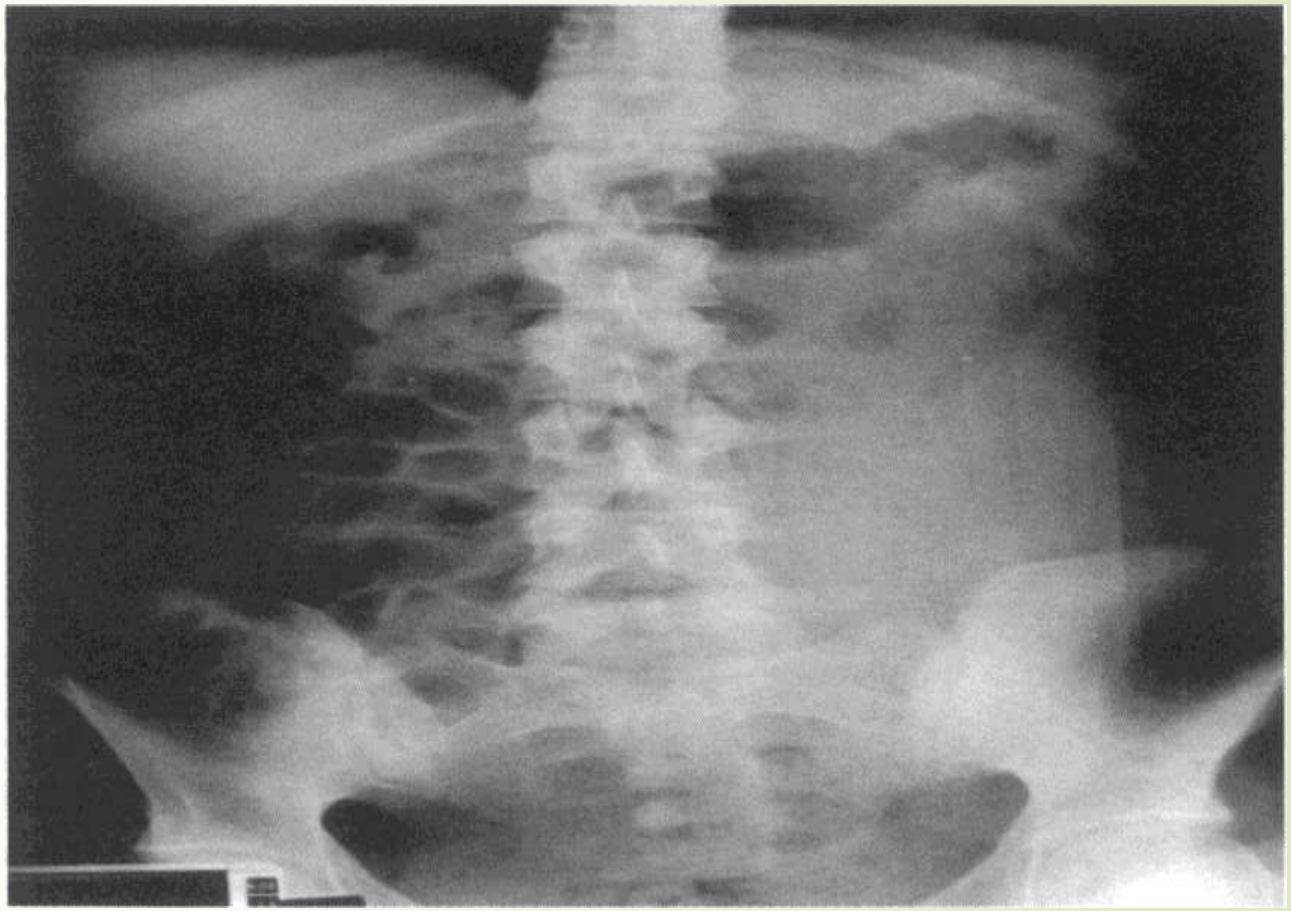
Elevated of the lt. hemidiaphragm Due to phrenic nerve injury- paralysis of the diaphragm



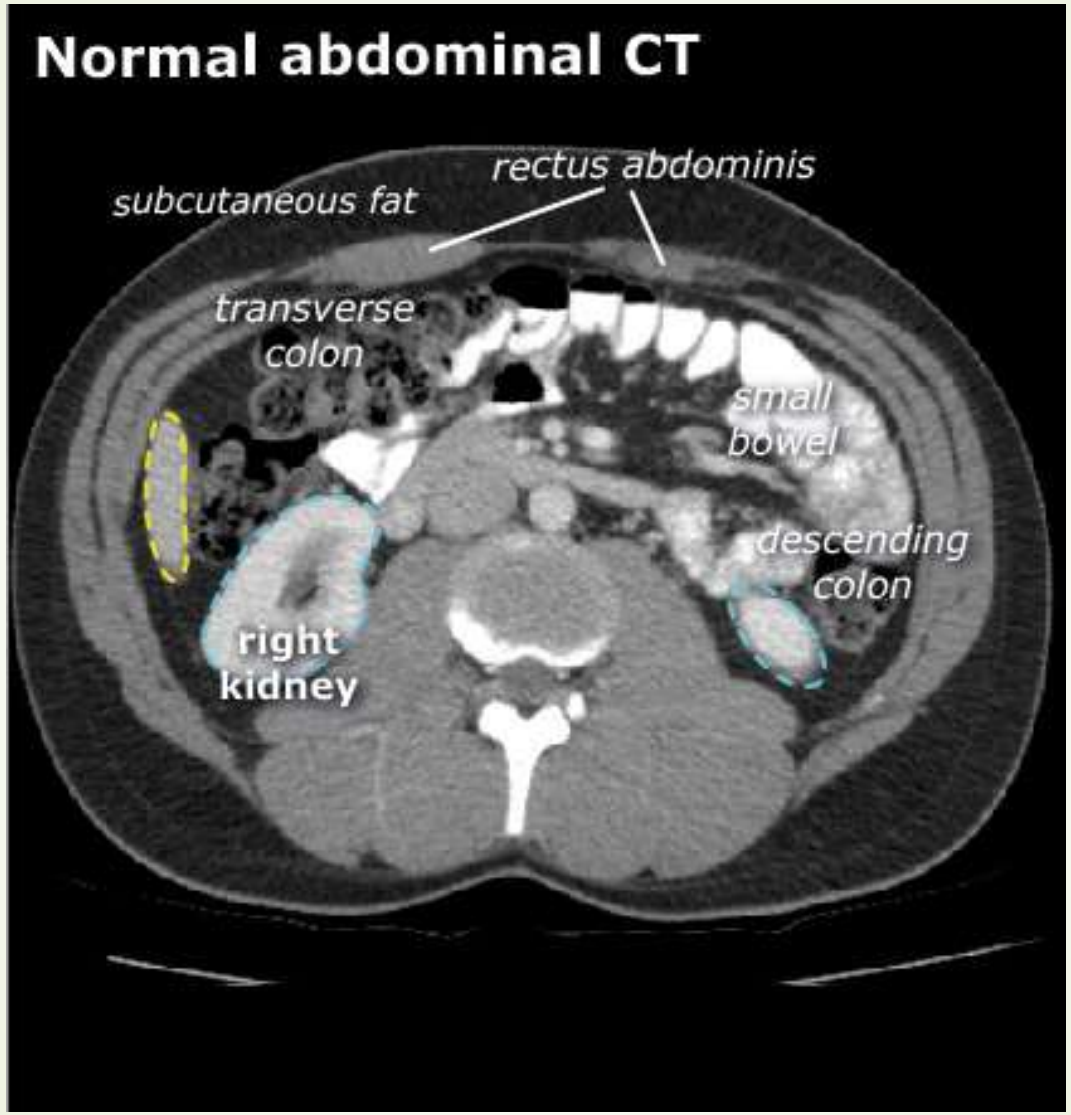
Chance fracture



Psoas shadow



obliteration of lt. Psoas shadow – retroperitoneal bleeding

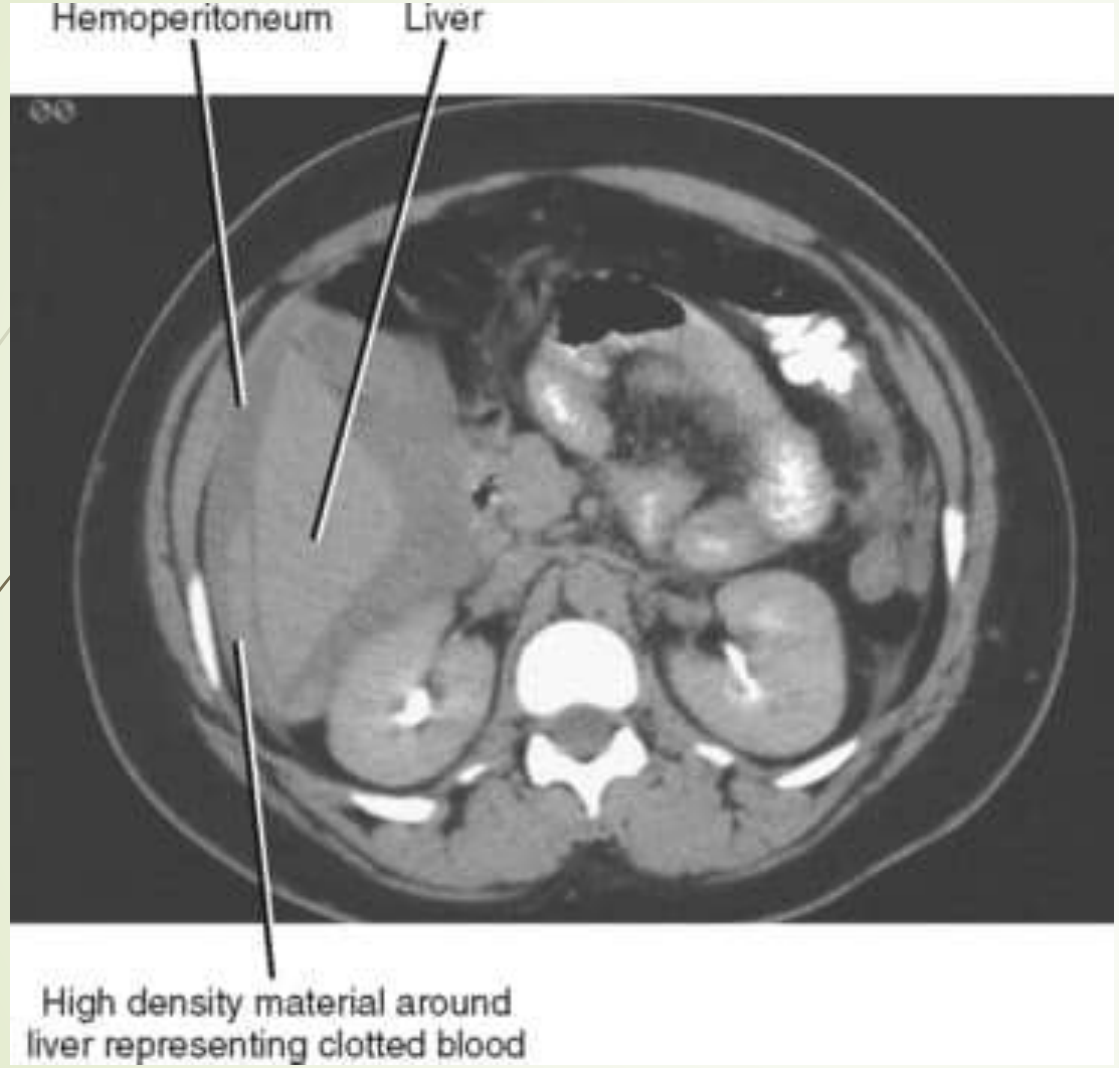

Normal abdominal CT
subcutaneous fat
rectus abdominis
transverse colon
small bowel
descending colon
right kidney

CT – scan

- **CT has become the 'gold standard' for the intra-abdominal diagnosis of injury in stable patient.**
- The scan should be performed using **intravenous contrast**.
- CT is sensitive for blood, and individual organ injury, as well as for retroperitoneal injury.
- An entirely normal abdominal CT is usually sufficient to exclude injury.

CT-scan

- Hemodynamically Stable (normal vital signs)
- Provides excellent imaging of the pancreas, duodenum, and Genitourinary system
- Standard for detection of solid organs injury.
- Determines the source(sentinel clot sign) and amount of bleeding.
- Good for retroperitoneal & vertebral column.
- Not operator dependent
- High Specificity-95%



Sentinel clot sign

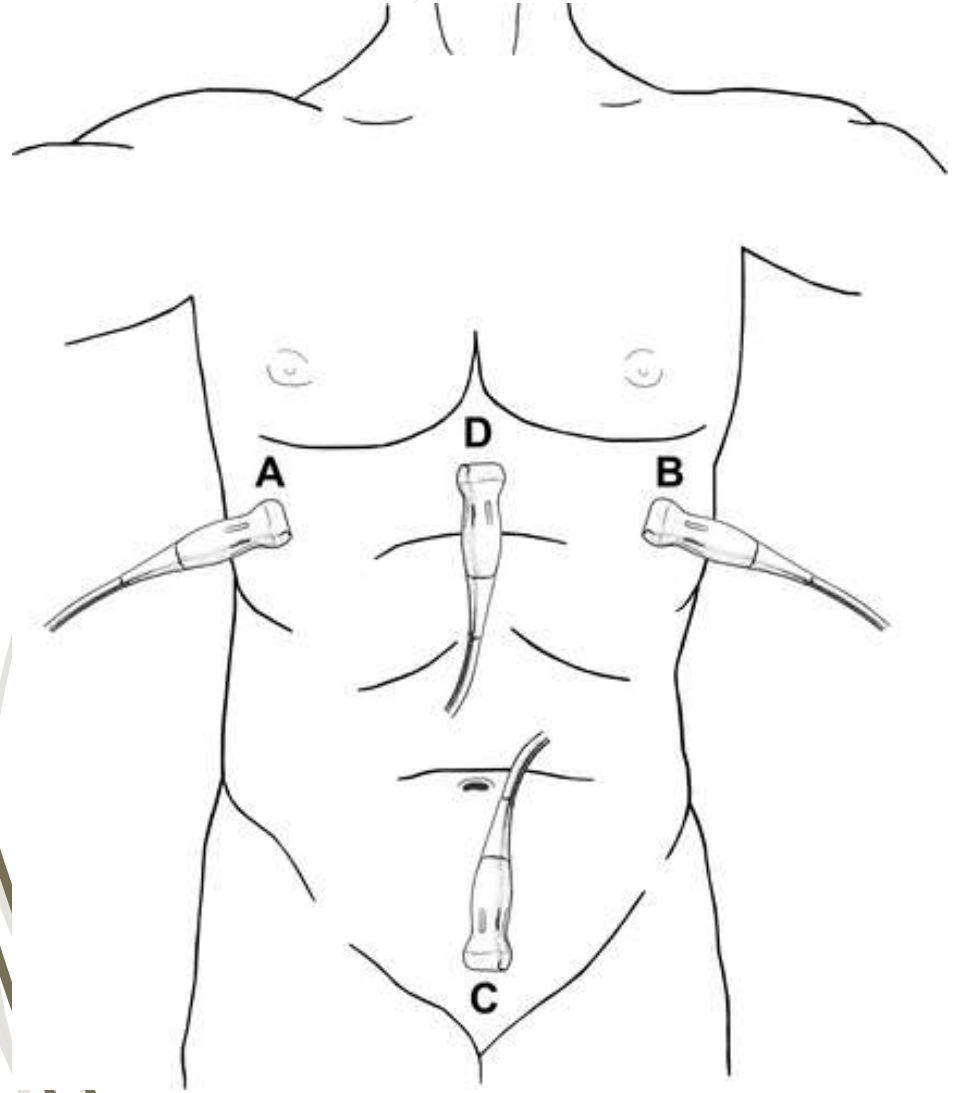
The following points are important when performing CT:

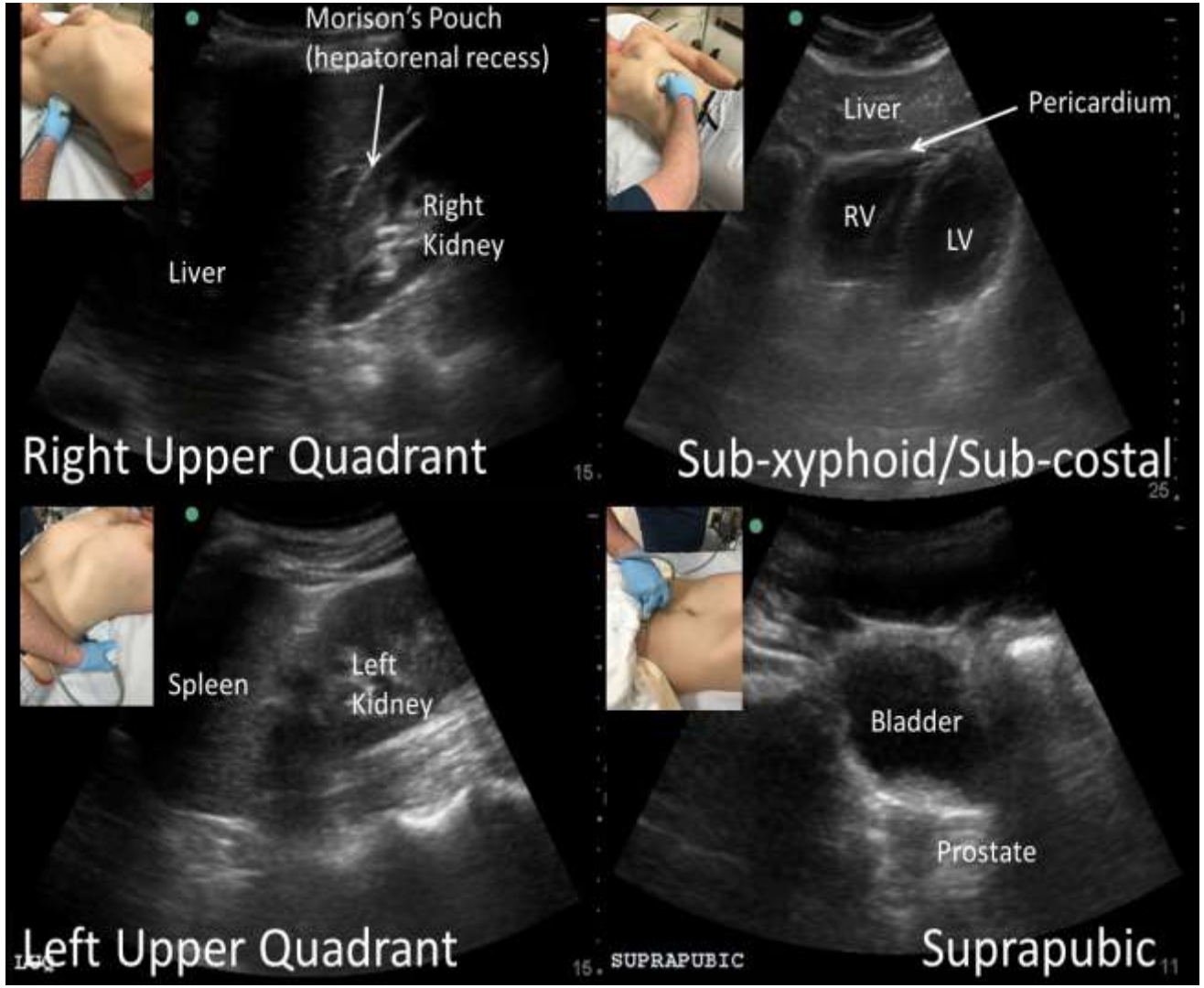
- Despite its tremendous value, it remains an inappropriate investigation for unstable patients.
- If a **duodenal injury** is suspected from the mechanism of injury, **oral contrast** may be helpful.
- If a **rectal and distal colonic injury** is suspected in the absence of blood on rectal examination, **rectal contrast** may be helpful

Focused ultrasound Assessment with Sonography for Trauma (FAST)

Focused Abdominal Sonar for Trauma ➨

- is a technique used to assess the presence of free blood, either in the abdominal cavity or in the pericardium.
- The technique, therefore, focuses on six areas:
  - the pericardium, the areas around the liver and the spleen, the left and right pericolic gutters, and the peritoneal space in the pelvis.


A
B
C
D


Morison's Pouch
(hepatorenal recess)
Right
Kidney
Liver
Right Upper Quadrant
Liver
Pericardium
RV
LV
Sub-xyphoid/Sub-costal
Spleen
Left
Kidney
Left Upper Quadrant
Bladder
Prostate
SUPRAPUBIC
Suprapubic

FAST-cont.

❑ Advantages:

- useful in evaluating trauma patients, especially **unstable patients**.
- rapid.
- Reproducible.
- portable and non-invasive bedside test.
- can be performed at the same time as resuscitation.
- FAST is accurate at detecting >100 mL of free blood.

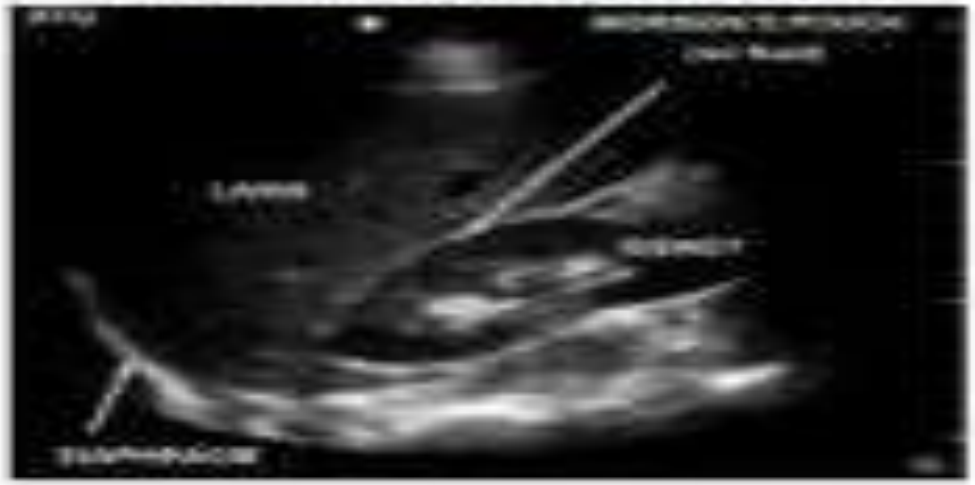
❑ Disadvantages:

- Operator-dependent
- experience-dependent
- if the patient is very obese or the bowel is full of gas, it may be unreliable
- It does not identify injury to hollow viscus
- unreliable for excluding injury in penetrating trauma

Right upper quadrant view

Longitudinal liver kidney scan

Normal Morison pouch



Fluid in Morison pouch

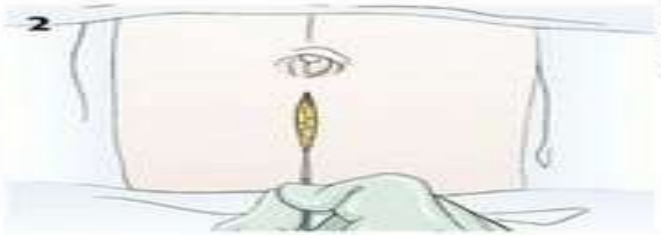
If mean thickness of fluid in Morison's pouch > 1 cm,
it can be assumed that up to 1 liter of intraperitoneal fluid is present

Diagnostic Peritoneal Lavage (DPL)

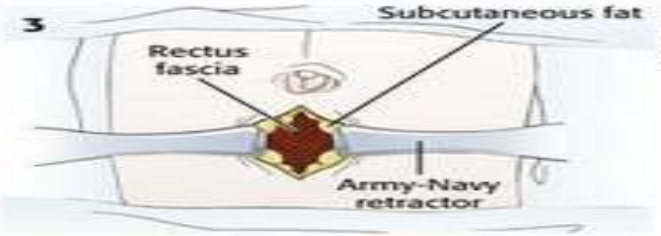
- OR **diagnostic peritoneal aspiration (DPA)** is a surgical diagnostic procedure to determine if there is free-floating fluid (most often blood) in the abdominal cavity.
- A gastric tube is placed to empty the stomach and a urinary catheter is inserted to drain the bladder.
- A cannula is inserted below the umbilicus, directed caudally and posteriorly. The cannula is aspirated for blood (>10 mL is deemed as positive) and, following this, 1000 mL of warmed Ringer's lactate solution is allowed to run into the abdomen and is then drained out.
- The presence of >100 000 red cells/µL or >500 white cells/µL is deemed positive
- Although DPL has largely been replaced by FAST, it remains the standard in many institutions where FAST is not available or is unreliable.
- **Indications:**
  - DPL is especially useful in the hypotensive, unstable patient with multiple injuries as a means of excluding intraabdominal bleeding.

DIAGNOSTIC PERITONEAL LAVAGE: SEMI-OPEN TECHNIQUE

Anesthetize the skin with lidocaine with epinephrine.



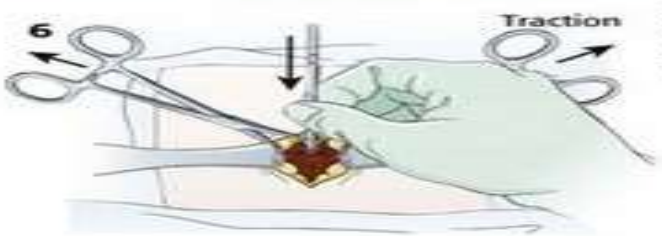
Make a 4- to 6-cm infra-umbilical midline skin incision with a No. 11 scalpel.



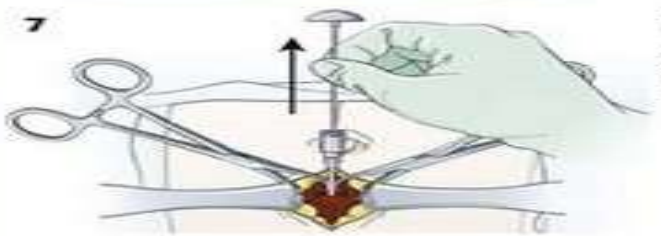
Using Army-Navy retractors, bluntly dissect to the linea alba.

Make a small 2- to 3-mm opening in the linea alba with a No. 15 scalpel blade.

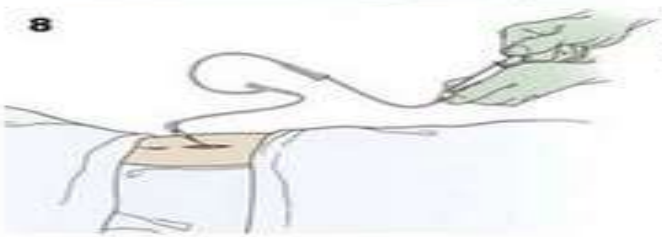
Place towel clips through this opening to grasp and lift each side of the rectus.



Advance the catheter and trocar 45° to 60° caudally into the peritoneum.



Retract the trocar within the catheter, and advance the catheter toward the pelvis.



Withdraw the trochar and aspirate for blood using a 10-cc syringe.

If lavage is necessary, infuse 1 L of warm normal saline and recover under gravity.

https://youtu.be/aRw3qQGjTzI

Diagnostic laparoscopy (DL)

- May be valuable screening investigation in **stable** patients with penetrating trauma,
  - to detect or exclude peritoneal penetration
  - and /or diaphragmatic injury.
- DL is not a substitute for open laparotomy, especially in the presence of haemoperitoneum or contamination.
  - In most institutions, evidence of penetration requires a laparotomy to evaluate organ injury, as it is difficult to exclude all intraabdominal injuries laparoscopically
- DL reduces the non - therapeutic laparotomy rate.

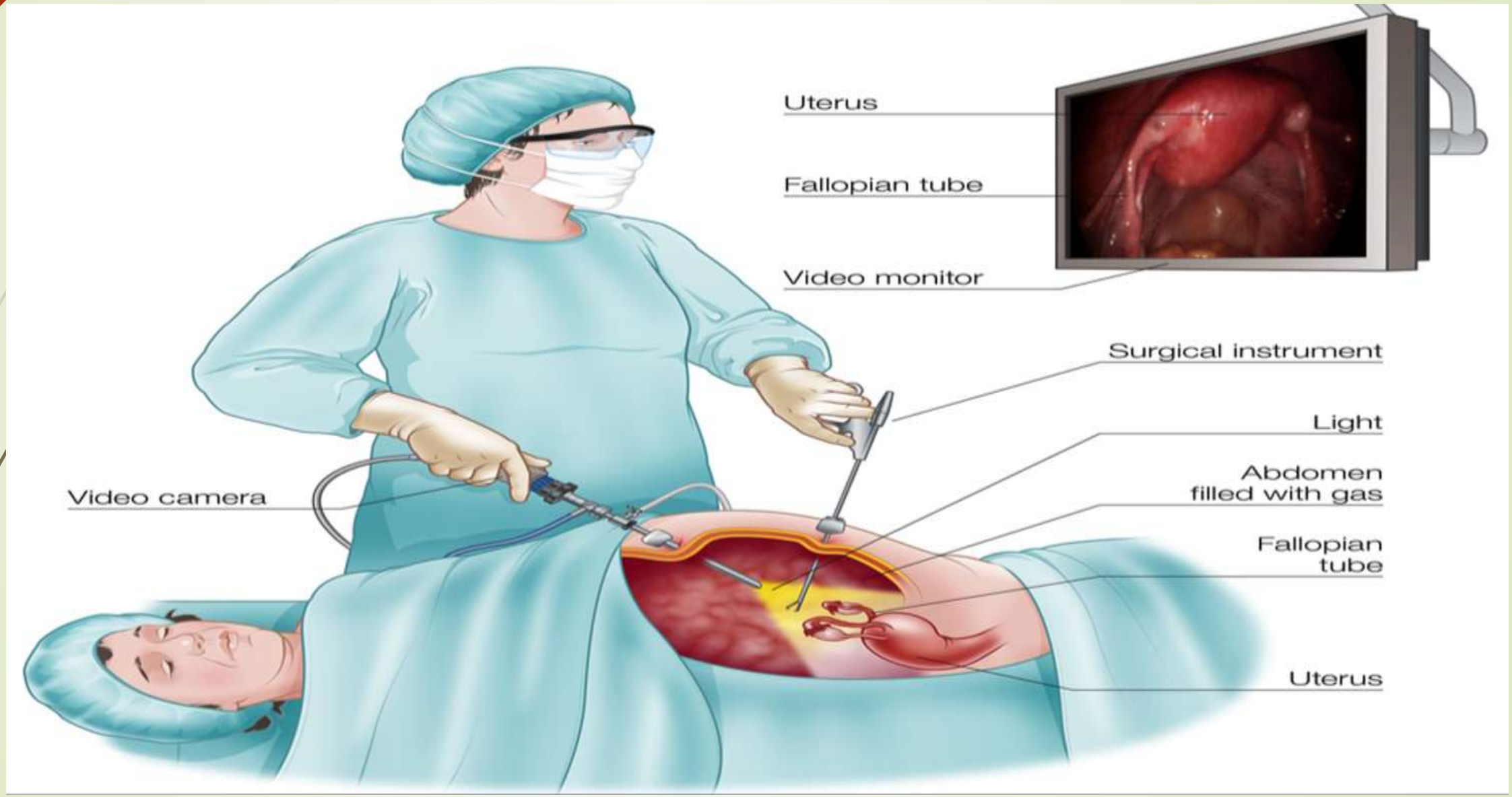

Uterus
Fallopian tube
Video monitor
Surgical instrument
Light
Abdomen filled with gas
Fallopian tube
Uterus
Video camera

TABLE 5-2 ■ Comparison of DPL, FAST, and CT in Blunt Abdominal Trauma

	DPL	FAST	CT SCAN
Advantages	• Early diagnosis • Performed rapidly • 98% sensitive • Detects bowel injury	• Early diagnosis • Noninvasive • Performed rapidly • Repeatable	• Most specific for injury • Sensitive: 92%–98% accurate
Disadvantages	• Invasive • Low specificity • Misses injuries to diaphragm and retroperitoneum	• Operator-dependent • Bowel gas and subcutaneous air distortion • Misses diaphragm, bowel, and pancreatic injuries	• Cost and time • Misses diaphragm, bowel, and some pancreatic injuries • Transport required

Penetrating abdominal trauma (PAT)

Definition :

Penetrating abdominal trauma results when an object (usually a bullet, knife, shrapnel, etc.) has breached the abdominal cavity.

The most common causes of PAT are :

- Stab wound
- Gunshot

others??

from unusual sources such as swordfish, elephant tusks, chainsaws, and shrapnel from firecracker accidents.

Stab Wounds

- Cutting.
- Splitting.
- Laceration.
- Low energy

Stab Wounds

- Knives are not the sole implement used in stabbings.
- Pens, coat hangers, screwdrivers, and broken bottles.

Stab wound

- Multiple in 20% of cases
- Involve the chest in up to 10% of cases.
- Most stab wounds do not cause an intraperitoneal injury
- The liver, followed by the small bowel, is the organ most often damaged by stab wounds.

Gunshot Wounds

- penetrating
  - Fragments
  - Cavitation
  - Reflection (bullet hit the bone & reflect & causing 2ry damage)

Gunshot Wounds

- Handguns, rifles, and shotgun
- The degree of injury depends:
  - Amount of kinetic energy imparted by the bullet to the victim
  - Mass of the bullet
  - Velocity
  - Distance

Most Commonly Injured Organs

Gunshot Wound	Stab Wound
Small bowel	Liver
Colon	Small bowel
Liver	Diaphragm
Vasculature	Colon

Options for Management

Gunshot Wounds → **operation**

Stab Wounds → **Hemodynamically stable**

,Hemodynamically instable

Options for Management

- Hemodynamically stable penetrating injury
  - Serial Observation
  - Wound Exploration
  - DPL
  - CT scan +/- Contrast
  - Laparoscopy
  - Laparotomy
  - Ultrasound/echo

Indications for Laparotomy – penetrating trauma

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

Thank you!