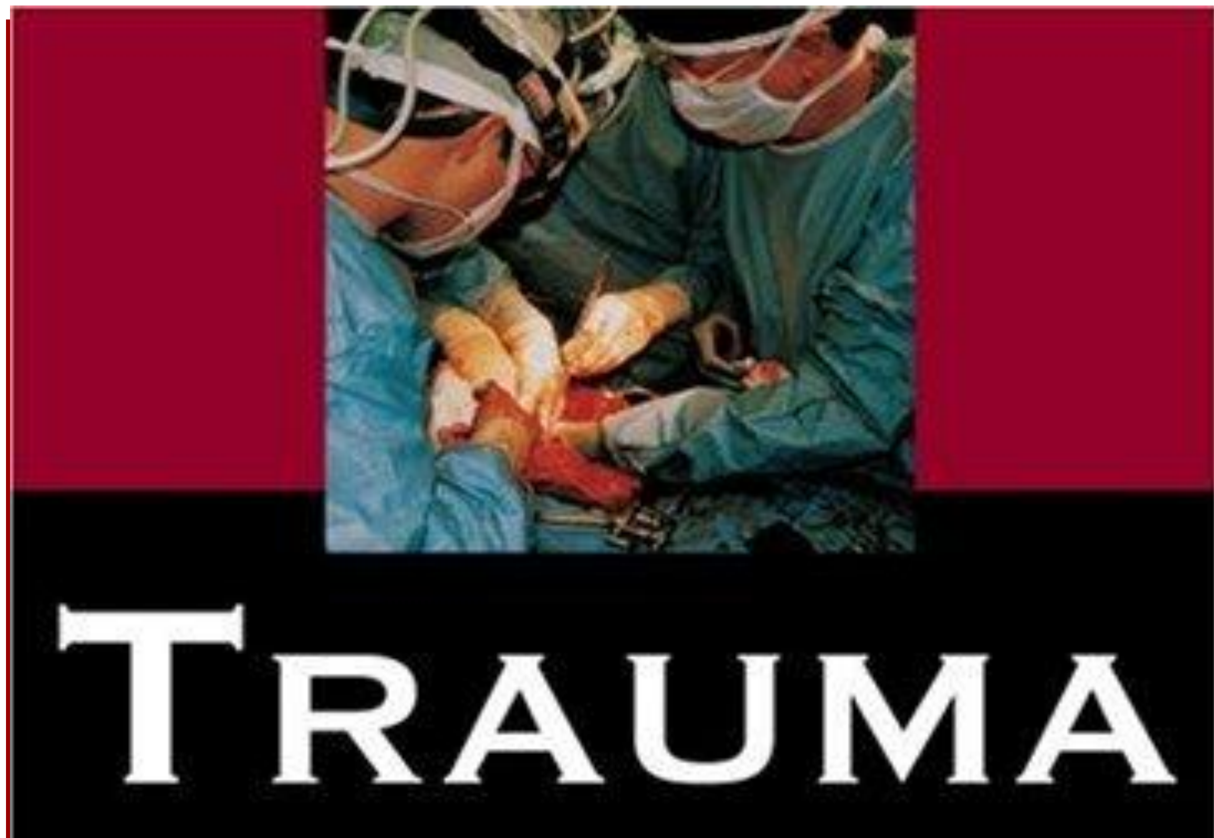
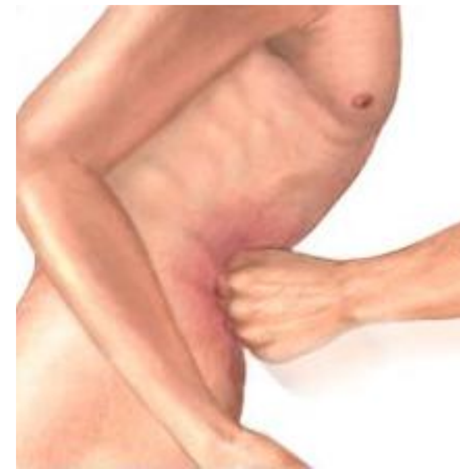


Specific organ injury

นพ.ธวัชชัย ตุลวรรธนะ

ภาควิชาศัลยศาสตร์ คณะแพทยศาสตร์ มศว

Biomechanic of injury



- ***Blunt trauma***

  - Vehicular impact when the patient is inside vehicle

  - Pedestrian injury

  - Injury to cyclists

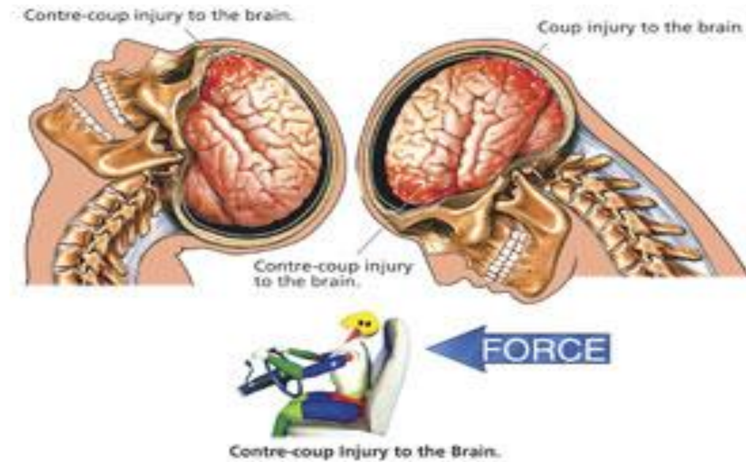
  - Assults

  - Falls

  - Blast injury

- ***Penetrating trauma***

Blunt trauma



- ***Vehicular impact***

Occupant collision : Frontal impact , Lateral impact,Rear impact,Quater panel impact,***Roll over,Ejection***

- ***Organ collision***

Compression injury : injury to lung parenchyma, myocardial, Diaphragmatic ruptured,Intraabdominal organ

Deceleration injury : stabilizing portion (Renal pedicle,Ligamentum terres,Descending thoracic aorta) cease forward motion with torso with movable part(spleen ,kidney,heart ,aortic arch) continue move forward

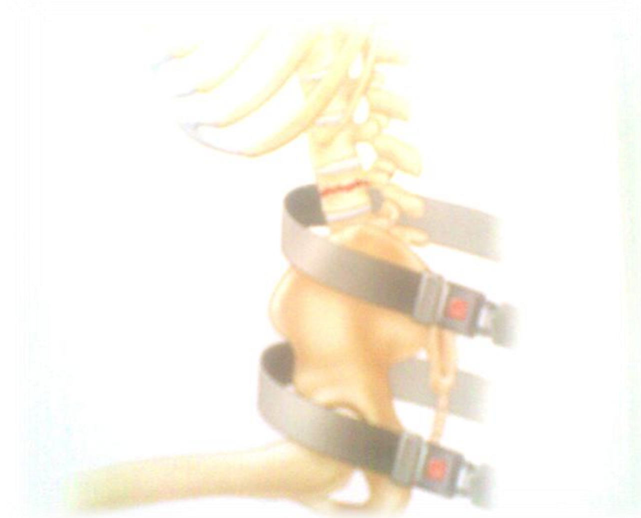
→ shearing force → Injury to pedicle of spleen,kidney

Central hepatic laceration

Aortic injury

C7-T1 spine injury

Blunt trauma

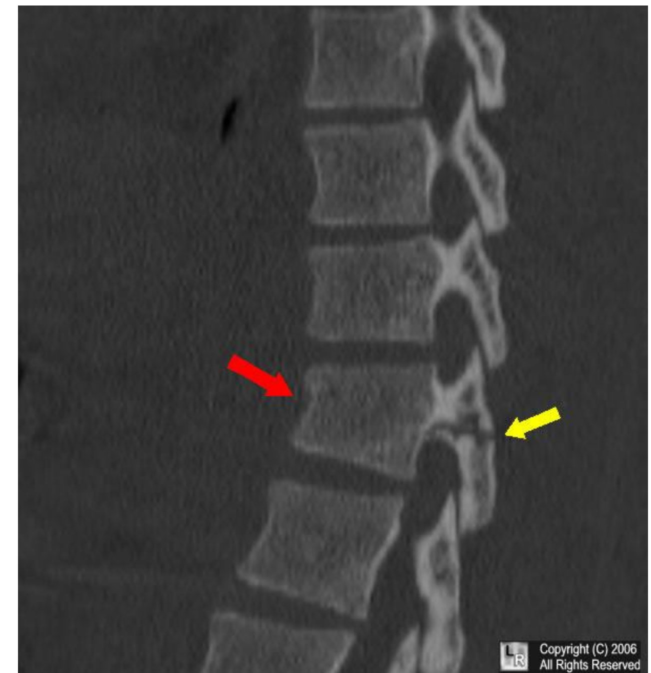


- ***Restrain injury***

  Incorrectly seat belt : Above ASIS

  → forward motion of posterior abdominal wall and vetebral column → trap pancrease ,liver ,spleen,small bowel,duodenum,kidney against the belt

  → Hyperflexion over incorrectly seat belt : Anterior compression fracture of L1 (chance fractures)



Blunt trauma

High energy transfer

- Pedestrian injury : change speed > 20 mph
- Fall : from heights greater than 20 feet

Blast injury

- Primary : direct effect of pressure wave to gas containing organ eg. tympanic membrane,alveoli, eye ball
- Secondary : flying object striking individual
- Tertiary : individual become missile and is thrown against solid object or ground
- Quaternary : Burn, inhalasion injury,dust

or complication of co-existing condition : Angina,Hypertension

Penetrating trauma

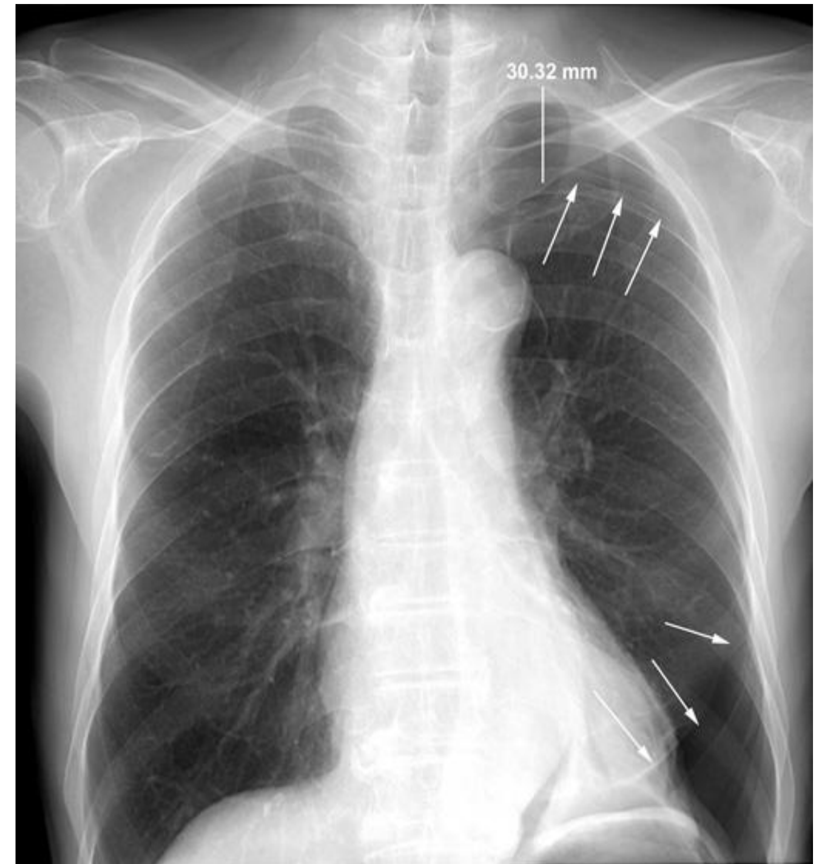
- **Stab wound**
- **Gun shot wound**
- **Short gun wound**

- *High energy transfer*
- GSW : Bullet velocity > 2000 ft/sec
- Closed range SGW < 7 m.

Chest injury

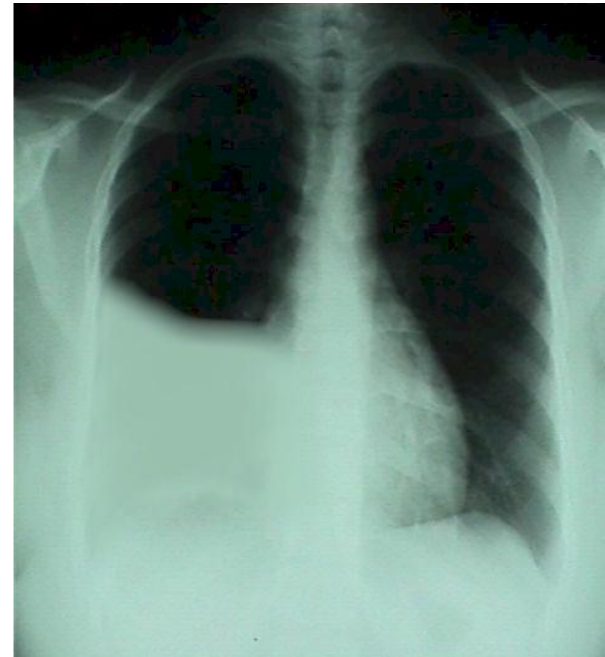
Simple pneumothorax

- Blunt/Penetrating injury
- Air leak in pleural space disrupted cohesive between visceral and parietal pleura
- Ventilation/perfusion mismatch
- Treatment : Intercostal chest drain



Hemothorax

- Lung laceration or Laceration of intercostal vessle
- Usually self limited bleeding
- Treatment : : Intercostal chest drain



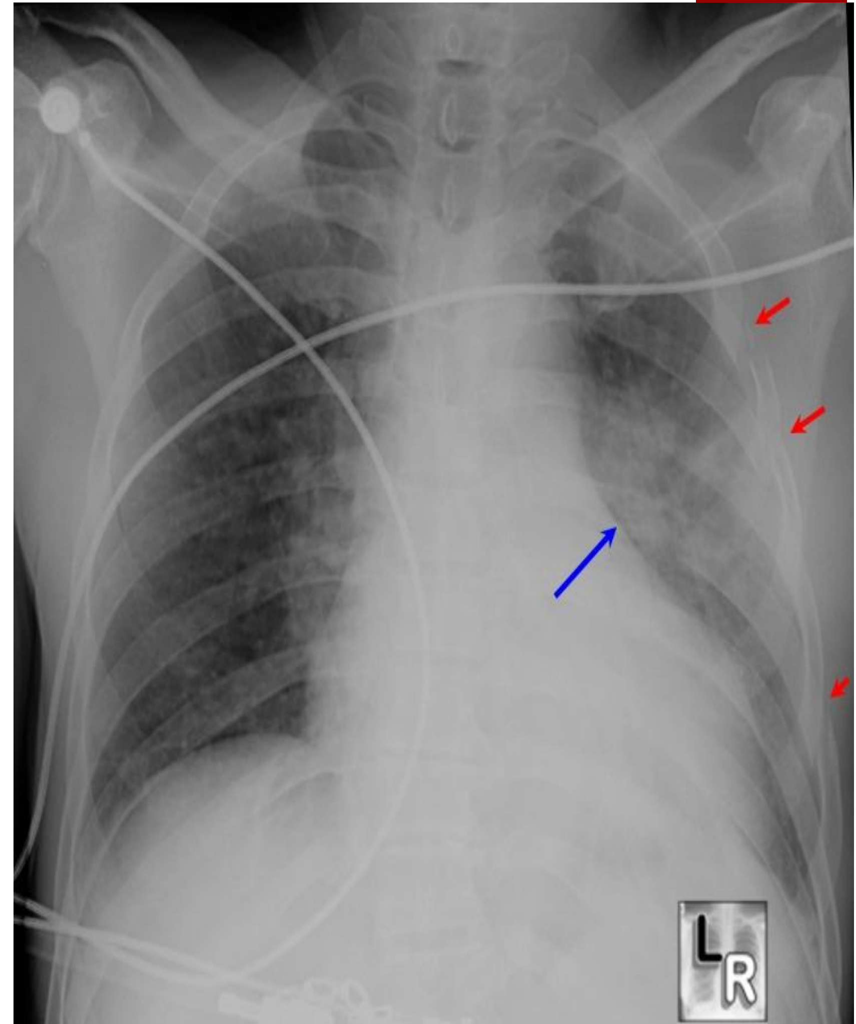
Massive hemothorax

Bleeding > 1500cc

Continue bleeding > 200 cc/hr for 2-4 hrs

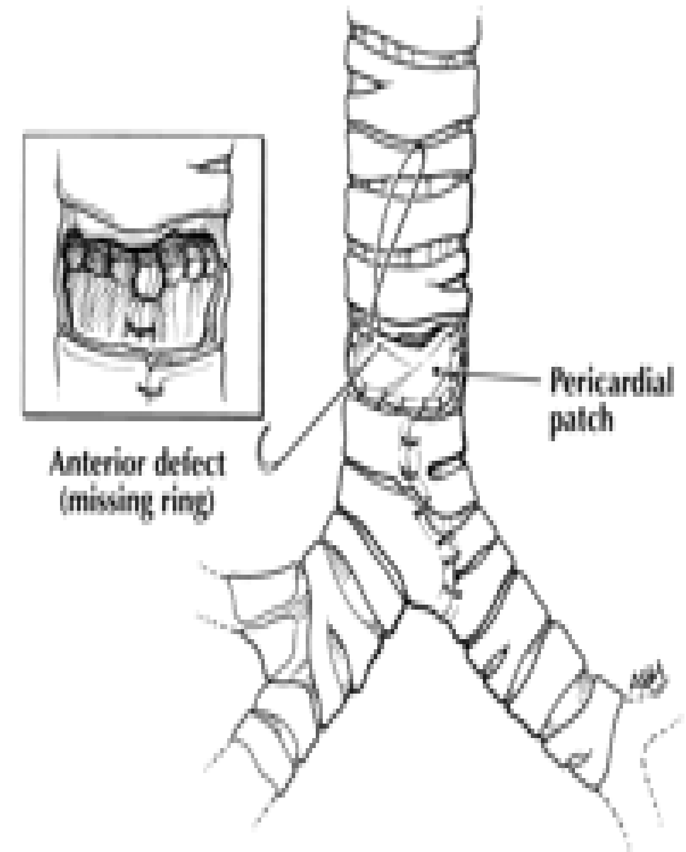
Pulmonary contusion

- Most common potential lethal chest injury
- Significant hypoxia
  PaO2 < 65 mmHg or
  Oxygen saturation < 90%
- Treatment : Intubation + Respiratory support
- Monitor : ABG ,Pulse oxymetry,EKG
- F/U CXR within 24 hr

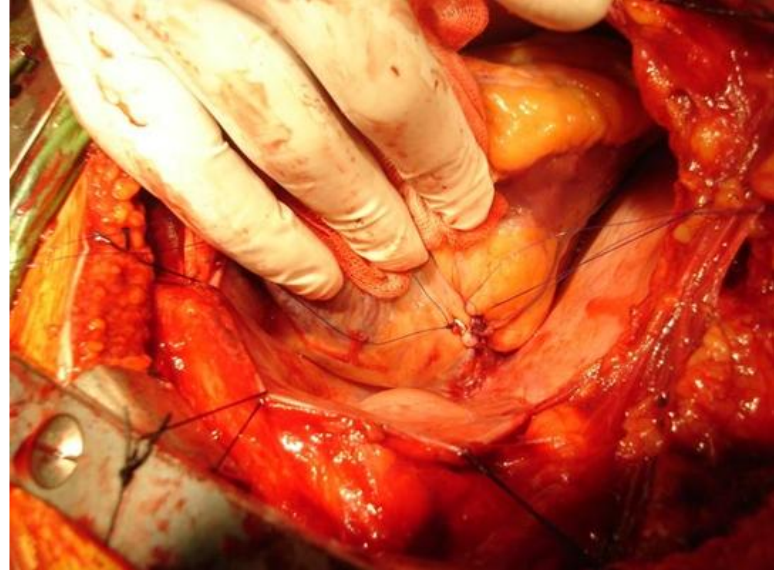


Tracheobronchial tree injury

- Trachea or main bronchus injury (2.54 cm above carina)
- Hemoptysis , Massive subcutaneous empysema or Tension pneumothorax with mediastinal shift
- Pneumothorax with persistent large air leak
- Diagnosis : Bronchoscope
- Management : Surgery



Blunt cardiac injury



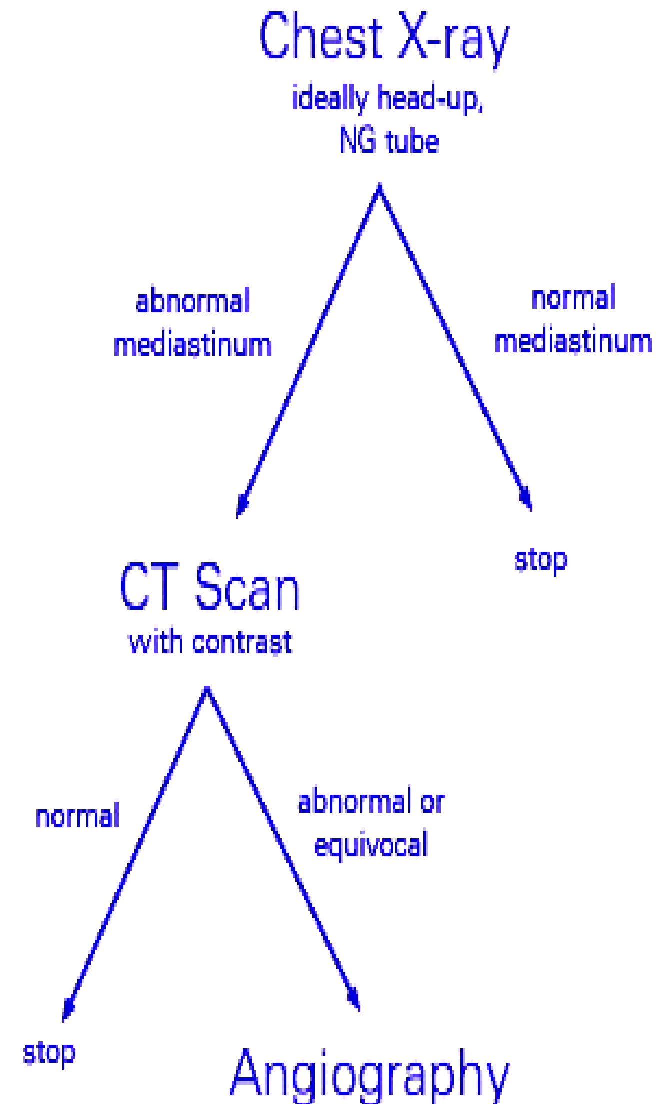
- ***Myocardial contusion***
- ***Cardiac chamber ruptured***
- ***Coronary artery dissection***
- ***Cardiac ruptured***

- ***Diagnosis : FAST , Echocardiography***

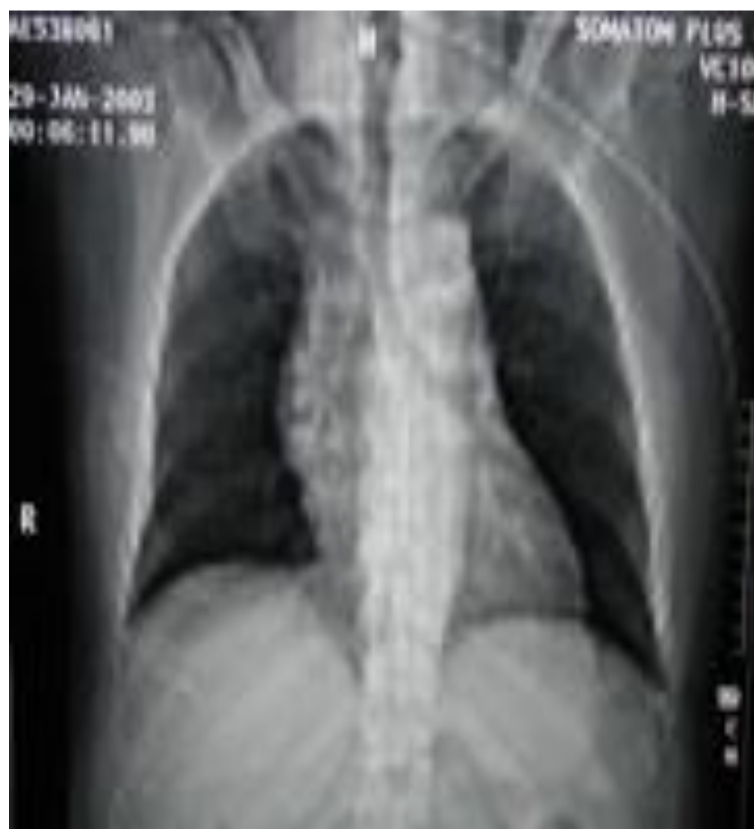
- **Myocardial contusion**
- Chest discomfort
- Hypotension
- Cardiac dysrhythmia (PVC,AF,Bundle branch block,ST-change)
- Trop-T : Myocardial infarction
- Monitor in ICU → improve after 24 hrs.

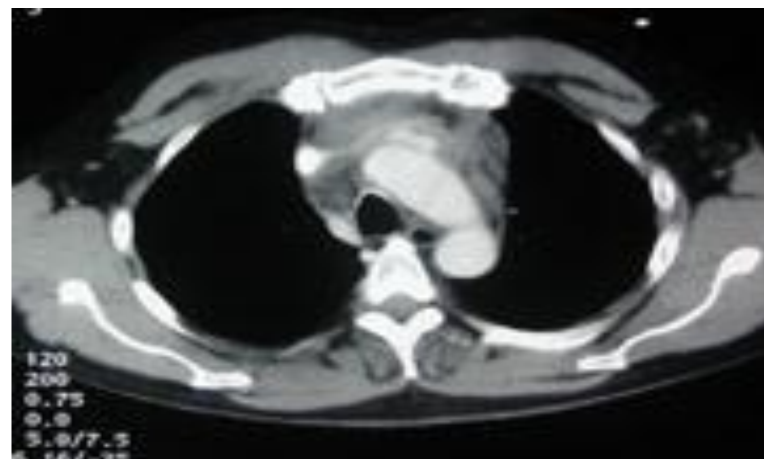
Traumatic aortic disruption

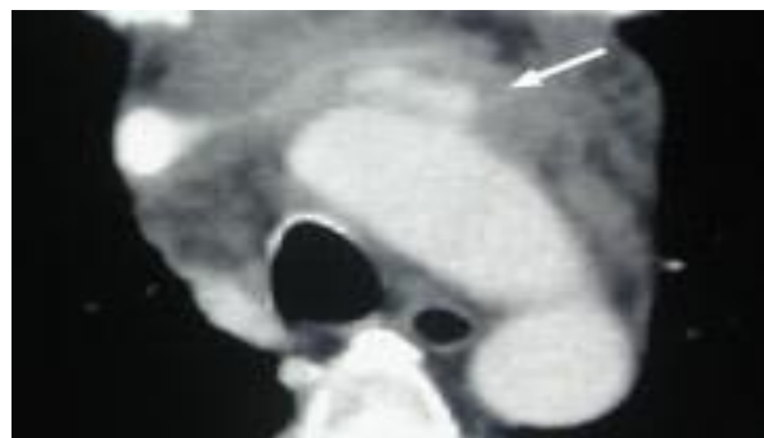
- ***High index of suspicious in Decelerating chest injury***
- ***Radiologic finding***
- *Widened mediastinum > 8cm*
- *Obliteration of aortic knob*
- Deviation of trachea to right
- Depression of left main stem bronchus
- Elevation of right main stem bronchus
- Widened paraesophageal strip
- Obliterated space between Pulmonary artery and Aorta
- Deviation od Esophagus (NG tube) to right



Traumatic aortic disruption

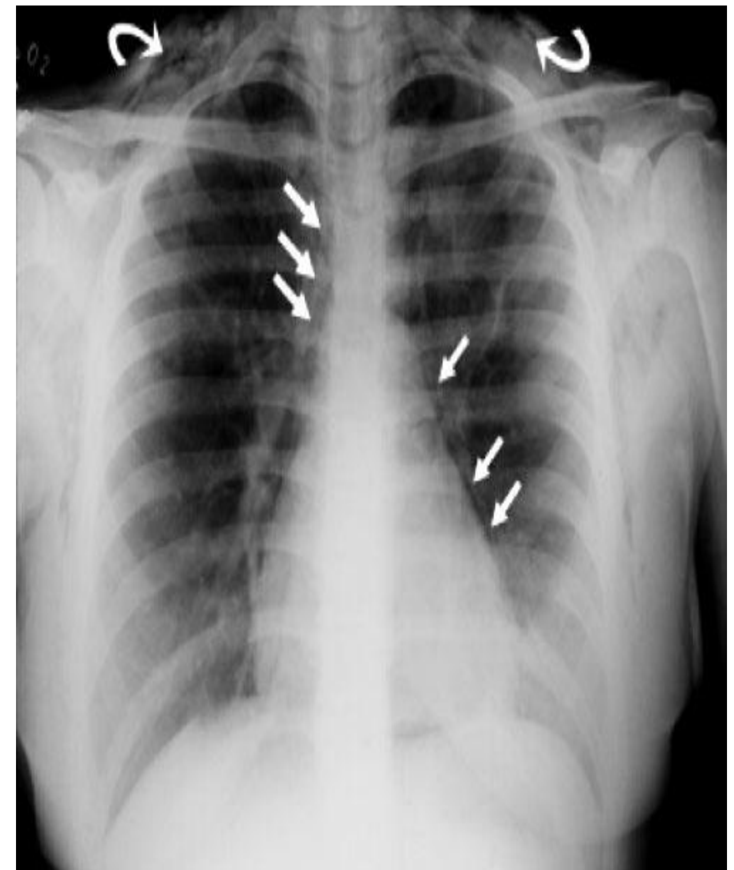






Esophageal injury

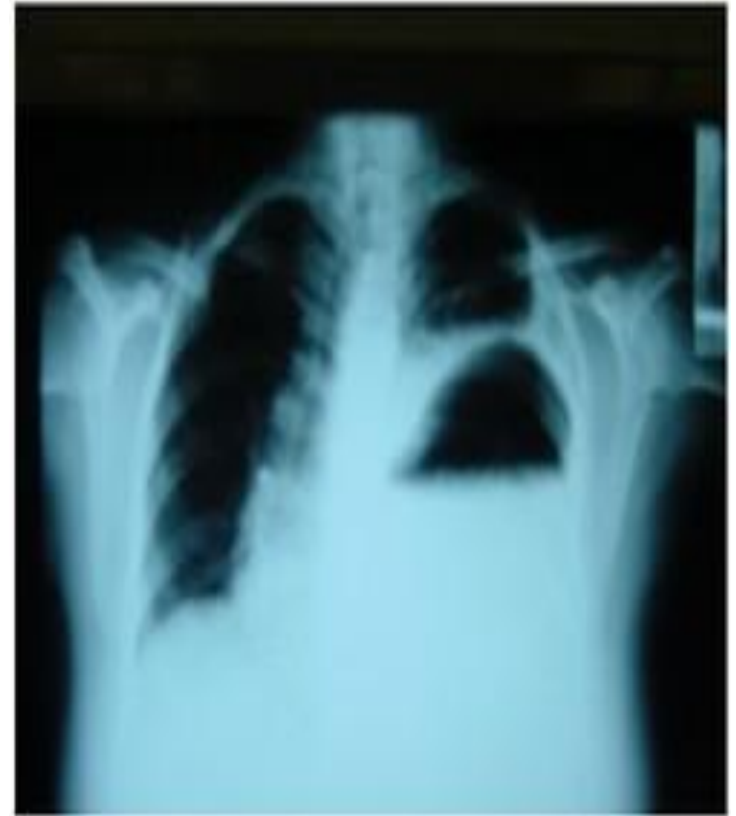
- Foreful expulsion of gastric content into esophagus from a severe blow of upper abdomen
- ***Clinical***
- Left pneumothorax or hemothorax without rib fracture
- Severe blow at epigastrium with pain or shock out of proportion to injury
- Present of Pneumomediastinum
- ***Diagnosis : water soluble contrast study***



Diaphragmatic injury

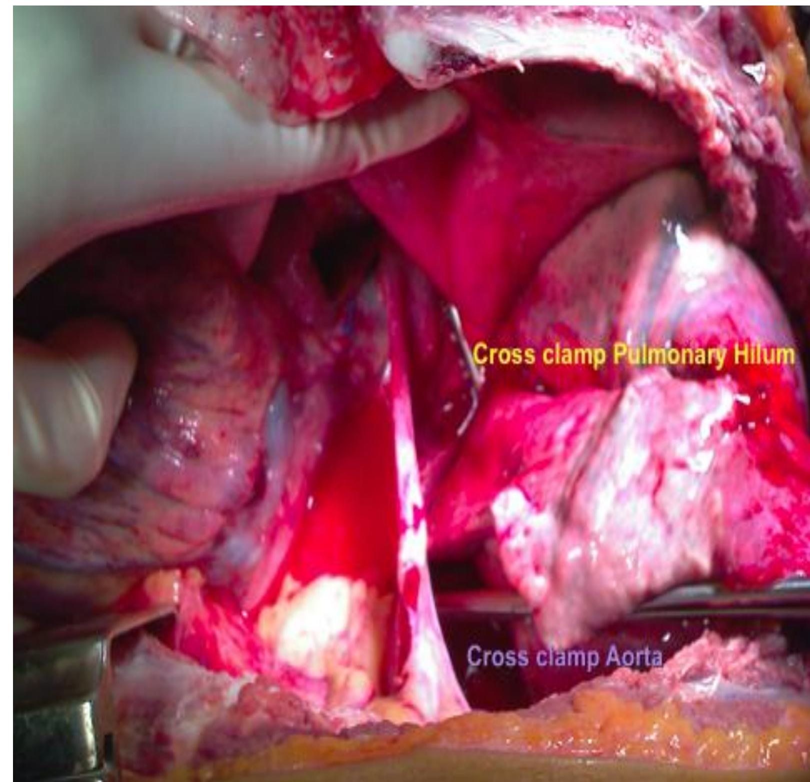
- More coomon on left side because liver protect defect on right side
- Blunt injury : large radial tear lead to herniation of bowel and stomach
- Penetrating injury : small perforation __> develop hernia in year
- ***Diagnosis***

1. Gastric tube appear in thoracic cavity in CXR
2. Present of DPL fluid in chest tube

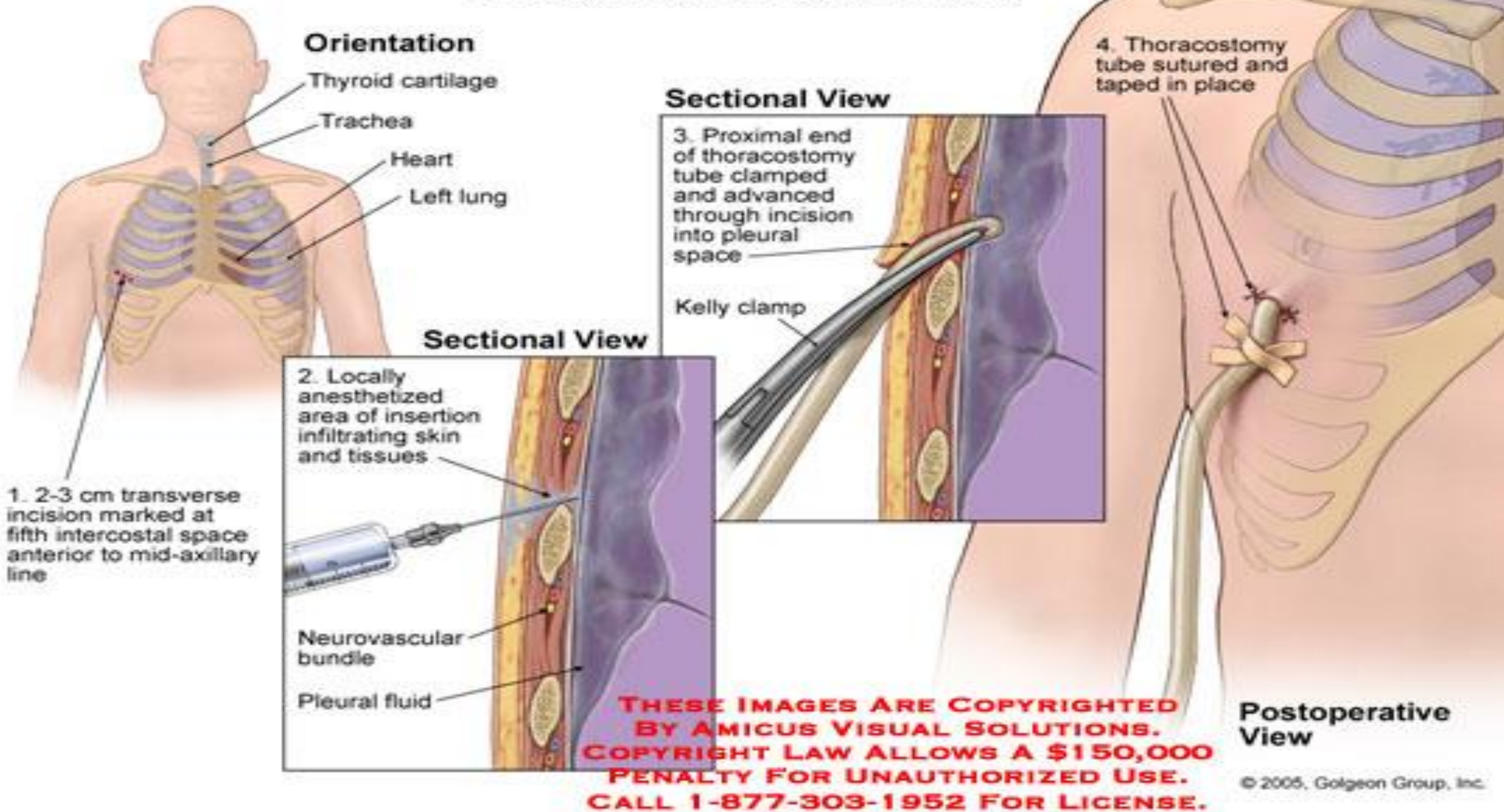


Indication for thoracotomy in chest injury

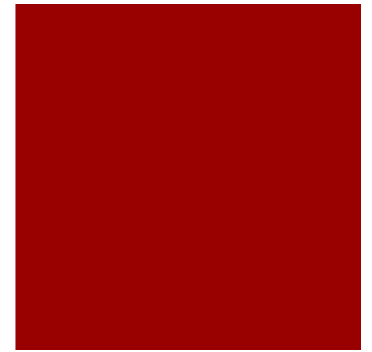
- Caked pneumothorax
- Large air leak with inadequate ventilation or persistent collapse of lung
- Massive hemothorax
- Esophageal perforation
- Perricardial tamponade



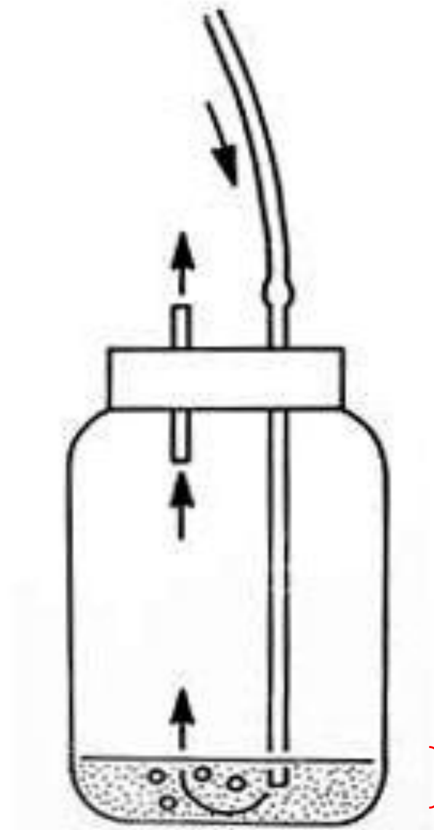
Intercostal chest drainage



การต่อแบบ 1 ขวด

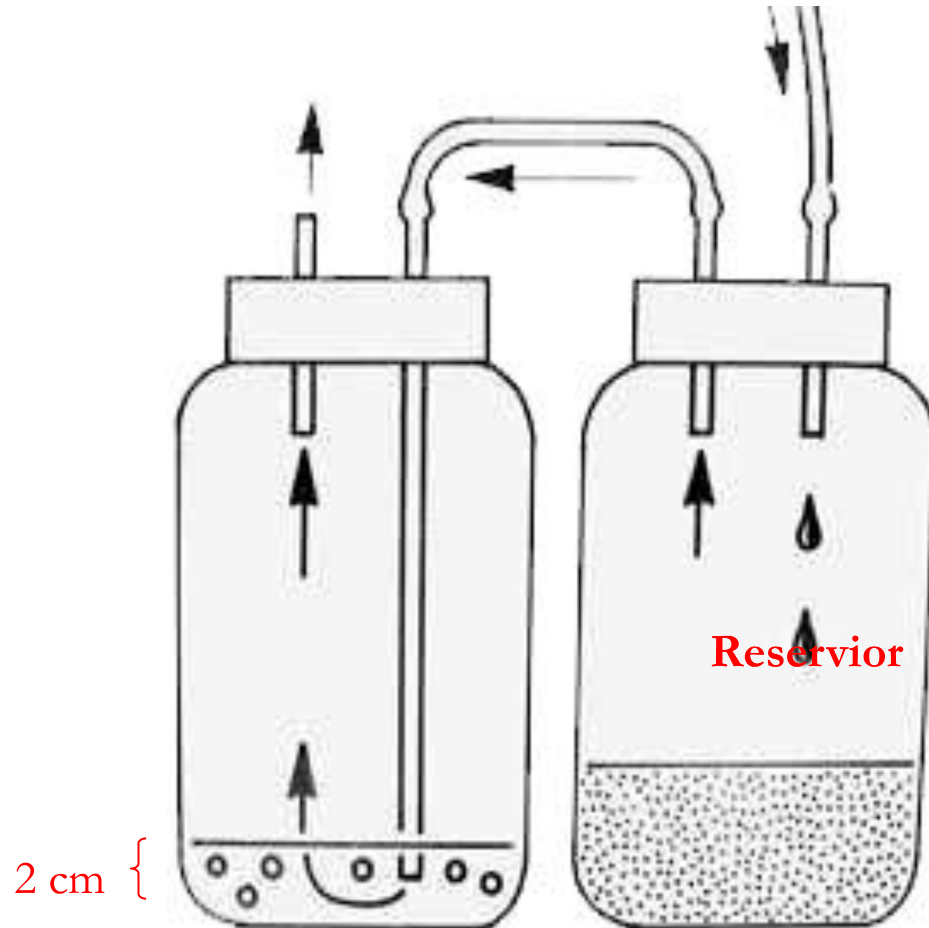


To patient

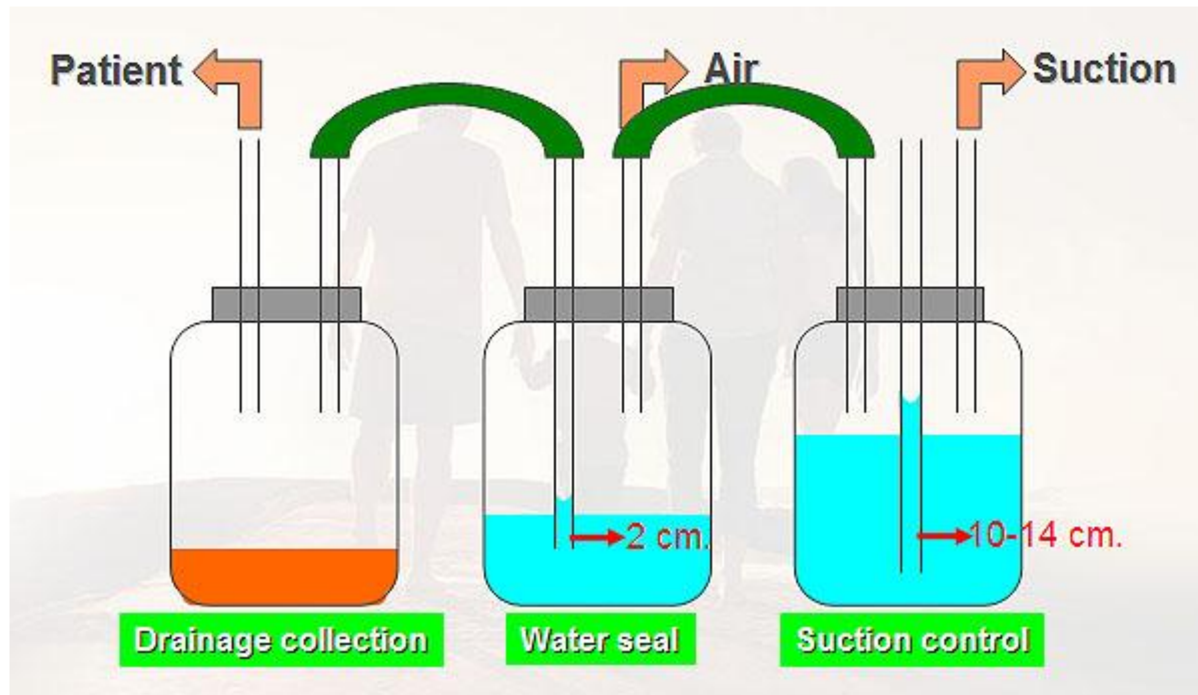


2 cm

การต่อแบบ 2 ขวด



การต่อแบบ 3 ขวด + Suction



Blunt Abdominal injury

Blunt abdominal injury

FAST **(sensitivity 86% specificity 98%)**

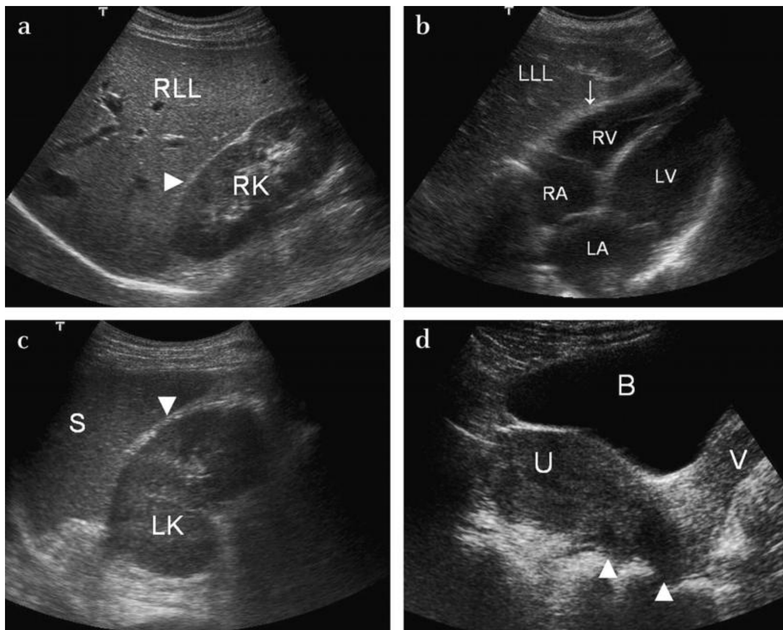
Positive
Negative

Equivocal

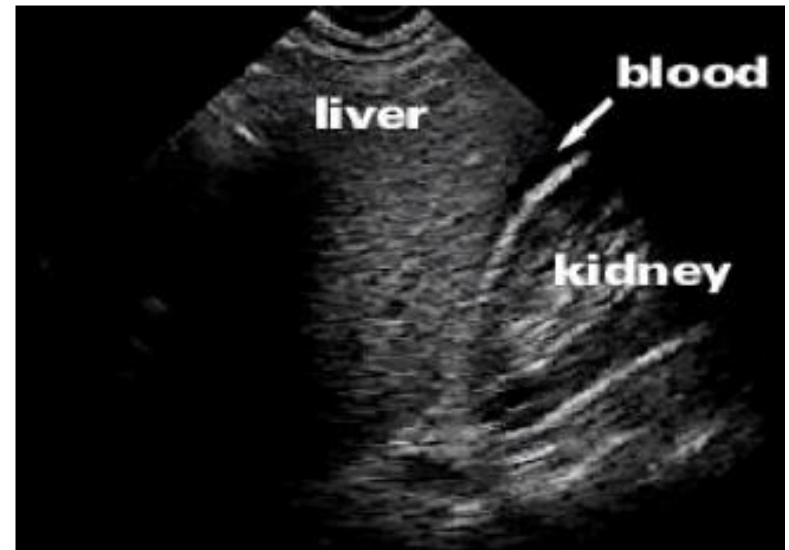
Stable Unstable Stable Unstable Repeat FAST

Diagnosis tool in Blunt abdominal trauma

- FAST : Negative



- FAST : Positive



Criteria For Positive DPL

1. **Aspiration 10 cc of frank blood or GI content**

2. ***DPL fluid examination***

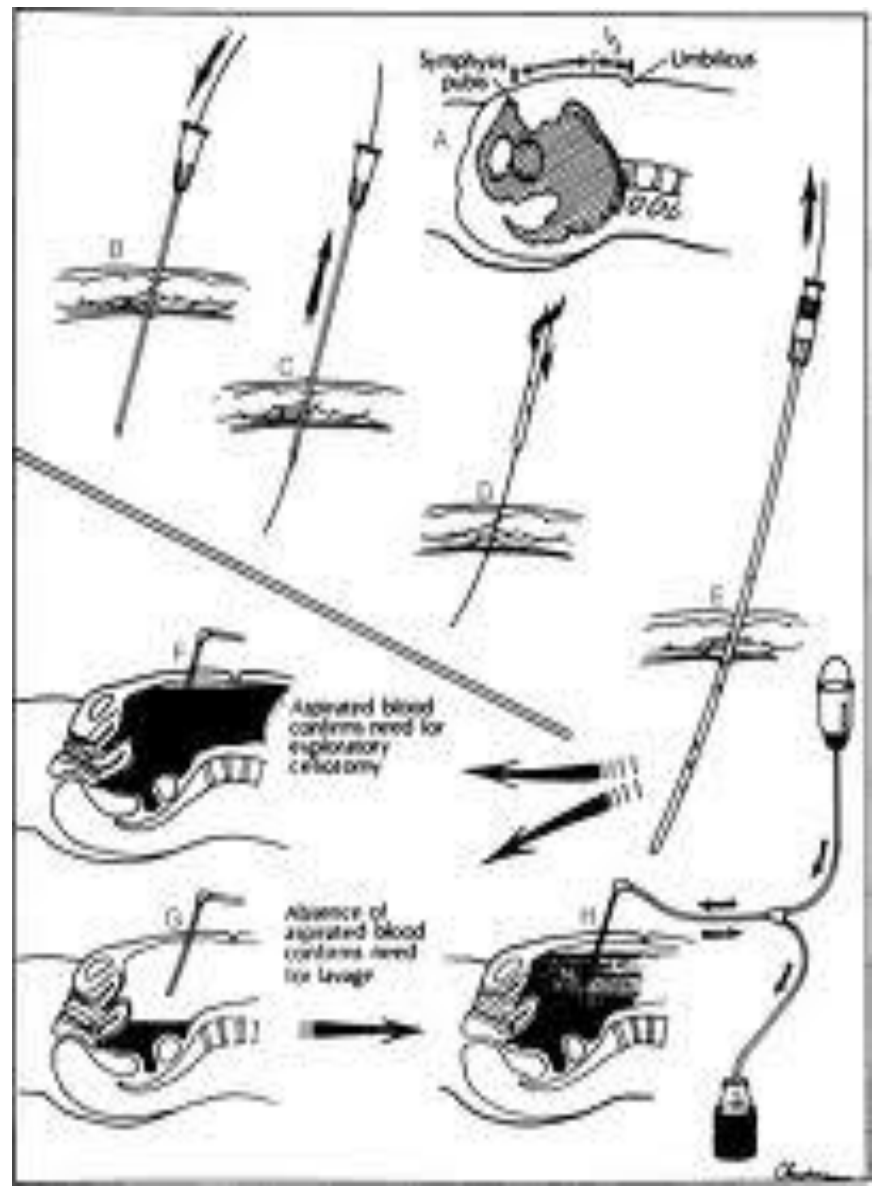
    RBC > 10000 cell/cc

    WBC > 500 cell / cc ??

    Amylase > 175 IU/ cc ??

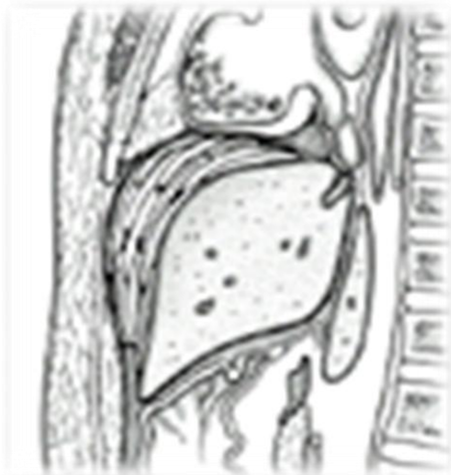
    Bilirubin ???

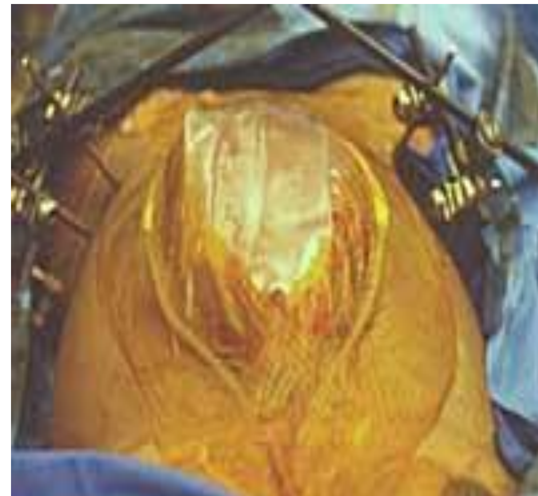
- Sensitivity 98-100% Specificity 90-96%
- Risk of Iatrogenic injury
- Missed retroperitoneal injury
- Use in unstable patient with negative or equivocal FAST



Blunt Abdominal injury

- Spleen : Most common solid organ injury in blunt abdominal trauma
- Liver : May need Liver packing in sever liver injury (Damage control surgery)





Bloody vicious cycle in trauma

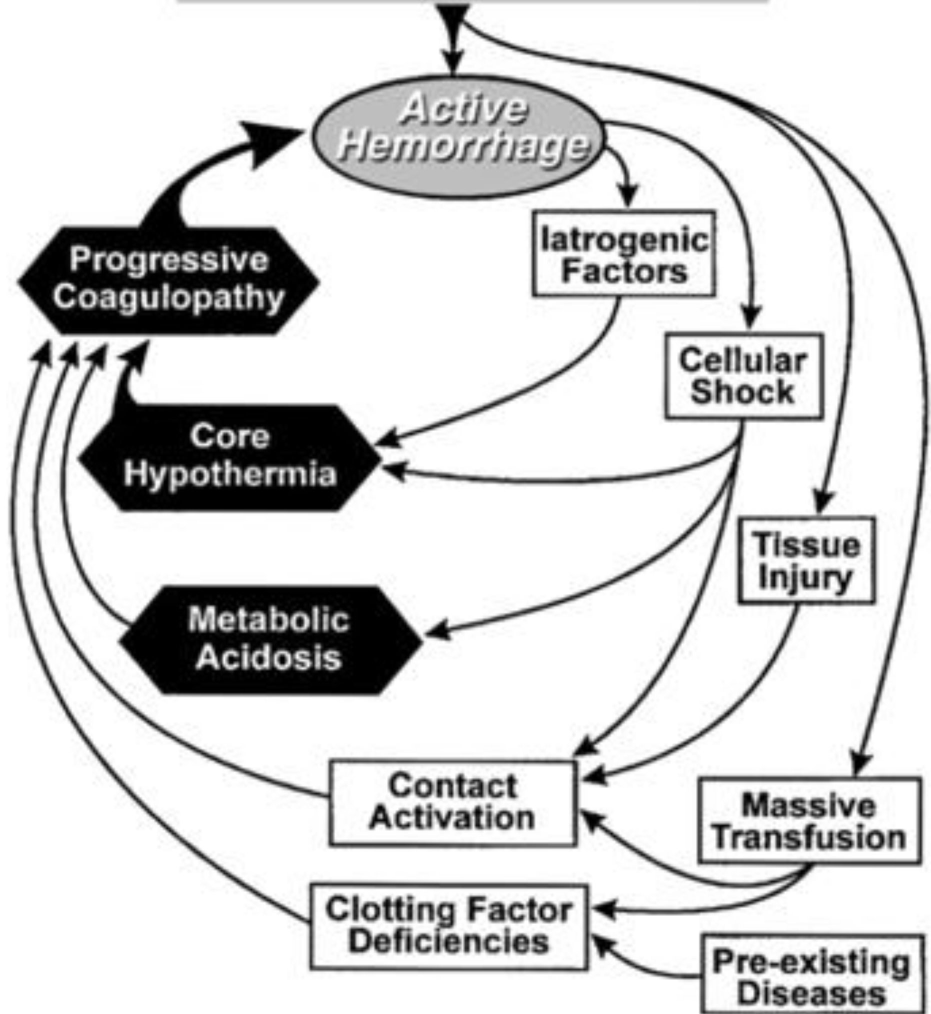
Treatment

-**Damage control surgery**

-**Transfer to ICU**

-**Correction of Hypothermia, Acidosis, Coagulopathy**

-**Definite surgery in next 24-48 hrs**



Penetrating abdominal trauma

GSW or SW with Hemodynamic unstable ,Peritonitis,Evisceration

Yes NO

Laparotomy Local wound exploration

(for anterior abdominal stab wound in thin and co-operative patient)

Fascial penetration → CT ,DPL **No Facial penetration**

Positive finding **Negative finding** → **Inpatient observation for 12-24 hrs** ↓

Laparotomy **Hemodynamic unstable** **Local wound care**

Peritonitis

D/C if no other injury

Yes **Decrease hemoglobin** **NO**

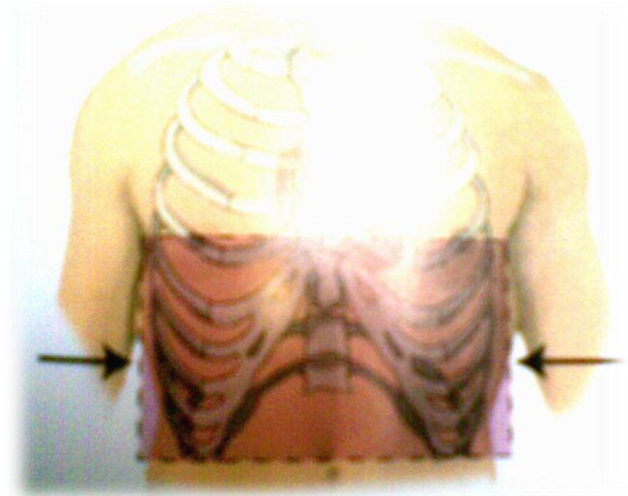
Leucocyte elevation

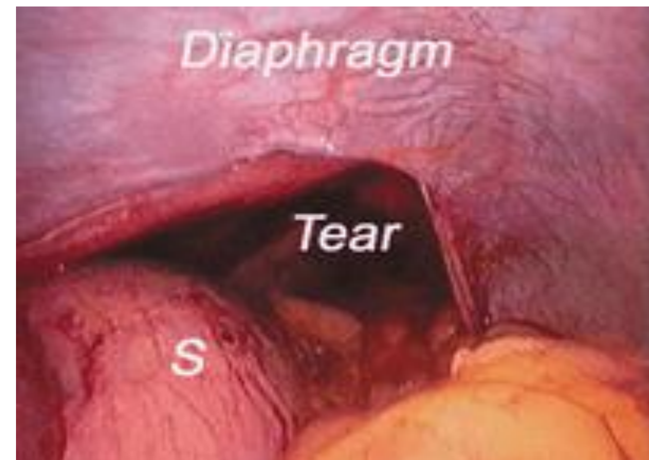
Thoracoabdominal injury

Area : Below nipple to costal margin

If injury to Left side : R/O Diaphragmatic injury

Should confirm by Diagnosis Laparoscopy





Back and flank stab wound

Should be R/O Retroperitoneal organ injury : pancreas, duodenum, kidney, Ureter, Colon

Other INJURY : LIVER ,SPLEEN INJURY

" AVOID LOCAL WOUND EXPLORATION "

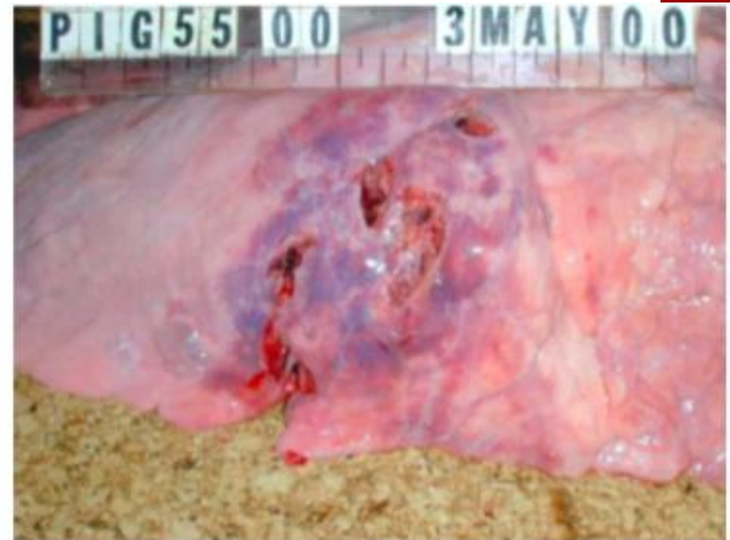
DIAGNOSIS : CT SCAN (TRIPPLE CONTRAST STUDYX

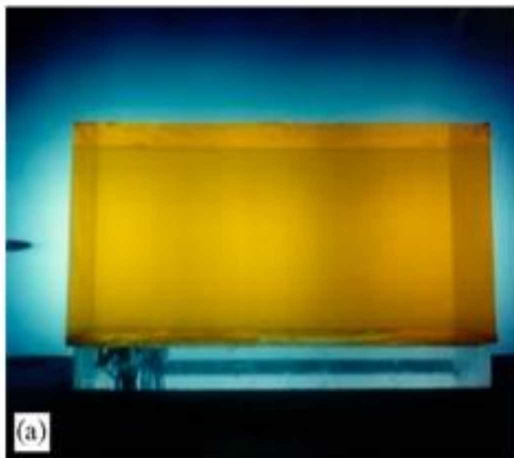
GUN SHOT WOUND

-90% of intraperitoneal penetration of GSW need operative repair

- Blast effect from High velocity GSW → increase severity of injury

-Tangential injury : CT ,Diagnosis laparoscopy





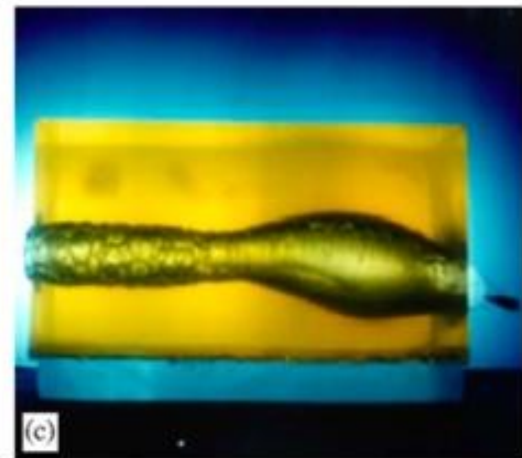
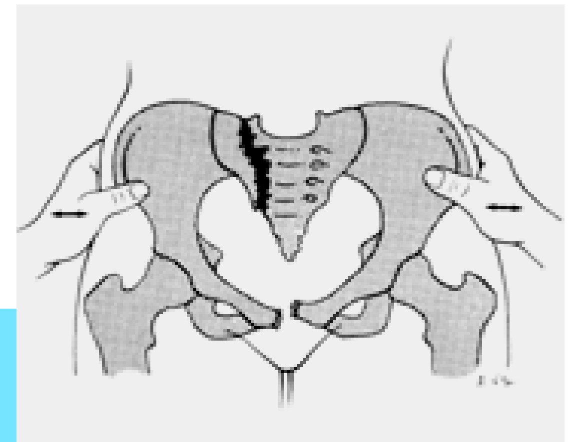


Figure 3 Demonstrates the passage of a round as it penetrates a gelotine block with the formation of a cavity.

Pelvic fracture



FAST Exam

Positive

Operating Room

Laparotomy, pelvic fixation, pelvic packing

Hemodynamically Stable?

Yes

No

Angiography

SICU

Negative

2 units PRBCs/ED trauma bay

HD stable

HD unstable

Operating Room

Pelvic fixation and pelvic packing

SICU +/– CT Scans**

Ongoing transfusion requirements?

Yes

No

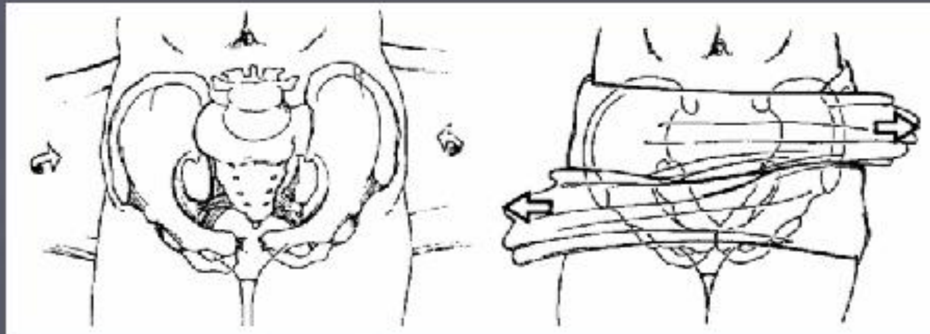
Angiography

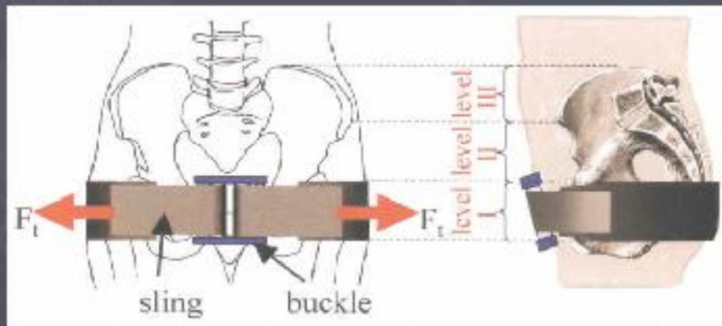
SICU

** Normalize coagulation status, consider factor VIIa if recalcitrant. Abdominal CT scan if no laparotomy done.

Source: Brunicardi FC, Andersen DK, Billiar TR, Dunn DL, Hunter JG, Matthews JB.

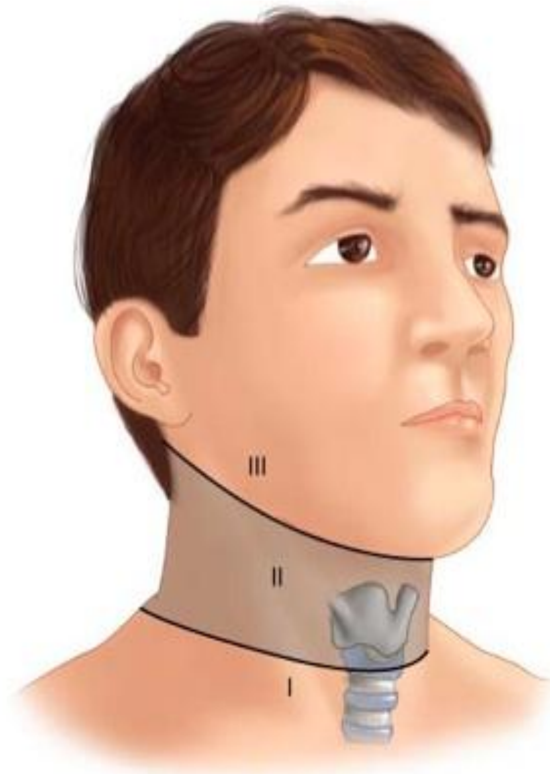
Pelvic wrap or Pelvic binder

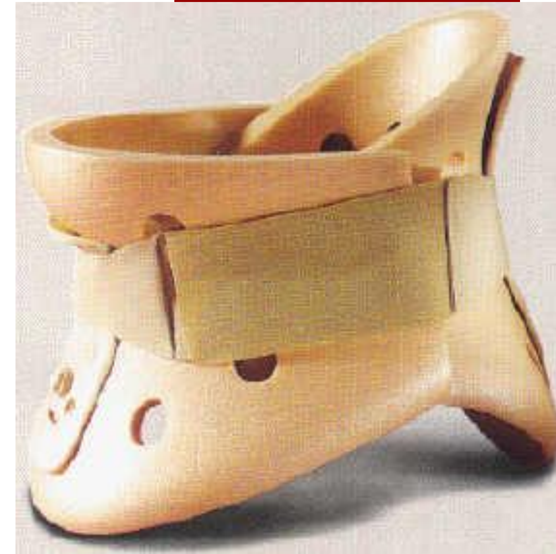




Pelvic fracture

Neck Injury





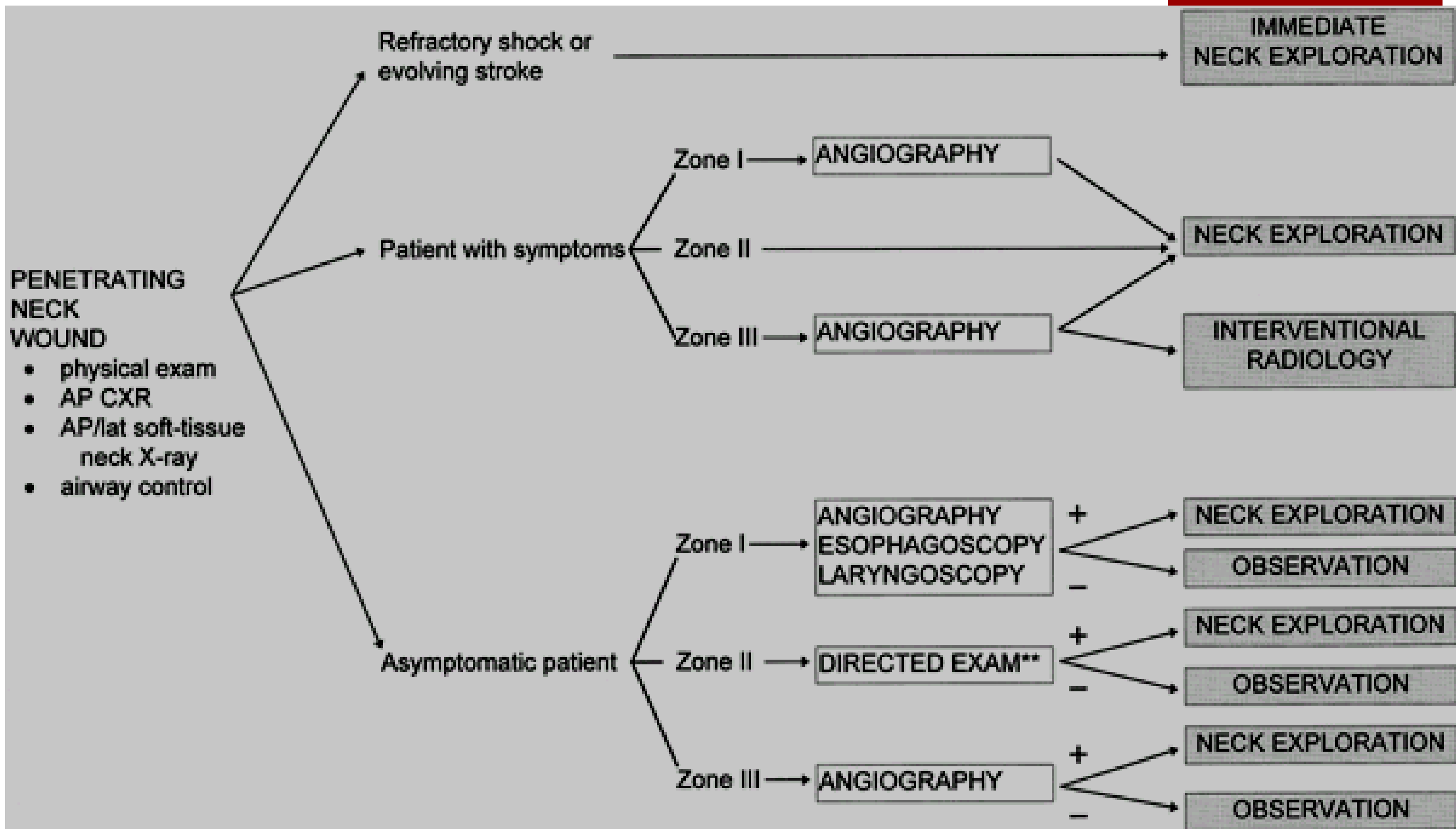


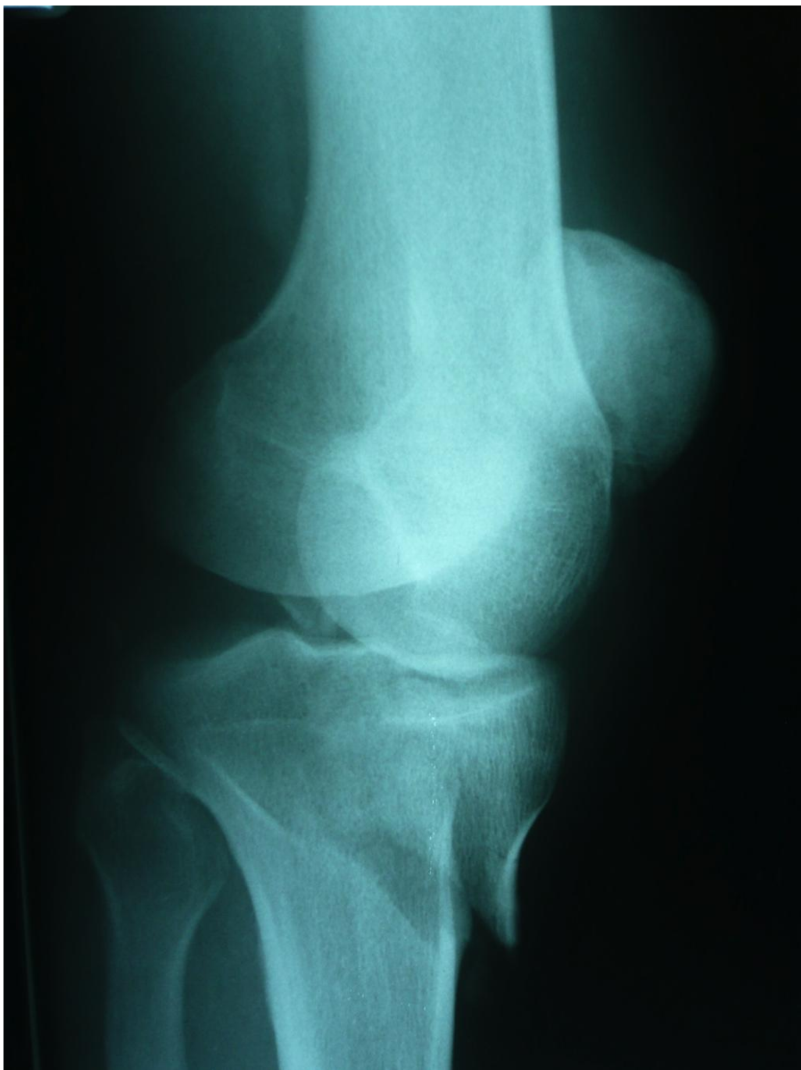
FIG. 73-9. Algorithm for the initial management of patients with penetrating injuries to the neck. (Modified from ref. 14, with permission.)

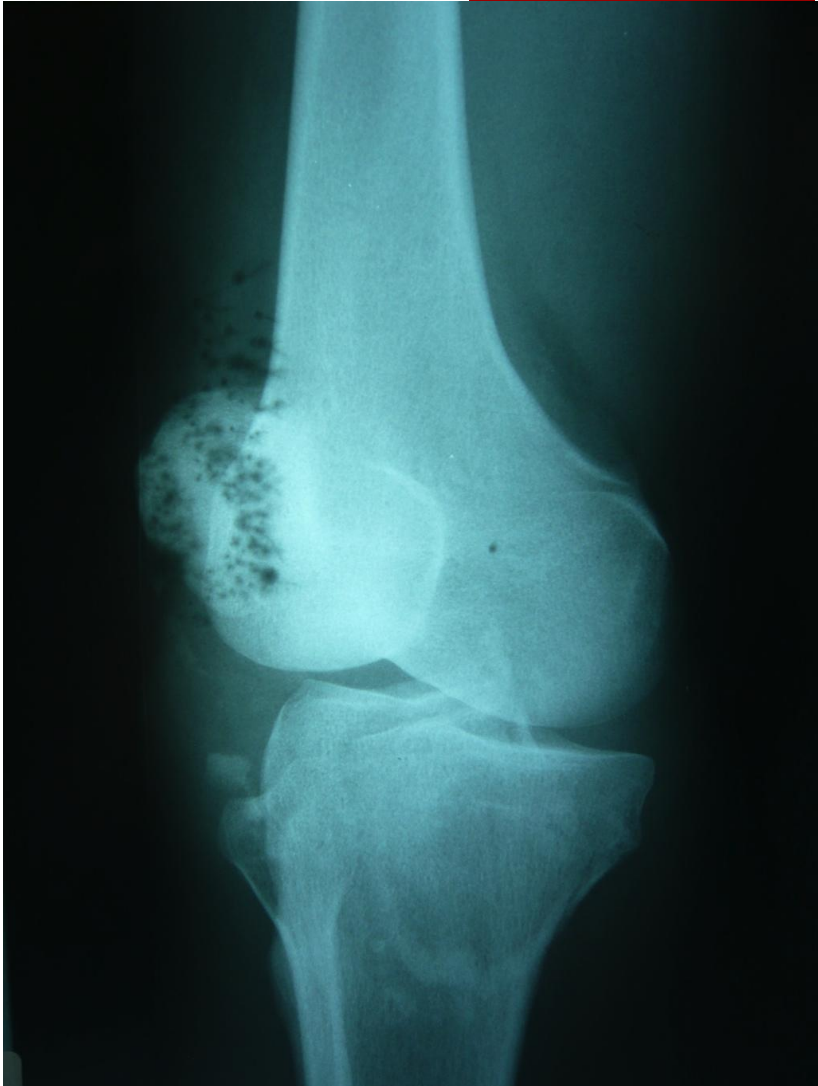
Vascular injury

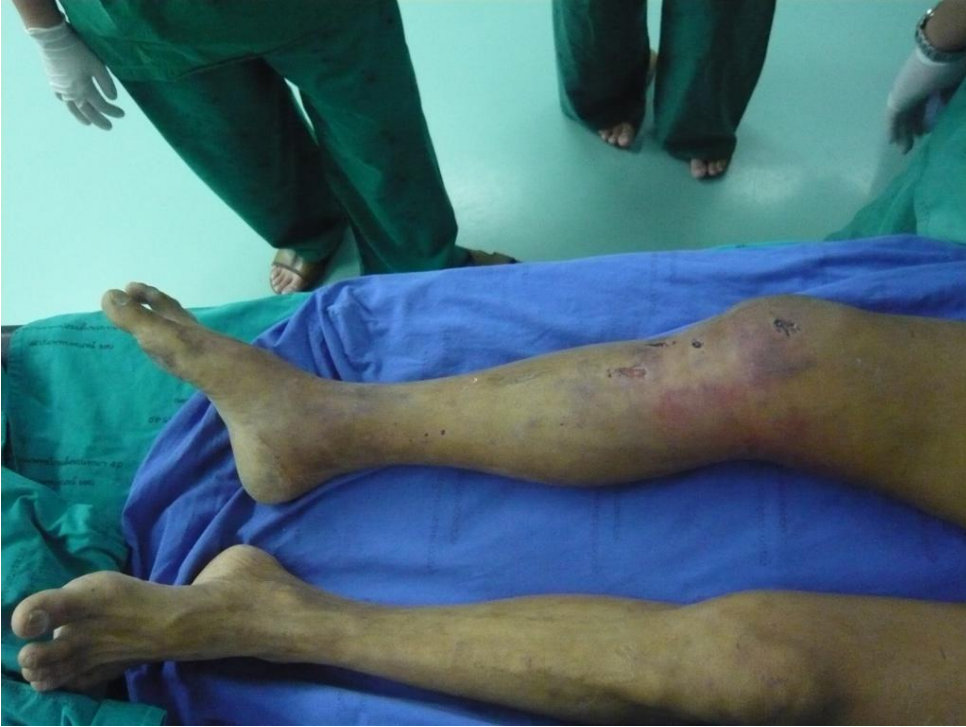
- **Hard sign**
- *absent of distal pulse*
- *active hemorrhage*
- *large expanding hematoma*
- *bruit or thrill*
- *distal ischemia (6 P)*

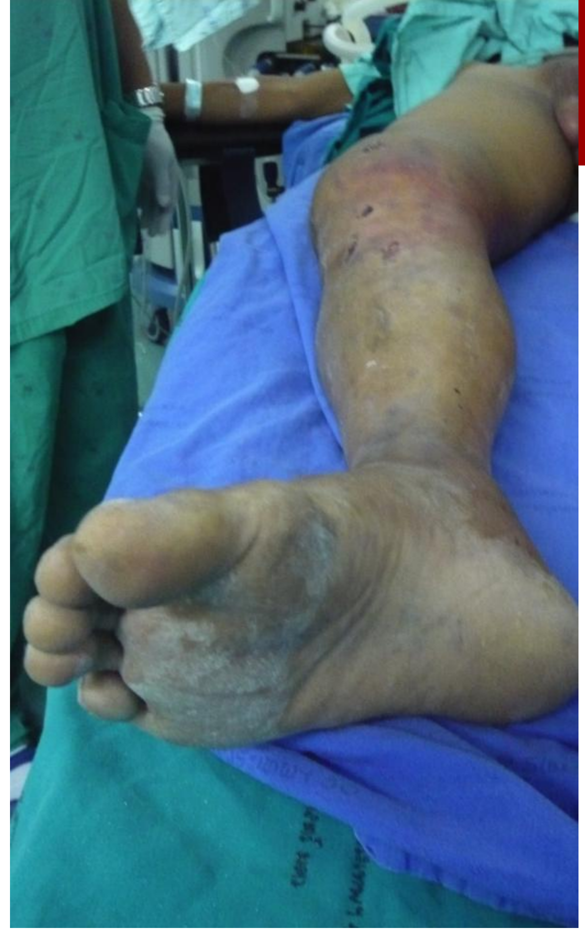
Soft sign

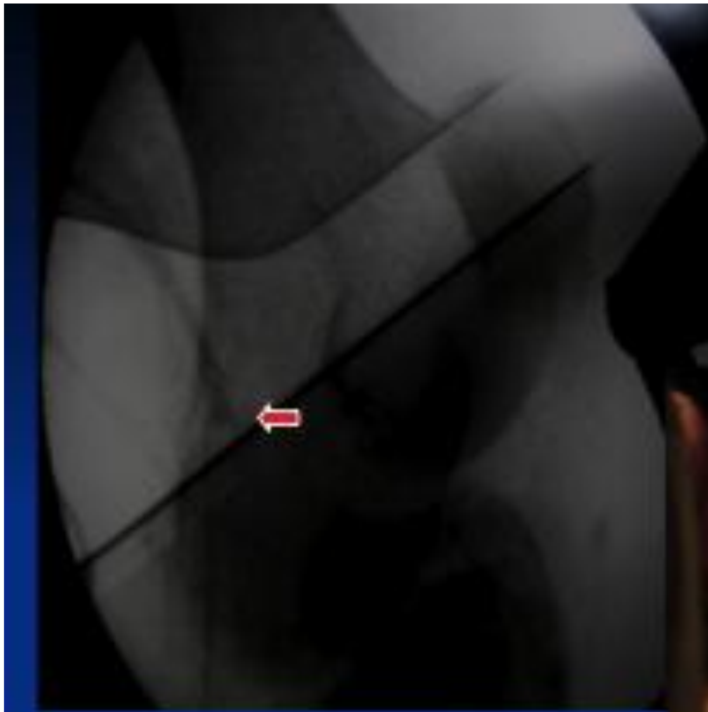
- ***Diminished distal pulse***
- ***small , non-pulsatile hematoma***
- ***proximity of injury to major vessel***
- ***Injury to anatomical related to nerve***
- ***unexplained hypotension***
- ***History of arterial bleeding at scene of accident***

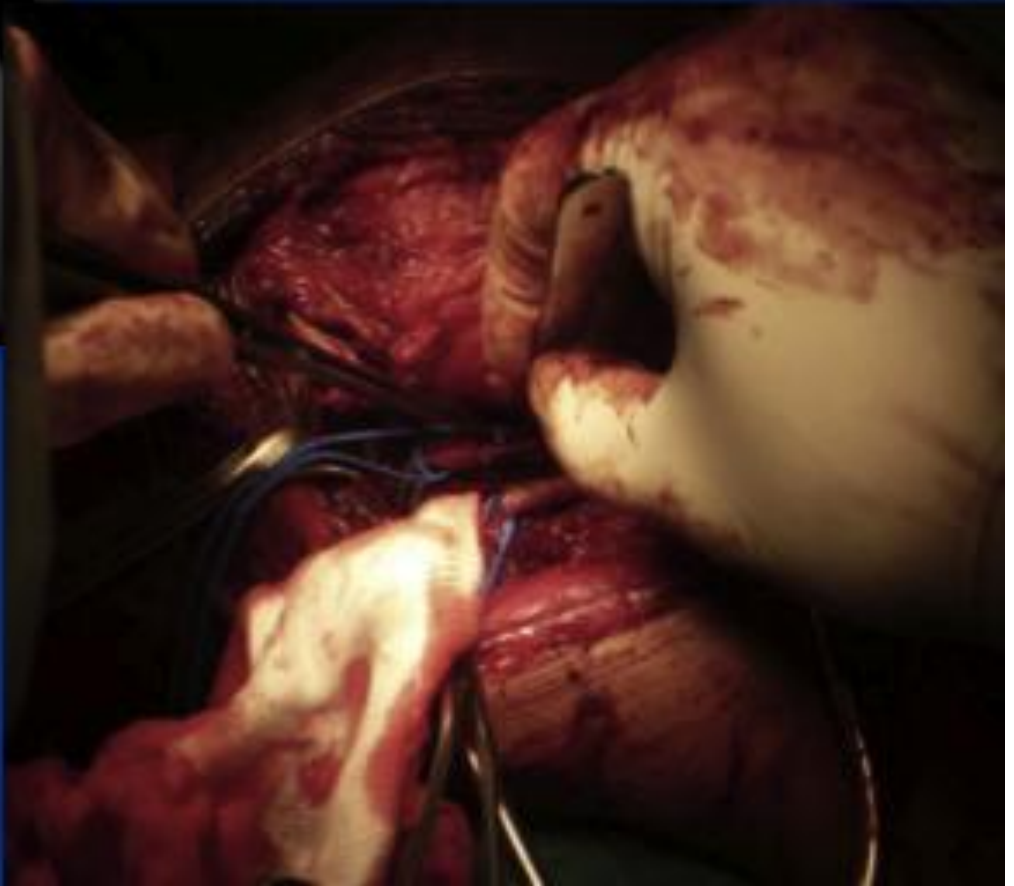


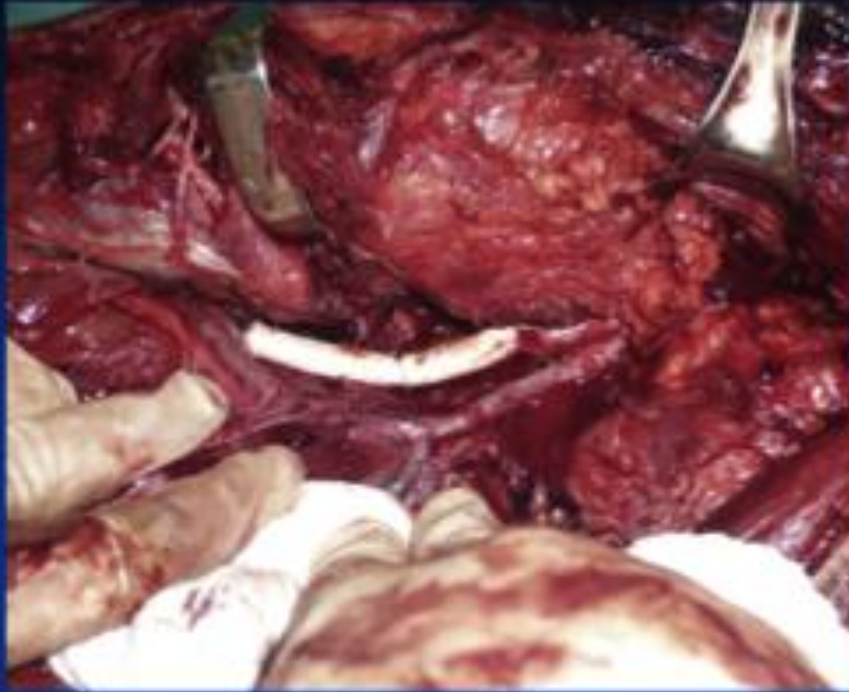


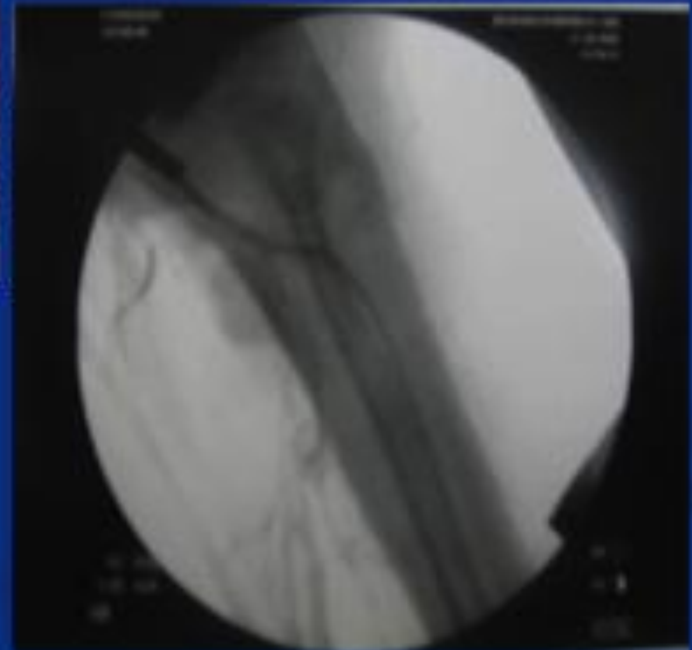


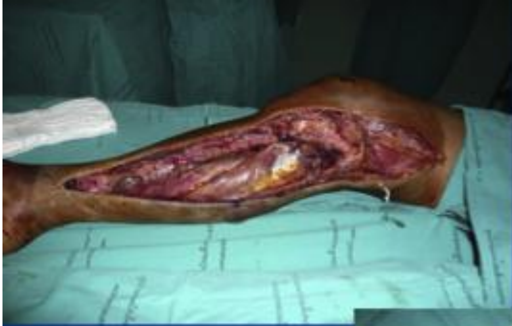
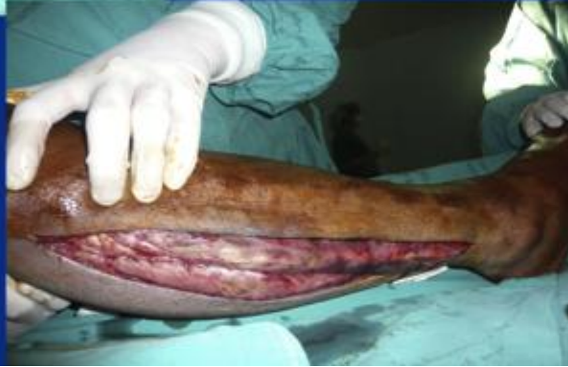


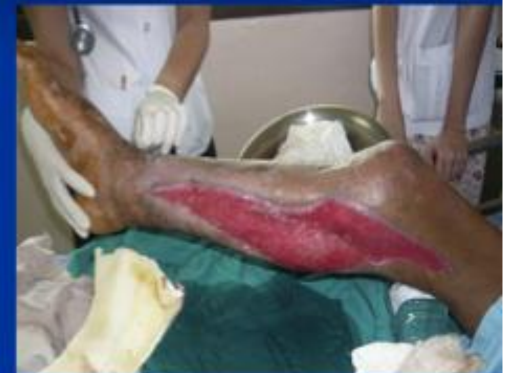








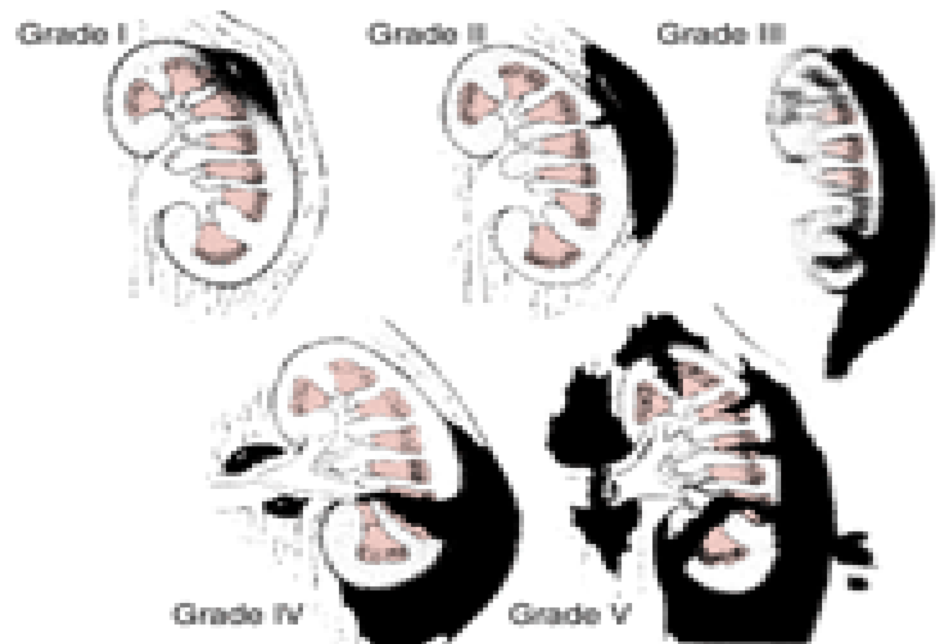



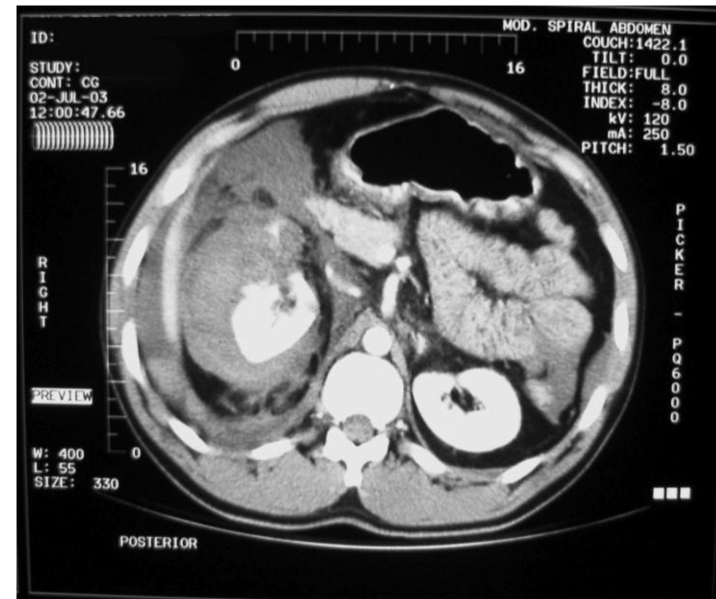


KUB INJURY

- KIDNEY INJURY
- Blunt /Penetrating injury
- CLINICAL : Hematuria, Flank pain
- Associated intraabdominal organ injury
- Diagnosis : IVP , CT SCAN

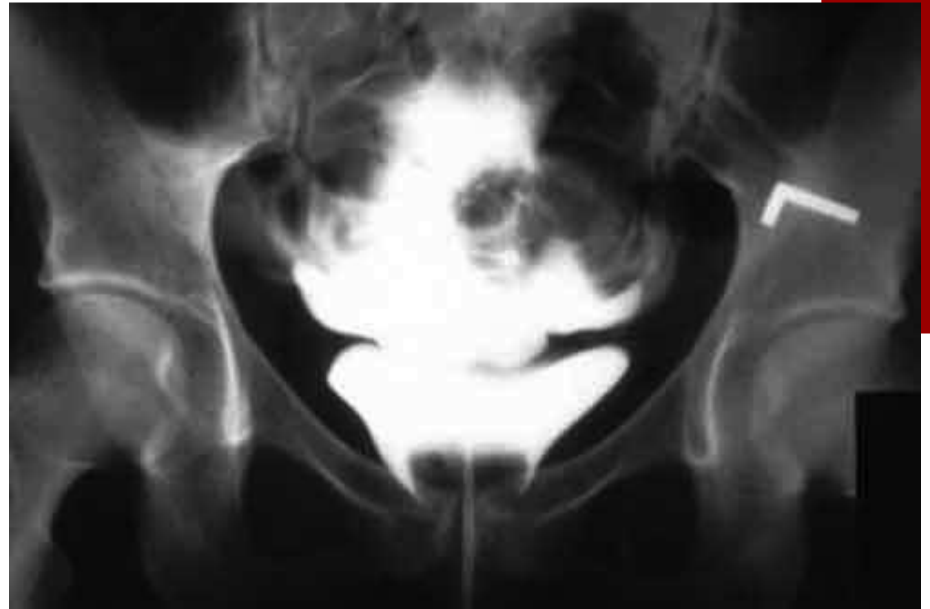
(Single shot IVP : contrast 1-2 cc/kg)

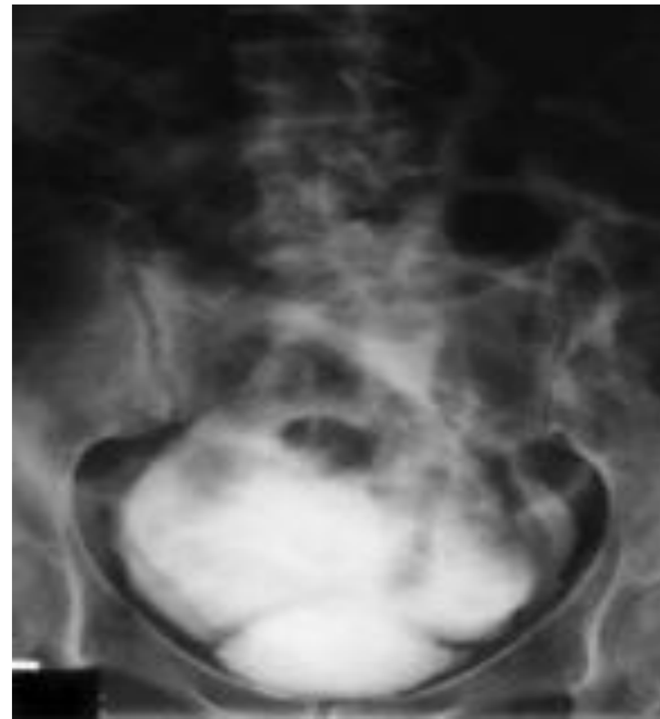




Bladder injury

- Clinical : Hematuria with lower abdominal pain
- Diagnosis : Cystography (250-350 cc)
- Intraperitoneal rupture : SURGERY
- Extraperitoneal rupture : on foley 's cath 10-14 days





Urethral injury

- Pelvic fracture : Membranous part
- Straddle injury : Bulbous part
- Clinical : Bleeding per meatus
- Diagnosis : retrograde urethrogram
- Avoid foley's cath → may need suprapubic cystostomy