

Thoracic Trauma:

Thoracic trauma:

- A significant cause of mortality.
- Many patients with thoracic trauma:
die after reaching the hospital

Many of them can be prevented by:

Prompt diagnosis and treatment.

≤10% of blunt chest injury

15-30% of penetrating chest injury

} require thoracotomy

Chest injury can induce:

- Hypoxia
- Hypercarbia
- Acidosis

Initial assessment and treatment:

- Primary survey
- Resuscitation of vital functions
- Detailed secondary survey
- Definitive care

- Because hypoxia is the most serious feature of chest injury the goal of early intervention is to prevent or correct hypoxia.



- What are the significant pathophysiologic effects of chest injury that I should identify in primary survey and when and who do I correct them?

Primary survey begins with the airway

- Major problems should be corrected as they are identified.
- **Listening** for air movement at the patient's nose, mouth and lung fields.
- **Inspecting** the oropharynx for foreign body obstruction.
- **Observing** for intercostal and supraclavicular muscle retractions.

- Acute laryngeal obstruction from laryngeal trauma.
- Posterior dislocation of the clavicular head causing upper airway obstruction (stridor or marked change in the expected voice quality.

Treatment with extending the shoulders or grasping the clavicle with a towel clip and reducing the fracture.

Breathing:

- Patient's chest and neck completely exposed for assessment of breathing and neck veins.
 - Observing
 - Palpating
 - Listening
- } for assessment of respiratory quality

Important signs of chest injury:

RR ↑

Change in breathing pattern

Shallow respirations

Cyanosis (late)

Major thoracic injuries:

- Tension pneumothorax
- Open pneumothorax
- Flail chest
- Pulmonary contusion
- Massive hemothorax

Pitfalls:

- After intubation:
common reason for loss of breath sounds in left thorax is a right mainstem intubation.

Tension pneumothorax:

- One way valve
- Also may occur after markedly displaced thoracic spine fractures.
- Is a clinical diagnosis.
- Chest pain, air hunger, respiratory distress, tachycardia, hypotension, tracheal deviation, unilateral absence of breath sounds, neck vein distension and cyanosis.
- Treatment: needle thoracentesis and then insertion of chest tube.

Open pneumothorax:

- If the opening in the chest wall is approximately two thirds the diameter of trachea air passes preferentially through the chest wall defect with each respiratory effort so ventilation is impaired.
- Closing the defect with a sterile occlusive dressing then taped on three sides+ a chest tube remote of the wound as soon as possible.
- Definitive surgical closure of the defect is frequently required.



Flail chest and pulmonary contusion:

- When a segment of the chest wall does not have bony continuity with the rest of the thoracic cage.
- Two or more ribs fractured in two or more places.
- Results in severe disruption of normal chest wall movement.
- If the injury to the lung (pulmonary contusion) is significant, serious hypoxia may result.
- Restricted chest wall movement associated with pain and underlying lung injury are important causes of hypoxia.

Cont. flail chest:

- May not be apparent initially.
- The patient moves air poorly.
- Movement of the thorax is asymmetrical and uncoordinated.
- Palpation of abnormal respiratory motion and crepitation of rib or cartilage fractures.
- CXR may suggest multiple rib fractures but may not show costochondral separation.
- ABG (respiratory failure with hypoxia) may aid in diagnosing a flail chest.

Cont. flail chest:

- Initial therapy includes:

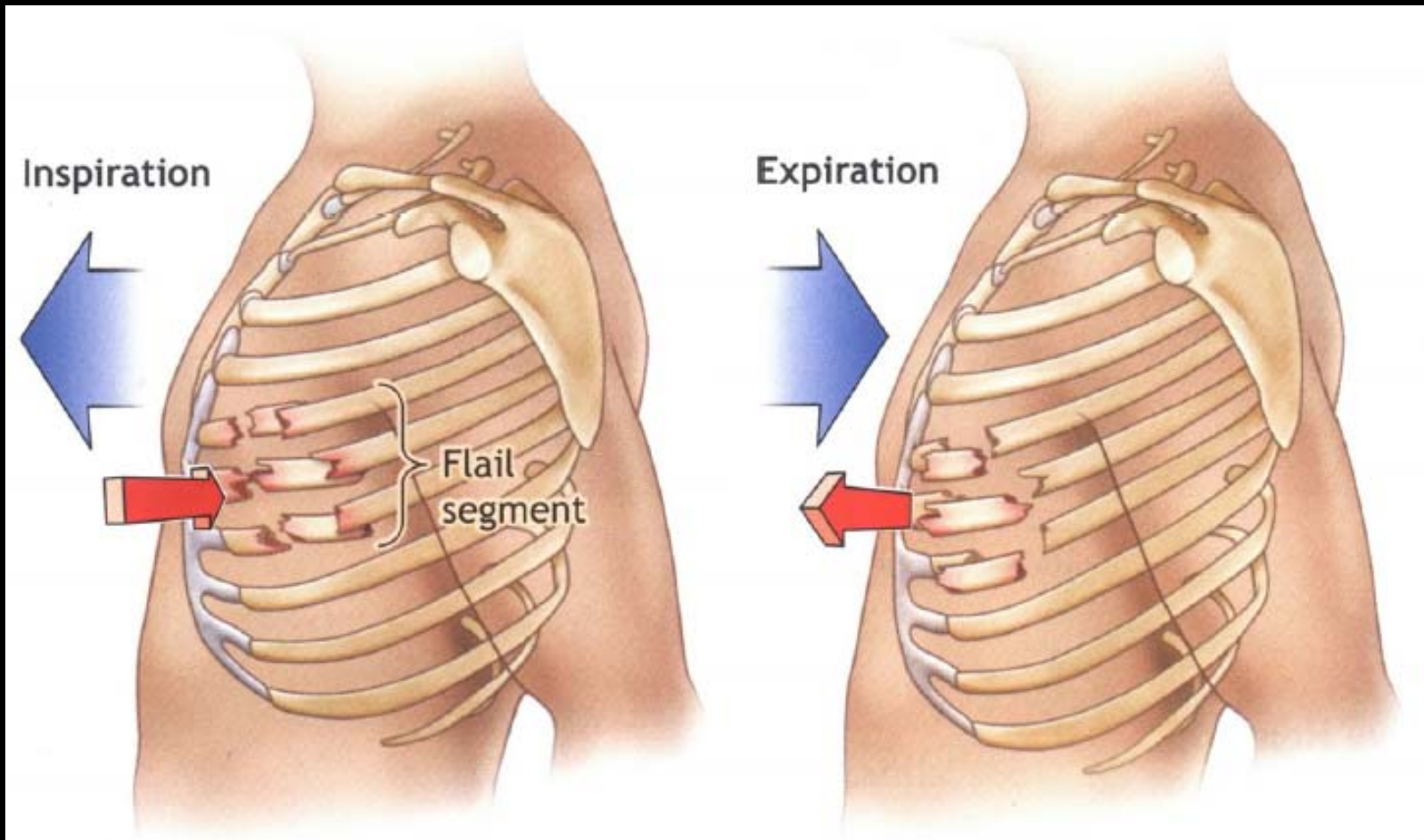
adequate ventilation

administration of humidified oxygen

fluid resuscitation (avoid over hydration)

provide analgesia to improve ventilation

A short period of intubation and ventilation
may be required.



Massive hemothorax:

- By compressing the lung and preventing adequate ventilation.
- Acute accumulations of blood more dramatically present as hypotension and shock.

Circulation:

- The patient's pulse should be assessed for quality, rate and regularity.
- Blood pressure and pulse pressure is measured and the peripheral circulation assessed by observing and palpating the skin for color and temperature.
- Neck veins should be assessed for distention, remembering that neck veins may not be distended in patients with hypovolemia and cardiac tamponade, tension pneumothorax or traumatic diaphragmatic injury.

- A cardiac monitor and pulse oximeter should be attached to the patient.
- Thoracic trauma are susceptible to myocardial injury, may lead to dysrhythmias. Hypoxia and acidosis enhance this possibility.
- PEA may be present in cardiac tamponade, tension pneumothorax, profound hypovolemia and cardiac injury.

Massive hemothorax:

- Rapid accumulation of more than 1500 ml of blood or one third or more of the patient's blood volume in the chest cavity.
- Discovered when shock is associated with the absence of breath sounds or dullness to percussion on one side of the chest.

Cont. Massive hemothorax:


- Large caliber intravenous and a rapid crystalloid infusion are begun and type specific blood is administered as soon as possible.
- restoration of blood volume and decompression of the chest cavity.
- A single chest tube (38 French) is inserted.
- Be prepare for autotransfusion.
- If 1500 ml is immediately evacuated it is highly likely that an early thoracotomy will be required.

- Initial volume output of less than 1500 ml but continue to bleed may require a thoracotomy.
- This decision is based not on the rate of continuing blood loss (200 cc/hour for 2-4 hr), but on the patient's physiologic status.
- A persistent need for blood transfusions is an indication for thoracotomy.

- Penetrating anterior chest wounds medial to the nipple line and posterior wounds medial to the scapula should alert the doctor to the possible need for thoracotomy.
- Thoracotomy is not indicated unless a surgeon qualified by training and experience is present.


Cardiac tamponade:

- Beck's triad:



- venous pressure elevation
- decline in arterial pressure
- muffled heart tones

Diagnostic methods include:



- Echocardiography (5-10% false negative)
- FAST,
- pericardial window.

- Initial administration of intravenous fluid.
- If surgical intervention is not available, pericardiocentesis can be diagnostic as well as therapeutic, but is not definitive treatment for cardiac tamponade.

Resuscitative thoracotomy:

- Patients with penetrating thoracic injuries (not blunt) with PEA may be candidates for immediate resuscitative thoracotomy (a qualified surgeon must be present)

Secondary survey:

The secondary survey:

- CXR
- ABG
- Pulse oximetry
- ECG monitoring

In this step, the injuries that usually are not obvious on physical examination and missed will be evaluated.

Simple Pneumothorax:

- Any pneumothorax is best treated with a chest tube. Observation and aspiration of an asymptomatic pneumothorax may be appropriate but the choice should be made by a qualified doctor.
- The patient with a pneumothorax should also undergo chest decompression before he/she is transported via air ambulance.

Hemothorax:

- Lung laceration
- Laceration of an intercostal vessel
- Laceration of internal mammary artery
- Thoracic spine fracture dislocation

An acute hemothorax large enough to appear on a CXR film is best treated with a large caliber (36 French) chest tube.

Operative exploration should be considered:


- If 1500 ml of blood obtained immediately through the chest tube
- If drainage of more than 200 ml/hr for 2-4 hr occurs
- If blood transfusion is required

Pulmonary contusion:

- Is the most common potentially lethal chest injury.
- Respiratory failure can be subtle (it develops overtime).
- $Pao_2 < 65$ mmHg or $Sao_2 < 90\%$ on room air may require intubation and mechanical intubation.
- Pulse oximetry monitoring, ABG, ECG monitoring and appropriate ventilatory equipment are necessary for optimal treatment.

- Any patient with the aforementioned preexisting conditions who is to be transferred should undergo intubation and ventilation.

Tracheobronchial tree injury:

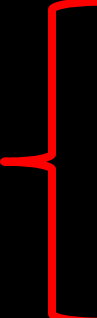
- Unusual and potentially fatal.
 - In blunt trauma the majority of such injuries occur within 1 in. (2.54 cm) of the carina. Most die at the scene.
 - If tracheobronchial injury is suspected immediate surgical consultation is warranted.
- 
- hemoptysis
 - subcutaneous emphysema
 - Tension pneumothorax
 - pneumothorax with a persistent large air leak after tube thoracostomy

Cont. Tracheobronchial tree injury:

- Placement of more than one chest tube is often necessary to overcome a very large leak and expand the lung. Temporary intubation of opposite mainstem bronchus may be required for adequate oxygenation.

Blunt cardiac injury:

- Can result in:

- 
- myocardial muscle contusion
 - cardiac chamber rupture
 - coronary artery dissection and/or thrombosis
 - valvular disruption.

The clinically important sequelae of myocardial contusion are hypotension, dysrhythmias or wall motion abnormality on 2D echocardiography.

ECG findings: Multiple PVC, Unexplained sinus tachycardia, AF, BBB (often RBBB), ST segment changes.

Elevated CVP in the absence of an obvious cause may indicate RV dysfunction secondary to contusion.

Traumatic Aortic disruption:

- A common cause of sudden death after an automobile collision or fall from a great height.

A history of decelerating force +

Widened mediastinum

Obliteration of aortic knob

Deviation of the trachea to the right

Depression of the left mainstem bronchus

Elevation of the right mainstem bronchus

CXR FINDINGS

- Obliteration of the space between pulmonary artery and aorta
- Deviation of the esophagus to the right
- Widened paratracheal stripe
- Widened paraspinal interfaces
- presence of a pleural or apical cap
- Left hemothorax
- fractures of first or second ribs and scapula

Cont. Traumatic Aortic disruption:

- Helical contrast CT: be an accurate screening method for patients with suspected blunt aortic injury.
- Suspected aortic injury= transfer to a facility capable of rapid definitive diagnosis and treatment center

Blunt esophageal rupture:

- Should be consider in:

left pneumothorax or hemothorax without a rib fx.

Received a sever blow to the lower sternum or epigastrium and is on pain or shock out of proportion to the apparent injury

Has particulate matter in chest tube

Presence of mediastinal air

- Subcutaneous emphysema
- Crushing injury to the chest (Traumatic Asphyxia):
 - crush injury to the chest include upper torso, facial and arm plethora with petechiae secondary to acute, temporary compression of the superior vena cava.
- Rib, sternum and scapular fx.

Thank you

Abdominal and Pelvic trauma:

- Penetrating torso wounds between the nipple and perineum must be considered as potential causes of intraabdominal injury.
- ***Ant. Abdomen:***
trans nipple line, Inguinal ligaments, symphysis pubis, ant. axillary line

Blunt trauma:

- Organs more commonly injured include:

The spleen (40-55%)

The liver (35-45%)

The small bowel (5-10%)

Retroperitoneal hematoma (15%)

Penetrating Trauma:

- Most commonly involve:
 - the liver
 - the small bowel
 - the abdomen vascular structures

- In patients with hypotension, the doctor's goal is to rapidly determine whether an abdominal injury is present and whether it is the cause of hypotension.

History:

- Speed of vehicle
- Type of collision (frontal impact, lateral impact, side swipe, rear impact or rollover)
- Vehicle intrusion in to the passenger compartment.
- Types of restraints used
- Deployment of air bags
- Patient's position in the vehicle
- Status of passengers

Information about VS, obvious injuries and prehospital treatment.

History in penetrating trauma:

The time of injury

The type of weapon (knife, handgun, rifles, shotgun)

Distance from the assailant (in shotgun wounds the likelihood of major visceral injuries decrease beyond the 10 foot or 3 meter range)

Number of stab or gunshot wounds sustained

The amount of external bleeding

The magnitude and location of abdominal pain and if it refer to shoulder or not

Physical examination:

- Inspection
- Auscultation
- Percussion
- Palpation
- Assessment of pelvic stability; urethral, perineal, rectal exam, vaginal exam and gluteal exam (penetrating injury to the gluteal injury are associated with an incidence of up to 50% of significant intraabdominal injury.)
- After rapid PhE the patient should be covered with warm blankets to prevent hypothermia.

Adjuncts to Physical Exams:

- Gastric tube
- Urinary catheter: inability to void, unstable pelvic fracture, blood at the meatus, scrotal hematoma, perineal echymosis, high riding prostate, mandate retrograde urethrography before inserting a Foley catheter.
- X-ray (CXR, AP pelvic)
- FAST: perform it again after 30 minutes.
- DPL
- CT scan: in stable patients with no apparent indication for laparotomy. Some GI, diaphragmatic, pancreatic injuries may be missed in CT.
- Urethrography, Cystography, IV pyelography, GI contrast study

- If there is early or obvious evidence that the patient will be transferred to another facility time consuming tests such as contrast urologic and GI studies, DPL and CT scan, should not be performed.

Evaluation of penetrating Trauma:

- Wound exploration and serial physical exam.
- DPL or CT in ant.abd.stab wounds
- Double or Triple contrast CT in flank and back injuries
- Most gunshot wounds to the abdomen managed with laparotomy.

DPL:



Indications for laparotomy in penetrating abdominal wounds:

Any patient with hemodynamic abnormality

Gunshot wound

Signs of peritoneal irritation

Signs of fascial penetration

Thoracoabdominal lower chest wounds:

- Options in asymptomatic patients:
serial PhE, CXR, Thoracoscopy, Laparoscopy, CT (for right thoracoabdominal wounds)

Due to late posttraumatic left sided diaphragmatic hernias after thoracoabdominal stabwounds so early or immediate laparotomy is an option.

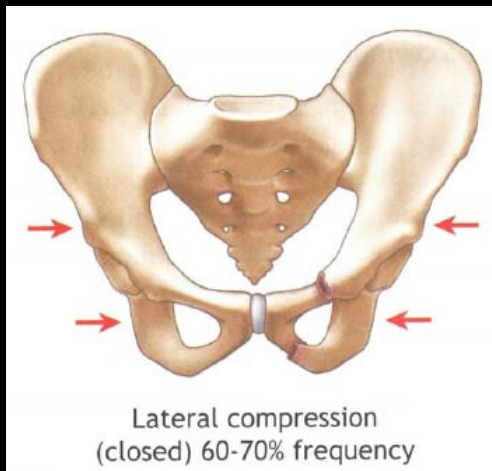
Indications for laparotomy in adults:

- Blunt abd. trauma+ hypotension+ positive FAST
- Blunt abd. trauma+ positive DPL
- Penetrating abd. Trauma+ Hypotension
- Gunshot wounds tracing peritoneal or retroperitoneal cavity
- Evisceration
- Penetrating trauma+ Bleeding from stomach, rectum, GU
- Peritonitis
- Free air, retroperitoneal air, rupture of hemidiaphragm
- Ruptured viscus

Specific diagnosis:

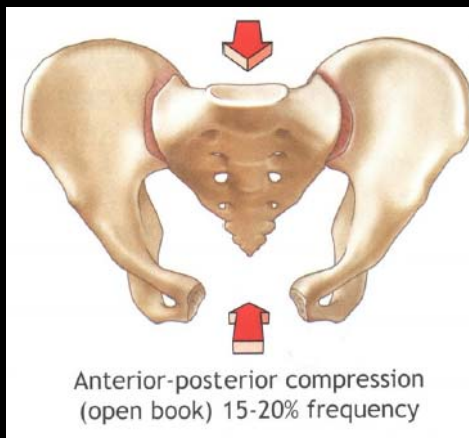
- Diaphragm injuries: L.hemidiaphragm is more commonly injured.
- Duodenal injuries: unrestrained drivers, bicycle handlebars: bloody gastric aspirate, retroperitoneal air
- Pancreatic injuries: elevated or rising Amylase, CT(recheck after 8 hours if think about it)
- Genitourinary injuries
- Small bowel injuries:sudden deceleration, corrected seat belts, early FAST and CT aren't diagnostic and DPL is better when there is abdominal wall echymosis
- Solid organs injuries(concomitant hollow viscus injury in less than 5% who primary think having only S.O.I)

Pelvic fractures:



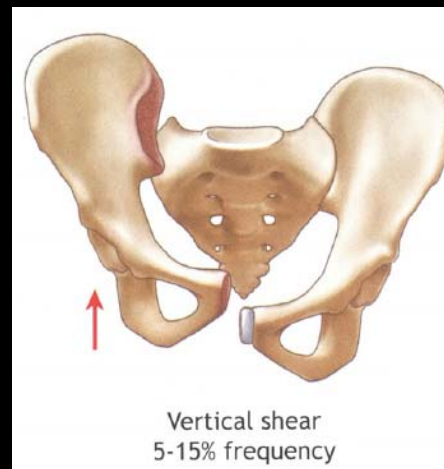
Lateral compression
(closed) 60-70% frequency

Closed Fracture.



Anterior-posterior compression
(open book) 15-20% frequency

Open Book Fracture



Vertical shear
5-15% frequency

**Vertical Shear
Fracture.**

Management:

- A sheet wrapped around the pelvis
- Pelvic splints
- Pelvis stabilizing devices

Since significant resources are required to care for patients with severe pelvic fractures early consideration for transfer to a Trauma center must be considered.





Thank you