Thoracic trauma

Prof Moaath Alsmady

Edited by :Haya Khader

Thoracic trauma

 Thoracic trauma is responsible for > 70 % of all deaths following RTA

Blunt trauma to the chest in isolation is fatal in 10 % rising to 30 % if other inj. are present

Penetrating wounds are increasingly seen with mortality rate of 3 % for simple stabbing to 15 % for gunshot wounds

Thoracic Trauma

Definition Trauma to the chest is usually divided into : blunt injury penetrating injury Proper emergency care and resuscitation are integral parts of the Mx. of these pts, who may have : airway obstruction, life-threatening hemorrhage, severe associated injuries.

Thoracic Trauma

Definition Trauma to the chest is usually divided into : blunt injury penetrating injury Proper emergency care and resuscitation are integral parts of the Mx. of these pts, who may have : airway obstruction, life-threatening hemorrhage, severe associated injuries.

BLUNT THORACIC TRAUMA

Chest Wall Injuries
Pulmonary Injuries
Tracheal/Bronchial Injuries
Cardiac/Great Vessel Injuries
Diaphragm Rupture

Chest Wall Injuries

Rib fracture is the most common thoracic injury

Flail chest is another common problem

It occurs when a segment of the rib cage becomes detached from the rest of the chest wall due to multiple rib fractures. This leads to paradoxical movement of the chest wall during breathing, impairing ventilation and gas exchange

Significant intrathoracic injury may be present without rib fracture in children due to rib cage elasticity

 Narcotics and intercostal nerve blocks are sufficient for simple rib fractures

Chest Wall Injuries

Consider tracheostomy for prolonged intubation to minimize laryngeal injury and facilitate pulmonary care

First rib # indicates significant force, and aortography is indicated if the patient also has
 brachial plexus deficit, absent radial pulse, pulsating supraclavicular mass, widened mediastinum.

Pulpest, leading to bruising of the lung Conflusion

caused by blunt trauma to the chest, leading to bruising of the lung tissue. This injury results in localized hemorrhage and edema within the lung, impairing gas exchange and potentially leading to respiratory distress. Potentially lethal

- Most common type of chest injury in US
- Interstitial
 hemorrhage and
 intra-alveolar
 hemorrhage
- Decrease pulmonary compliance and gas exchange
 Increased secretions and hemoptysis



Pulmonary Injuries

Left pulmonary contusion

Pulmonary Iniuries



blunt thoracic trauma shows surgical emphysema and pulmonary hemorrhage left upper lobe. The patient presented with hemoptysis following injury

Initially asymptomatic

May progress to respiratory failure
reduced lung transparency caused by fluid, infection, inflammation, or other pathological processes
Hazy opacity on Chest X-ray
Tx : ventilation & O2
Central line & restricted fluids
Watch for development of ARDS

Rib Fracture

- Second most common chest injury
- Result of blunt trauma
- May cause
 Pneumothorax
- Physiologic splinting
 ventilation
- Adequate pain relief necessary to improve ventilation
- Uncomplicated Fx usually not splinted
- Do not use rib belt because it decreases expansion



Flail Chest

One of most critical injuries
40 % mortality rate
Result of direct blunt trauma
May result in hemothorax

Flail Chest



Figure 13-11. Two examples of flail chest, one on the laeral and one on the anterior portion of the chest wall. Several adjacent ribs are fractured in two places. Arrows indicate direction and force of injury.

Paradoxic Respiration

Inward chest movement during inspiration

Outward movement during expiration
 Usually one side of chest

Occurs when a loose segment of chest wall is left because of Fx of 2 or more adjacent ribs
 Movement of this segment becomes paradoxic

Flail Chest

Inspiration

Expiration



Inspiration



Eap ration

Fluit chest (a.w.), Coking Networks, 1996,

Assessment

Paradoxic Chest Movement Dyspnea Cyanosis Tachycardia Hypotension Shallow respirations Tachypnea Chest pain **Diminished Breath Sounds**

Interventions

Humidified Oxygen Pain management Promote lung expansion with deep breathing Secretion clearance by cough & suction Bedrest, limit activity Prepare for intubation/ventilation

Pneumothorax

Thoracic injury which allows atmospheric air to enter pleural space Rise in intrathoracic pressure and reduced vital capacity **Diagnoses by chest** x-ray





or communicating

under skin)

Open pneumothorax = Opening through chest wall air move in in inspiration and move out in expiration

air only moves in inspiration and isnt go out in expiration

cause mediastinal shift

Tension pneumothorax = blunt trauma or mechanical ventilation with PEEP & build up of positive pressure in pleural space with tracheal deviation to unaffected side. Also related to chest tubes, central line or line insertion Spontaneous pneumothorax = rupture of bleb (accumulation of fluid

mall, air-filled blister located on the surface of the lung

Development of Spontaneous Pneumothorax



FIGURE 29-2 Mechanism for development of spontaneous pneumothorax.

Open or Communicating Air moves in and out no shift







Diminished breath sounds on auscultation

- Hyperresonance on percussion
- Decreased chest expansion unilaterally
- Dyspnea, Cyanosis
- Tachycardia & Tachypnea (shift of PMI)
- Hypotension
 - Subcutaneous emphysema

Sucking sound with open wound

Interventions

Pressure dressing to open wound Oxygen Prepare for chest tube insertion Monitor Chest tube with water seal until fully expanded Monitor for subcutaneous emphysema (crepitus)

Rib fractures & Flail Chest

The main significance of a flail chest is that it indicates the presence of an underlying pulmonary contusion.

Dx. by physical examination. Bruising or seat-belt signs , palpation may reveal the crepitus associated with broken ribs





Tension pneumothorax

shifting of the heart





Tension extends tension behind liver pneumothorax Right

Open pneumothorax





Open pneumothorax back Stab wounds to

Hemothorax

Simple= blood loss
 <1500ml into
 thoracic cavity
 Massive = > 1500

indication for urgent bronchotomy

 Due to blunt trauma or penetrating injury
 R/T Pulmonary contusions or lacerations or rib

fracturac



haemothorax



Haemothorax: Erect

Haemothorax

CT may also be useful in differentiating hmx. from other thoracic pathology such as pulmonary contusion or aspiration.



CT Haemothorax (massive)

Assessment in Hemothorax

Interventions

Chest tubes to evacuate blood Careful monitoring of drainage Possible thoracotomy if >1500 ml or persistent bleeding 200ml over 3 hrs. Frequent vital signs, I & O Evaluate Pt response IV fluids, blood as ordered or reinfusion of drainage after filtering

Chest tube placement



haemothorax



Haemothorax: Erect

Chest Tube Insertion

Site in the mid- or anterior- axillary line, behind pectoralis major above the 5th rib (to prevent diaphragm inj.





Chest Tube Insertion

Procedure

- local anaesthetic
- Scrubing & draping
- An incision is made along the upper border of the rib
- By a curved clamp the track is developed by blunt dissection splitting the fibres. A track developed with the operator's finger
 The clamp is angled over the rib & dissection continued until pleura is entered.





Chest Tube Insertion

Procedure

- A large-bore (32 or 36F) chest tube is passed into the pleural cavity.
- The tube is connected to an underwater seal and sutured / secured in place. a U-stitch
 - A chest X-ray is taken to confirm placement & position.



- Myocardial contusion is the most common injury and is suspected with ECG changes and serial enzyme elevations
- Coronary artery injury can result in thrombosis and myocardial infarction
- Atrial or ventricular rupture is usually fatal, although the pericardium may restrict bleeding enough to allow survival to the ER

- The patient should be monitored in ICU, may require heparin for coronary thromb. and anti-arrhythmic therapy
- Echo and angiography are indicated for tamponade and post-injury murmurs, which suggest valvular insufficiency or septal defect
- Aortic rupture is also usually fatal, but can result in formation of a false aneurysm, typically at the aortic isthmus

Pt. with a widened mediastinum on CXR should have prompt aortography, which will demonstrate an intimal tear

 Surgical repair should be done promptly, as fatal hemorrhage can occur at any time

 Techniques include LA-FA bypass, proximal aortadistal aorta shunting, and cross-clamping without cardiopulmonary bypass
 1-Left Atrium to Femoral Artery bypass

1-Left Atrium to Femoral Artery bypass
2- A shunt is placed between the proximal aorta (above the site of repair) and the distal aorta (below the site of repair)
3-he aorta is clamped above and below the area requiring repair.

Diaphragm Rupture

- Most lacerations occur on the left hemidiaphragm and result from automobile accidents
- Usually, the stomach herniates and undergoes volvulus, massively dilates, and causes left lung collapse and mediastinal shift to the right
- Gastric distension can also result in perforation and should be prevented by NG tube placement

Diaphragm Rupture

Rupture of the diaphragm rarely occurs in isolation, and associated injuries to the thoracic aorta, liver & spleen and pelvis are often present

35 % of pt. initially have normal or, minimally abnormal CXR

The diaphragm can be repaired either through the chest or abdomen, and all tears should be closed in double-layer fashion

normal right diaphragm stomach in left chest wall

Diaphragm Rupture



Diaphragm Rupture



 The right ventricle is most commonly injured, followed by the left ventricle. The ventricle inj.
 > atrial inj.

Right ventricle43%Left ventricle34%Right atrium16%Left atrium7%

Ventricular septal defect is the most commonly intracardiac injury

Cardiac/Great Vessel Injuries Most patients do not reach the hospital, as the injury to the pericardium leads to exsanguination instead of severe loss of blood from the body.

life-threatening condition where fluid, blood, or gas accumulates in the pericardial sac, creating pressure that impairs the heart's ability to pump effectively.

 Hypotension that does not respond to rapid volume replacement suggests significant injury

CXR, ECG, and echocardiography have little diagnostic value in these patients

minimally invasive procedure to drain fluid or blood from the pericardial sac via a needle inserted through the subxiphoid region

Subxiphoid pericardiocentesis is useful for diagnosis; negative deflection of the QRS complex indicates contact with the epicardium and a drain should be left in place

Subxiphoid pericardial window is preferred for tamponade, however, and should be performed in the operating room, as the patient may rapidly exsanguinate blood loss

Emergency Department Thoracotomy

EDT is seldom indicated, being reserved for moribund pt. or rapid deterioration without time to transfer to the OR

Median sternotomy is the preferred approach

Repair of ventricular lacerations with pledgetted nonabsorbable horizontal mattress sutures

Initial Management in Thoracic Trauma

establishing ABCs

to assess the airway and to establish adequate ventilation keeping O₂ sat. >94% keep sys. BP at a minimum of 110 mmHg obtaining IV access

Indications for emergency endotracheal intubation include
 apnea RR > 30
 profound shock, severe and life-threatening state of circulatory collapse, result in inadequate blood flow and oxygen delivery to vital organs

Indications of Thoracotomy

Acute indications

- Cardiac tamponade
- Acute hemodynamic deterioration/cardiac arrest in the trauma center
- Penetrating truncal trauma (resuscitative thoracotomy)
- Vascular injury at the thoracic outlet
- Loss of chest wall substance
- C

- Massive air leak
 - Endoscopic or radiographic evidence of significant tracheal or bronchial injury

Emergency Thoracotomy

The major goals and potential therapeutic maneuvers are as follows

release pericardial tamponade control cardiac or great vessel bleeding control hilar bleeding perform open cardiac massage redistribute blood to myocardium and brain limit sub-diaphragmatic hemorrhage via aortic crossclamping

thoracotomy



THANK YOU