

Thoracic trauma

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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.

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BLUNT THORACIC TRAUMA

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

Chest Wall Injuries

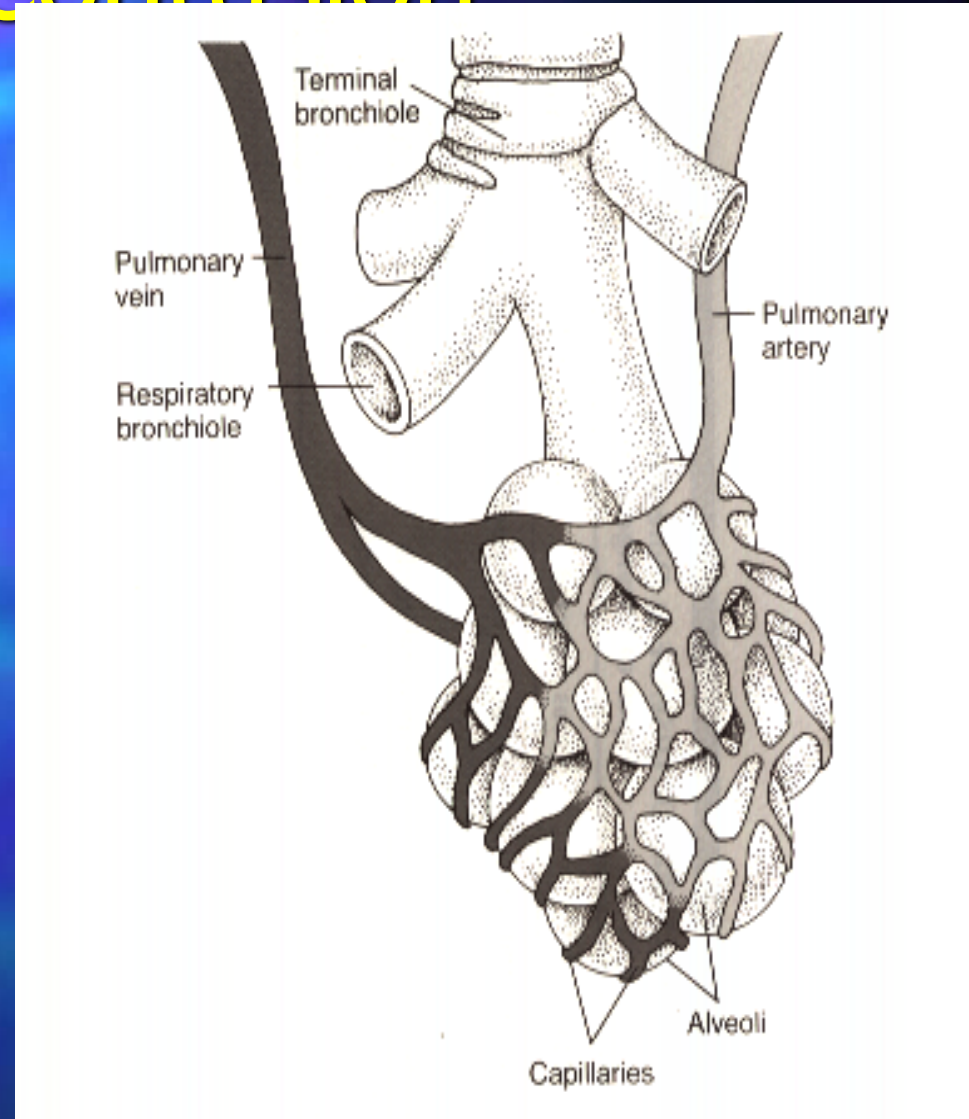
- ❑ Rib fracture is the most common thoracic injury
- ❑ Flail chest is another common problem
- ❑ Significant intrathoracic injury may be present without rib fracture in children due to rib cage elasticity
- ❑ Narcotics and intercostal nerve blocks are sufficient for simple rib fractures

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.

Pulmonary Contusion

- 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 Injuries



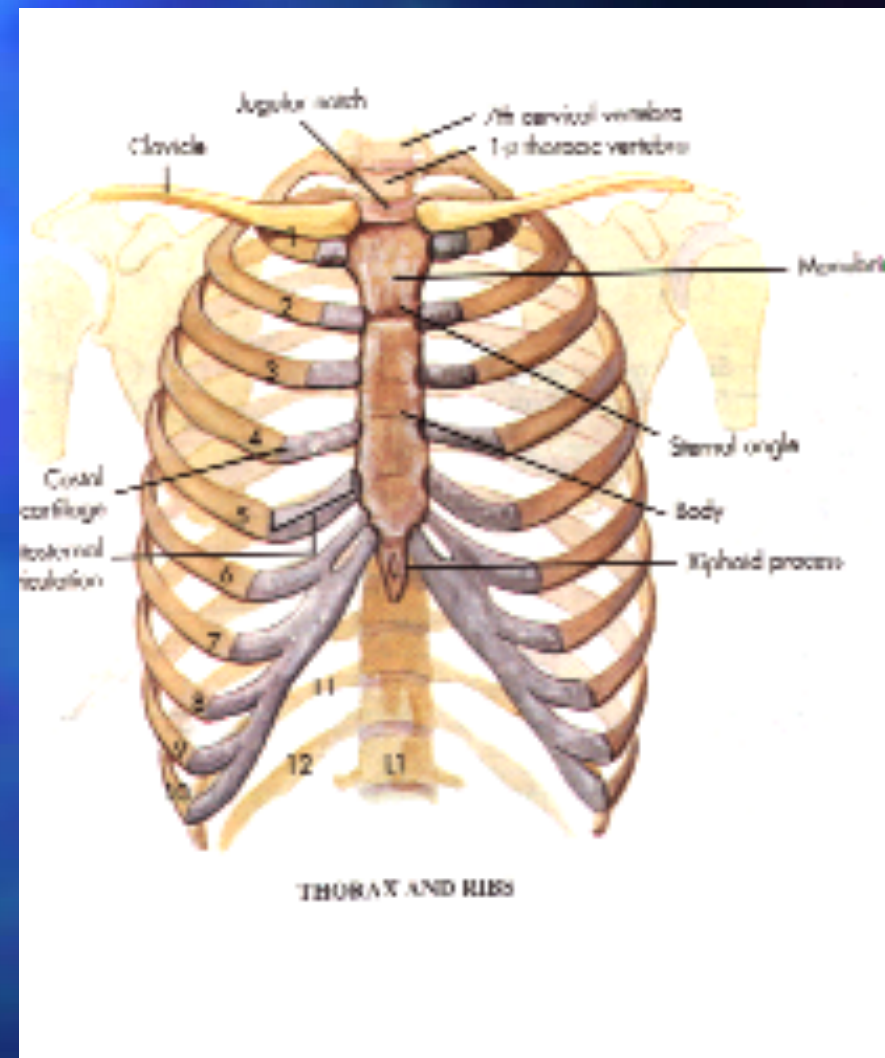
blunt thoracic trauma shows surgical emphysema and pulmonary hemorrhage left upper lobe. The patient presented with hemoptysis following injury

Initially asymptomatic

- May progress to respiratory failure
- 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

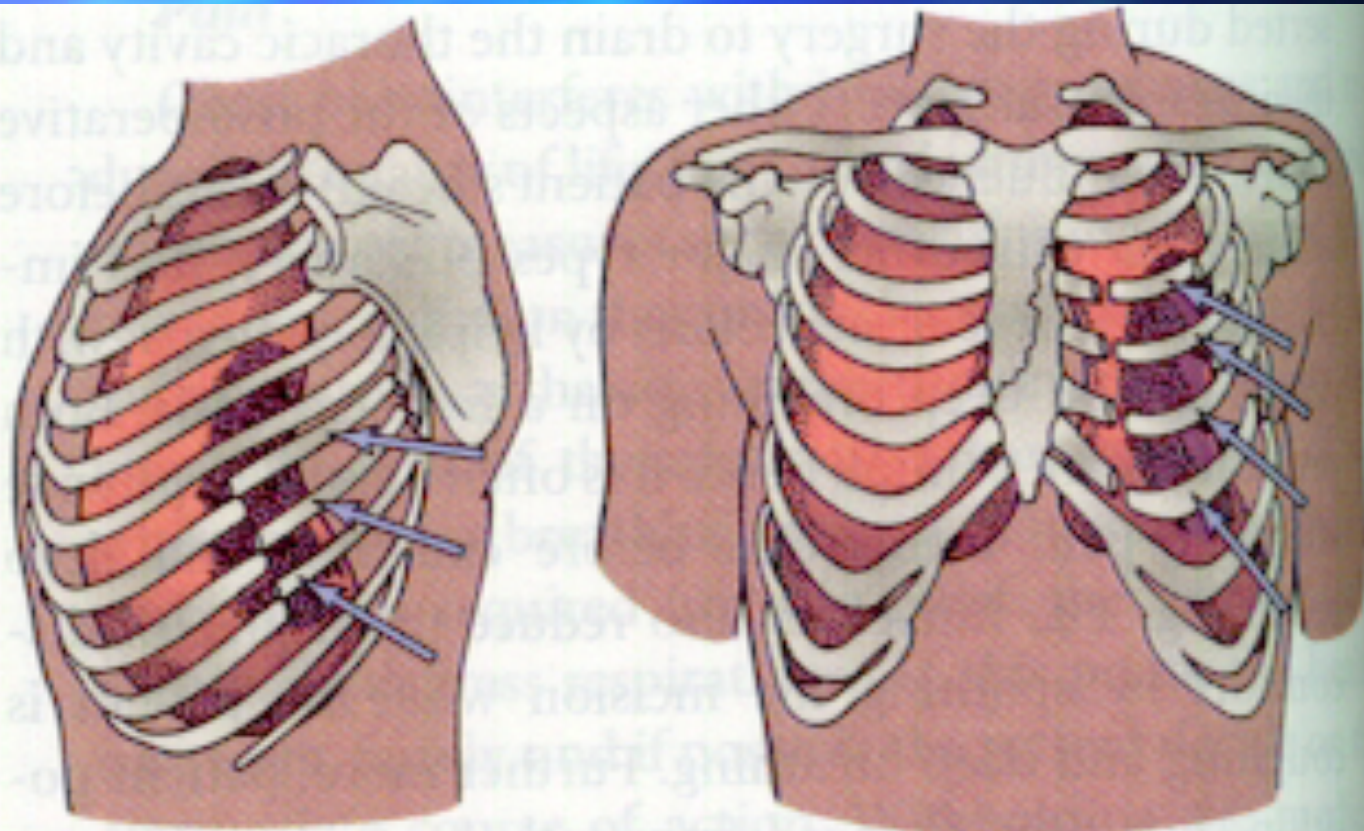


Figure 13-11. Two examples of flail chest, one on the lateral and one on the anterior portion of the chest wall. Several adjacent ribs are fractured in two places. Arrows indicate direction and force of injury.

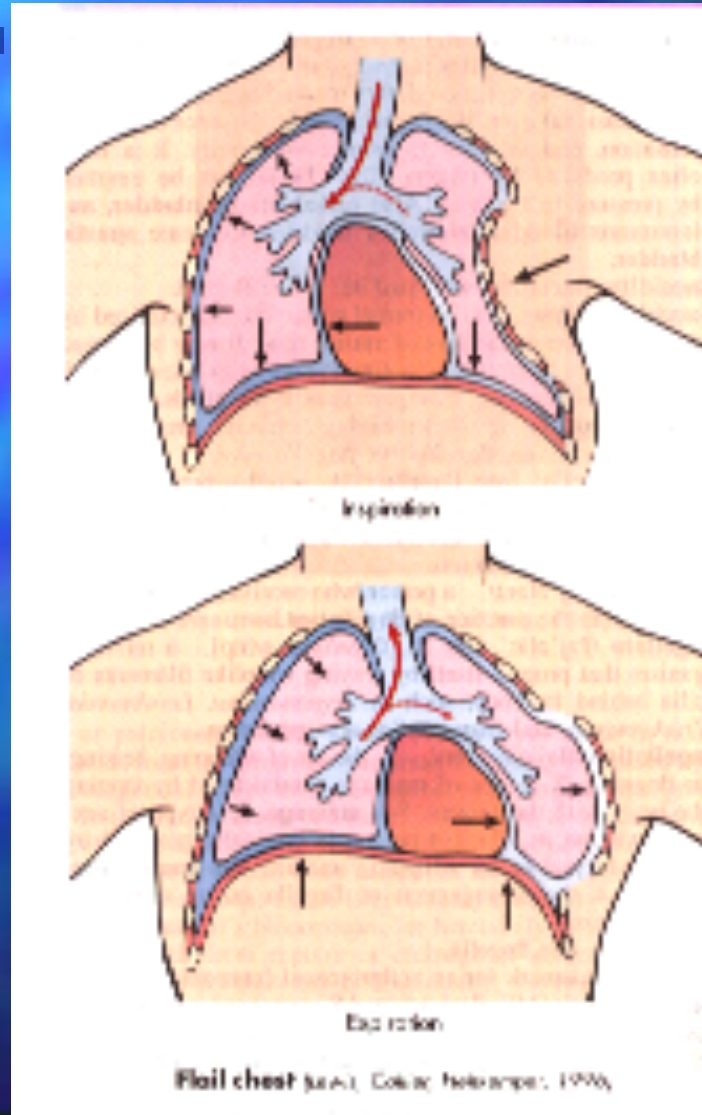
Paradoxical Respiration

- 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 paradoxical

Flail Chest

□ Inspiration

□ Expiration



Assessment

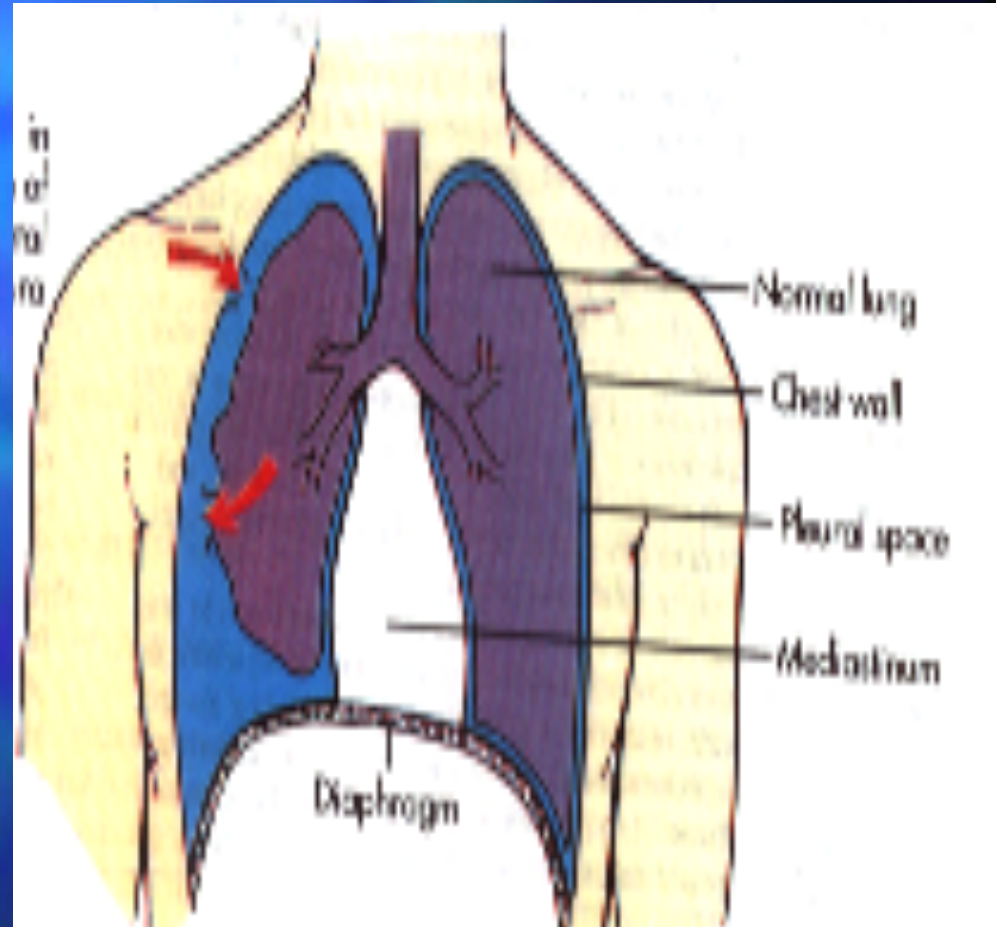
- ▣ Paradoxical Chest Movement
- ▣ Dyspnea
- ▣ Cyanosis
- ▣ Tachycardia
- ▣ Hypotension
- ▣ Shallow respirations
- ▣ Tachypnea
- ▣ Chest pain
- ▣ Diminished Breath Sounds

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



Types

- **Open pneumothorax** = opening through chest wall
- **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 under skin)

Development of Spontaneous Pneumothorax

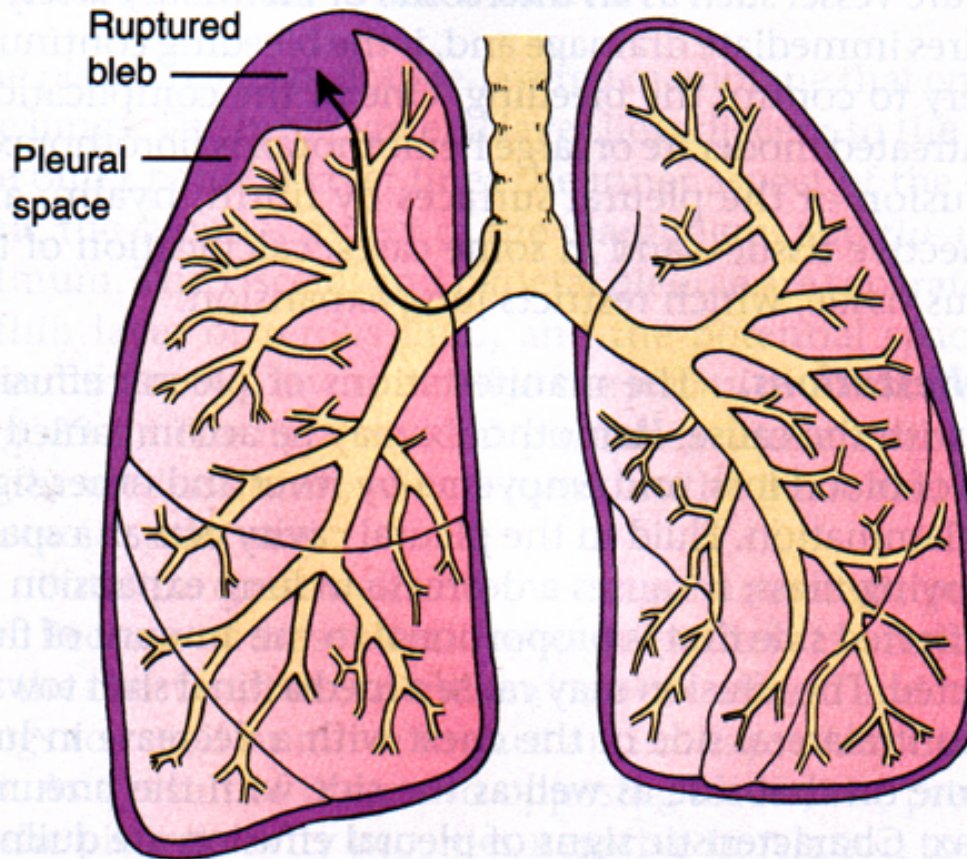
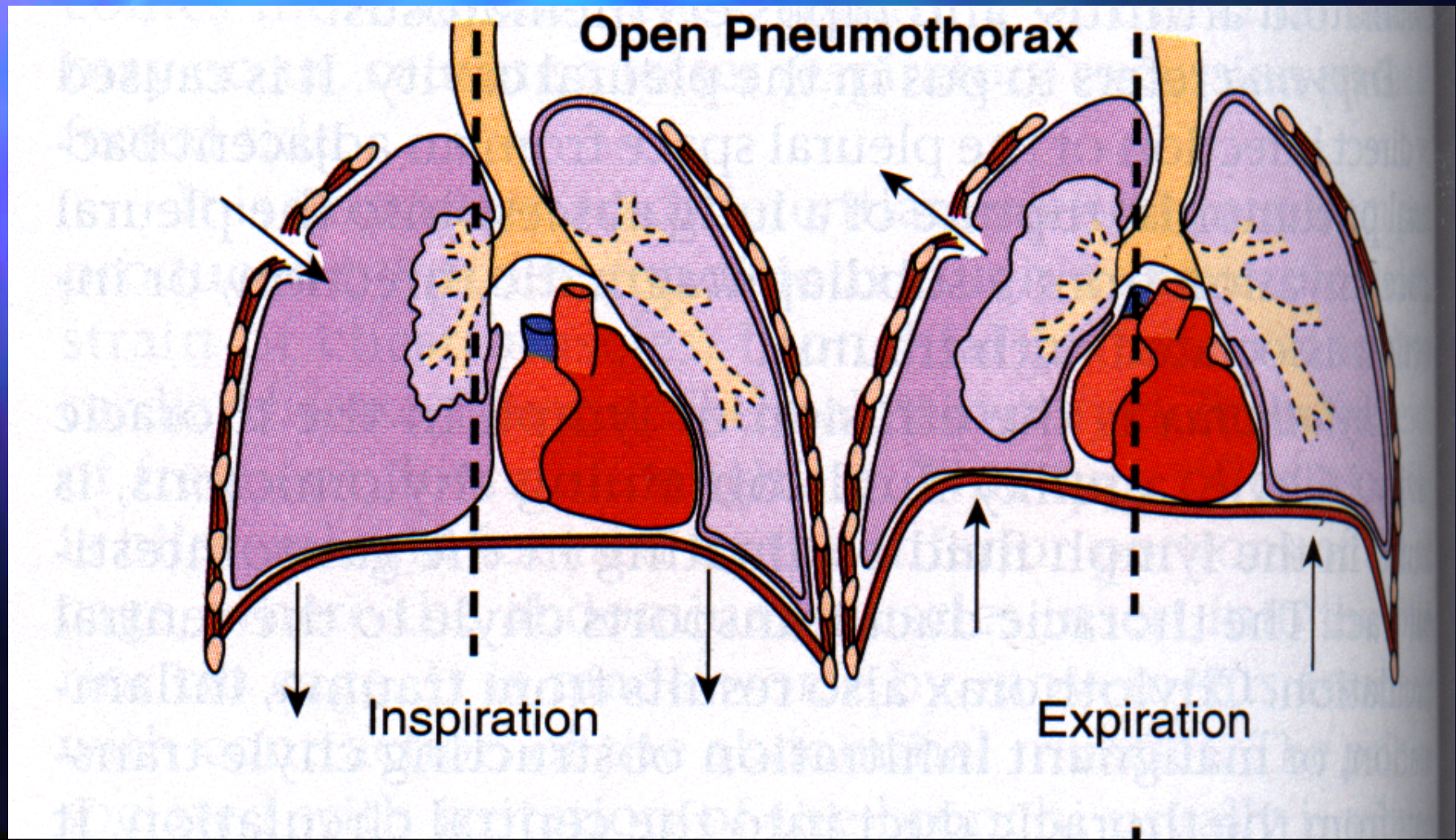


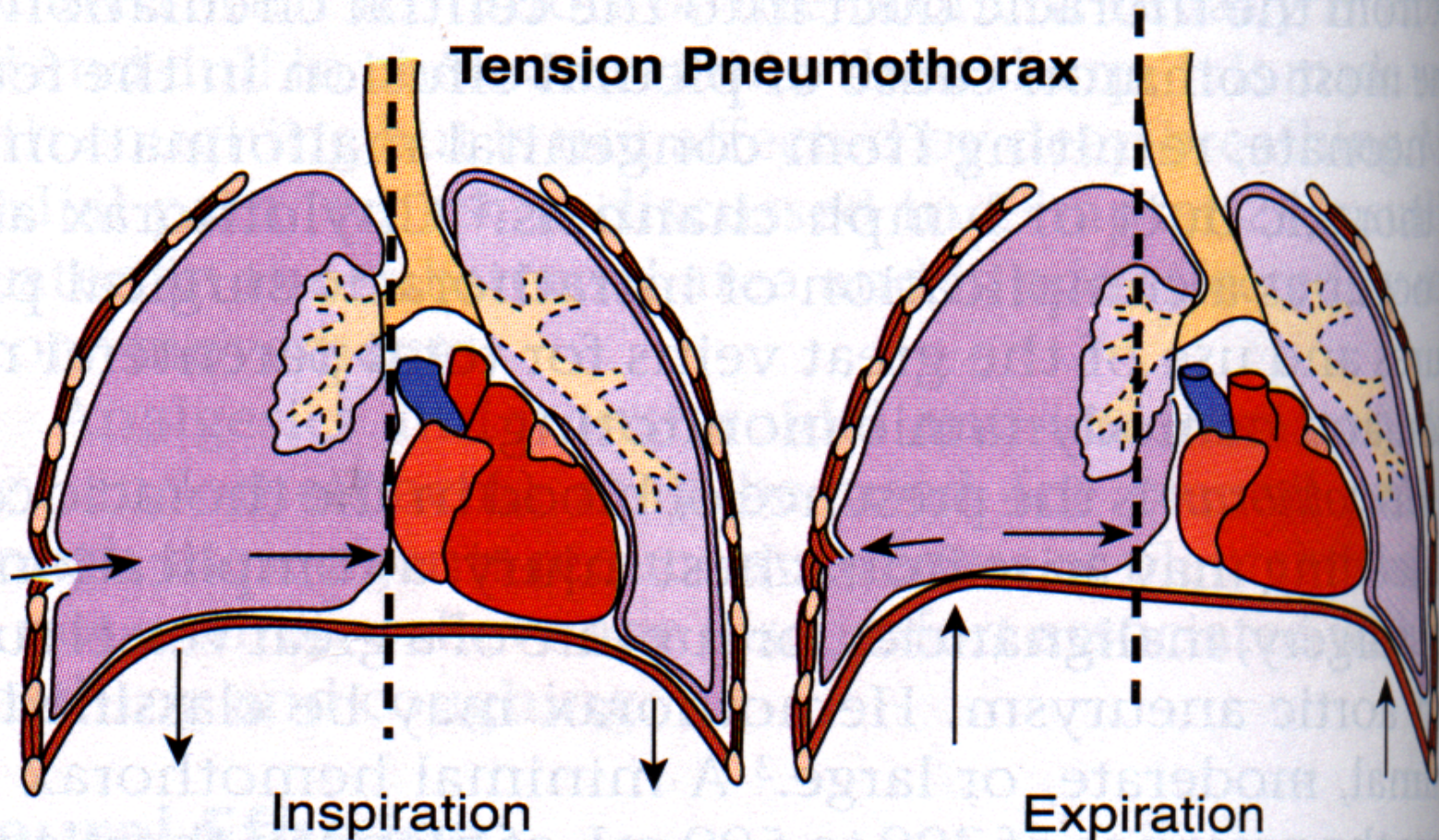
FIGURE 29-2 Mechanism for development of spontaneous pneumothorax.

Open or Communicating Air moves in and out no shift



Tension Pneumothorax

- Air only moves in
- Pressure pushes to unaffected side
- Creating mediastinal shift



Assessment

- ❑ 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

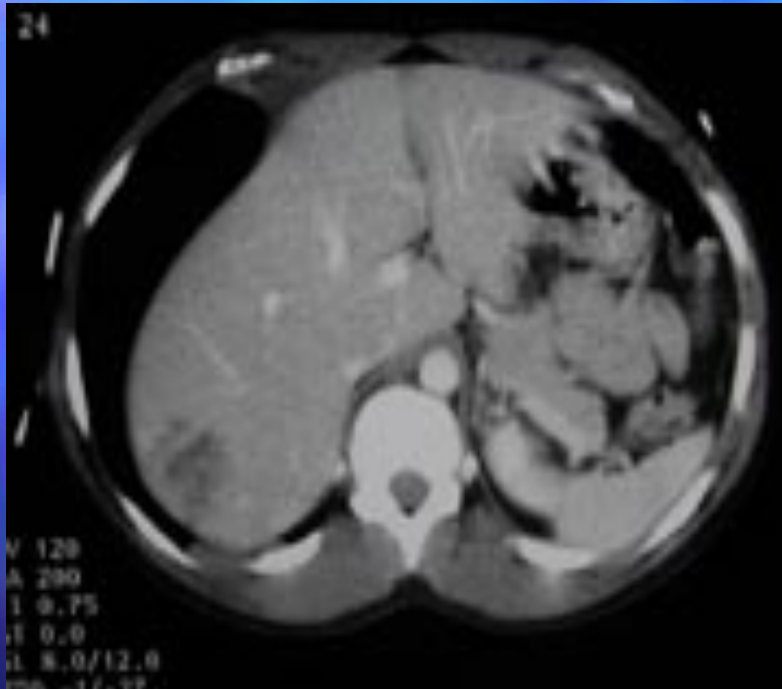
- Pressure dressing to open wound
- Oxygen
- Prepare for chest tube insertion
- Monitor Chest tube with water seal until fully expanded
- Monitor for subcutaneous emphysema (crepitus)

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



**Tension extends
tension
behind liver
pneumothorax**



Right

Open pneumothorax



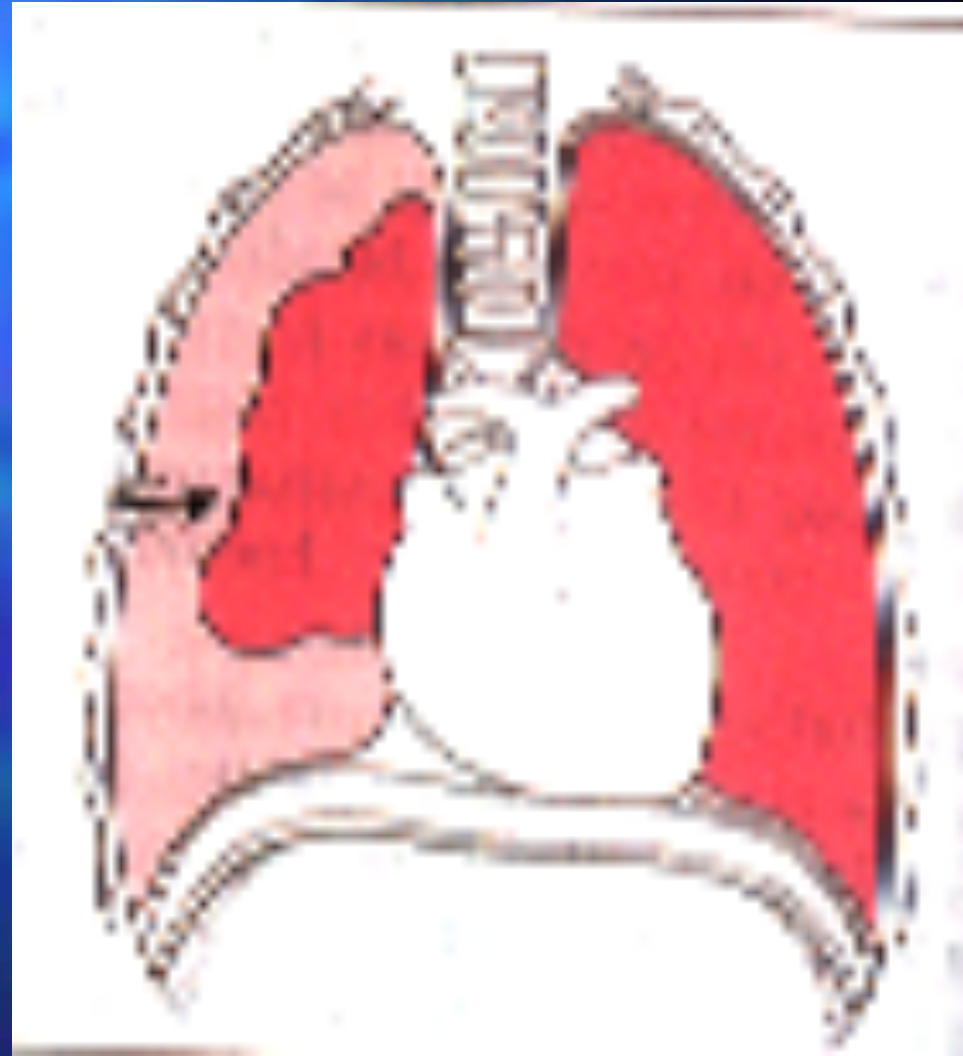
**Open pneumothorax
back**



**Stab wounds to
back**

Hemothorax

- **Simple** = blood loss <1500ml into thoracic cavity
- **Massive** = > 1500 ml
- Due to blunt trauma or penetrating injury
- R/T Pulmonary contusions or lacerations or rib fractures



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

- May be asymptomatic
- Respiratory distress
- Diminished breath sounds
- Dull on percussion
- Chest x-ray confirms blood in pleural space

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

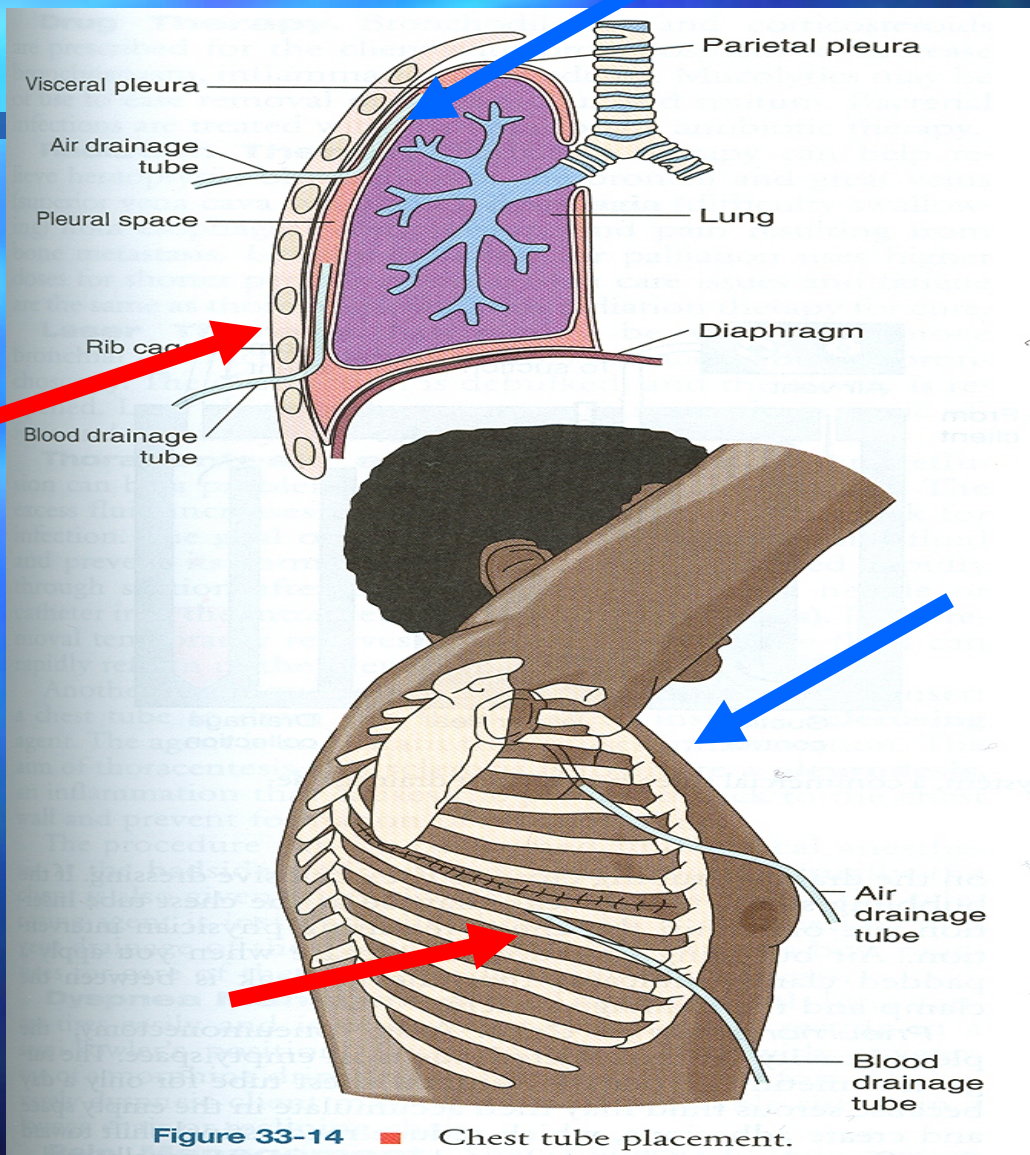


Figure 33-14 ■ Chest tube placement.

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
- Scrubbing & 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.



Cardiac/Great Vessel Injuries

- ❑ 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

Cardiac/Great Vessel Injuries

- 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

Cardiac/Great Vessel Injuries

- 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 aorta-distal aorta shunting, and cross-clamping without cardiopulmonary bypass

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

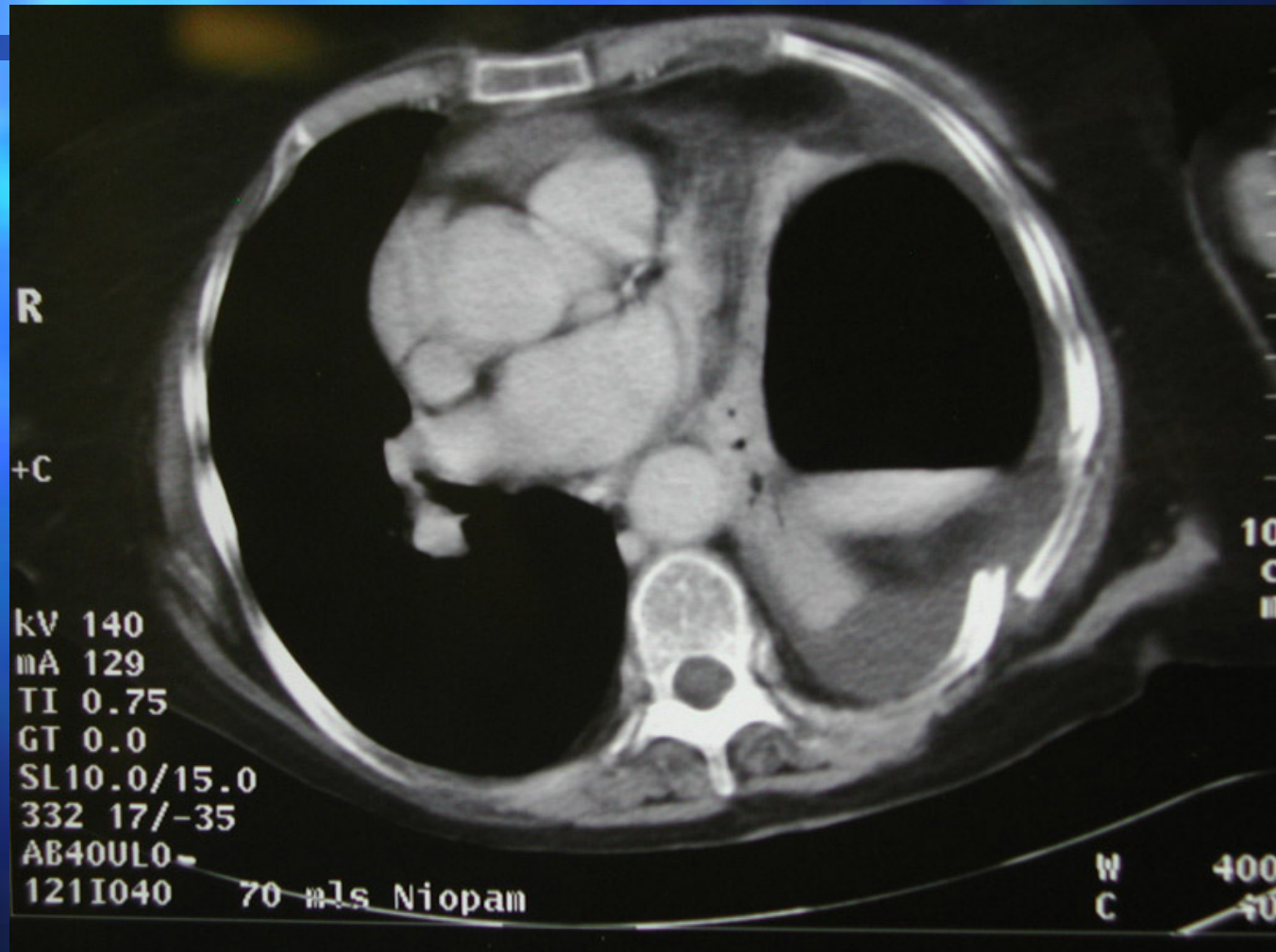
Diaphragm Rupture

- 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

Diaphragm Rupture



Diaphragm Rupture



Cardiac/Great Vessel Injuries

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

Right ventricle	43%
Left ventricle	34%
Right atrium	16%
Left atrium	7%

- 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 tamponade
- Hypotension that does not respond to rapid volume replacement suggests significant injury
- CXR, ECG, and echocardiography have **little** diagnostic value in these patients
- **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

Cardiac/Great Vessel Injuries

- ❑ Subxiphoid pericardial window is preferred for tamponade, however, and should be performed in the operating room, as the patient may rapidly exsanguinate
- ❑ 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,
 - inadequate ventilation PaO₂ < 60 , PaCO₂ >

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
- 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

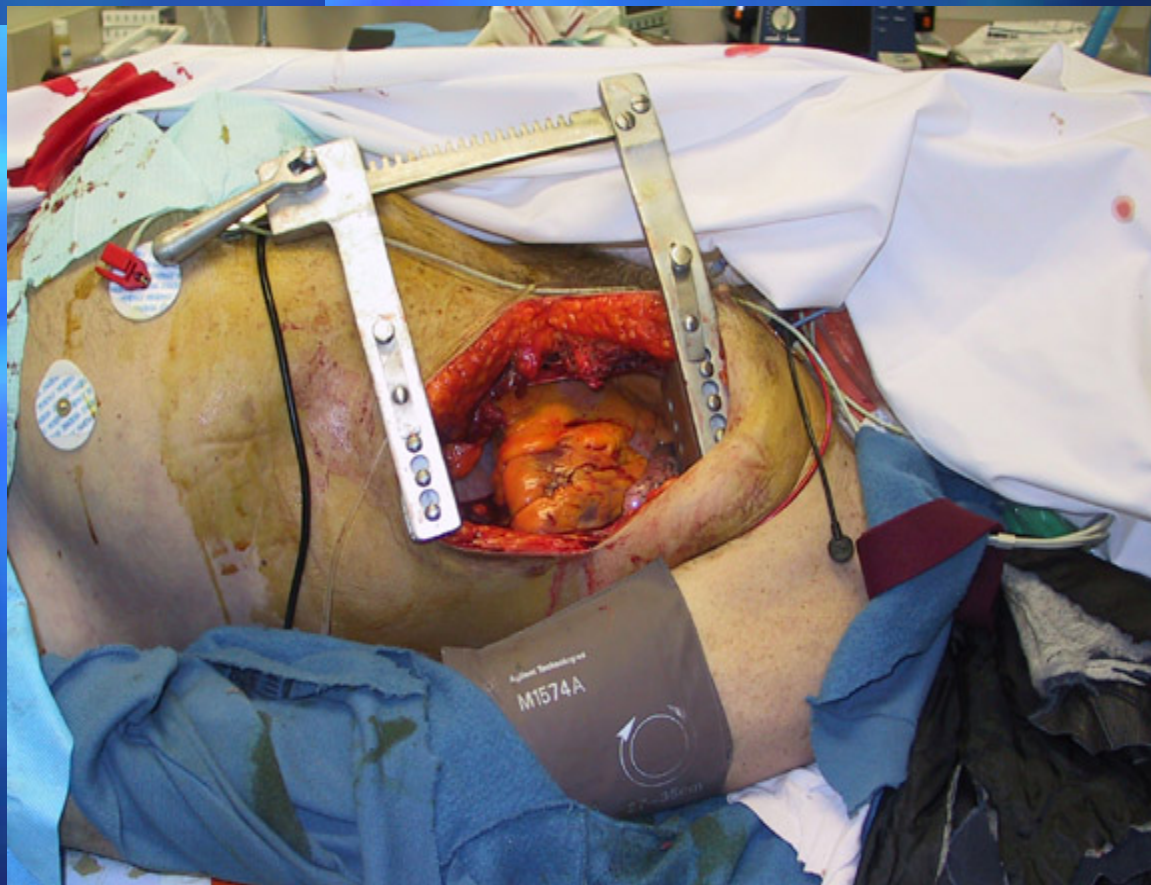
- control hilar bleeding

- perform open cardiac massage

- redistribute blood to myocardium and brain

- limit sub-diaphragmatic hemorrhage via aortic cross-clamping

thoracotomy



THANK YOU