CHEST INJURIES

By

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Surgical Importance:

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

**Blunt trauma** to the chest is fatal in 10% of cases, rising to 30% if other injuries are present.

**Penetrating injuries** have a mortality rate of 3% for simple stabbing to 15% for gunshot wounds.
AETIOLOGY & MECHANISM OF INJURY

1- Blunt trauma:
- Direct blow to the chest
- Fall from a height
- Car accident

2- Penetrating trauma
- Stab wound (low velocity)
- Gun shots (high velocity)

3- Blast injury (explosive injuries)
Fig. 1 Deceleration type automobile accident.
Fig. 5 High and low velocity bullets.
Fig. 6 Cavitation caused by a high velocity bullet.
Fig. 29 Knife wound of the chest passing through the pericardium. A near miss.
Clinical types

- 1- simple rib fracture & flail chest
- 2- pneumothorax
- 3- haemorrhax
- 4- contusion or laceration of the lung
- 5- cardiac injuries
- 6- injuries to major blood vessels
- 7- diaphragmatic injuries
- 8- oesophageal injuries
Pre-hospital care

- Done by well trained paramedical personnel (Basic Trauma Life Support Training Course).
- Need ambulance cars, aircrafts, & helicopters.
The prehospital medical services include support of:

- the patient’s *airway, breathing, and circulation (ABCs)* & stoppage of *external hemorrhage*.
- iv lines, & iv fluids in the field.
- Spinal protection (*cervical & lumber*), immobilization, splinting.
- *Rapid transport to a trauma center*.
Fig. 13 On-site resuscitation (a) and helicopter transportation (b) of a patient with major injuries.
Hospital care

- The 3 R management plan is useful: Resuscitation – Review – Repair
1- Resuscitation

- **ABCDE done by a team work:**
  - Maintain a patent airway and restore the blood volume.
  - **Maintain a patent airway**
    - Remove an oral foreign body; dentures, food particles, etc.
    - Blood and secretions are removed from the oropharynx by suction.
    - Occlude sucking chest wound with dressing
  - **Stop an external bleeding & maintain the circulation.**

- If *laryngeal & pharyngeal reflexes are present* → forward tongue retraction with insertion of an oral *(air way).*

- Absent reflexes → **endotracheal intubation**
Relief of airway obstruction.
Airway Tubes
Endotracheal intubation

You can do:

- **Tracheostomy** in cases of **failed intubations**
- **Laryngotomy when** tracheostomy set is **not** available (insert **needle** just below the thyroid cartilage)
- Then do thorough tracheal & bronchial aspiration.
Needle in trachea to establish temporary airway.
**Indications of ventilation in chest injuries:**

**Five main factors:**

1. Multiple rib fractures with *Severe Pain* interfering with coughing.

2. *Flail chest* → multiple bilateral or two rows fractures (unilateral).

3. Extensive *pulmonary contusions*.

4. Massive *haemo or pneumothorax*.

5. Associated *head injuries* with respiratory depression

**NB:** Always do a chest tube before ventilation.
Urgent actions:

1- Severe pain, strong analgesic is given (morphia is contraindicated in associated head injuries)

2- Tension pneumothorax is deflated by a needle in 2nd IC

3- Thoractomy is done in case of uncontrollable bleeding.

4- If there is cardiac tamponade, needle aspiration of the pericardium is life saving until more controlled surgery to be performed.

5- In serious chest injuries, admit the patient to ICU.
5- Insert 5 tubes:

1) bilateral iv canulae (16G )
2) urethral catheter
3) NGT
4) CVP canula

Push IV fluids (Ringer’s lactate)

Once the patient has been stabilized;

Do the next step:

Review
2- REVIEW

- It includes:
- 1- History taking: AMPLE
  (allergy, medications, past history, last meal & event of the accident)
- 2- Measure "vital signs"
- 3- Assess roughly the level of consciousness:
  AVPU (alertness, verbal response, pain response, or un response)
4- Do full clinical examination:

- **Inspection** of the chest wall;
  *the frequency & pattern of breathing, external evidence of trauma of the thorax.*

- **Palpation** will detect;
  *surgical emphysema, paradoxical movement and a stove-in chest.*

- **Auscultation and percussion** should reveal;
  *the existence of a pneumo & or haemothorax, rib fractures & flail chest wall*

  &

  **Look for associated injuries**
5- Investigations:

- Blood samples for blood groups & cross matching, CBC, electrolytes, etc.
- X ray chest, CT & further treatment decided on the basis of the patient’s condition and the radiographic result.
After doing those measures?

- **Classify your patient into:**
  - **1- Highest priority:**
    - Cervical Fr.
    - Thoracic injuries.
    - Cardiac injuries.
    - External bleeding from big vessels.
2- High priority
- Abd. Injuries
- Head injuries (including brain injuries)
- Fracture of long bones with extensive soft T. injuries.

3- Low priority
- GIT injuries
- Periph. Vascular & nerve injuries.
- Fr. & dislocation
- Facial & soft tissue injuries.
3- REPAIR (definitive treatment)

- Chest wall injuries.
- Localised rib fracture
  - Pain, tenderness & crepitus at the fracture site.
  - Uncomplicated fractures require analgesia or an intercostal nerve blockade.
- Encourage a normal respiratory movement and effective coughing (physiotherapy).
- Chest strapping or bed rest is no longer advised.
With plain X ray; 2 ribs fractured
The same patient with 3 D.CT, 6 ribs fractured
2- Flail chest

More than 4 ribs are fractured in **two places:**
on one side of the chest (lateral)
*(on either side of the sternum, anterior)*;
**called stove in chest**

The flail segment moves paradoxically, *inwards during inspiration and outwards during expiration,* with side to side movement of the heart & mediastinum (*mediastinal flutter*); thereby reducing effective gas exchange.
Flail chest:  A- lat. Flail.  B- ant. Flail (stove in)
**Treatment of flail chest:**

- If not affecting oxygenation, treat with analgesia & regular blood gas analysis until the flail segment stabilizes.

- In case of impaired oxygenation, endotracheal intubation with:
  - *Intermittent positive pressure breathing (IPPB) for up to 3 weeks*
    Until the fractures become fixed.

- Thoracotomy with fracture fixation is indicated if there is an underlying lung injury to be treated at the same time.
2- Pleural injuries

An erect chest X ray to confirm or exclude pneumothorax or haemorthorax.
Traumatic pneumothorax

- Blunt or penetrating trauma to the chest wall may result in a lung laceration from a rib fracture.
- Air comes from the lung or from the atmosphere
- **3 types:**
  - 1- simple
  - 2- open
  - 3- tension
- Clinically; decreased air entry on the affected side & the trachea may be pushed to the opposite side.
- There is an increased percussion note (resonance).
• **Simple pneumothorax**
• Limited amount of air
• No mediastinal shift
• If there is no marked dyspnea, treated conservatively
• For patient with dyspnea, do *intercostal chest tube*
2- Open pneumothorax

Wound in chest wall (sucking chest wound) leading to communications between pleural space & atmosphere

During inspiration air passed outwards through the cutaneous wound.

Lung collapse & mediastinal shift to & fro (mediastinal flutter)

1- The wound is closed at first with dressing then repaired surgically at OR.

2- Insert chest tube
3- Tension pneumothorax

- Causes:
  1- A small valve like wound of the visceral pleura allows air to accumulate in the pleural cavity during inspiration.
  2- A pleuro-cutaneous wound that allows air to enter but not pass out of the pleural cavity.
  3- Also, coughing, straining, or positive pressure ventilation may result in tension pneumothorax.
Treatment is **urgent** and **before X ray chest** can be taken.

- A wide-bore needle introduced into the affected side, **in 2nd I.C. space** will release any air under tension and is life saving.

- Then a wide-bore intercostal tube is introduced in 5th IC space midaxillary and directed to the apex of the pleural cavity.

- A second drain may be introduced basally to drain blood.
Tension pneumothorax with mediastinal shift
Relief of pneumothorax. Tension pneumothorax must be immediately decompressed by a needle introduced through the second anterior intercostal space. A chest tube is usually inserted in the mid-axillary line at the level of the nipple and is directed posteriorly and superiorly toward the apex of the thorax. The tube is attached to a "three-bottle" suction device, and the rate of escape of air is indicated by the appearance of bubbles in the second of the three bottles. Cessation of bubbling suggests that the air leak has become sealed.
Traumatic haemothorax.

- Due to blunt or penetrating injuries
- Bleeding comes from intercostal or internal mammary vessels.

*Chest tube using a wide bore tube (>28 Fr).*

- Continuing blood loss in excess of 200 ml/hour, clotted or encysted blood require urgent thoracotomy.
Multiple rib fracture with haemthorax
Fig. 7 Haemothorax following a bullet wound to the right chest.
Some special injuries:

1- First rib fracture.

Fracture of the first rib should alert the clinician to a potentially serious chest injury, such as injuries to the great vessels.

The mortality rate associated with a fracture of the first rib exceeds 30%.
- **2- Injury of thoracic vertebrae**
  - Usually stable
  - A quick **neurological examination** confirming the integrity of the nerve supply to the **lower limbs** (paraplegia) should be performed and documented.
3- Lung contusions:

- Persistent air leak require thoracotomy.
- Avoid infection by early mobilization, prophylactic antibiotics, suction drainage and physiotherapy.
Haemthorax with left lung contusion
4- Major airways injuries

- 1- Injuries to major bronchi
- 2- Injury to the trachea

Infrequently seen.
There is usually a combination of surgical emphysema, haemoptysis and pneumothorax.
less than 25% of patients survive to reach hospital.
The treatment is exploration and repair if possible.
Fig. 27 Stab wound involving the trachea and causing extensive subcutaneous emphysema of the face and neck.
5- Diaphragmatic rupture

- Caused by a high-speed blunt abdominal trauma.
- More commonly on the left hemi-diaphragm (the right is protected by the liver).
- Colon and stomach may herniate into the thorax displacing the lung.
- Bowel sounds may be heard in the chest and the chest radiograph may reveal bowel gas in the lung fields.
Diagnosis

- A barium study will confirm the diagnosis. Occasionally, the injury is overlooked and the patient presents later on with a diaphragmatic hernia.

- Treatment is by thoracotomy to reduce the bowel and repair the diaphragm.
6-Oesophageal injury

- Perforation of oesophagus leads to mediastinitis (a very dangerous).
- The management of penetrating trauma to the oesophagus is by urgent repair.
7-Cardiac injury

- Major injuries to **the heart and great vessels** from blunt trauma are **frequently fatal**.
- **Clinically:**
  - Profuse external bleeding
  - Massive hemothorax
  - Cardiac tamponade (Beck’s triad)
    - 1- engorged neck veins
    - 2- faint heart sounds
    - 3- hypotension
  - There may be **arrhythmias and signs of heart failure.**
Fig. 24 Cardiac tamponade after a stab wound. (a) Plain chest radiograph.
Fig. 24 Cardiac tamponade after a stab wound. (b) Distended neck veins confirm the diagnosis.
Treatment

- **1- Life saving measure**
- **Aspiration of cardiac tamponade**
- Inert a long needle below & to the left of xiphoid process, directed to the the tip of left scapula
- **Left thoracotomy** is indicated to deal with big problems such as ruptured aorta, ruptured cardiac chamber or massive haemothorax
The indications for thoracotomy

1- 500—1000 ml of fresh blood at the time of initial drainage.

2- Continued bleeding (>100 ml/15 min) from the intercostal drains.

3- Continued bleeding of >200 ml/h for 3 or more hours from the intercostal drains.

4- Rupture of the bronchus, aorta, oesophagus or diaphragm.

5- Cardiac tamponade (if needle aspiration is unsuccessful)
Thoracotomy incision
Management of Penetrating injury

- At first: wound dressing and intercostal tube.
- Resuscitation as usual
- In OR; explore the track of bullet and stab wounds in the chest to exclude damage to the heart, great vessels, and the diaphragm and abdominal viscera in addition to the lung injury.
THANK YOU