Patient With An Intercostal Chest Drain.

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Patient with an intercostal chest drain
- Short case / Radiology viva.
- Short case: History, examination, diagnosis.
- Lead the viva
- Viva:
  - Flail chest
  - Pneumothorax
  - Chest drains

Flail Chest
- What is a flail chest?
- How do you manage a patient with a flail chest?
- Is prophylactic intubation and mechanical ventilation essential?

Flail Chest
- Paradoxical movement of a segment of chest wall caused by fractures of 3 or more consecutive ribs at 2 or more places.
- Treatment: pulmonary contusion, pain, and possible acute respiratory failure.
- Mere presence of a flail segment on chest x-ray is not an indication for “prophylactic” intubation and mechanical ventilation.

Pneumothorax
- What is pneumothorax?
- What is its etiology?
- How many types can you enumerate?

Pneumothorax
- Air or gas in the pleural cavity
- Etiology:
  - Trauma (blunt or penetrating)
  - Barotrauma (IPPV / PEEP)
  - CVP placement / CPR / PCDT
  - Pneumoperitonium
  - FOB bronchoscopy with closed-lung biopsy.
Pneumothorax

• Types:
  Primary spontaneous
  Secondary spontaneous
  Traumatic
  Tension

Primary Spontaneous Pneumothorax

• Tall young people without lung disease.
• Smoking / females / familial, recurrent.
• Rupture of apical pleural blebs.
• Linked genetic disorders: Marfans / homo cystinuria & Birt-Hogg-Dube syndrome
• Gene identified, located on CH – 17.

Sign & Symptoms.

Early findings
• Pain / Dyspnea / Tachypnea / Tachycardia
• Hyper resonance of the chest wall
• Decrease breath sounds on the affected side.
• Pulsus paradoxus

Late findings
• Decreased level of consciousness
• Tracheal deviation / Hypotension
• Distension of neck veins / Cyanosis

Pulsus paradoxus

• Decrease in systolic arterial pressure that normally accompanies the reduction in arterial pulse amplitude during inspiration is accentuated.
• ‘Paradox’ refers to the fact that heart sounds are heard over the precordium when the radial pulse is not felt.
Pulsus paradoxus

- Measurement
- When the differences between the 2 levels exceeds 10 mm Hg paradox pulse is present.
- Reverse pulsus paradox
  - Rise in SBP during inspiration, in patients with IHSS and patients of LVF on positive pressure ventilation.
  - A rise in peak systolic pressure on inspiration by more than 15 mm Hg is considered significant.

Pulsus paradoxus: Causes

**Cardiac causes**
- Cardiac tamponade / Pericardial effusion / Constrictive pericarditis / Restrictive cardiomyopathy / Pulmonary embolism / Acute MI / Cardiogenic shock

**Extra cardiac pulmonary causes**
- Bronchial asthma / Tension pneumothorax.

**Extra cardiac non-pulmonary causes**
- Anaphylactic shock / Volvulus of the stomach / Diaphragmatic hernia / SVC obstruction / Extreme obesity.

Pneumothorax

- How would you recognize it under anesthesia / in an ICU patient who is being mechanically ventilated?

Cyanosis

Desaturation

Signs in ventilated patients.

- Increased pleural pressures necessitate an increase in peak airway pressure in order to deliver the same tidal volume.
- Decreased expiratory volumes secondary to air leakage into the pleural space.
- Increased end-expiratory pressure, even after discontinuation of PEEP.
- Tachycardia, hypotension, hypercarbia.
- Nitrous oxide

CHEST DRAIN
Why do you need an intercostal chest drain?

What are the components of a chest drainage system?

Chest Drains

To evacuate air / fluid into a closed collection system to restore
* Negative intra-thoracic pressure
* Promote lung expansion
* Prevent lethal levels of pressure from developing in thorax

Indications

- Significant pneumothorax. > 30%
- Lessor pneumothorax - Requiring ventilation, air shifting
- Hemothorax, Empyema
- Chylothorax, Pleural Effusion
- Hydopenemothorax

Chest Drains: Sites

- 4th - 5th I/C space in Anterior axillary line.
- 2nd I/C space in Mid clavicular line.
- Superior border of the underlying rib.

What are the indications of inserting a chest drain?

What are the sites of insertion?
Chest drain Insertion

Triangle of safety

- Posterior border of Pectoralis Major
- Anterior axillary line
- 6th Rib
- Anterior border of Latissimus Dorsi

Pneumothorax

Are all to be drained?
How can you calculate the size?

Pneumothorax size - Measurement

- L/T volume \( \alpha \) to their diameter cube
- Length spine to lateral chest wall - 8cm
- Pneumothorax 2 cm from chest wall
- Volume of lung - (6cm)\(^3\) = 216 cm
- Volume of hemithorax - (8cm)\(^3\) = 512 cm
- Lung size = 216/512 = 42%
- Pneumothorax size = 58% size

Chest Tubes

- Red rubber / Silastic PVC
- Right angled / straight
- Sizes 6 - 40 F / Infants: 6 - 24 F
- Adults: 24 - 28 for air, 32 - 34 for pleural effusion, 36 - 40 for blood / pus

Chest Drains: Drainage Bottles

- Simple system: single bottle
- Large bottle (8in. / 20cm)
- Disadvantage: increasing resistance as bottle fills
- 1/2/3 bottle systems
- Heimlich Valves

Physics & physiological aspects

- Under water seal - A one way valve
  Produces a siphon effect, enhances drainage
- Distal end of drainage tube 2 cm below water
  (The depth determines the hydrostatic pressure needed to overcome during expiration)
Physics & physiological aspects

• **Collection chamber always 100cm below the chest.** (To prevent the chamber fluid getting sucked up the tube during obstructed inspiration).
• **Large diameter collection chamber (20cm diameter)** (To prevent loss of underwater seal as water moves up the drainage tube during deep inspiration).

Complications

- Incorrect positioning
- Intra thoracic / abdominal injury
- I/C neurovascular bundle injury
- Re-expansion pulmonary oedema
- Accidental disconnection
- Infection / Obstruction

Management of Chest drain

- Bubbling chest tube - never to be clamped.
- Controlled drainage for large pleural effusions
- Re-expansion pulmonary edema.
- Avoid clamping in pneumothorax

Avoiding Re Expansion PE

- Mild symptoms: Chest discomfort & cough.
- Suggestions: Clamp for 1 hour after 1 litre.
- No standard recommendations.
- Not more than 1- 1.5 liters at one time.
- 500 ml per hour.

Suction to a chest drain

- How?
- How much?
- Type of patients
- Disadvantages -- Infection.
Contraindications

- Lack of Air fluid
- Coagulopathy
- Complications
- Malposition
- Hemorrhage

CHEST DRAIN CARE

- Avoid clamping, examine daily
- Keep below the level of patient
- Tight fittings connections / no kinking
- Milking with caution
- Pain
- Serial X-rays - Proximal holes

Removal of chest drains

- 24 hours after drainage stopped
- At removal ask patient to inhale deeply and perform Valsalva
- Chest drain removed swiftly
- Purse string suture closed
- Check CXR

Where as an anesthetist would you come across pneumothorax?

Anesthetist & Pneumothorax

- Trauma
- ARDS
- Urology
- Monitoring
- Pain clinics and nerve blocks
- PCDT

Examiner describes a patient in A&E and features of tension pneumothorax

1. How would you treat him.
2. Draw the arrangement of a chest drain bottle
3. How far does the tube go in the water & why?
4. Why is the bottle so large?
Questions

5. Why mustn't you lift the drain above the patient?
6. Draw the arrangement of three bottles.
7. What do you do if the drain stops bubbling?
8. Anesthesia implications.