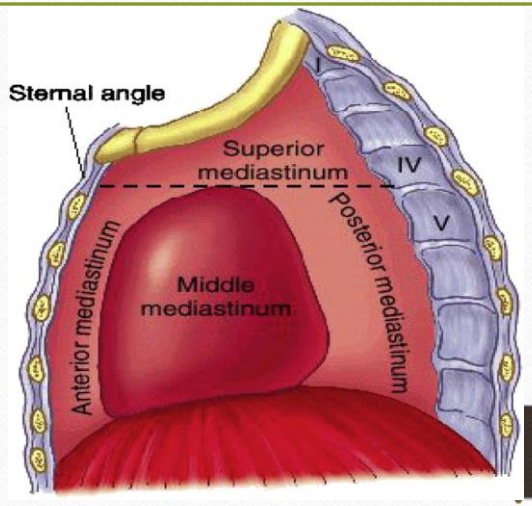
دانشگاه علوم پزشکی و خدمات
بهداشتی درمانی کرمان



pneumomediastinum

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AKA mediastinal emphysema

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What is pneumomediastinum?

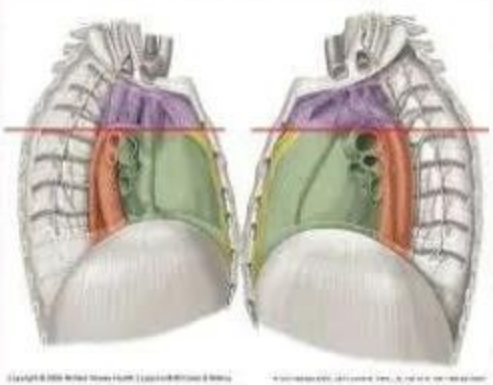
Pneumomediastinum, also known as mediastinal emphysema, is a condition in which air is present in the mediastinum (the space in the chest between the two lungs). This can be caused by a traumatic injury or in association with pneumothorax or other diseases.

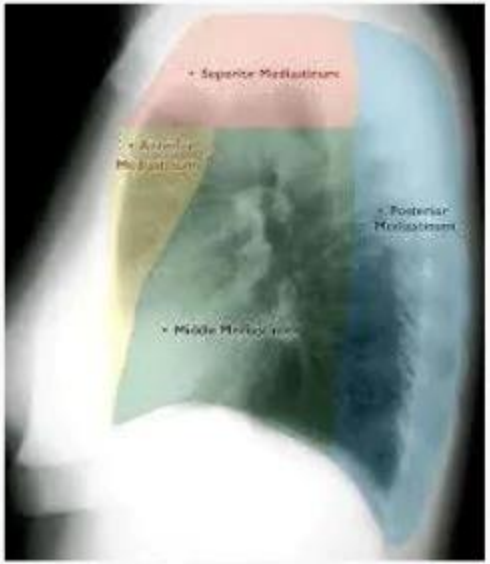
Epidemiology

- Spontaneous (20%) or secondary (traumatic & iatrogenic) (80%)
- Incidence of 1 in 30 000 emergency dept presentations
- Peak incidence in late infancy / early childhood thought to be due to increased respiratory infections
- More common in thin young men (M:F 2:1)

Anatomy of the Mediastinum

- Borders
- Divisions
- Contents





Spontaneous Pneumomediastinum – the Macklin Effect

- Increased alveolar pressure → alveolar rupture
- Gas tracks through interstitium along bronchovascular sheaths toward mediastinum
- Gas dissects to the hilum, through loose mediastinal fascia into the subcutaneous tissues of the mediastinum, neck, chest wall, upper limbs.
- Results in subcutaneous emphysema!

Etiology of pneumomediastinum

- Spontaneous
  - Acute asthma attack
  - Scuba diving
  - Mechanic ventilation
  - Vomiting
- Trauma
- Surgery
- Tracheostomy
- Bronchoscopic procedures
- Respiratory tract infections
- Dental infections or procedures
- Acute mediastinitis
- Pneumoperitoneum
- Esophageal perforation

Pulmonary Causes:

- Rupture of the alveolus with air dissection along the peribronchial vascular sheaths into the hilum and mediastinum
- Ruptured bleb with peripheral extension
- Sudden rise in intrapulmonary pressure
  - Asthma, vomiting, forceful coughing, crying,

Trauma

- Rupture of trachea or mainstem bronchus, usually via accidental trauma
- Trauma to the neck
- Boerhaave's Syndrome
- Barotrauma

Mediastinum Connections

- The mediastinum communicates with the submandibular space, retropharyngeal space and vascular sheaths within the neck
- Also can communicate with the retroperitoneum via sternocostal

Presentation

- Infants-typically none
- Adults-
  - May complain of retrosternal chest pain radiating down both arms that is exacerbated by respiration and swallowing
  - Dyspnea-in association with asthma, tension PM or pneumothorax

Physical Exam

- Subcutaneous Air
- Associated Pneumothorax
- Oxygen Saturations
- Hamman's Sign-
  - "Crunching" sound heard over the apex of

Causes of SPM

- Asthma
- forceful coughing or sneezing
- changes in pressure with diving or flying
- childbirth
- Valsalva manoeuvre

- use of inhalational drugs (THC –hits from the bong) and sympathomimetics

Clinical Presentation

- Chest pain, retrosternal & pleuritic (usually sudden onset after a fit of coughing), can radiate. Dyspnoea, Subcutaneous emphysema ('diagnostic triad')
- Also may see dysphonia, dysphagia, neck pain / swelling, torticollis, abdominal pain, low grade fever
- Most frequent in tall, thin young men.

Physical Examination

- Patient appears surprisingly well!
- Vitals are typically within normal limits, including SpO2
- Hamman's sign – this is diagnostic. Crunching sound synchronous with heart beat, over the praecoardium. Possible muffling of heart sounds.
- Respiratory exam may be entirely normal *
- Subcutaneous emphysema over chest wall or neck
- Peak flow is generally contraindicated as it can worsen SPM
- Signs of tension pneumomediastinum (will discuss later)

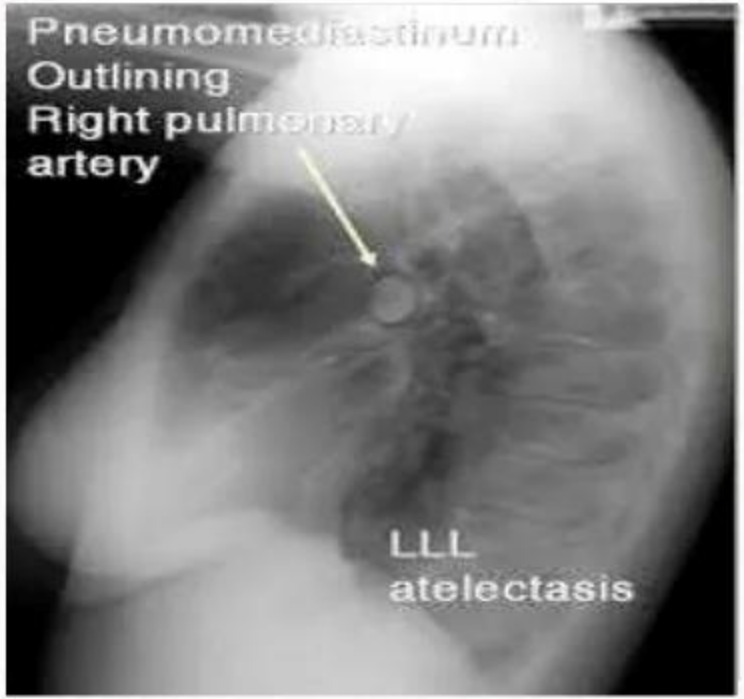
Clinical Work up

- CXR – PA & lateral. Lucent streaks; check cervical region.
- Bloods, ABG. May be entirely normal.
- ECG – mild STE, TWI, low voltage, axis deviation
- Bedside USS, CT chest, oesophagoscopy / swallow studies

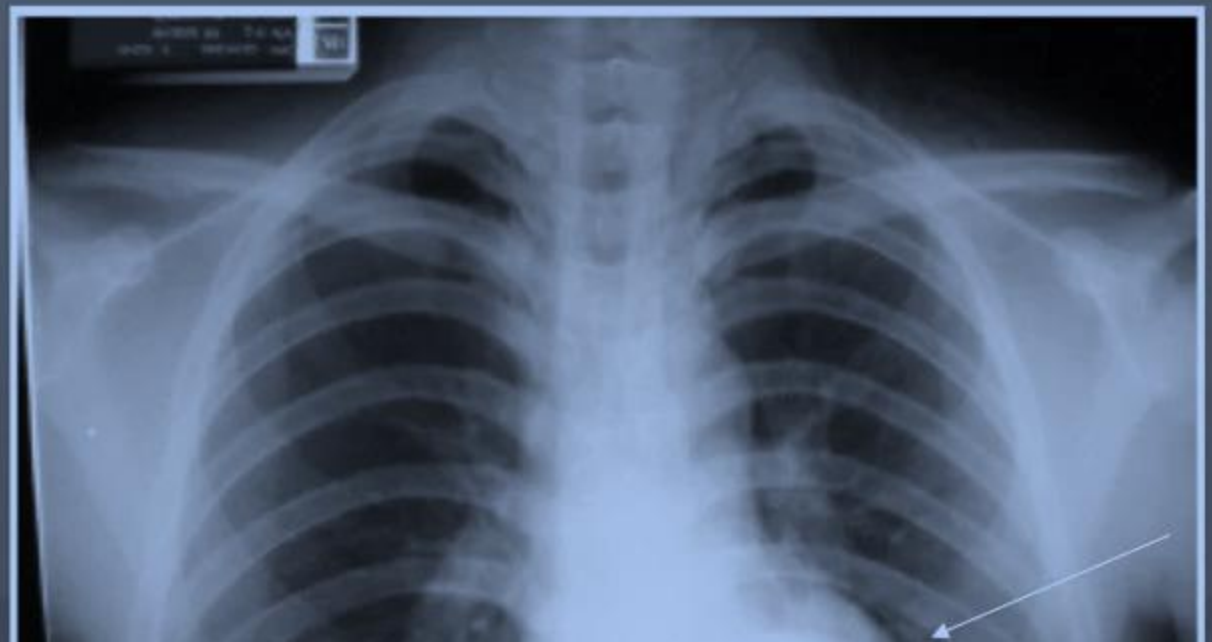
CXR Findings

1. Streaky lucency, most commonly seen along left heart border
2. Continuous diaphragm sign
3. V sign of Naclerio
4. Ring around the artery sign

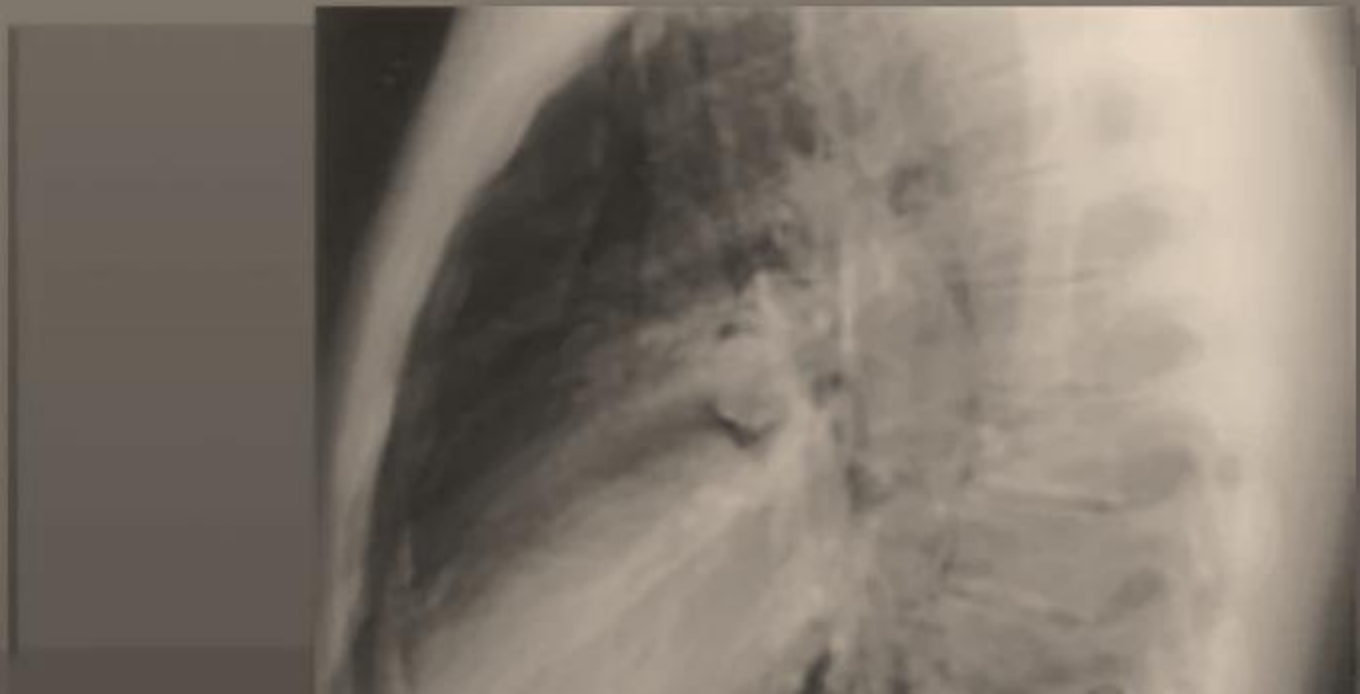
Also look for subcutaneous emphysema!



Linear density parallel to the heart border

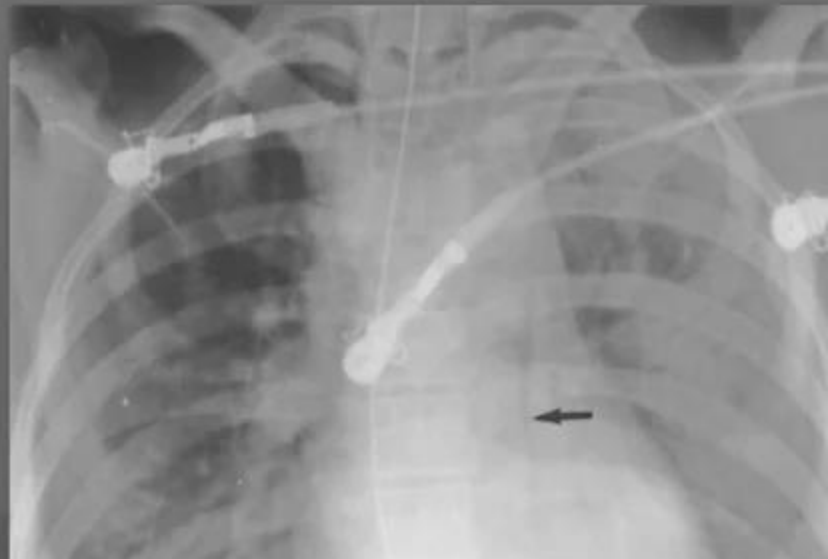


Ring around the Artery Sign



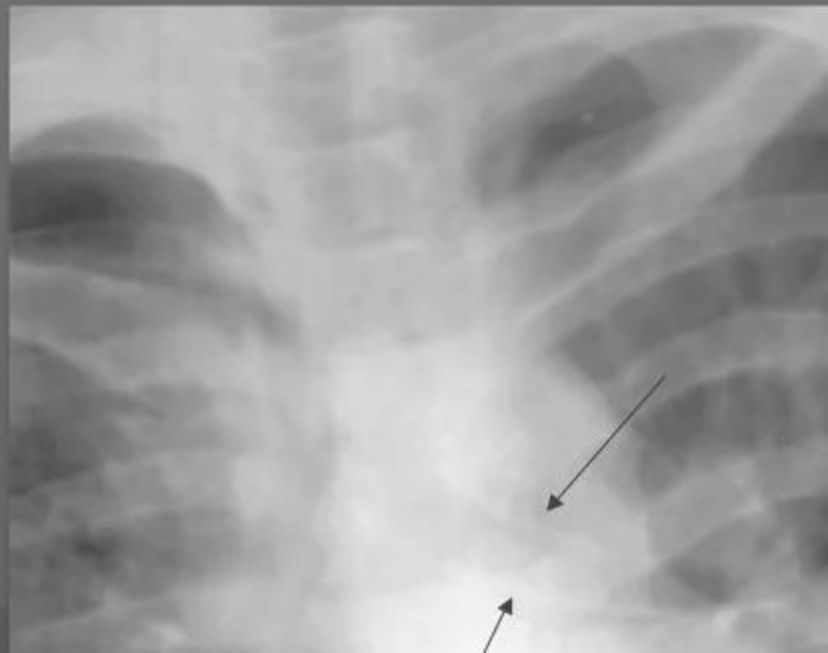
Extrapleural Sign

- Air from the mediastinum can extend laterally between the parietal pleura and the diaphragm to produce the



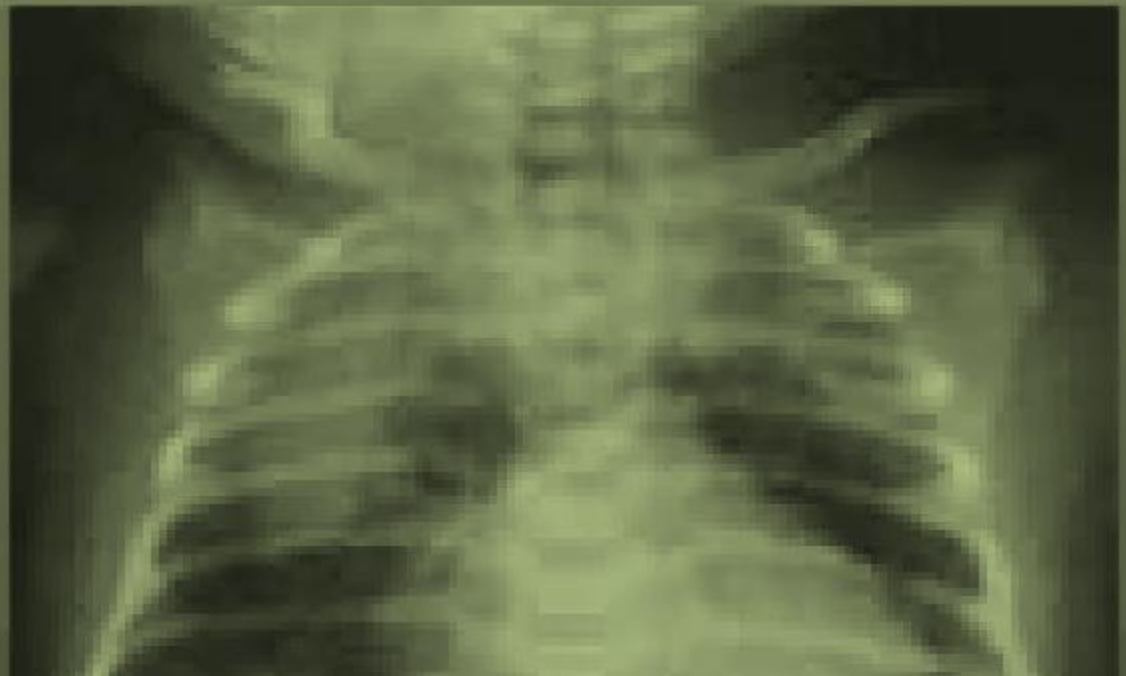
Double Bronchial Sign

- Air in the mediastinum and left main bronchus allows visualization of both sides of the bronchial wall.

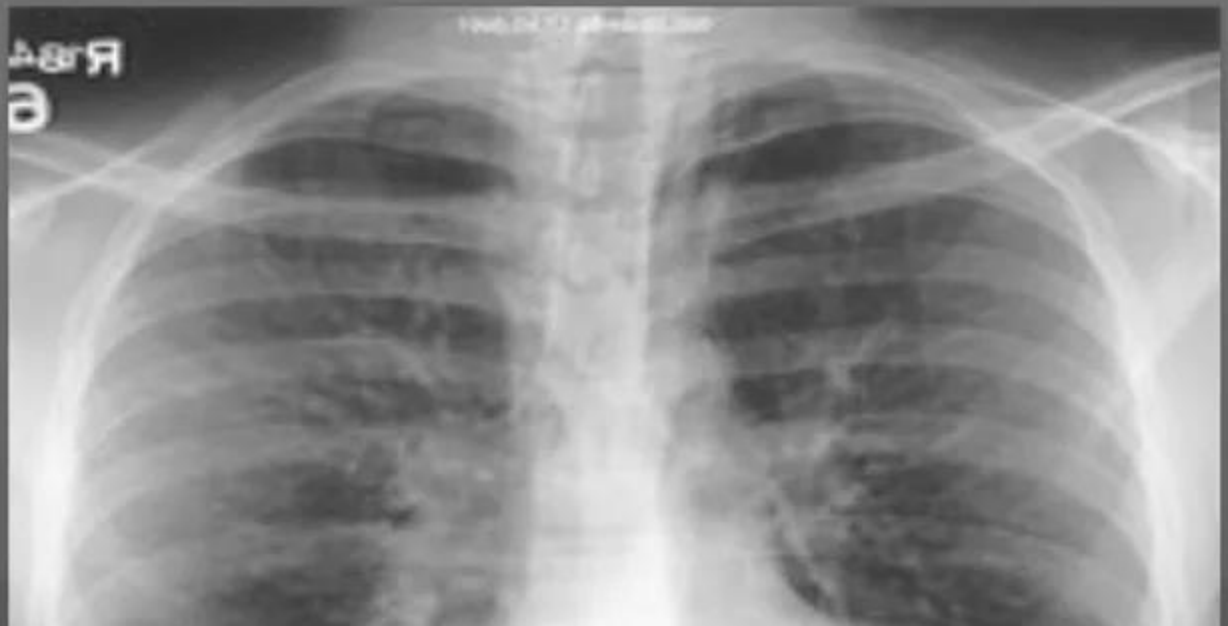


Spinnaker Sign (Thymic Sail Sign)

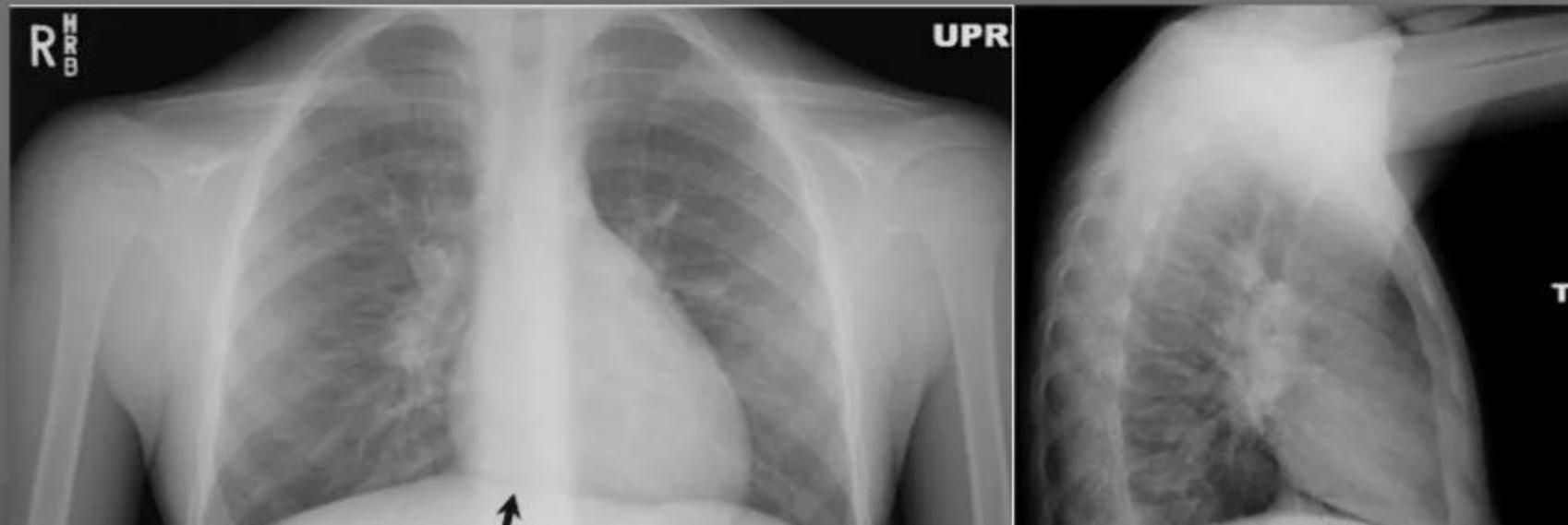
With sufficient mediastinal air, the thymus can become elevated, creating the



Tubular Artery Sign



Continuous Diaphragm Sign

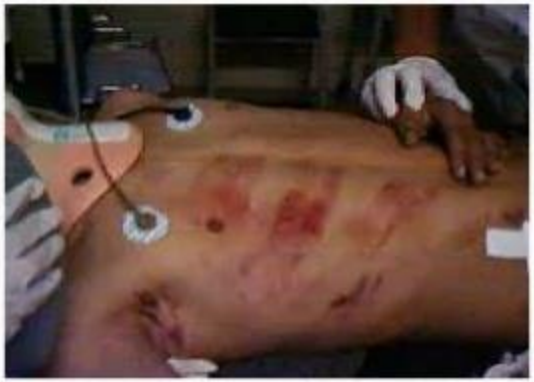


Management

- Typically conservative
- Some advocate admission for 24 hours to rule out other significant pathology (e.g. oesophageal rupture)
- Analgesia
- ?Role of high flow O2 (nitrogen washout to reabsorb gas faster)
- Typically full resolution over 3-5 days. No reports of complications or recurrences in patients with true SPM

Secondary Pneumomediastinum

- Found in 10% patients with blunt force trauma to chest or neck – also Macklin effect – mostly high speed MVA
- Trauma to aerodigestive tract
- Iatrogenic (e.g. intubation, mechanical ventilation, surgical intervention of neck / chest / abdomen)
- Rupture of a viscus



Tension Pneumomediastinum

- Rare – 7 cases reported in literature between 1975 – 2009
- Occurs is severe blunt force chest trauma
- May mimic cardiac tamponade – neck distention with progressive respiratory and cardiovascular collapse. Look for subcut emphysema
- Suggested Mx – secure airway, bolus fluid, bilateral chest drains (even without PTX) – may resolve, Otherwise – pericardiocentesis, subxiphoid window by surgeon at bedside or OT.

Boerhaave's Syndrome

- Should always be suspected if pneumomediatrinum detected and patient has recent history of forceful vomiting or retching (assoc w alcohol)
- Mackler's triad: violent vomiting, chest pain, subcut emphysema
- Usually a linear tear in the left posterolateral wall near gastroesophageal junction. Not contained as no serosa.
- Rapidly leads to mediastinitis, sepsis, MOF, death

Boerhaave's – Ix & Mx

- Patients will typically have CT to assess degree of injury, oesophagoscopy , endoscopy or swallow study to confirm diagnosis (water soluble contrast)
- First 24 hours critical – resuscitation, broad spectrum Abx, surgical intervention. Mortality high after first 24 hours and a non-surgical / conservative approach may be taken
- Primary closure appears most successful, high mortality with stenting (delayed formation of aortoesophgeal fistula and massive haemorrhage). Oesophagectomy in certain cases.

Summary

- Pneumomediastinum – rare presentation to the ED
- Classical pleuritic chest pain, dyspnoea and subcutaneous emphysema
- Spontaneous – Macklin effect, associated with asthma, Valsalva and drug use. Typically managed conservatively with full resolution and no recurrence.
- Secondary – associated with blunt force trauma. Consider aerodigestive track trauma as aetiology. Iatrogenic causes also.
- Tension pneumomediastinum is rare, bilateral chest drains even without pneumothorax
- Boerhaave syndrome – always consider in pt with PM and history of vomiting. First 24 hours is critical, early surgical involvement and broad spectrum Abx.


PRESENTATION FINISHED