PNEUMOMEDIASTINUM:
A PATIENT PRESENTATION

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AGENDA

I. Patient Presentation
II. Diagnosis of Pneumomediastinum
III. Causes of Pneumomediastinum
IV. Work-Up of Pneumomediastinum
V. Patient Wrap-Up
PATIENT PRESENTATION
CM is a 19 year-old pre-med Harvard College male who presented to UHS complaining of sore throat when drinking liquids and pleuritic chest pain in the superior chest radiating to the neck. Symptoms began upon awakening this morning and patient reports having several bouts of intense emesis of unknown cause (likely viral gastroenteritis) yesterday evening. Patient denies any hematemesis and denies vomiting this AM.
PHYSICAL EXAM

BP- 122/72, T- 99.5

General- Pt. talking clearly, in no apparent respiratory distress.

HEENT- Tenderness in the area of the cricoid. Crepitance felt in the right supraclavicular area. Otherwise unremarkable.

Chest- Clear to auscultation bilaterally. No stridor.

Heart- Regular rate and rhythm. No murmurs.

Source: Harvard University Health Services
CM’S PA CHEST X-RAY

Air in neck tissues

Air outlining ascending aorta

Source: Harvard University Health Services
DIAGNOSIS OF PNEUMOMEDIASTINUM
CLINICAL SIGNS & SYMPTOMS

- Subcutaneous emphysema - crepitation in neck
- Pleuritic chest pain
- Neck pain
- Dyspnea
- Dysphagia
- Hamman sign = “mediastinal crunch”
- Pneumothorax
RADIOGRAPHIC VIEWS

• PA Chest x-ray (inspiration and expiration)
• Lateral Chest x-ray
• Lateral decubitus
• Neck films
RADIOGRAPHIC SIGNS OF PNEUMOMEDIASTINUM

PA Chest X-Ray
Streaky radiolucencies in mediastinum (most commonly in left paracardiac area)
Air outlining mediastinal structures
Continuous diaphragm sign of Levin

Lateral Chest X-Ray
Retrosternal air

Lateral Decubitus Chest X-Ray
Air will not move with change in position

Neck Films
Air outlining fascial planes of the neck
CM’S PA CHEST X-RAY (expiration)

- Streaky lucencies
- Air outlining ascending aorta

Source: Harvard University Health Services
CM’S LATERAL CHEST X-RAY

Source: Harvard University Health Services
CM’S NECK FILMS

- Streaky lucencies
- Contrast in hypopharynx
- Aberrant air

Source: Harvard University Health Services
COMPANION PATIENT #1-
PNEUMOMEDIASTINUM ON CT

Source: BIDMC PACS
PNEUMOMEDIASTINUM VS. PNEUMOTHORAX OR PNEUMOPERICARDIUM

Pneumomediastinum vs. Medial Pneumothorax

- Lateral decubitus positioning will reveal change in air distribution in pneumothorax, whereas mediastinal air will remain locked in position
- Clear delineation of intramediastinal structures in pneumomediastinum

Pneumomediastinum vs. Pneumopericardium

- Lateral decubitus positioning will reveal change in air distribution in pneumopericardium, whereas mediastinal air will remain locked in position
- Pericardial reflections do not extend above ascending aorta
- Thickened pericardium in pneumopericardium can be differentiated from mediastinal pleura
CAUSES OF PNEUMOMEDIASTINUM
DIFFERENTIAL DIAGNOSIS OF PNEUMOMEDIASTINUM

Where did the air come from?

• Air from outside
• Air from inside
• Air from gas-producing organisms
AIR FROM OUTSIDE

Trauma
- Gunshot wound
- Stab wound
- Other penetrating trauma

Iatrogenic
- Mediastinal surgery
- Mediastinoscopy
- Sternal bone marrow aspiration
- Thyroidectomy
- Tonsillectomy
AIR FROM INSIDE

4 Sources:
1) Pulmonary
2) Mediastinum
3) Head and Neck
4) Abdomen
AIR FROM INSIDE- PULMONARY

Increased alveolar pressure

Abnormally weak lung parenchyma

Alveolar overdistention and rupture

Air leak into pulmonary interstitium

Air dissects to lung roots

Air enters mediastinum
AIR FROM INSIDE- PULMONARY

**Increased alveolar pressure**
- Ventilation assistance (e.g. PEEP)
- Airway obstruction (e.g. asthma)
- Vomiting (e.g. anorexia nervosa)
- Coughing
- Straining (e.g. Valsalva maneuver)
- Heimlich maneuver
- Blunt chest trauma

**Abnormally weak lung parenchyma**
- Infection (especially viral or TB)
- Sarcoid
- Emphysema
- ARDS
- Metastases to the lung
- Needle biopsy of lung
- Atelectasis
AIR FROM INSIDE- PULMONARY

Routes of Air

(1) Air ruptures from alveolus into perivascular-peribronchial fascial sheath

(2) Fascial sheath ruptures

(3) Rupture into the pleural space may occur

(4) Mediastinal air under tension may rupture mediastinal pleura

Source: Cyrlak D, 1984
AIR FROM INSIDE- MEDIASTINUM

Rupture of air-containing mediastinal structures (esophagus, trachea, bronchi) caused by:

- **Trauma**
  (blunt or penetrating)
- **Iatrogenic disease**
  (intubation, tracheotomy)
- **Acute increased intraluminal pressure**
  (vomiting, childbirth, coughing, defecation, weightlifting, seizures)
- **Malignancy**
  (fistula formation)
- **Spontaneous**
  (less common)
AIR FROM INSIDE- HEAD & NECK

Perforation of the nasopharynx, larynx, and cervical portion of the esophagus and trachea caused by:

• **Trauma**
  (including facial fractures, especially those involving the sinuses)
• **Iatrogenic disease**
  (placement of nasogastric tube, endotracheal intubation, facial surgery, dental procedures, neck surgery)
AIR FROM INSIDE- ABDOMEN

Air extending from abnormal collections of air in the abdomen, intra- or extraperitoneal air, caused by:

- Trauma
- Iatrogenic
  (perforation of the bowel during gastroscopy, colonoscopy, rectal or renal surgery)
- Bowel perforation
  (perforation of diverticula, gastric or duodenal ulcers)
AIR FROM GAS-PRODUCING ORGANISMS

• Acute infection of the mediastinum causing mediastinitis is rare.
• Retroperitoneal infections may introduce gas into the soft tissues, which spreads to mediastinum.
WORK-UP OF PNEUMOMEDIASTINUM
ASSESS FOR UNDERLYING ILLNESS

Work-up is predicated on underlying illness that may have caused pneumomediastinum. Recall differential diagnosis:

- **Air from outside**
  Assess defects from trauma or iatrogenic sources

- **Air from inside**
  Pulmonary- Address causes of increased alveolar pressure or abnormally weak pulmonary parenchyma
  Mediastinum- Contrast medium swallow to rule-out esophageal perforation (water-soluble contrast agent); Endoscopy, bronchoscopy if indicated
  Head & Neck- Assess perforations from trauma/iatrogenic sources
  Abdomen- Evaluate source of abnormal air in the abdomen

- **Air from gas-producing organisms**
  Assess and treat infection
ASSESS FOR POSSIBLE COMPLICATIONS/ PROGRESSION

_Serious Complications_: 
- Tension pneumothorax 
- Tension pneumopericardium 
- Mediastinitis

Follow-up chest x-ray within 12-24 hours to detect any progression or complications.
May admit for observation.
PROGNOSIS

• Prognosis depends on underlying illness and complications.
• Generally good prognosis.
• Pneumomediastinum and symptoms usually resolve in 2-7 days.
PATIENT WRAP-UP
CM’S GASTROGRAFFIN SWALLOW ONE DAY LATER

No esophageal perforation

Source: Harvard University Health Services
COMPANION PATIENT #2 - ABNORMAL GASTROGRAFFIN/BARIUM SWALLOW

Leakage of contrast

Source: BIDMC PACS
Pneumomediastinum still present, but not expanding

Source: Harvard University Health Services
OUTCOME

• CM’s symptoms resolved one day later, although a pneumomediastinum remained visible yet stable on the chest x-ray.

• CM was never admitted to the hospital but was told to return to the clinic if symptoms continued.

• CM has never had any problems since and is now in his third year of medical school.
SUMMARY

I. Patient Presentation

CM demonstrated clinical and radiographic signs and symptoms of pneumomediastinum

II. Diagnosis of Pneumomediastinum

- Clinical signs and symptoms including crepitance, pleuritic chest pain, neck pain, dyspnea
- Radiographic signs on PA, lateral, lateral decubitus chest x-rays, neck films, CT

III. Causes of Pneumomediastinum

- Air from outside
- Air from inside (pulmonary, mediastinal, head & neck, abdomen)
- Air from gas-producing organisms

IV. Work-Up of Pneumomediastinum

- Assess underlying illness
- Monitor for complications and progression
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