NON-CARDIAC CHEST PAIN

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AKA ALL THE DIFFERENTIALS

- Costochondritis
- Mediastinitis
- Pleural Effusion
- Pneumonia
- Pneumothorax (Simple & Tension)
- Sarcoidosis
- Pulmonary Neoplasm
- Non-Cardiogenic Pulmonary Edema
- Inhalational injury
- Environmental Lung Disease (Asbestosis, Silicosis, Pneumoconiosis)
- Tracheostomy Complications
- Cricothyroidotomy (Indicators & Complications)

BIGGEST TAKE HOMES

- Don't change your answer unless you have a GREAT reason
- They aren't trying to trick you
- Go with your gut

COSTOCHONDritis AND MSK CHEST WALL PAIN

- Common
- Attached to everything
- Usually worse with movement
- F>M
- Reproducible
- Insidious

REPRODUCIBLE ≠ BADNESS

True or False?

FALSE! You can still have AMI/ACS/PE
PSA: LOOK AT THE AREA

PLEURIS/PLEURISY

- Viral etiology is most common
- Autoimmune
- Bacterial infections

Tests are to R/O other causes:
- CXR
- EKG
- CBC
- D-dimer (if PERC/Wells criteria +)

PLEURAL EFFUSION

- Fluid between parietal and visceral pleura
- In addition to CP, may have SOB, DOF, respiratory failure

PLEURAL EFFUSION

Diagnosis & Treatment?

Exudative vs Transudative
**LIGHT’S CRITERIA**

- **EASY TO TEST**
  - Pleural fluid protein/serum protein (AKA TPR) > 0.5
  - Pleural fluid LDH/serum LDH (AKA LDHR) > 0.6
  - Pleural fluid LDH >2/3s upper limit of normal serum LDH or >200 U/L

- **EXUDATIVE FLUID**
  - **Two-Test Rule**
    - Pleural fluid cholesterol >45mg/dl
    - Pleural fluid LDH > 0.5× upper limit of normal for serum LDH
  - **Three-Test Rule**
    - Pleural fluid protein > 2.9 g/dl
    - Pleural fluid cholestrol >45 mg/dl
    - Pleural fluid LDH > 0.45 x upper limit of normal for serum LDH

**OTHER TESTS ON THE FLUID**

- Amylase ↑ in pancreatitis effusions
- Adenosine deaminase ↑ in TB effusions
- BNP. ↑ in CHF
- Tumor markers
- Cell count: WBC >10,000 in infectious exudates
- Diff: Lymphocytes > 50%
  - lymphoma/TB/Sarcoid
## PLEURAL EFFUSION

<table>
<thead>
<tr>
<th>Disease</th>
<th>Fluid Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Empyema</td>
<td>Gross pus, C&amp;S, High WBC</td>
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<tr>
<td>Pregnancy</td>
<td>+ cytology, + tumor markers</td>
</tr>
<tr>
<td>Lupus pleuritis</td>
<td>LE cells, fluid ANA &gt; 1.0</td>
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<tr>
<td>TB pleurisy</td>
<td>+ AFB stain, C&amp;S</td>
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<tr>
<td>Esophageal rupture</td>
<td>+ Food, low fluid pH</td>
</tr>
<tr>
<td>Rupture</td>
<td>+ AFB stain, C&amp;S</td>
</tr>
<tr>
<td>Chylous fluid</td>
<td>+ High lymphocytes, chylomicrons</td>
</tr>
<tr>
<td>Hemorrhagic</td>
<td>Fluid/stool: fluid &gt; 1.0</td>
</tr>
<tr>
<td>Peritoneal dialysis</td>
<td>Glc: 100-400 mg/dl, protein &lt; 200 mg/dl</td>
</tr>
</tbody>
</table>

## DRAINING THE PLEURAL EFFUSION

- Patient position?
- Rib Space?

## MEDIASTINITIS

- 4 days post thyrroidectomy
- Gradual onset, pleural pain
- WBC 33.5

## ESOPHAGEAL RUPTURE

Causes?

CXR showing air adjacent to the aorta and left pleural effusion in a patient with mediastinitis secondary to esophageal rupture and infection.
**ESOPHAGEAL RUPTURE**

Vomiting/instrumentation of the esophagus → severe CP → radiating to back (v.r.)

Severe CP → dysphagia, melena

Can have subq emphysema, fever, shock, epigastric abdominal pain

MACKLER TRIAD: vomiting, lower chest pain, cervical subq emphysema (seen in ~50% of cases)

ANDERSON TRIAD: subq emphysema, rapid respirations, abdominal rigidity

**ESOPHAGEAL RUPTURE DIAGNOSIS**

CT-scan showing large extravasation of contrast into the left pleural cavity due to esophageal perforation.

Esophagoscopy confirmed the diagnosis:

1-cm longitudinal left-sided rupture was seen at the lower level of the esophagus.

**TREATMENT?**

- Fluid resuscitation
- Chest tube if necessary
- Intubation if necessary
- Empiric abx → cover Gram+ and Gram-
- Surgical repair for large tears

**DIAGNOSIS & TREATMENT?**

CXR - often LEFT sided effusion, subq air, pneumothorax

CXR, Gastrographin swallow or CT

Emergency EGD
Simple, spontaneous pneumothorax without evidence of tension pneumothorax.

Tension pneumothorax with tracheal deviation and shift of the heart to the left.

TREATMENT OPTIONS

- Small, spontaneous → oxygen and observation
- Large, large air leaks, traumatic → may need chest tube with continuous drainage
- CASP (catheter aspiration of spontaneous pneumothorax) is also an option for smaller ones

INTERSTITIAL LUNG DISEASE

Environmental or occupational MCC etiologies (asbestos, silica, flour, cotton, smoke, soot, coal dust)

Rheumatic diseases (sarcoid, SLE, scleroderma)

INTERSTITIAL LUNG DISEASE

An example of sarcoid perihilar reticular pattern infiltrate characteristic of interstitial lung disease - bat wing pattern

INTERSTITIAL LUNG DISEASE

- Clinically: CF, COPD, dry non-productive cough, crackles (Velcro sound)
- abX CXR: restrictive ventilatory pattern on PFTs, clubbing, cor pulmonale
- Work-up: routine labs, ABGs, CXR, Chest CT, PFTs
- Treatment: symptomatic, refer to pulm, emergent tx usually end stage of dz
LUNG CANCER

MCC cause of cancer mortality worldwide

Cigarette smoking MCC both non-small cell and small cell

May present to ED for pain from mets or endocrine issues

Diffuse squamous cell carcinoma of the lung with local metastatic spread and mets to the brain.

Mets most common to where?

Paraneoplastic problems

WHAT MAKES THIS LIKELY LUNG CA?

ARDS

- High mortality (25-80%)
- MOF/S
- Acute to hyperacute onset
- Bilateral infiltrates w/ pulm edema
- PaO2/FiO2 ratio <200 (All f 1:200, 300)
- OBT: main diagnostic test

ARDS NET VENTILATOR RECOMMENDATIONS

INCLUSION CRITERIA for ARDS:
- Acute onset of:
  1. PaO2/FiO2 < 300.
  2. Bilateral patchy, diffuse, or homogeneous infiltrates w/ pulmonary edema.
  3. No clinical evidence of left atrial hypertension.

VENT SETUP & ADJUSTMENT:
- Calculate predicted body weight: (males=50+2.3(ht. in inches)-60 / females=45.5+2.3(ht. in inches)-60.
- Select vent mode (AC, pressure, APRV).
- Initial TV = 8 ml/kg PBW.
- Reduce TV by 1 ml/kg at 2-hour intervals to achieve TV of 6 ml/kg.
- Initial rate at baseline minute ventilation, not >35/minute.
- Adjust Vt and RR to achieve pH and plateau pressure goals (see next).

OXYGENATION GOALS:
- PaO2 = 58-80 mmHg, consider FiO2/PEEP combinations as below:

PLATEAU PRESSURE GOALS:
- Adjust to <30 cmH2O, monitoring PIP/PEEP combinations as needed
ARDS

Airways collapse → alveoli fill fluid/debris → loss of surfactant leading to loss of compliance → impaired oxygen and CO₂ exchange

High PEEP to promote airway recruitment and keep airways open that do open

Pressure control may be more useful than volume control

SMOKE INHALATION

Smoke has high temperature but is often dry → not much thermal injury beyond the oropharynx and upper airway

Smoke containing water particles → more thermal energy as do superheated gases particularly those under pressure → serious direct burns deep into the lung tissue

Fires in confined spaces use up the available O₂ causing hypoxia and suffocation

The plastics in buildings burn toxic gases such as arsenic, cyanide, acrolein, formaldehyde, phosgene, SO₂, NO

Bronchorrhea, dyspnea, wheezing, and respiratory failure up to 24-36 hours post-exposure if they do not kill outright

CO is the most common lethal toxic gas produced in a fire

It tightly binds to hemoglobin preventing the release of oxygen at the tissue level

Clinically: headache, nausea, confusion, fatigue, dyspnea, angina, CHF, seizures, coma, and death

Diagnosis: by measurement of carboxyhemoglobin either by photometric oximetry or venous and/or arterial blood gas analysis

What level is symptomatic and what level is fatal?

A Word on Hyperbarics

Pregnant → the answer is always yes to hyperbarics because of ↑ risk of fetal demise

For everyone else - oxygen

Hyperbarics have not shown significant clinical or outcome improvement
SMOKE INHALATION

Cyanide is a common by-product of burning plastics and synthetic fabrics.

- It binds to the mitochondrial cytochrome a3 decoupling electron transport and oxidative phosphorylation.
- It takes very little cyanide to produce cardiac dysfunction, apnea, coma, and death.
- Direct measurement of cyanide levels is not helpful.
- Have a high index of suspicion in a smoke inhalation patient, particularly one who remains in shock despite treatment and adequate oxygenation and fluids.

IN CASE WE DIDN'T COVER IT IN TOX

The older cyanide antidote kit included administration of three medications: amyl nitrite pearls (inhalation), sodium nitrite and sodium thiosulfate (infusion). However, methemoglobin was a by-product that could contribute to the oxygenation problems.

The newer Cyanokit contains hydroxycobalamin that reacts with cyanide to form cyanocobalamin that can be eliminated by the kidneys - this is a simpler and more effective antidote than the older Lilly kit.

Have a low threshold for the administration of hydroxycobalamin in the appropriate clinical situation.

TRACHEOSTOMY IN 3 EASY STEPS

- TRACH EMERGENCIES

  Tube falls out or plugs up
  ___________________________
  May need to change out the tube or suction it

  Replace with a new Shiley cuffed trach tube

  Granulation or scar tissue to stoma → could make tube replacement difficult → surgery consult

TRACH EMERGENCIES

Shiley cuffed tracheostomy tube with stylet and inner cannula.

Obstructed tube? Suction cannula can help differentiate btw debris obstruction or tracheal stenosis distally.

Infections/skin breakdown → abx, admit for surgical consultation, may need ETT to let area heal.

Change in mental status? Aspiration pneumonia and nosocomial pneumonia is frequent.

Low threshold for obtaining CXR.
TRACH EMERGENCIES... THE ONE YOU WORRY THE MOST ABOUT

Bleeding from erosion of an arterial vessel (innominate) or a tracheoarterial fistula

- The bleeding can be massive, causing compromise of the airway and even exsanguination as controlling the hemorrhage can be very difficult
- The trach has to be removed. Artery has to be clamped
- Occasionally you can see the bleeder and control it. Most need to be taken to the OR to obtain control of the bleeding
- Vigorous resuscitation with fluids and blood

Small amount of arterial bleeding seen above does not seem like much but shortly afterwards more serious bleeding started and kept increasing, the patient was taken urgently to the OR

Two examples of stoma erosion and infection. Above due to the tracheostomy tube itself and to the right due to the wings that hold the tube in place. Both problems are difficult to manage

CRICOTHYROTOMY

W H E N  D O  Y O U  P E R F O R M  A  C R I C  I N  T H E  E D ?

W H A T  G O E S  W R O N G ?

- Done in the wrong place
- Waited too long
- Bleeding
- Cervical outside of the trachea
- Above thyroid cartilage
- Go over the steps regularly, on your free time during lecture, we're working out...

CRICOTHYROTOMY
This is the Cook Melker Emergency Cricothyrotomy kit with a needle to penetrate the skin and cricothyroid membrane, a wire to secure access to the trachea, scalpel to widen the skin incision, and cannula with dilator. New iteration has a cuffed tracheostomy tube.

**CRICOTHYROTOMY**

**KNOW YOUR STEPS.. WHICHEVER TECHNIQUE YOU USE**
- Kuhn-finger-bougé
- Andy Heard’s bougie-assisted cric technique
- [https://litfl.com/surgical-cricothyroidotomy/](https://litfl.com/surgical-cricothyroidotomy/)
- Good idea to mark the skin before intubation

**GOOD LUCK!! YOU’LL DO GREAT!**
SPECIAL THANKS TO DR. BRADFORD WALTERS