EMC 451

Advanced ECG Interpretation

Unit 15: Miscellaneous Patterns II

Unit Objectives

- Upon completion of this unit, you should be able to:
  - Describe the EKG changes of pericarditis.
  - Describe the EKG changes of pericardial tamponade and pericardial effusion.
  - Describe the EKG changes of COPD.
  - Describe the EKG changes associated with hypothermia.
  - Describe the EKG changes following cardiac transplantation.
  - Describe the EKG changes of pulmonary embolism.
  - Describe the EKG changes of early repolarization syndrome.

Pericarditis

- Inflammation of the pericardium
- Results in net positivity of the epicardium, which is expressed as ST elevation
- EKG criteria
  - PR depression (> 0.8 mm)
  - Diffuse ST elevation or T wave inversion
  - Scooping, upwardly concave ST segments
  - Notching of the end of the QRS complex
- Difficult to distinguish from early repolarization by EKG alone. Must rely on history and physical exam.

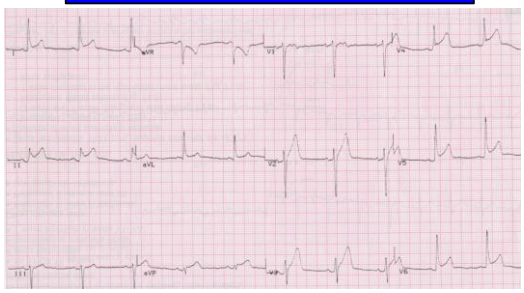
Pericarditis: History and P.E.

- Chest pain
  - Pleuritic
  - Increases with inspiration
  - Relieved by sitting up
  - Unrelieved by NTG
- Pericardial friction rub
- Causes
  - MI
  - Cardiac surgery
  - Bacterial and viral infections
  - Radiation
  - Tumors

Pericarditis vs. MI

	Acute Pericarditis (Typical Stage 1)	Acute Myocardial Infarction
Q Waves	• Large Q waves are absent (unless patient had Q waves before- or pericarditis complicates acute infarction). • Small septal q waves may be seen.	• Development of new Q waves is the marker of acute infarction.
ST Segment Elevation	• Concave up (i.e., "smiley") ST segment elevation tends to be seen diffusely (with the possible exception of leads aVR, III, and V_1).	• Convex (i.e., "frowny") ST segment elevation is seen- localized to the leads overlying the area of infarction.
Reciprocal ST Segment Depression	• Reciprocal Changes are typically *not* seen.	• Reciprocal changes are commonly seen in leads located away from the area of infarction.
T Wave Appearance	• T waves generally remain upright in Stage 1 pericarditis. (T waves usually don't invert while the ST segment is still elevated.)	• Symmetric T wave inversion is often seen- and may occur while the ST segment is still elevated.

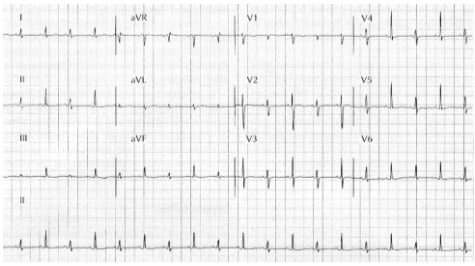
Pericarditis



Pericardial Tamponade and Effusion

- Differing etiologies, prognosis, and treatment, but similar EKG changes
- Effusion usually results from pericarditis
- Acute tamponade usually results from trauma or ventricular rupture
- EKG changes
  - Low voltage
    - QRS < 5 mm in extremity leads
    - The larger the effusion, the smaller the QRS complex
    - Other causes of low voltage
      - Obesity
      - Emphysema
      - Pleural effusion
      - hypothyroidism
  - May also have ST and T wave changes of pericarditis
  - May result in electrical alternans

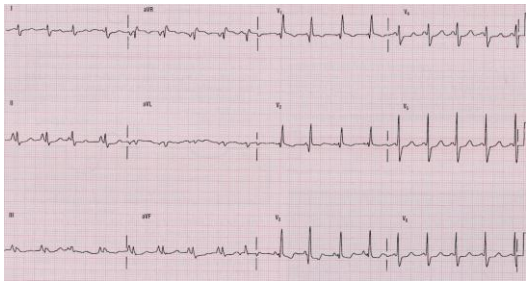
Pericardial Effusion



COPD

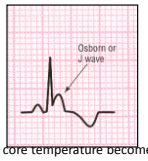
- EKG Findings
  - Low voltage from air trapping
  - Poor R wave progression due to downward displacement of diaphragm (electrodes are relatively higher)
  - RAD due to right ventricular dilation
  - R wave > S wave in V_1 (RVH)
  - RV strain pattern (inverted T waves in V_1 and V_2)
  - Tall and narrow P waves (RAE)

COPD

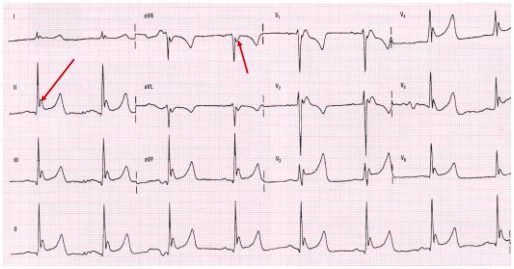


Hypothermia

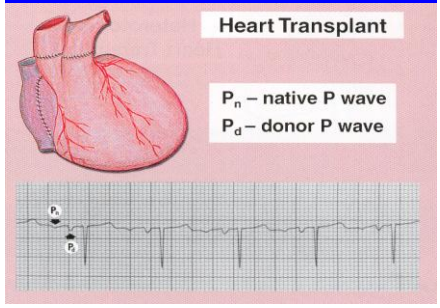
- EKG changes become apparent as core temperature drops below 30 C
- Hypothermia has causes other than environmental exposure
  - Severe hypothyroidism
  - Addison's disease
  - Sepsis
- EKG changes
  - Sinus bradycardia
  - Prolonged intervals
    - PR
    - QRS
    - QT
  - Osborne or J wave (is not RSR')
  - Osborne wave becomes taller as core temperature becomes lower
  - Atrial fibrillation is common
  - Prone to VF/VT



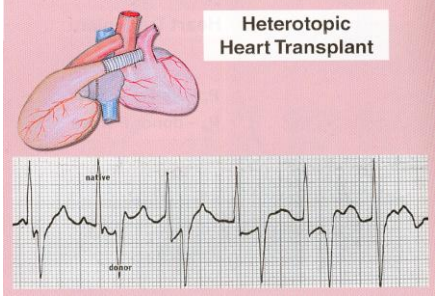
Hypothermia



Cardiac Transplantation

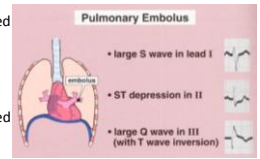


Cardiac Transplantation



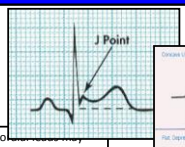
Pulmonary Embolus

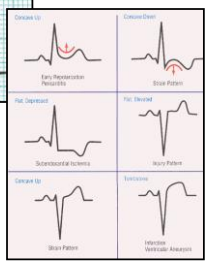
- EKG is not sensitive for P.E.
- EKG changes
  - Sinus tachycardia
  - RV strain pattern (inverted T waves in V_1 and V_2
  - $S_1Q_3T_3$
  - RAD (negative Lead I, positive AVF)
  - P pulmonale (large, tented P waves associated with RAE)
  - RBBB (wide QRS in V_1 with positive terminal complex)
  - RVH (R > S in V_1)



Pulmonary Embolus

Early Repolarization Syndrome





- ST segments in preco… rise up to 3 mm above baseline
- Most common in young, healthy people
- May mimic acute pericarditis or MI
- Not associated with reciprocal changes
- Upwardly concave ST segment
- ST segment is merged with QRS complex

Early Repolarization Syndrome