

EMC 451

Advanced ECG Interpretation

Unit 15: Miscellaneous Patterns II

EMC 451: Miscellaneous Patterns II 1

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.

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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.

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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

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Pericarditis vs. MI

	Acute Pericarditis (Typical Stage 1)	Acute Myocardial Infarction
Q Waves	<ul style="list-style-type: none"> • Large Q waves are absent (unless patient had Q waves before or pericarditis complicates acute infarction). • Small septal q waves may be seen. 	<ul style="list-style-type: none"> • Development of new Q waves is the marker of acute infarction.
ST Segment Elevation	<ul style="list-style-type: none"> • Concave up (i.e., "smiley") ST segment elevation tends to be seen diffusely (with the possible exception of leads aVR, II, and V1). 	<ul style="list-style-type: none"> • Convex (i.e., "frowny") ST segment elevation is seen (localized to the leads overlying the area of infarction).
Reciprocal ST Segment Depression	<ul style="list-style-type: none"> • Reciprocal changes are typically not seen. 	<ul style="list-style-type: none"> • Reciprocal changes are commonly seen in leads located away from the area of infarction.
T Wave Appearance	<ul style="list-style-type: none"> • T waves generally remain upright in Stage 1 pericarditis. (T waves usually don't invert while the ST segment is still elevated.) 	<ul style="list-style-type: none"> • Symmetric T wave inversion is often seen and may occur while the ST segment is still elevated.

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Pericarditis

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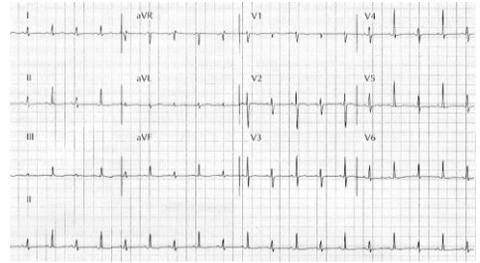
Pericardial Tamponade and Effusion

- 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

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Pericardial Effusion



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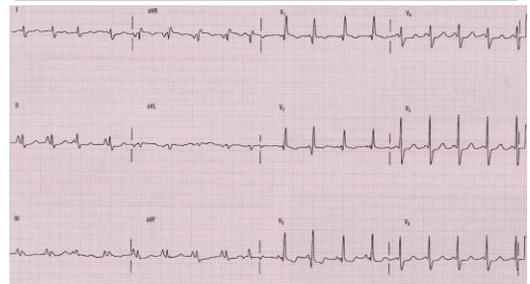
COPD

- 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 V₁ (RVH)
 - RV strain pattern (inverted T waves in V₁ and V₂)
 - Tall and narrow P waves (RAE)

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COPD

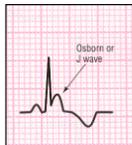


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Hypothermia

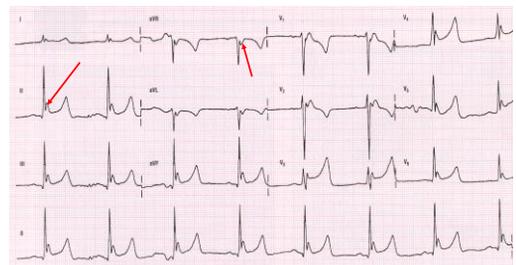
- EKG changes become apparent as core temperature drops below 30 C
- Hypothermia has causes other than environmental exposure
 - Severe hypothyroidism
 - Addison's disease
 - Sepsis
- EKG changes
 - Sinus bradycardia
 - Prolonged intervals
 - PR
 - QRS
 - QT
 - Osborne or J wave (is not RSR')
 - Osborne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



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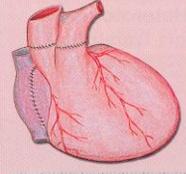
Hypothermia



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Cardiac Transplantation



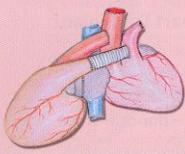
Heart Transplant

P_n – native P wave
P_d – donor P wave



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Cardiac Transplantation



Heterotopic Heart Transplant



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Pulmonary Embolus

- EKG is not sensitive for P.E.
- EKG changes
 - Sinus tachycardia
 - RV strain pattern (inverted T waves in V₁ and V₂)
 - S₁Q₃T₃
 - RAD (negative Lead I, positive AVF)
 - P pulmonale (large, tented P waves associated with RAE)
 - RBBB (wide QRS in V₁ with positive terminal complex)
 - RVH (R > S in V₁)



Pulmonary Embolus

- large S wave in lead I
- ST depression in II
- large Q wave in III (with T wave inversion)

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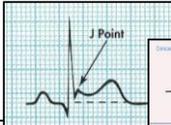
Pulmonary Embolus



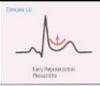
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Early Repolarization Syndrome

- ST segments in precordial leads may 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



Normal



Early Repolarization Phenotype



ST Segment Depression



ST Segment Elevation



Concordant ST

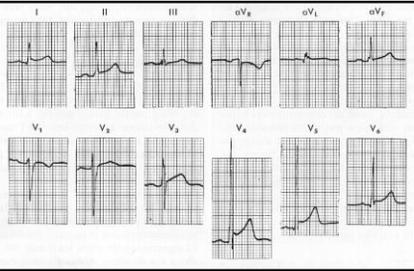


Discordant



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Early Repolarization Syndrome



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