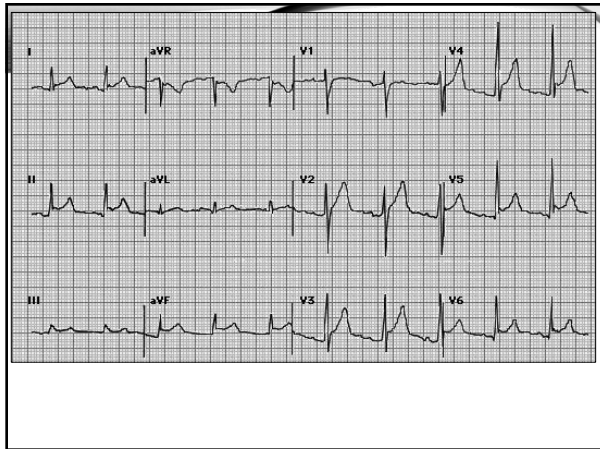


12 LEAD ECG CASE STUDIES

Lisa Riggs MSN, RN, ACNS-BC, CCRN-K

CASE #1

31 y/o male presents to ED with c/o chest pain and SOA



WHAT ELSE WOULD YOU ASSESS?

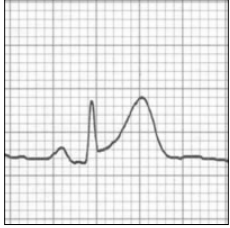
- Vital Signs

WHAT'S YOUR DIAGNOSIS?

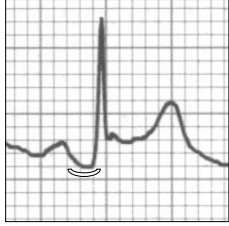
PERICARDITIS

- Distinguishing features
 - ST segment elevation appears concave
 - Ventricular surface involved is greater (more leads involved)
 - PR depression may be present in all leads except aVR and V1

ECG COMPLEX CHANGES



ST elevation in
Acute MI

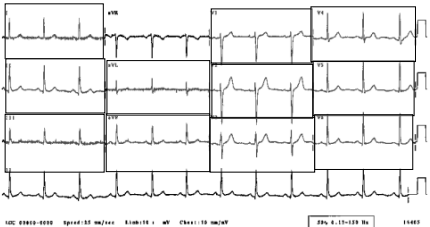


ST elevation in
Pericarditis

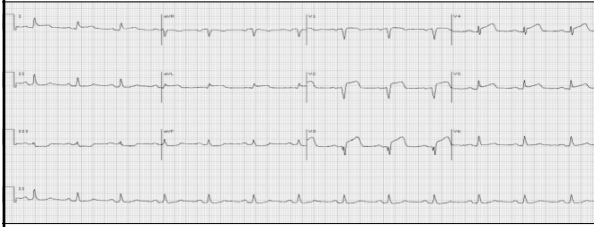
ST SEGMENT ELEVATION

- STEMI features
 - ST elevation in a few leads – grouped by “families” according to walls of heart
 - II, III, aVF – Inferior wall
 - I, aVL, V5, V6 – Lateral wall
 - V1, V2 – Septum
 - V3, V4 – Anterior wall
 - Q waves may be present
 - Reciprocal ST depression may be evident in other leads

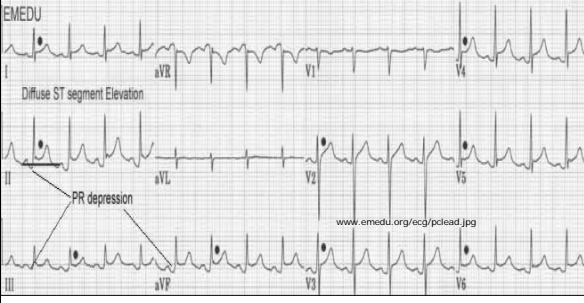
12-LEAD FAMILIES



ST SEGMENT ELEVATION



PERICARDITIS



PERICARDITIS

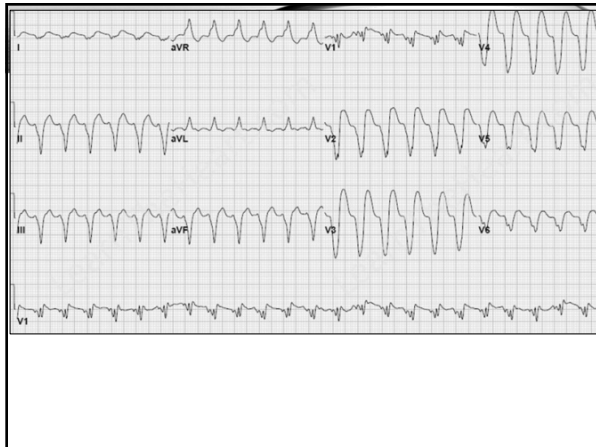
- Patient presentation:
 - Chest pain – sharp, severe, may radiate to the back, neck, shoulders.
 - Pain worse lying down and when taking a deep breath or coughing
 - Pericardial Friction Rub – scratchy, high-pitched sound. Changes in intensity with respiration. Heard best with the diaphragm of stethoscope at the lower left sternal border with the patient sitting forward

PERICARDITIS

- Etiology
 - Idiopathic, viral or bacterial infections, tuberculosis, cancer, autoimmune processes
- Treatment
 - Usually uncomplicated and self-limiting
 - First-line therapy is NSAIDS
 - Can develop pericardial effusions

CASE #2

52 y/o male with history of cardiomyopathy being admitted from the ED. Presented with complaints of fatigue & palpitations with wide complex tachycardia.

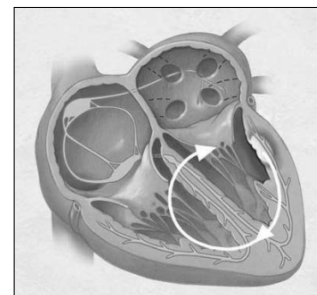


WHAT'S YOUR DIAGNOSIS?

V-TACH CHARACTERISTICS

- Regular rhythm
- Rate greater than 100 bpm
- P waves dissociated or unable to see
- Unable to measure PR interval
- QRS longer than 0.10 sec

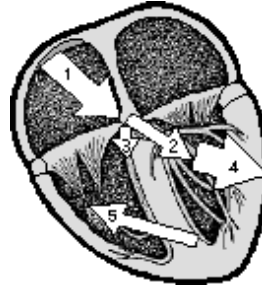
V-TACH CONDUCTION



SVT CHARACTERISTICS

- Regular rhythm
- Rate greater than 150 bpm
- Unable to distinguish P waves
- Unable to measure PR interval
- QRS 0.10 sec or less
- A-flutter, Junc Tach, Atrial Tach

ABERRANT CONDUCTION



DIFFERENTIAL CRITERIA

- History
- AV Dissociation
- QRS Width
- QRS Morphology
- QRS Axis

FACTS ABOUT V-TACH

If you see a wide complex tachycardia...it's more likely to be V-tach. SVT aberrantly conducted is much less common than V-tach. One study of 150 patients with wide complex tachycardia found that 122 of those were in V-tach.

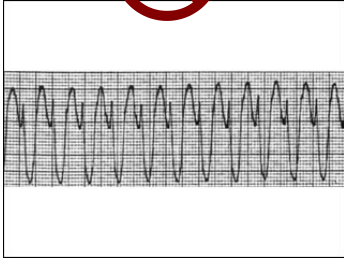


MEDICAL HISTORY

- Structural Heart Disease (95%)
 - Cardiomyopathy
 - Valve Disease
 - Congenital Heart Disease
- Myocardial Infarction (98%)

PATIENT PRESENTATION

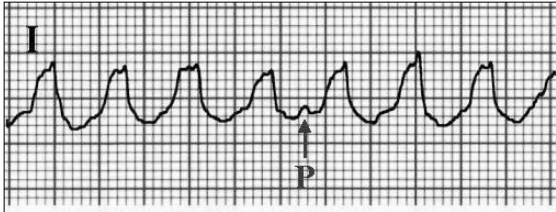
- Hemodynamic stability is a differential criteria




AV DISSOCIATION

- Best indicator that patient in V-tach
- Greater than 50% of patients with VT have evidence of AV Dissociation
- What to look for...
 - Check in all leads
 - Check for distortion within single cycles
 - Check for inverted P waves in II, III, aVF

VT WITH AV DISSOCIATION



PHYSICAL SIGNS WITH AV DISSOCIATION



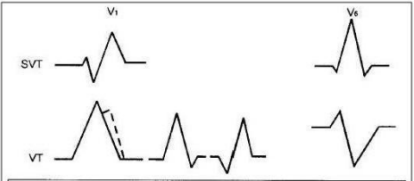
- Irregular "cannon A waves"
- Variable systolic BP from beat to beat

QRS WIDTH

- QRS is wider than 0.10 seconds for both VT and aberrant SVT
- Usually aberrant SVT QRS width is less than 0.14 seconds
- Usually VT QRS width is greater than 0.14 seconds

QRS MORPHOLOGY – V1 POSITIVE

- If V1 is positive deflection...then
 - Monophasic or biphasic in VT
 - Triphasic in SVT
- V6 is qRS in SVT



QRS MORPHOLOGY – V1 NEGATIVE

- V1 or V2 downslope is notched or slurred indicates VT
- V6 has a q wave in VT

The diagram shows two ECG waveforms. The first waveform, labeled 'VT', shows a V1 lead with a QRS complex that has a notched or slurred downslope. A horizontal line indicates a duration of >30 ms for the notched portion, and another horizontal line indicates a duration of >60 ms for the entire QRS complex. The second waveform, labeled 'Any Q', shows a V6 lead with a small, deep q wave.

COMPARE CRITERIA

<ul style="list-style-type: none"> • SVT <ul style="list-style-type: none"> • No history of heart disease • No AV dissociation • QRS width < 0.14 • QRS morphology <ul style="list-style-type: none"> • Triphasic if V1 + • V1 downstroke sleek • V6 has no q wave 	<ul style="list-style-type: none"> • V-tach <ul style="list-style-type: none"> • History of structural heart disease or MI • AV Dissociation • QRS width > 0.14 • QRS morphology <ul style="list-style-type: none"> • Not triphasic if V1 + • V1 downstroke notched or slurred • V6 has a q wave
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AXIS DETERMINATION

AXIS DETERMINATION

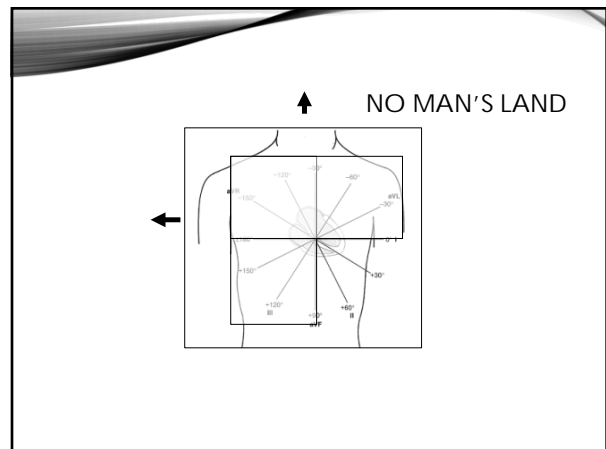
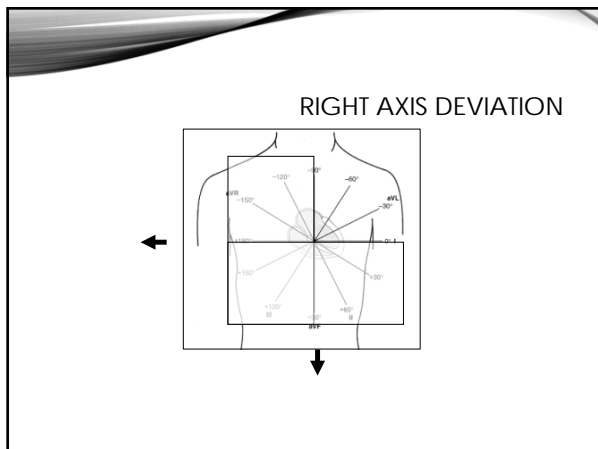
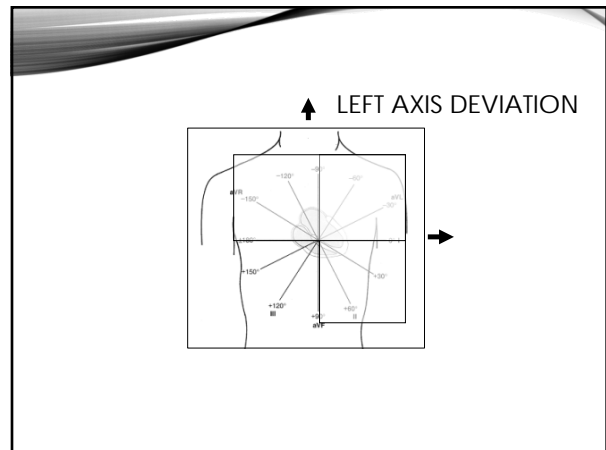
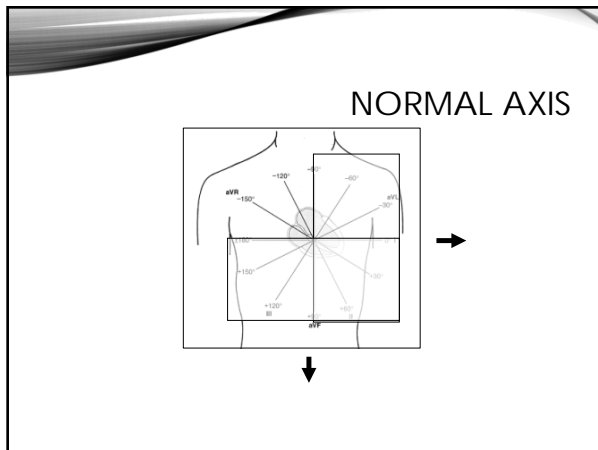
The diagram shows a cross-section of a heart with arrows indicating the direction of electrical impulses. The impulses flow from the top of the heart towards the apex, and from the inside of the muscle wall towards the outside.

- Impulse flows from the top of the heart to the apex and from the inside of the muscle wall to the outside
- These impulses are vectors
- Vectors added together are called axis

DETERMINING AXIS

- Use only Leads I and aVF to divide the chest into 4 quadrants
 - Normal
 - Right deviation
 - Left deviation
 - Northwest or "No man's land"

The diagram is a circular axis determination chart. The horizontal axis represents Lead I (0 degrees) and the vertical axis represents Lead aVF (90 degrees). The quadrants are labeled: 'Left' (top-left), 'Normal' (bottom-right), 'Right' (bottom-left), and 'No Man's Land' (top-right). Leads II, III, aVR, and aVL are also plotted. Lead II is at 30 degrees, Lead III is at 120 degrees, Lead aVR is at -150 degrees, and Lead aVL is at -30 degrees. The leads are arranged in a hexagonal pattern around the center.



QRS AXIS FAVORING V-TACH

- Right axis deviation
 - Lead I negative
 - aVF positive
- No Man's Land
 - Lead I negative
 - aVF negative

SUMMARY OF CRITERIA FAVORING V-TACH

- Cardiac History
- AV Dissociation
- QRS width greater than 0.14 sec
- V1 and V6 positive and not triphasic
- V1 and V2 negative with notched or slurred downstroke and V6 has q wave
- Lead I is negative deflected

CASE #3
66 y/o woman brought directly to the ED from the funeral of a close friend with c/o chest pressure
No history of cardiac risk factors



WHAT'S YOUR DIAGNOSIS?

APICAL BALLOONING

- Patient presents with chest pain, dyspnea, ECG changes and elevated enzymes
- Most are post-menopausal women, many with no CAD risk factors
- Left ventricle spontaneously normalizes within days to weeks

APICAL BALLOONING
AKA...
Tako-tsubo's cardiomyopathy

A "tako-tsubo" is an octopus trap used in Japan --

The top image shows a tako-tsubo, a traditional Japanese octopus trap. The bottom image is an echocardiogram showing apical ballooning, where the apex of the left ventricle is dilated and the walls are thin.

APICAL BALLOONING
AKA...
"Broken Heart Syndrome"

Many women who present with this condition have had a recent psychological or physiological stressor.

The icon shows a heart shape with a jagged crack down the center, symbolizing a broken heart.

APICAL BALLOONING

- Emotional stressors associated with takotsubo cardiomyopathy:
 - Unexpected death of friend or relative
 - Domestic abuse
 - Confrontational argument
 - Catastrophic medical diagnosis
 - Armed robbery
 - Surprise party
- Physical stressors
 - Exacerbated systemic disorders
 - Invasive procedures
 - Asthma attack

Thank You!

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