12 LEAD ECG CASE STUDIES

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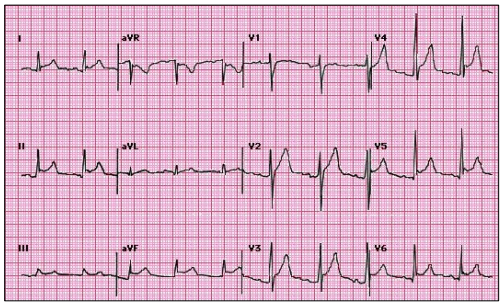
CASE #1

31 y/o male is a direct admit from the physician's office with c/o chest pain and SOA



WHAT ELSE WOULD YOU ASSESS?

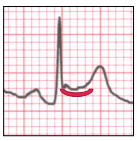
WHAT'S YOUR DIAGNOSIS?

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

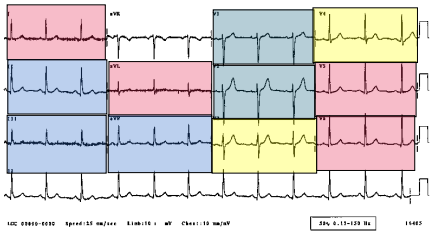


ST elevation in Pericarditis

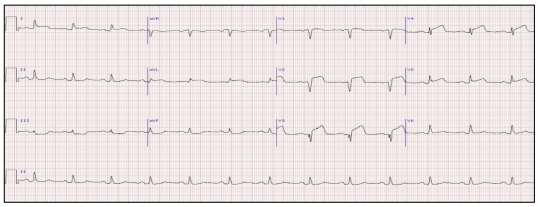
ST SEGMENT ELEVATION

- 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

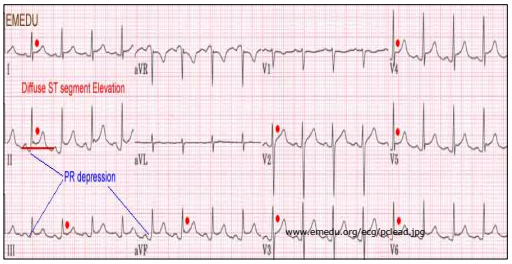
12-LEAD FAMILIES



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

Caring for a 52 y/o male with history of cardiomyopathy with fluid overload.

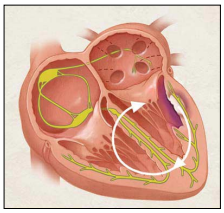
Begins to complain of fatigue & palpitations at the same time the monitor alarms.

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

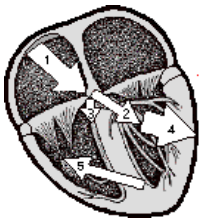


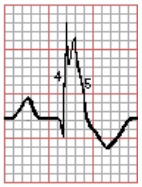
SVT CHARACTERISTICS

- 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

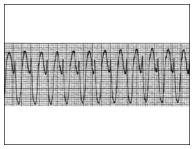
If you see a wide complex tachycardia…it's more likely to be V-tach. SVT aberrantly conducted is much less common than V-tach. One study of 150 patients with wide complex tachycardia found that 122 of those were in V-tach.

MEDICAL HISTORY

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

PATIENT PRESENTATION

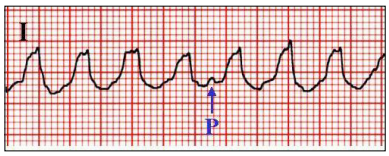
- Hemodynamic stability and differential criteria



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

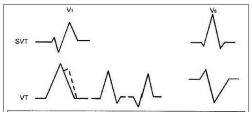
- Irregular "cannon A waves"
- Variable systolic BP from beat to beat

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

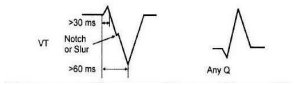
QRS MORPHOLOGY – V1 POSITIVE

- 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



COMPARE CRITERIA

- SVT
  - No history of heart disease
  - No AV dissociation
  - QRS width < 0.14
  - QRS morphology
    - Triphasic if V1 +
    - V1 downstroke sleek
    - V6 has no q wave
- V-tach
  - History of structural heart disease or MI
  - AV Dissociation
  - QRS width > 0.14
  - QRS morphology
    - Not triphasic if V1 +
    - V1 downstroke notched or slurred
    - V6 has a q wave

AXIS DETERMINATION

AXIS DETERMINATION

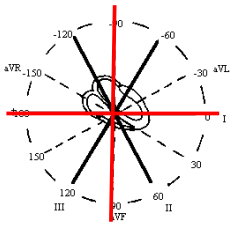
- Impulse flows from the top of the heart to the apex and from the inside of the muscle wall to the outside
- These impulses are vectors
- Vectors added together are called axis

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"

No Man's Land

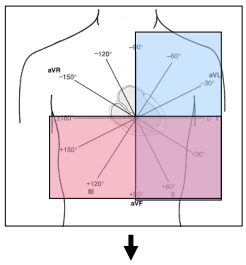
Left



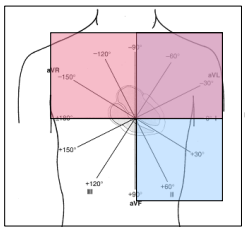
Right

Normal

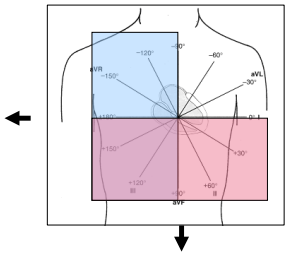
NORMAL AXIS



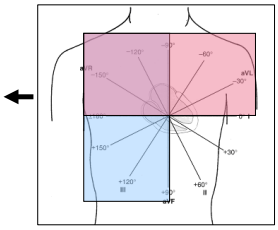
LEFT AXIS DEVIATION



RIGHT AXIS DEVIATION



NO MAN'S LAND



QRS AXIS FAVORING V-TACH

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

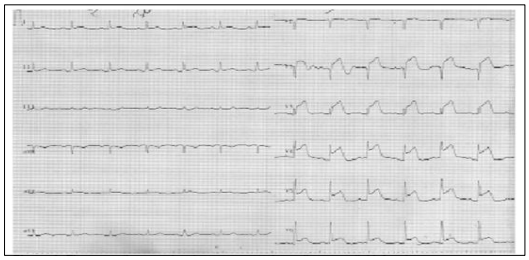
SUMMARY OF CRITERIA FAVORING V-TACH

- 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

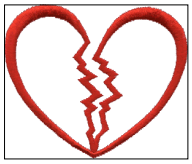
A "tako-tsubo" is an octopus trap used in Japan --

APICAL BALLOONING

AKA...

"Broken Heart Syndrome"

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



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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