

# STRESS TESTING: WHAT EVERY TECHNOLOGIST NEEDS TO KNOW

## ECG Findings

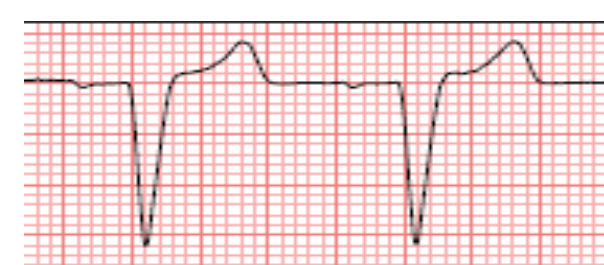
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### Intraventricular Conduction Abnormalities

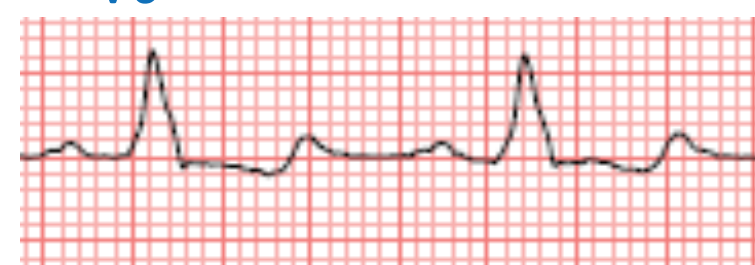
#### Left Bundle Branch Block

- Wide QRS (duration  $\geq 120$  ms)
- Broad/slurred R wave in I, aVL, V5, V6
- Absent q waves in I, V5, V6
- R wave peak time  $> 60$  ms in V5 and V6
- WiLLiaM: W pattern in V1, M pattern in V6
- Uninterpretable for ischemia

V1



V6



#### Paced Rhythm

- A-paced: pacer spikes before P waves
- V-paced: pacer spikes before QRS complex
- V-paced uninterpretable for ischemia



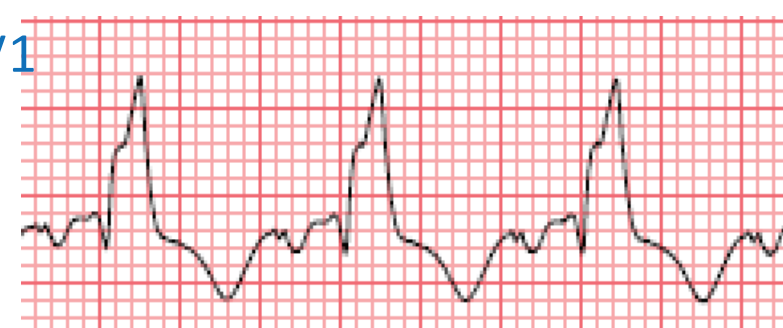
#### Intraventricular conduction delay (IVCD)

- QRS  $\geq 100$  ms
- Does not meet criteria for either LBBB or RBBB

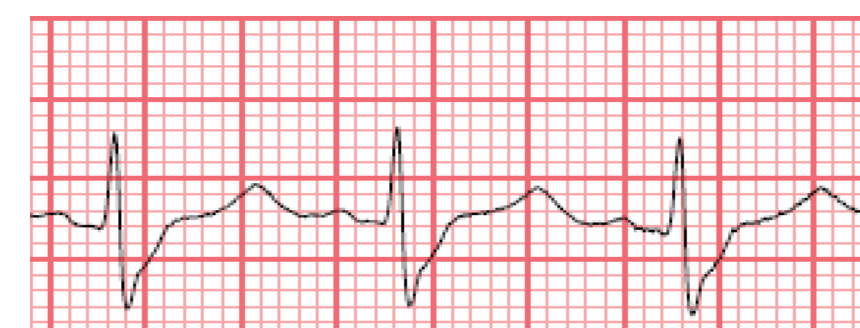
#### Right Bundle Branch Block

- Wide QRS (duration  $\geq 120$  ms)
- rsr', rsR', or rSR' pattern "Rabbit ears" in V1
- Deep slurred S wave ( $> 40$  ms) in I and V6
- MaRRoW: M pattern in V1, W pattern in V6

V1

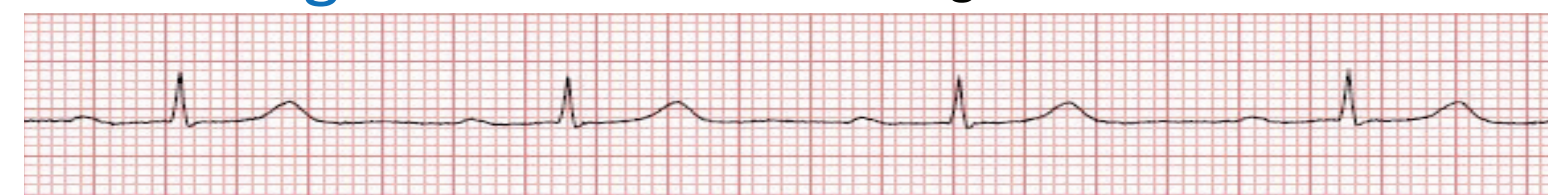


V6



### Bradyarrhythmia "Slow"

#### First Degree AV block: Prolonged PR $> 200$ ms



*Safe for Regadenoson*

#### Second degree AV block Mobitz type I:

PR interval gradually increases then a QRS complex gets dropped (dropped beat)

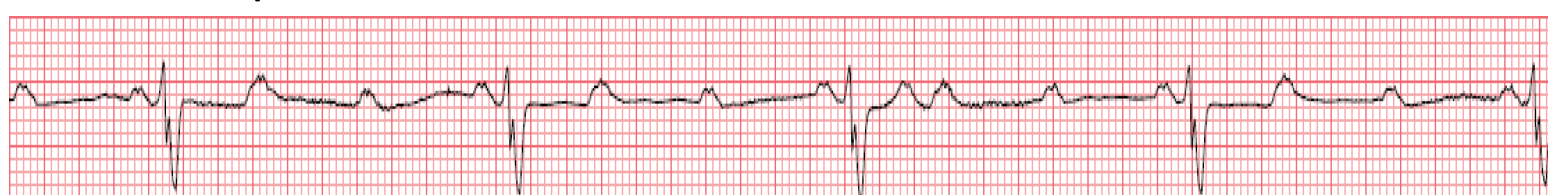


**2:1 AV block:** Every other P wave is conducted. Can be secondary to Mobitz I or Mobitz II



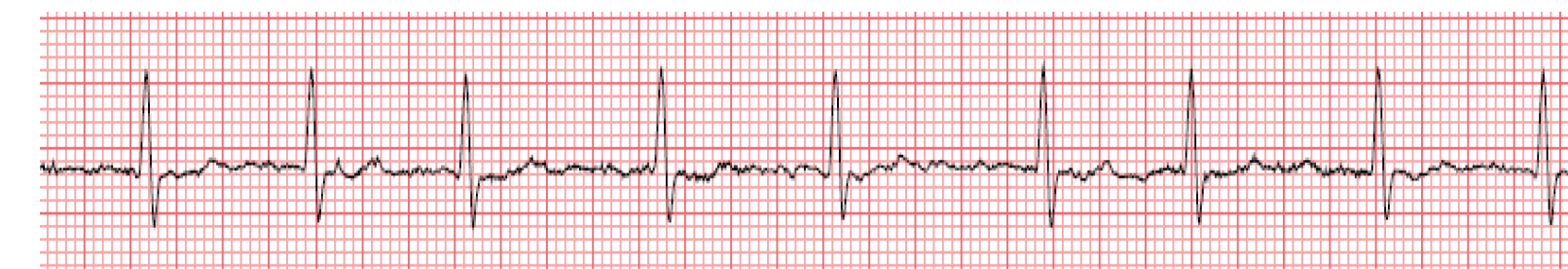
*Regadenoson contraindicated*

**Third degree (Complete) AV block:** None of the P waves are conducted. More than two P waves for every QRS complex.



#### Atrial Fibrillation

- No clear P waves
- Irregularly irregular rhythm/tachycardia



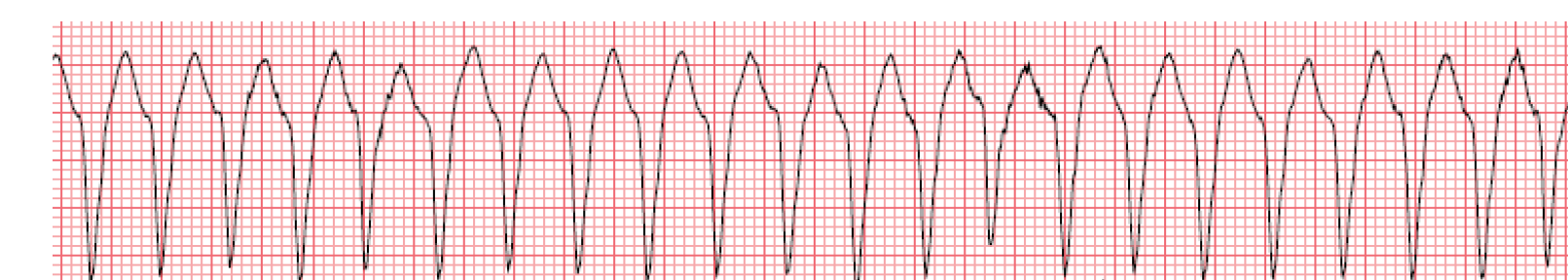
#### Atrial Flutter

- Flutter waves (Saw-tooth appearance)
- Fixed (usually 2:1) or variable AV block
- Usually at 130-150 bpm



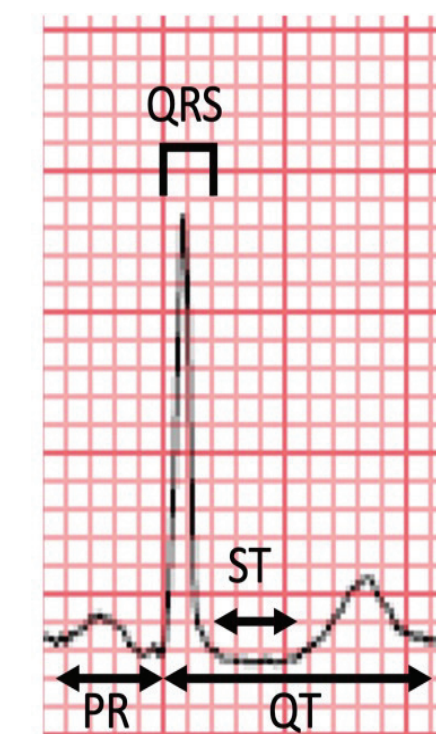
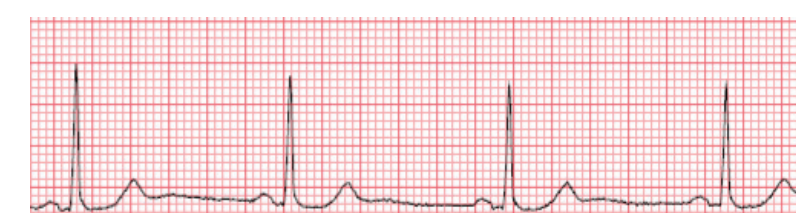
#### Ventricular Tachycardia

- Wide QRS: Usually  $> 140$  ms; rate  $> 100$  bpm
- Non-sustained  $\rightarrow < 30$  seconds and no requirement of emergency termination
- Sustained  $\rightarrow > 30$  seconds or requires emergency termination if there is evidence of hemodynamic compromise



### Normal Sinus Rhythm

- Upright P waves in leads I, II & biphasic in V1
- Rate 60–100 beats per minute
- Normal PR 120-200ms (3-5 small squares)
- Normal QRS  $< 120$ ms (3 small squares)



#### Other Tachycardias

- Sinus tachycardia
- Atrial tachycardia
- SVT: supraventricular tachycardia

### Ischemic Changes

#### ST Depression

- $\geq 1$  mm horizontal or down-sloping ST Depression in two or more leads
- Measured at 60-80 ms after the J-point
- During exercise, pharm stress and/or recovery



#### ST elevation

- $\geq 1$  mm ST segment elevation in the absence of q-wave
- High risk feature and localizing for myocardial ischemia
- Suggests transmural ischemia or severe multivessel coronary artery disease
- ST elevation in aVR may be suggestive of multi-vessel or left main disease

