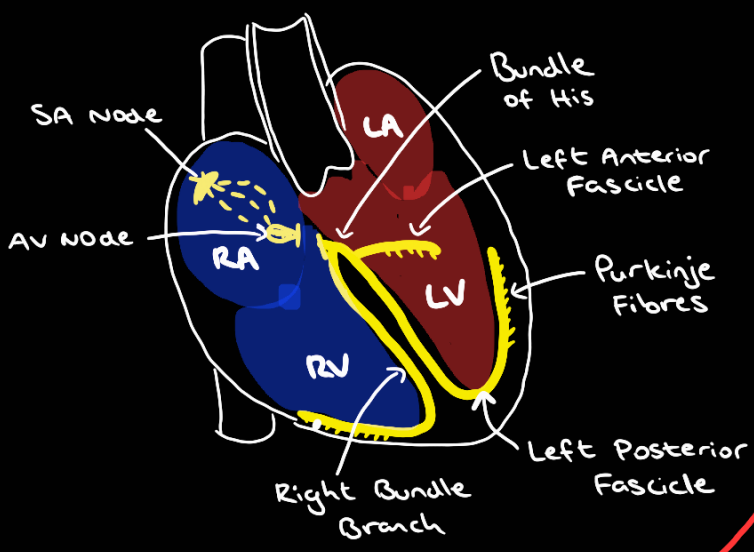
ECG

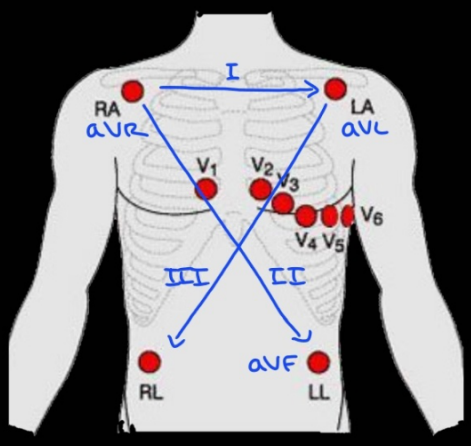
NORMAL CONDUCTION SYSTEM



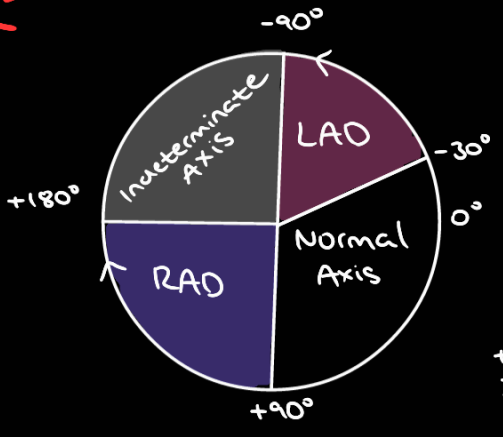
HOW IT WORKS?

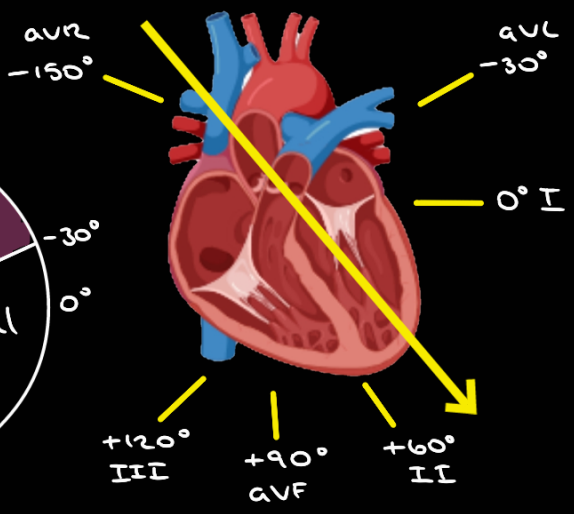
- Electrical impulse (wave of depolarisation) picked up by electrodes on patient.
- Voltage change sensed by measuring current change.
- Electrical impulse → electrode = Positive deflection
- Electrical impulse ← electrode = Negative deflection

ELECTRODE PLACEMENT



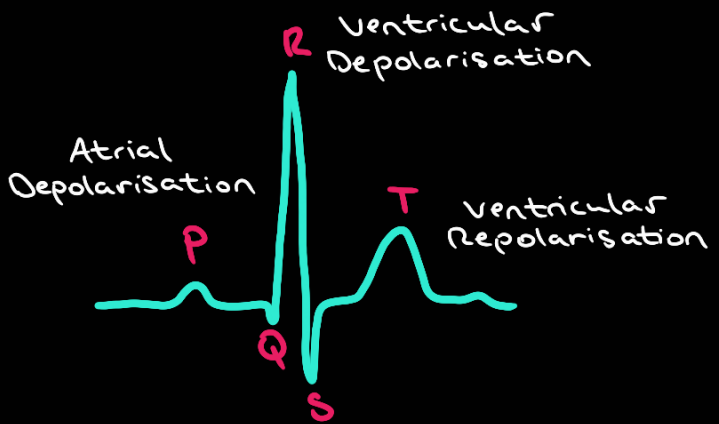
AXIS DEVIATION





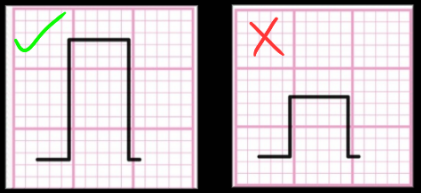
	Normal	Left axis deviation	Right axis deviation
I	+	+	-
II	+	-	+/-
III	+/-	-	+

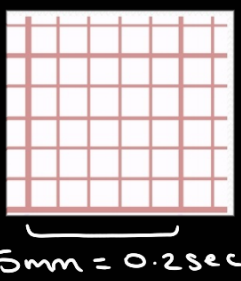
ECG MORPHOLOGY



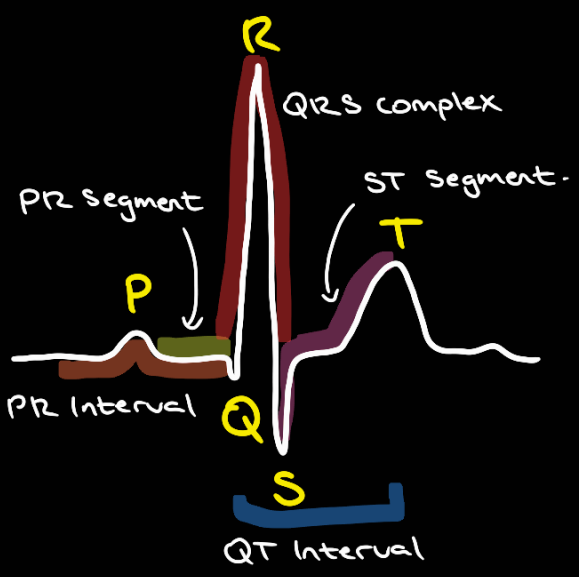
CALIBRATION

- Left of ECG page
- 10mm tall





WAVEFORMS / INTERVALS



- PR Interval : time to conduct through AVN / His
- QRS Complex : time for Ventricular depolarisation
  - Patterns of conduction disease through bundles
  - RBBB , LBBB
- ST Segment : start of Ventricular repolarisation.
  - ST elevation / depression

NORMAL VENTRICULAR CONDUCTION

Fibres of LBB begin conduction
- small r wave V1
- small q wave V6

↓

Impulse travels across interventricular septum from left → right.

↓

Travels across ventricles causing depolarisation of both RV + LV.

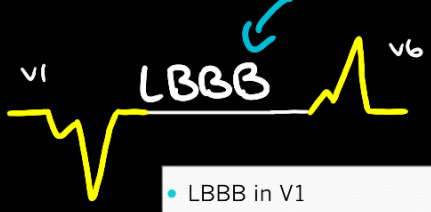
↓

LV contributes most to complex.
- Deep S wave V1
- Tall r wave V6.

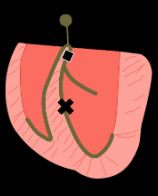
WOLF-PARKINSON-WHITE SYNDROME

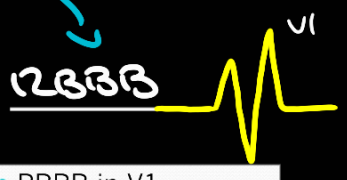
- PR interval issue
- A to V conduction through accessory pathway (AV node rather than SA node) on rest ECG.
- Risk of Ventricular fibrillation if patient develops atrial fibrillation + if accessory pathway conducts rapidly.

BUNDLE BRANCH BLOCK

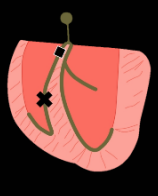


- LBBB in V1
  - initial deflection altered since travels right to left now
    - Q wave/ negative deflection
  - RV depolarizes unopposed
    - may produce small r wave
  - travels across septum to depolarize LV
    - deep S wave
- W pattern in V1
  - 'WiLLiaM' pattern
- ** note if patient has LBBB then ST segments is uninterpretable





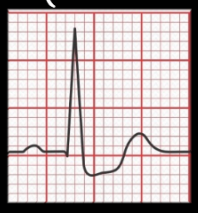
- RBBB in V1
  - no change in initial impulse travel
    - small r wave
  - impulse depolarizes LV by itself since RBBB (s wave)
  - RV depolarized late by impulse thru muscle (r' wave)
  - Hence RSR' pattern ('M' shape)
  - 'MaRRoW' pattern



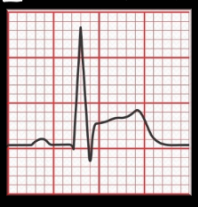
ST SEGMENT ABNORMALITIES

- Begins at END of QRS Complex.
- Ends at BEGINNING of T wave.
- Normal = Isoelectric line
- ST Segment elevation/depression could indicate mycardial ischaemia or infarction.

Depression



Elevation

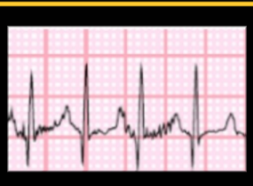


ANATOMICAL GROUPS

I Lateral	aVR None	V_1 Septal	V_4 Anterior
II Inferior	aVL Lateral	V_2 Septal	V_5 Lateral
III Inferior	aVF Inferior	V_3 Anterior	V_6 Lateral
LIMB LEADS		CHEST LEADS	

HEART RATE

Tachyarrhythmia

Narrow complex tachycardia	Broad complex tachycardia
	
• QRS duration <0.12s	• QRS duration >0.12s
• Uncontrolled atrial fibrillation or flutter	• Ventricular tachycardia
• Atrial tachycardia	• Ventricular fibrillation

CALCULATING HEART RATE

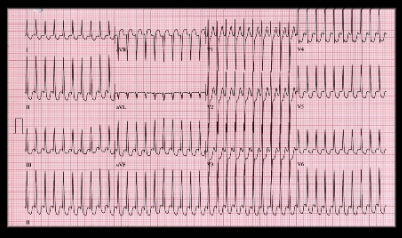
REGULAR

$$HR = \frac{300}{\text{Number of large squares between R waves}}$$

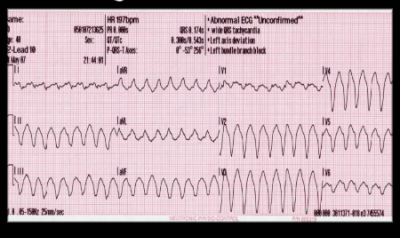
IRREGULAR

$$HR = \text{Number of QRS complexes} \times 6$$

SVT:



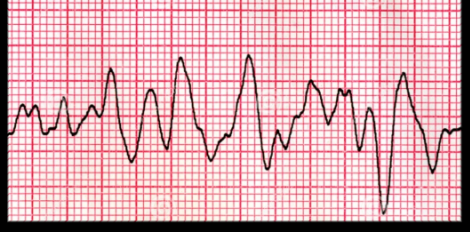
Ventricular Tachycardia



Atrial fibrillation:

Atrial Flutter:

Ventricular Fibrillation:



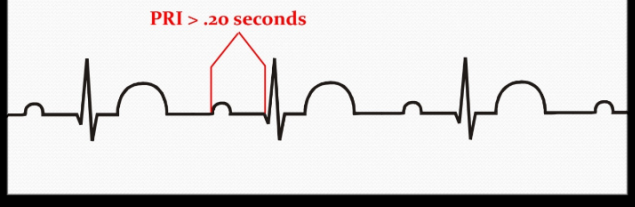
Bradyarrhythmia

- Abnormality resulting in a slow heart rate (<60bpm)

HEART BLOCK:

1st Degree:

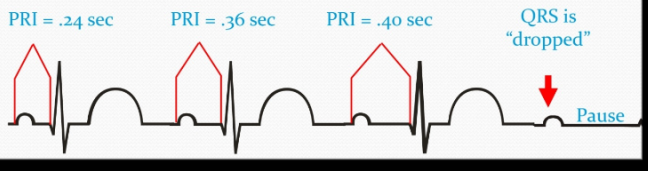
- Regular Rhythm
- PR interval > .20 seconds and is CONSTANT
- Causes: IHD, conduction system disease, seen in healthy children or athletes
- Usually does not require treatment



2nd Degree:

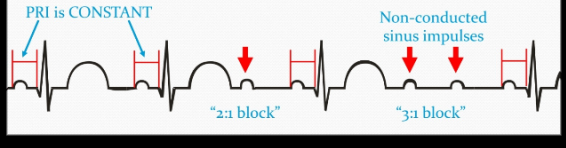
- Mobitez I

- Irregular Rhythm
- PR interval continues to lengthen until a QRS is missing (non-conducted sinus beat)
  - PR interval is NOT CONSTANT
- Rhythm is usually benign unless associated with underlying pathology, (i.e. MI)



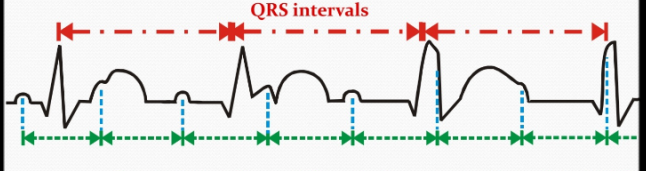
- Mobitez II

- Irregular Rhythm
- QRS complexes may be wide (greater than .12 seconds)
- Non-conducted sinus impulses appear at irregular intervals
- Rhythm is somewhat dangerous as the block is lower in the conduction system (BB level)
- May cause syncope or may deteriorate into complete heart block (3rd degree block)
- It's appearance in the setting of an acute MI identifies a high risk patient
- Cause: IHD, fibrosis of the conduction system
- Treatment: pacemaker



3rd Degree:

- Atria and ventricles beat independent of one another (AV dissociation)
  - QRS's have their own rhythm, P-waves have their own rhythm
- May be caused by inferior MI and it's presence worsens the prognosis
- May cause syncopal symptoms or angina, especially if ventricular rate is low
  - Treatment: usually requires pacemaker +/- temporary pacing/ isoprenaline



P-wave intervals – note how the P-waves sometimes distort QRS complexes or T-waves