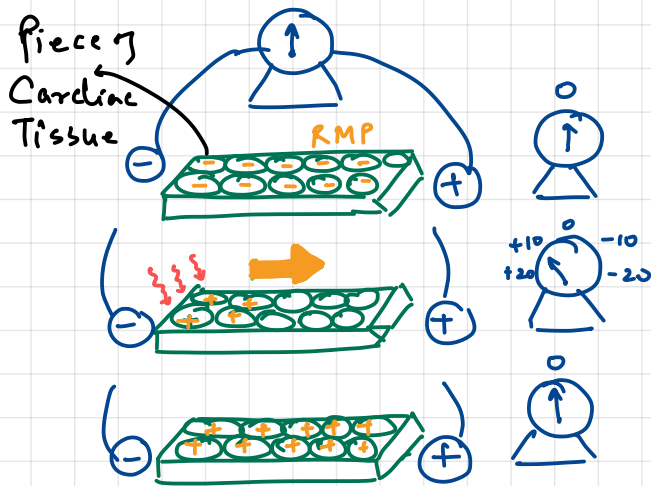


ECG

Electrocardiography

• RMP $\rightarrow -90\text{mV}$

• SA node & AV node depolarisation are based on Ca^{2+} not Na^{+} influx.

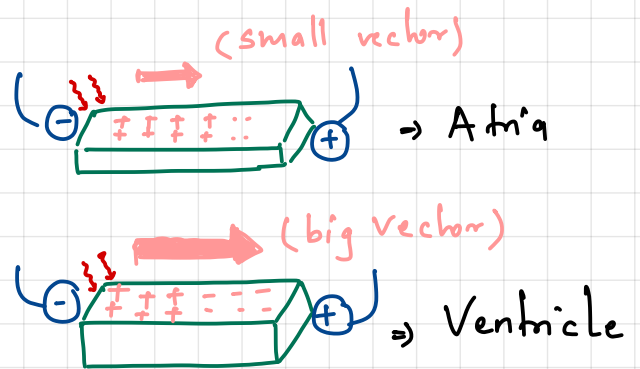


• Deflection will be faster in ventricles as it conducts electrical impulse very fast as it has Purkinje fibres.

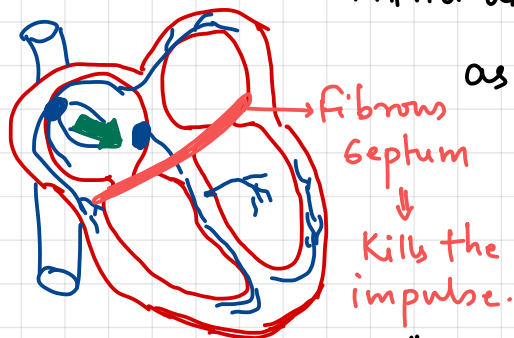
* Deflection will be strong if piece of cardiac tissue is bigger.

$\therefore$ Ventricle tissue > Atrial tissue

$\therefore$ Deflection in Ventricle > Deflection in Atria.



Electrical Event in One Cardiac Cycle :-



• Atria is depolarised downward & leftward; as Atria is at Right & Upward.

① AV node is specialised in Slow conduction.

• Bundle of His & Purkinje are specialised in Fast conduction.

So only way for impulse to go forward is by AV node.

AV node



Slow conduction

- more cell memb to pass
- Less gap junctions
- Depolarisation depends on Ca^{2+}
- RMP $\Rightarrow -60$ mV
- Cations move slow

Purkinje fibre



Fast conduction

- Large & less Resistant cells
- More gap junction.
- Depolarisation depends on Na^+
- RMP $\Rightarrow -90$ mV
- Cations move fast.

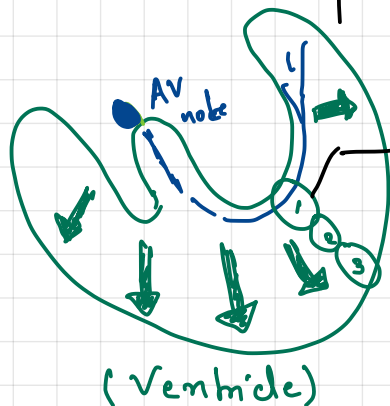
Vel. of Conduction

- SA Node - 0.05 m/s
- AV Node - 0.05 m/s
- Atrial pathway - 1 m/s
- Bundle of His - 1 m/s
- Purkinje sys - 4 m/s
- Ventriple - 1 m/s

* Electrical vector is very small (in AV)

* thus ECG machine does not pick up the current. * $\rightarrow$ Heart is silent

② Ventricular septal depolarisation: Small but fast.

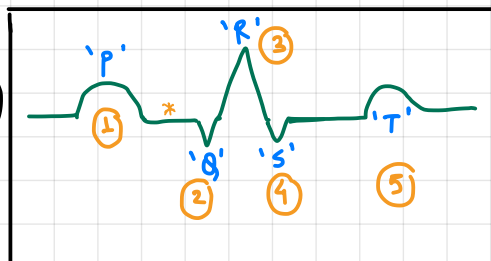
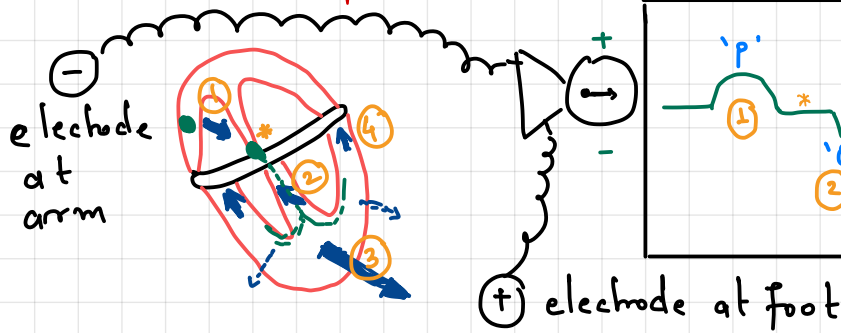


③ Inner myocardium is depolarised first.

$\rightarrow$ Left ventricle depolarisation is bigger/larger than right ventricle.

④ Ventricle Base depolarises at last.

Summary of Depolarisation Vector



⑤ Repolarisation of Ventricle from (outer to inner) myocardium.

P $\rightarrow$ Atrial Depolarisation

PR $\rightarrow$ Atrial Repolarisation

QRS $\rightarrow$ Ventricle Depolarisation

ST $\rightarrow$ Ventricle Totally depolarised

T $\rightarrow$ Ventricle Repolarisation.



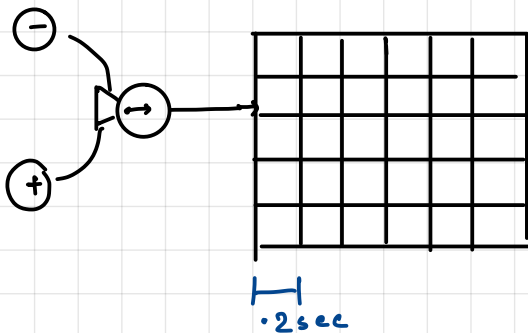
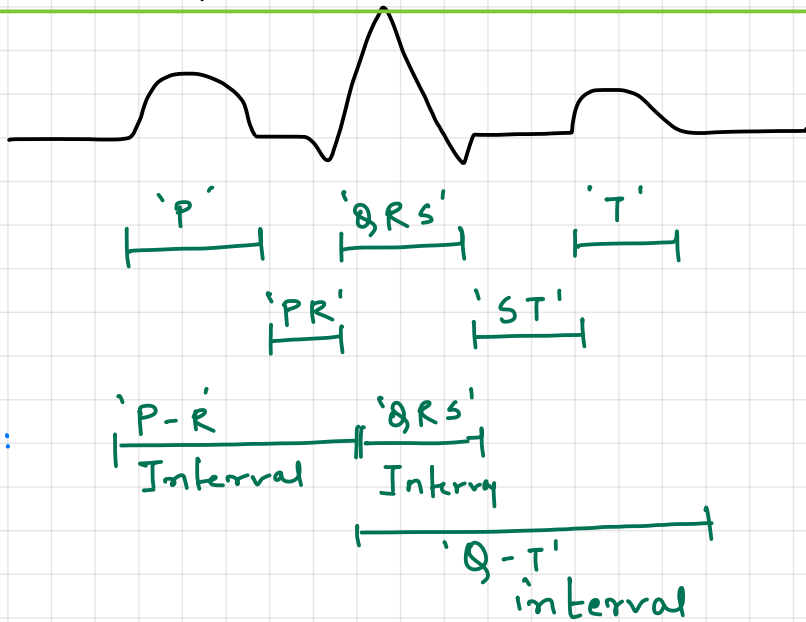
* 'PR' segment not 'PQ'

* 'U' wave $\rightarrow$ Repolarisation of Purkinje fibre.

Waves:

Segments:

Intervals:



On ECG paper

300 Big sq = 1 min

1 Big sq = $\frac{60}{300}$ sec $\Rightarrow 0.2$ sec

* There are 5 small sq in 1 Big sq.

$\therefore$ 5 small sq $\rightarrow 0.2$ sec

* 1 small sq $\rightarrow 0.04$ sec

① P wave $\Rightarrow 2\frac{1}{2}$ small sq.

So, P wave $\Rightarrow 2\frac{1}{2} \times 0.04$

$\Rightarrow 0.1$ sec

② PR interval $\Rightarrow 2\frac{1}{2}$ small sq.

$\Rightarrow 0.1 + 0.1$

$\Rightarrow 0.2$ sec

③ QRS complex $\Rightarrow 2\frac{1}{2}$ small sq

$\Rightarrow 0.1$ sec

④ QT interval $\Rightarrow 10$ small sq

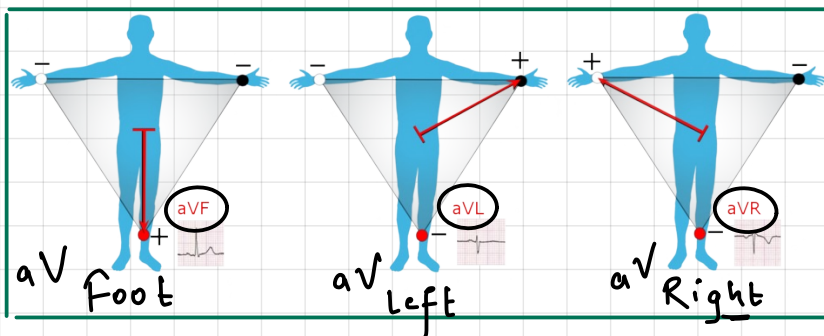
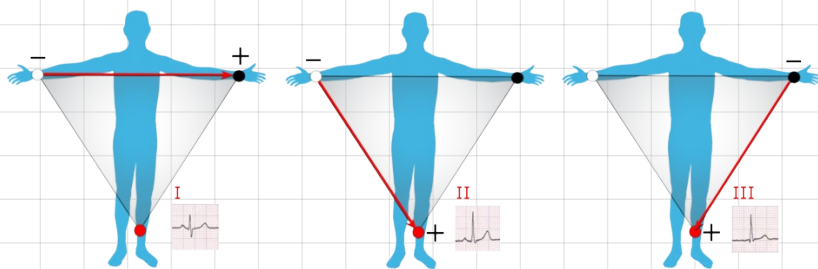
$\Rightarrow 10 \times 0.04$

$\Rightarrow 0.4$ sec

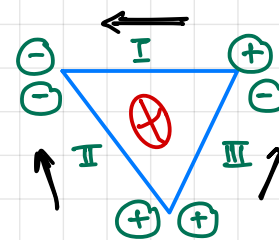
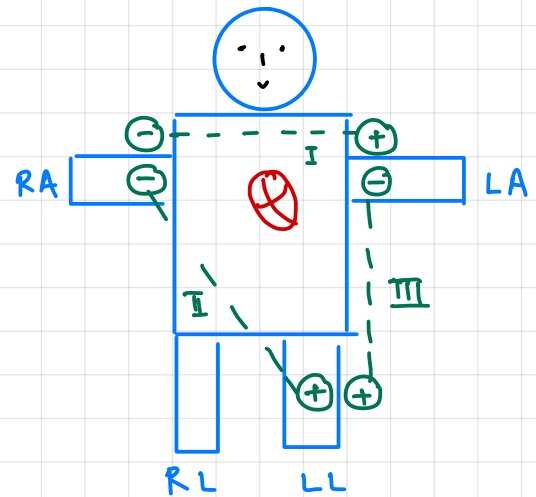
Leads

• 12 Leads

- 3 bipolar limb lead (I, II, III)
- 3 Augmented unipolar limb lead (aVR, aVL, aVF)
- 6 Precordial (Chest leads) (V₁ - V₆)



Bipolar limb lead

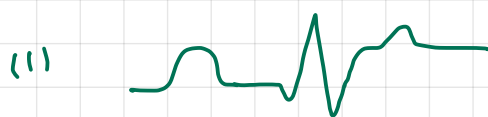


Einthoven Law

$$\Rightarrow I + III = II$$

(based on Vector)

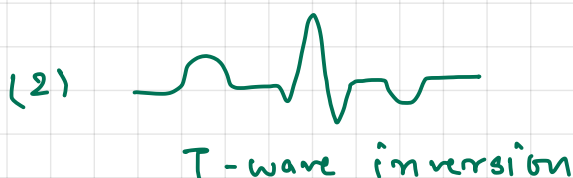
Abnormalities



STEMI

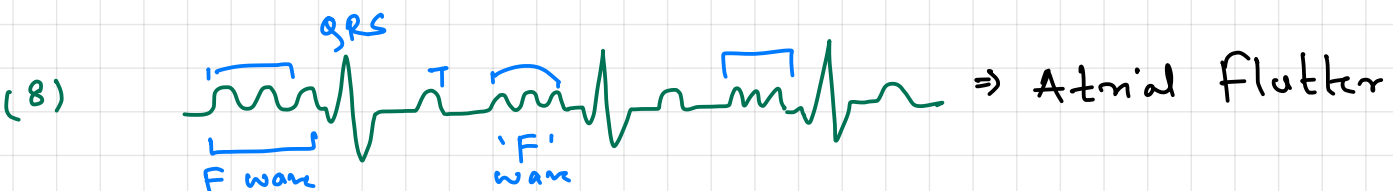
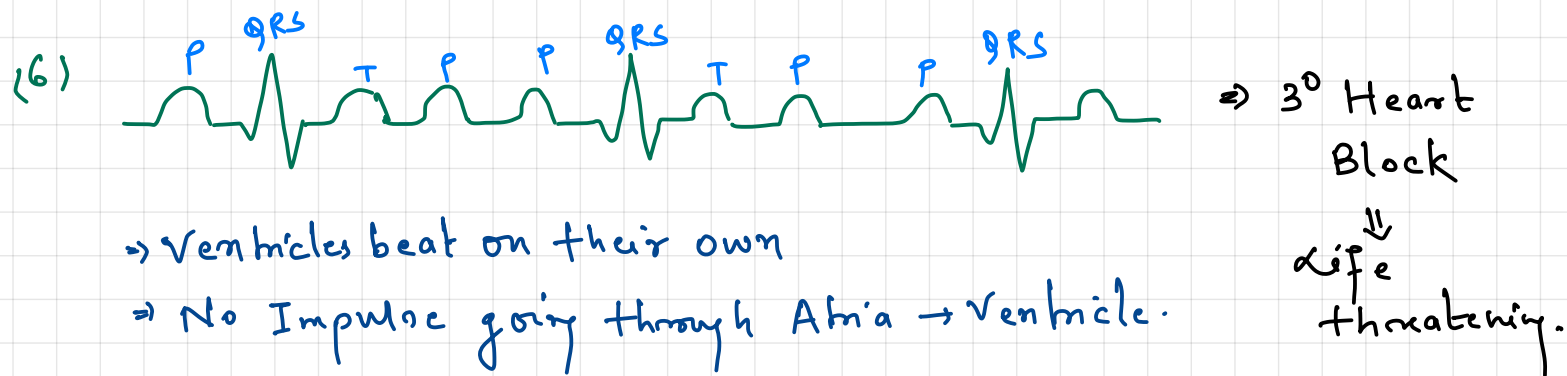
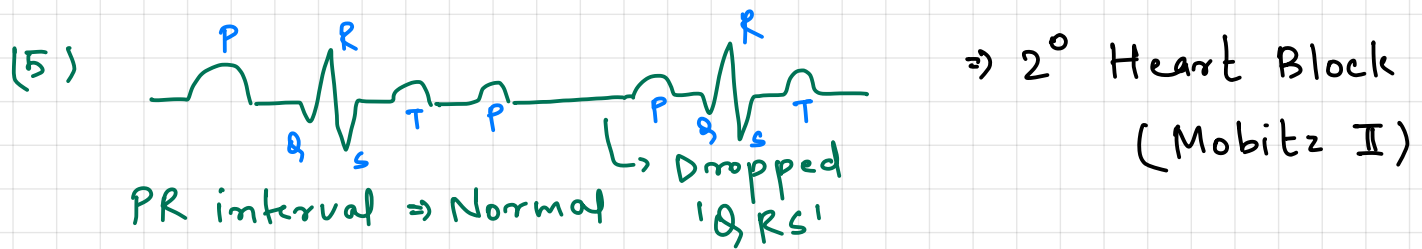
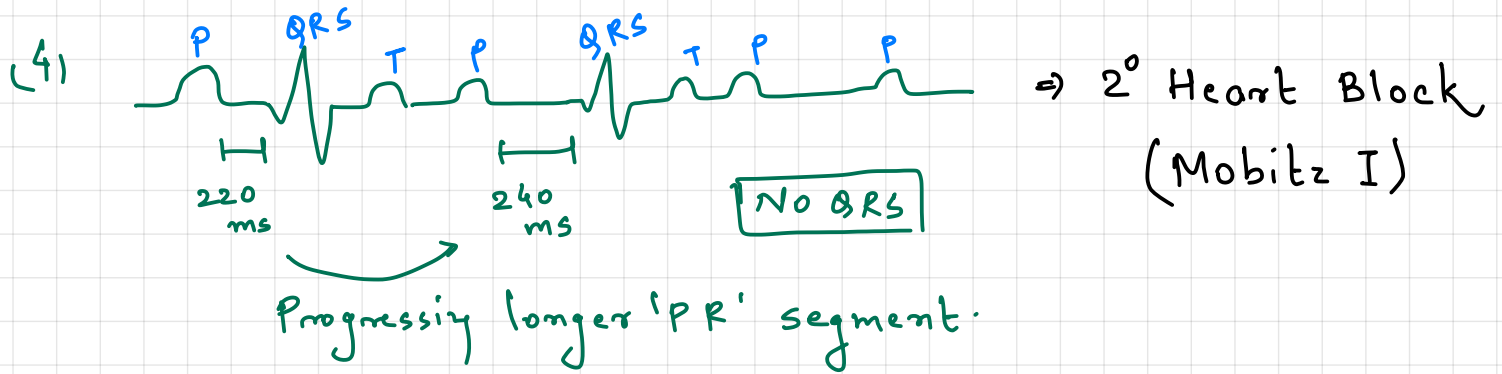
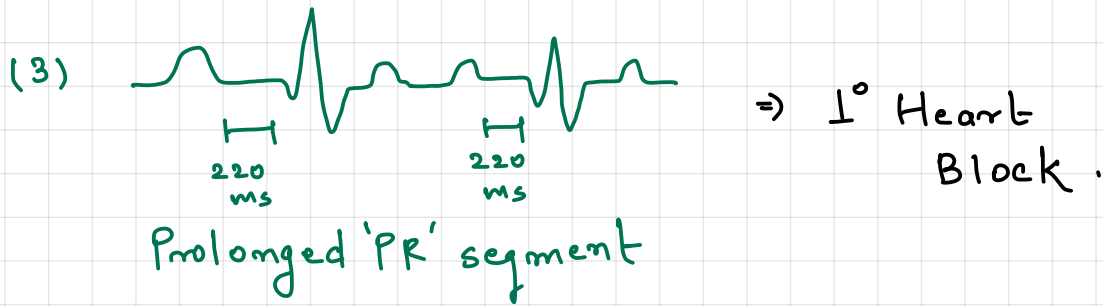
ST segment Myocardial infarction.

$\Rightarrow$ Myocardial infarction



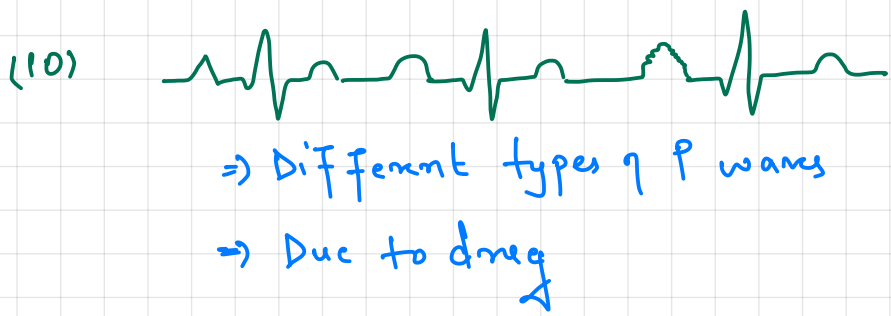
T-wave inversion

$\Rightarrow$ Ischemia of Myocardial tissue

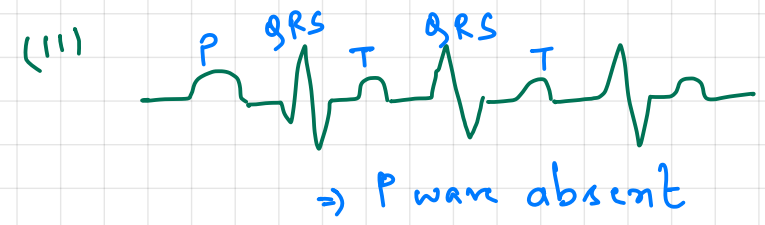




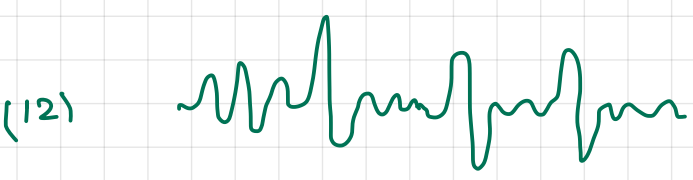
⇒ Atrial fibrillation.



⇒ Wandering Atrial Pacemaker



⇒ common due to exercise, Nicotine etc.



⇒ Torsades De Pointes
(Polymorphic ventricular tachycardia)
(VT)

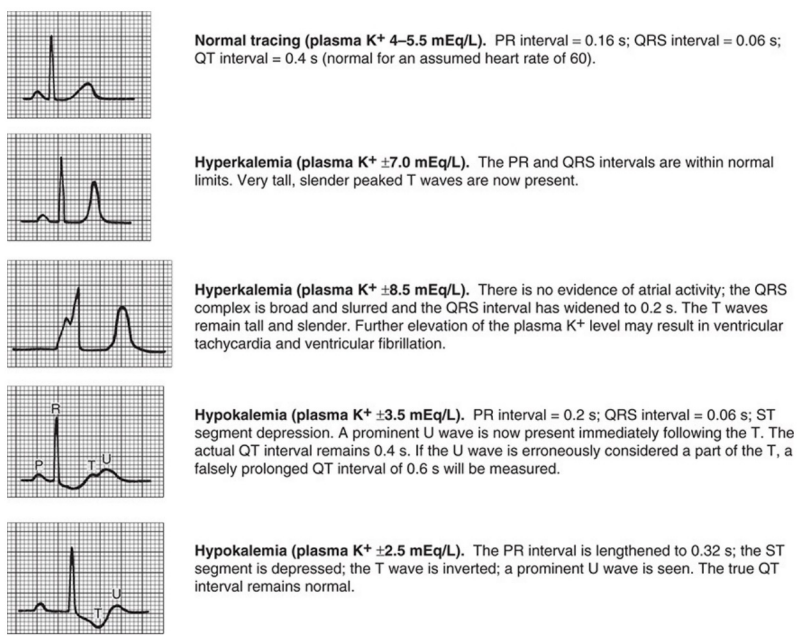


FIGURE 29-18 Correlation of plasma K^+ level and the ECG, assuming that the plasma Ca^{2+} level is normal. The diagrammed complexes are left ventricular epicardial leads. ECG, electrocardiogram. (Reproduced with

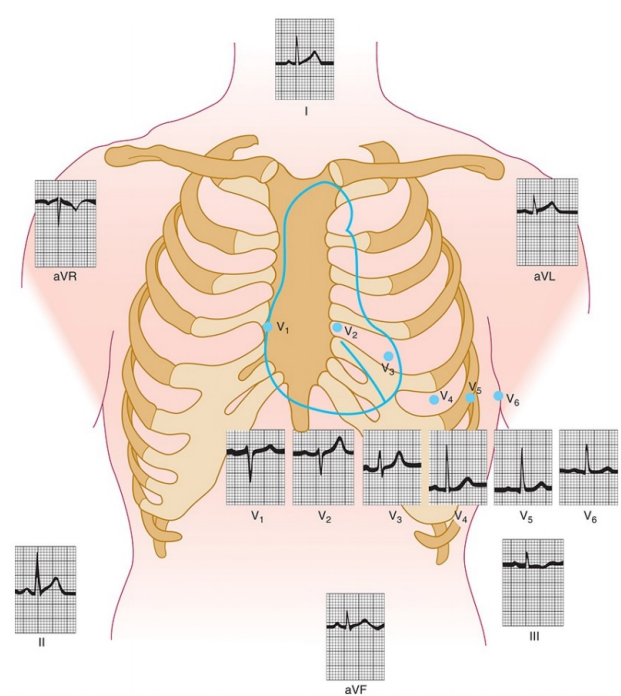


FIGURE 29-7 Normal ECG. Tracings from individual electrodes (positions