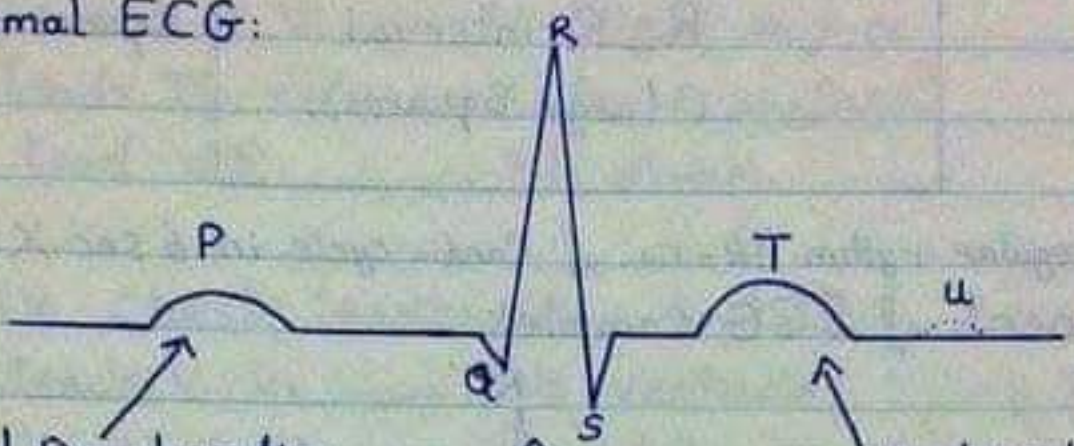
بسم الله الرحمن الرحيم

ECG

* Normal ECG:

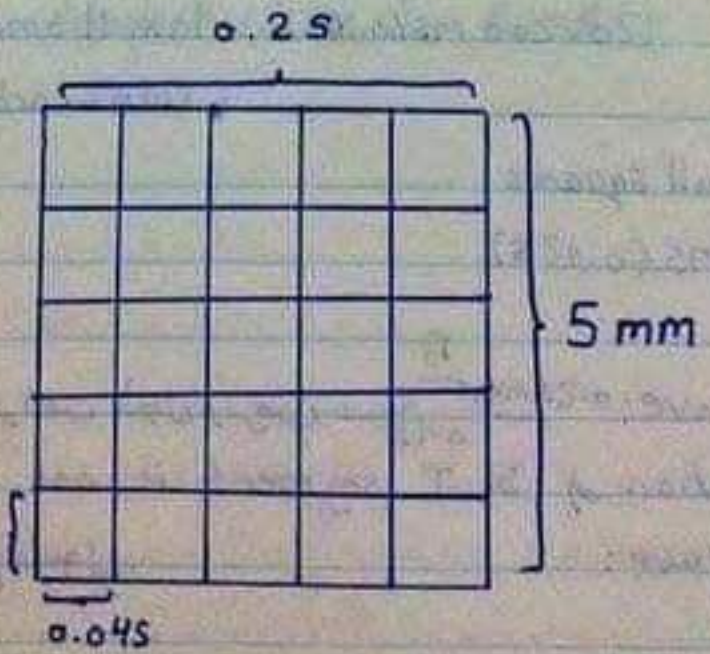


Atrial Depolarization (Atrial Repolarization marked by QRS comp.).

Ventricular Depolarization

Ventricular Repolarization.

* ECG paper (time & speed):
  - paper speed = 25 mm/s.
  - Large Square = 0.2 s (5mm).
  - Small Square = 0.04s

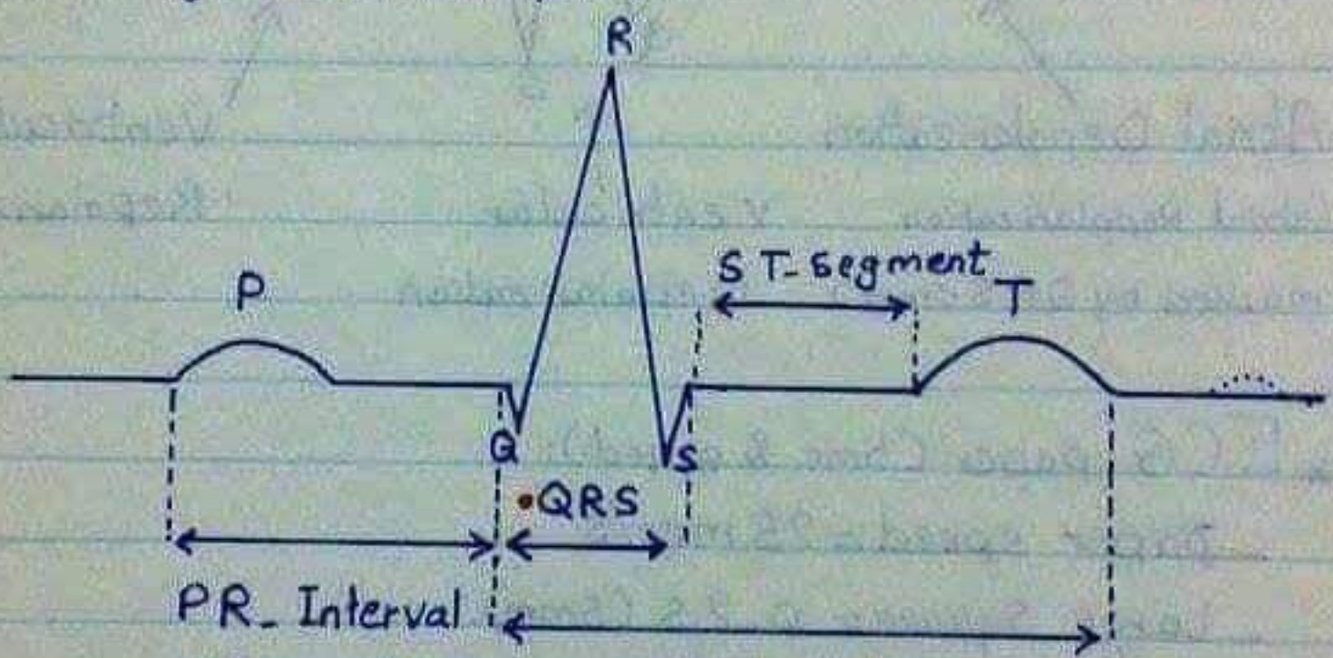


$$HR = \frac{300}{R\_R \text{ interval (large Squares)}}$$

Every 5 small squares = 1 sec

- if irregular rythm HR = no. of Cardia cycle in 6 sec X 10

* Component of ECG Complex:



PR_ Interval
3_5 small sq.
120- 200 ms (0.16s)

QT_ Interval
Max. 11 small sq. (450 ms)
(vent. action potential).

- QRS : 3 small squares
  120 ms (0.12s).

(N.B) * P wave: 0.25mv, 0.1s — لاتزيد عن مربعين ونص طول ومربع عرض

* Duration of S_T segment is not Important.

* Q wave: مربع عرض و مربع طول.

* The 12-ECG leads:

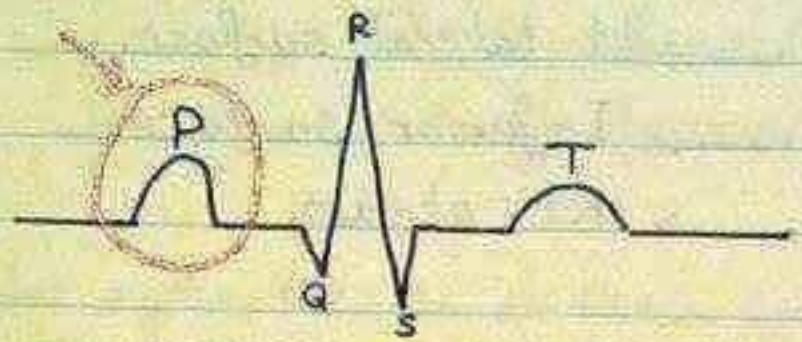
① Six standard Limbs leads: (vertical):
- Leads I, II, VL ⟶ Lt lateral surface.
- Leads III, VF ⟶ Inferior surface.
- Lead VR ⟶ Rt atrium.

② Six Chest leads: (Horizontal):
- Leads V_1, V_2 ⟶ Rt ventricle.
- Leads V_3, V_4 ⟶ Ventricular Septum.
  ⟶ ant wall of Lt ventricle.
- Leads V_5, V_6 ⟶ ant & lat wall of Lt ventricle.

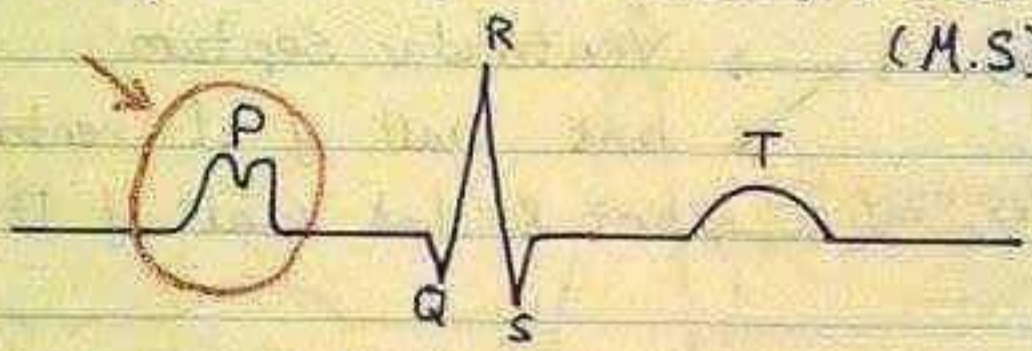
N.B - Look to P wave at lead II
- Lead aVR negative (لعشان نعرف الـ ECG متوصل X و V)
- lead II positive.
- Interventricular septum is a Lt. V structure so it is depolarized by Lt Bundle.

I. Abnormalities of P wave:- Lead I, II, V,

* Peaked P wave (P_pulmonale) ⟶ Rt atrium Hypertrophy. (T.S, P.S)



* Broad & Bifid P wave (P_Mitrale) ⟶ lt atrial Hypertrophy. (M.S)



N.B: _ if pulmonale in some leads & Mitral in others ⟶ Bilateral Hypertrophy.

_ Abscent P wave with irregular ryhthm ⟶ A.F.

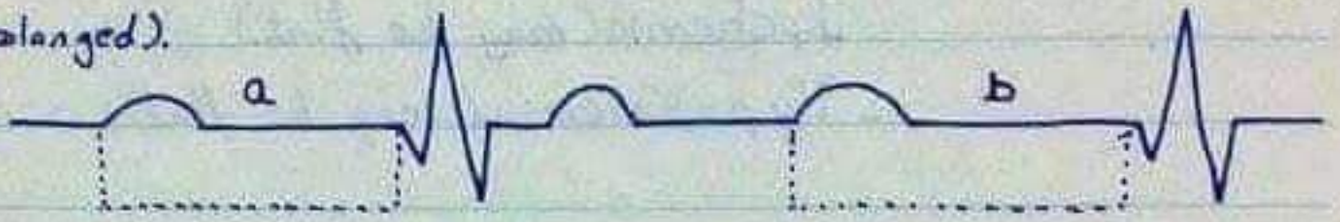
Ⅳ. Abnormalities of P-R interval:

* 1st degree heart Block:

prolonged P-R interval > 1 large Square + fixed.

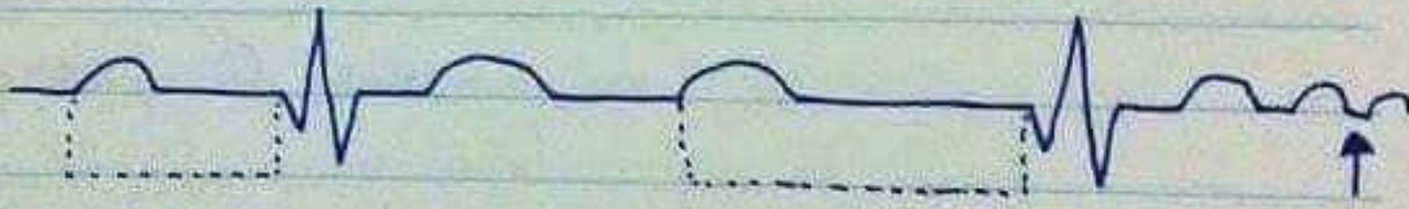
Normal = 200 ms prolonged > 200 ms.

a = 6 (prolonged).

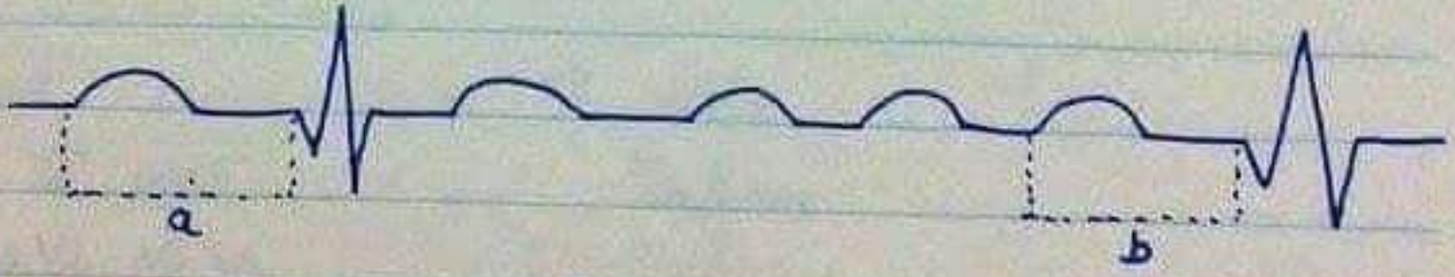


* 2nd degree heart Block: (Mobitz Ⅰ, Ⅱ)

- Mobitz Ⅰ: progressive prolonged P-R then dropped QRS Complex (Wenckebach phenomenon).



- Mobitz Ⅱ: a=b (Equal ratio)



* 3rd degree heart Block:

A-V dissociation V < P

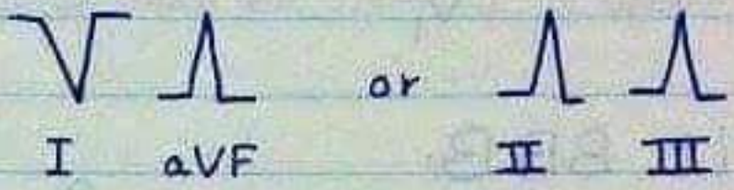
Abnormal QRS complex.

II. Abnormalities of the QRS Complex:

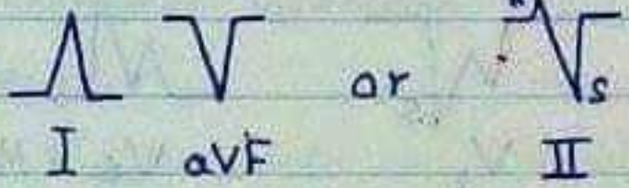
(A) Axis Deviation:

* Normal axis:

* Rt axis deviation:



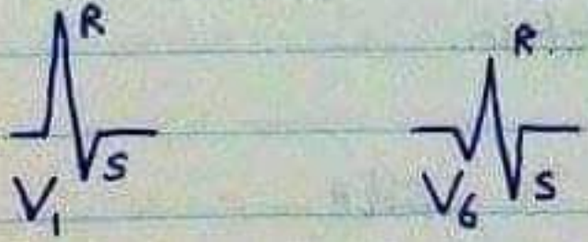
* Lt axis deviation:



(B) Voltage:

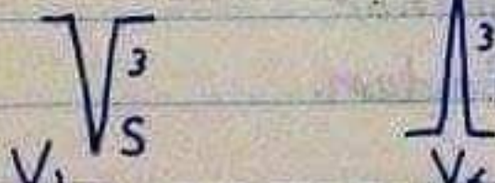
for ventricular Hypertrophy (lead V_1, V_6).

* Rt ventricular Hypertrophy.



(usually associated ê Rt axis).

* Lt ventricular Hypertrophy.

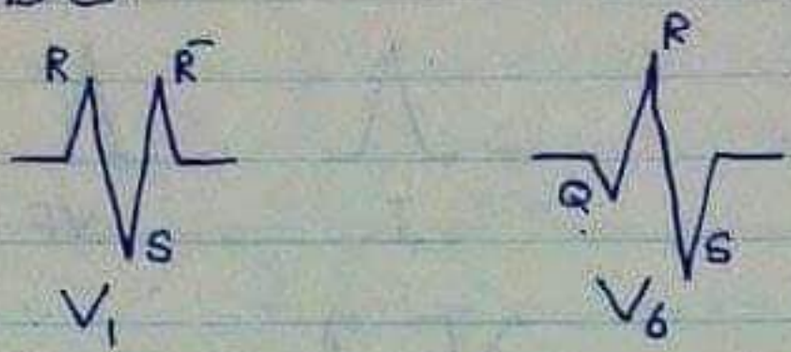


= 6 if > 7 Lt. V. Hypertrophy

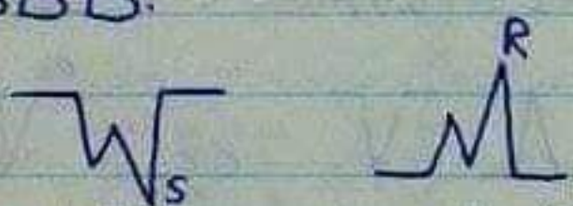
(usually associated è Lt axis).

(C) Bundle Bransh Block: Wide QRS Complex

* Rt BBB:



* Lt BBB:



+ T wave inversion in (I, aVL, V_5 , V_6)

(D) Abnormal Q wave:

* Q wave > 1 small Square Width & deep indicate Old Transmural infarction.

Lead	Site
II, III, aVF	Inferior
I, aVL, V_5, V_6	Lateral
V_3, V_4	Antrior
V_1 , V_2	Septum.

V. S_T segment Abnormalities:

* Elevated S_T segment: (recent)
  + Inverted T wave
  + pathological Q (old)
  - Transmural infarction (ms injury).

* Depressed S_T segment:
  + Inverted T wave
  (no old, no recent, no pathological Q)
  - Subendocardial Ischemia.

III. Abnormalities of the T wave:

* Inverted:
  - Normaly in aVR, V_1
  - Ventricular Hypertrophy (Rt or Lt).
  - Ischemia (may be flat).
  - HypoKalemia (may be flat). + U wave.

* Hyperacute:
  - Recent Transmural infarction.
  - HyperKalemia.

RYTHM

I. Regular:

المسافات بين QRS متساوية

To Know the pacemaker (focus)

(A) SAN: (sinus) Look at lead II aVR

* ≥ 100 Sinus Tachycardia, Regular, Rapid, Normal QRS.
* < 60 Sinus Brady Cardia, Regular, slow, Normal QRS.

(B) Not sinus:

Paroxysmal Abid Tachy. — Paroxysmal Vent Tachy.

no P wave
Regular
Rapid

Normal QRS Complex. — Abnormal QRS Complex.

II. Irregular:

المسافات بين QRS غير متساوية

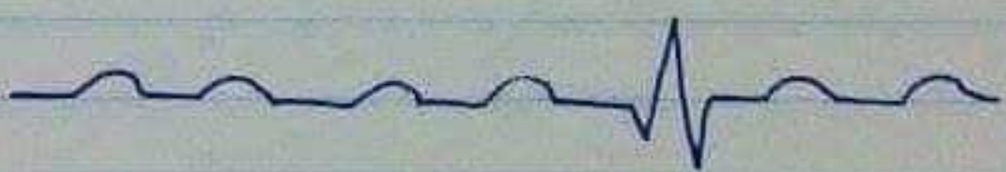
(A) Extra Systole:

* Identical Complex è Abnormal p wave in E.S.
  = Atrial extrasystole.

* Abnormal QRS Complex + Abnormal T wave in E.S
  = Ventricular extrasystole.

(B) Atrial flutter:

* Multible p waves not followed by QRS Complex



(C) Atrial fibrillation:

* No p wave, Irrgular QRS + F waves

(D) Ventricula Tachycardia:

* No p No T abnormal Regular Broad QRS.