بسم الله الرحمن الرحيم

* How to report an ECG :-

① patient's name, gender and age

② Cardiac Rhythm

Normal "SA Rhythm"

* Dep.. begins in the SA and spreads in it's normal pathway

* P wave prior to every QRS complex
* R-R Interval Regular all the pathway (>0,12) sec

Nodal "AV rhythm"

* Dep.. begins elsewhere and named after the part where it starts.

② check Heart Rate

Normal

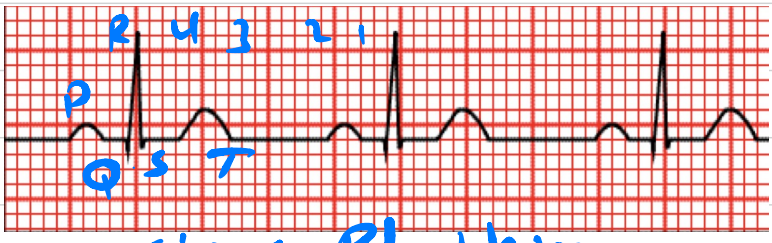
(60-100) BPm

* 300/large squares In R-R Interval

Ab-Normal

Tachycardia >100 BPm

Bradycardia <60 BPm

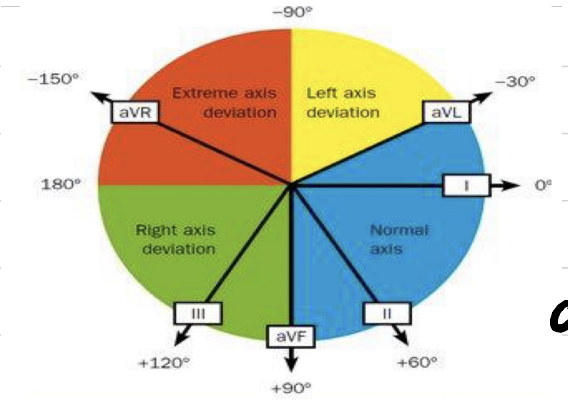


Sinus Rhythm

HR = 300/4 = 75 BPm

R-R → 0,04 * 20 = 0,8 normal

① Cardiac axis



* you can determine cardiac axis in many ways but best one if you have all checs Leads by looking at (I and aVF) leads

* Factors causing Axis deviation:-

Ⓐ Normal QRS duration and Voltage:-

1. Left Angulation of the heart and Left axis:

① Deep expiration ③ abdominal fat

② Lying down ④ short and obese

2. Right Angulation of the heart and Right axis:-

① Deep Inspiration ③ Thin and tall

② Standing up

Ⓑ Ab-Normal QRS duration and Voltage:

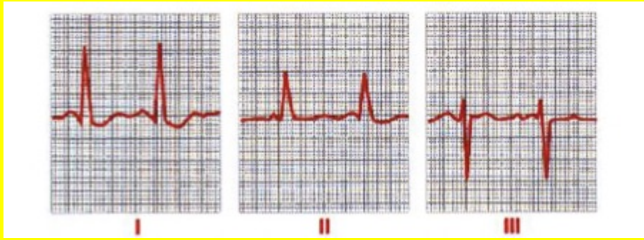
(0,09 - 0,12)s ← → >4 mV

Ventricular Hypertrophy:-

1. Hypertrophy of left ventricle (left axis shift) caused by hypertension, aortic stenosis or aortic regurgitation

2. Hypertrophy of right ventricle (right axis shift) caused by pulmonary hypertension, pulmonary valve stenosis, interventricular septal defect.

To find the voltage, look at leads I, II and III. Calculate how many small squares are taken up by both the R and S (R+S) for each of them, then add them all together, multiply the resulting number by how many mV a small square is worth.



Example:
- R+S for lead I: 16
- R+S for lead II: 10
- R+S for lead III: 18
- 16+10+18 = 44
- Assume that each small square is worth 0.1 mV
- 44 x 0.1mV = 4.4mV

(c) Ab-Normal QRS duration and Normal voltage:

One Bundle branch block:

1. Left bundle branch block causes left axis shift
2. Right bundle branch block causes right axis shift

(5) Description of P waves, QRS, T...:

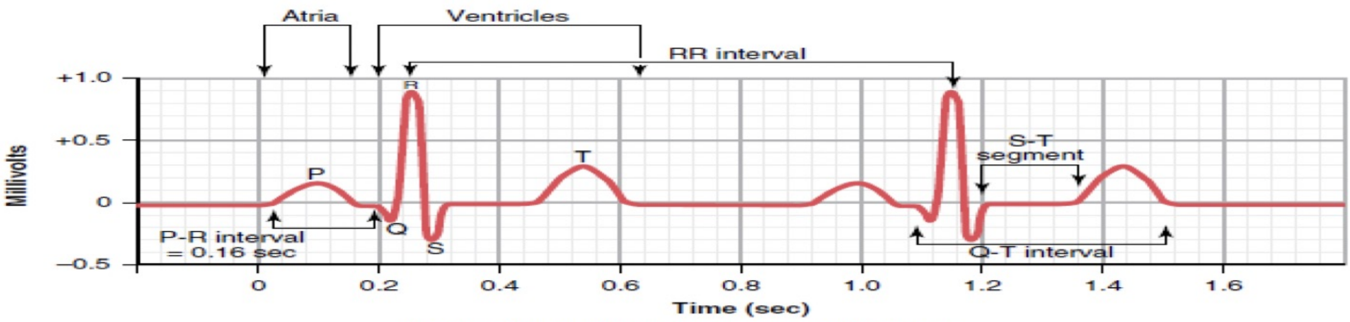
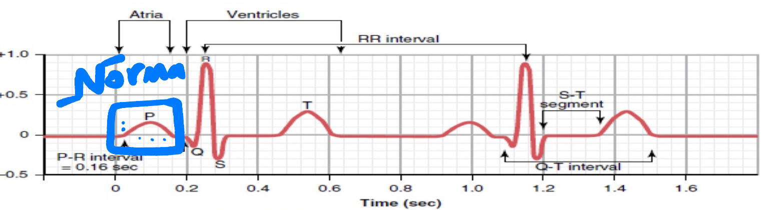


Figure 11-1 Normal electrocardiogram.

* Normal Conditions:

(A) * P-wave: Atrial Depolrization.
- * Normally ⊕ve deflection
- * Maximum high = 2,5 mm — مربعين صغار ونص طول
- * Duration < 0,12 — أقل من ٣ مربعات صغار



(B) * P-R Interval :- from beginig of P wave to begining of QRS

* Normally (0,12-0,20) من ٣ مربعات لحد ٥ مربعات صغار , بالعرضي

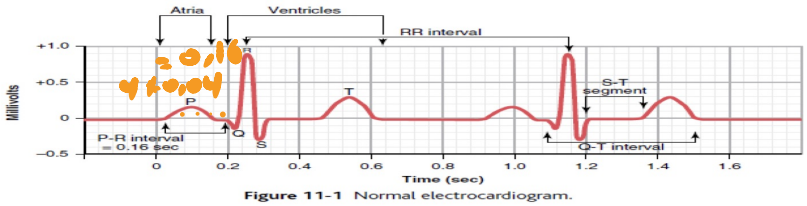


Figure 11-1 Normal electrocardiogram.

0,04 * 4 = 0,16 N

(C) * QRS Complex :-
Ventricular depolrization

* (0,06 - 0,10) sec
* (0,5 - 2,0) mV)) Normally

* In limb Leads aVR usually One deflection

(D) * T wave :- In normal adults, the T wave is usually upright in all leads, except the aVR and V1 leads

* Rounded and Asymmetricaly with Round peak

* height of the T wave should not exceed 5 mm in limb leads and 10 mm in chest leads

(E) * QT Interval : Begin of QRS to End of T wave

* Less than 0,44 sec

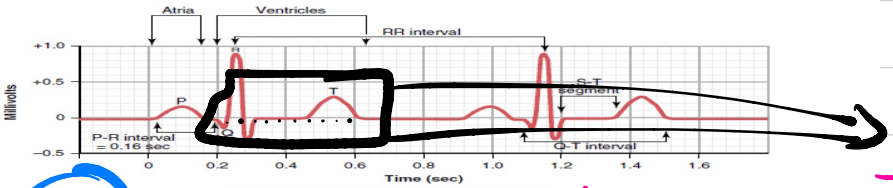


Figure 11-1 Normal electrocardiogram.

أقل من ١١ مربع صغير

10 * 0,04 = 0,4

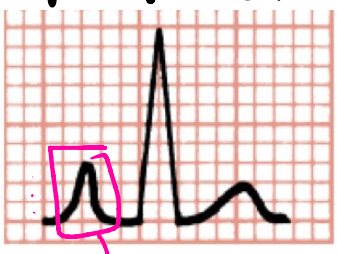
Normal

(F) * ST egment :- end of the QRS complex to the beginning of the T wave

* Ab-Normal Conditions

(A) P-Wave

P-Pulmonale



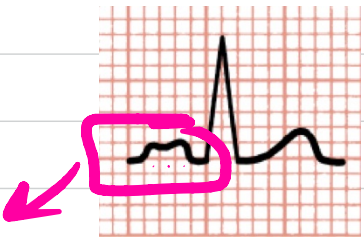
* Right Atrial Enlargement

* Peacked, higher and Narrower

أعلى من ٢.٥ ملي

أقل من ٣ ملي ثانية

P-Mitrale



* Left Atrial Enlarg...

* Notched and Prolonged

أكثر من ٣ ملي ثانية

(B) P-R Interval

Short

Abnormally fast conduction from the atria to the ventricles

Long

First degree heart block

(C) QRS Complex

Increased width:-

Cardiac hypertrophy or dilatation

- Bundle branch block

low voltage

Old myocardial infarctions.

- Pericardial or pleural effusion

High voltage

Cardiac hypertrophy

4

T- wave

Inversion

1. Mild ischemia
2. Ventricular hypertrophy
3. Bundle Branch Block
4. Digoxin Toxicity
5. Normal finding in aVR & V1

Peaked

1. Early stages of myocardial infarction
2. Hyperkalemia

Flattend

1. Hypokalemia 2. Ischemia

5

QT segment

Prolonged QT interval is seen in Long QT syndrome, hypokalemia, hypercalcemia & hypothyroidism.

6

S-T segment

Depressed or raised in ischemia or myocardial infarction

more than 1 mm of ST segment elevation/ depression in at least two contiguous limb leads (e.g. I and VL; III and VF)

more than 2 mm of ST segment elevation/depression in at least two contiguous chest leads

Arrhythmias: Abnormal heart Rhythm

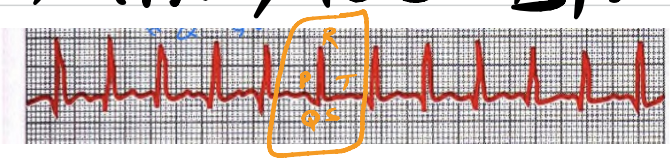
1. Sinus Tachycardia
2. Sinus Bradycardia
3. Sinus arrhythmia
4. Sino-Atrial Block
5. Atrioventricular Block
6. Ventricular fibrilation
7. Re-Entry
8. Atrial fibrilation
9. Atrial flutter

- First degree
- Second "
- Third "

1. Abnormal rhythmicity of the pacemaker
2. Shift of the pacemaker from the sinus node to another place in the heart
3. Blocks at different points in the spread of the impulse through the heart
4. Abnormal pathways of impulse transmission through the heart
5. Spontaneous generation of spurious impulses in almost any part of the heart

① Sinus Tachycardia:-

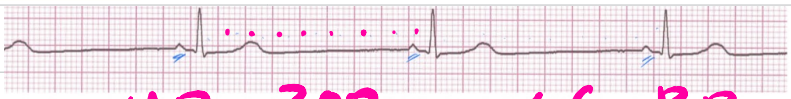
* Normal ECG Components (Normal P, QRS, T)
* HR > 100 BPM



$HR = \frac{300}{T6} \simeq > 100$

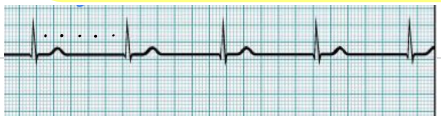
② Sinus Bradycardia:-

* Normal ECG
* HR < 60 BPM



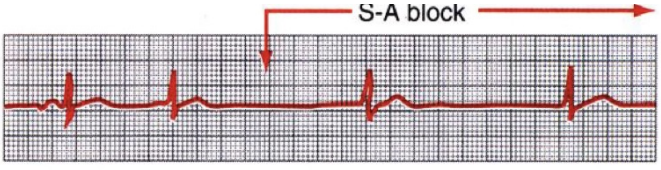
$HR = \frac{300}{8,5} = < 60$ BPM

③ Sinus Arrhythmia:-



No P wave - But Normal ((QRS-T))

④ Sino-Atrial Block:-



No P wave

Slow HR

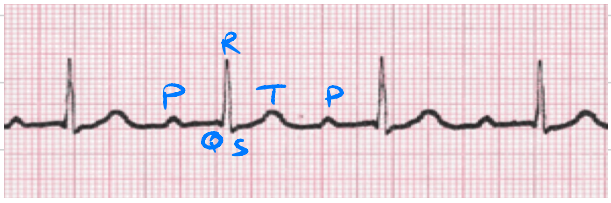
⑤ Atrio-ventricular Block :-

* Slowed or Blocked Atria → Ventricul
* pro-longed P-R Interval
* Can Cause no P wave Conductance.

Ⓐ First degree :- PR > 0,20 ①

② Each P wave → give QRS Complex

⑤ Caused by coronary artery disease, acute rheumatic carditis, digoxin toxicity or electrolyte disturbances



PR Interval = 0,04 * 7 = 0,28 prolayed

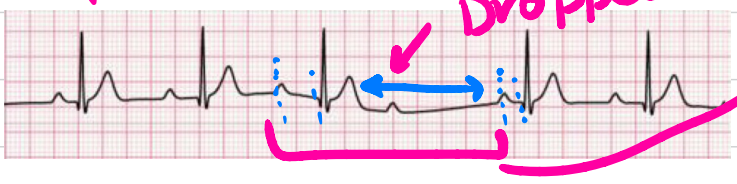
HR = 300 / 4,5 Normal

Ⓑ Second degree :- < Wenckebach / Fixed Ratio

* prolonged P-R (0,25-0,45) sec
* action potential is sometimes strong enough to pass through the bundle into the ventricles and sometimes not strong enough to do so

* Dropped Beat :- P ✓ QRS X

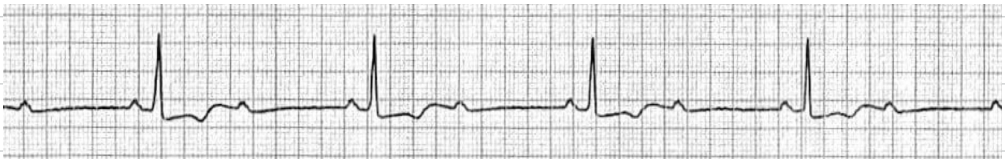
✱ Wenckebach periodicity



Tip:
Long Period .... Dropped .... Short Period
Then it Wenckebach

Ⓐ Fixed ratio blocks usually a fixed number of non-conducted P waves for every QRS complex

* Ab-Normality In bundle of His-Purkinje

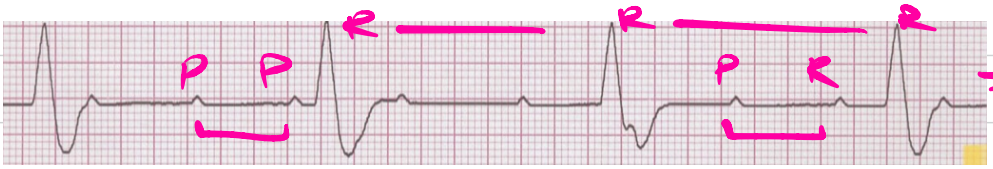


⑤ Third degree = Complete Block:-

- Total Block
- R-R Intervals are Regular
- P-P " " "

make it different from first degree.

- Atrial faster than ventricle



→ Notice the Regularity.

⑥ Adams stroke syndrome:-

Ventricles stop contracting for 5-30 sec because of overdrive suppression meaning they are used to atrial drive.

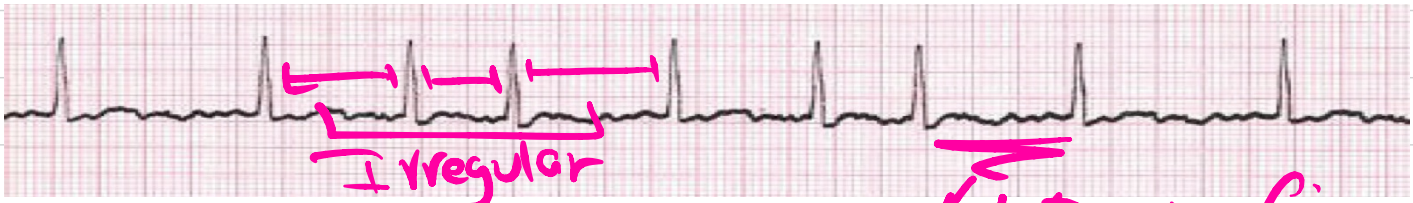
Tips: ? Patient faints because of poor cerebral blood flow

⑦ Ventricular fibrilation:-

Disorganized rhythm with no identifiable waves.

⑧ Atrial fibrilation:-

no P waves are seen or only a fine, high frequency, very low voltage wavy record. The QRS complexes are normal in shape but are irregular



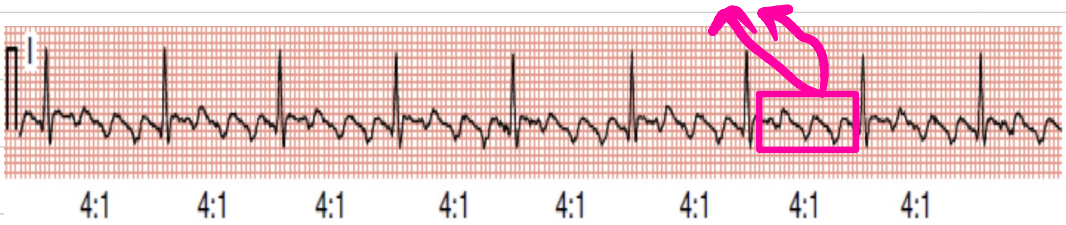
Irregular R-R Intervals

No or fine P wave

⑨ Atrial flutter:-

Atrial rate is around 300 bpm (200-400)

P waves are strong (saw tooth appearance)

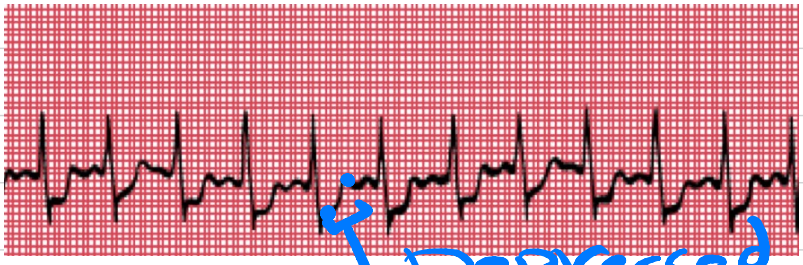


Angina Pectoris:-

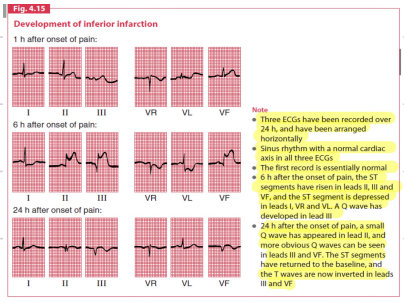
noticed while the patient is in pain, once the pain has resolved the ECG returns to normal.

Depression of the ST segment, is usually a sign of ischaemia.

Rem!! ← End of QRS to Start of T



Depressed (Notice here)!!



ST segment elevation myocardial infarction (STEMI)

① The earliest ECG changes are ST segment elevations

② hyperacute T waves

③ Large and transmural MI might produce permanent pathological Q waves within the first day of infarction

④ Hours or days later ST segments return to the baseline and deep T wave inversions appear in the leads that previously showed ST elevations.

Non-ST segment elevation myocardial infarction (NSTMI)

Associated with ST segment depression and T wave inversion in the leads corresponding to the site of myocardial damage

	NSTEMI	STEMI
INFARCT LOCATION	Subendocardial	Transmural
LAYERS INVOLVED	Subendocardium (inner 1/3) especially vulnerable to ischemia	Full thickness of myocardial wall
ECG CHANGES	ST-segment depression, T-wave inversion	ST-segment elevation, pathologic Q waves