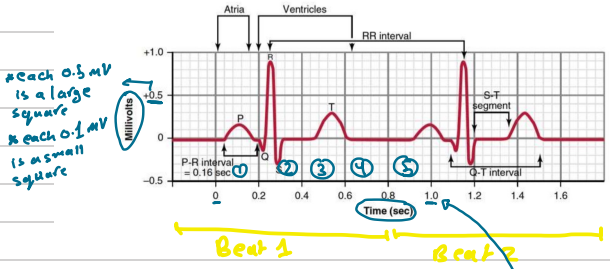
ECG

* ECG: recording of cardiac activity

- stimulation of the heart by SA node → electrical current ⇉ some of these currents reach the skin, so ECG machine uses this data to make a graph
  ↓ ↓ ↓
  simple / non-invasive



* each 0.5 mV is a large square
* each 0.1 mV is a small square

* large square → 5 mm
* small square → 1 mm
* 1 large square = 5 small squares

* Time is according to speed
* the standared time is 25 mm/sec, so each large square is 0.2 sec
  يعني كل ثانية عبارة عن خمس مربعات كبار

* the heart is made of four chambers but from the electrical point of view it's made of two chambers because the 2 atria polarize/depolarize as one unit as well as the 2 ventricles

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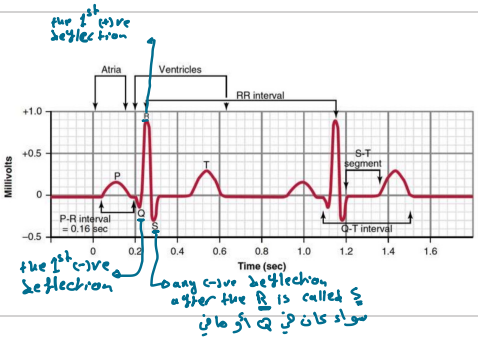
* ECG is made of 5 waves/intervals/segments

① waves (P/QRS complex/T)



- P-wave: atrial depolarization (both atria)
  the impuls generated in SA node will exite both atria at the same time
- QRS-complex: - composed of 3 parts but may also be composed of 2 parts [QRS or RS only]
  - it is the depolarization of ventricles (both ones)
  - the repolarization of atria is masked by the QRS complex because it takes place at the same time (we might see it in abnormal conditions)
- T-wave: ventricular repolarization

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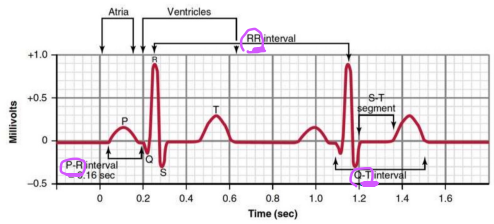
② intervals (PR/RR/QT)
it is a period of time with at least one wave



- PR-interval: - from the beginning of P-wave to the beginning of QRS
  - also called PQ-interval
- QT-interval: - from the beginning of QRS to the end of T-wave
- RR-interval: - between two R-waves
  - represents a whole cardiac cycle
  - important to measure heart rate

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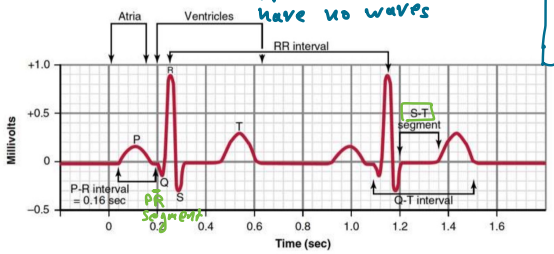
③ segments (PR/ST)
a period where we have no waves



- PR-segment: from the end of P-wave to the beginning of QRS-complex
- ST-segment: from the end of QRS-complex to the beginning of T-wave

* ECG lead is the graphical representation of the electrical activity, to get a lead the machine should receive data from at least two electrodes

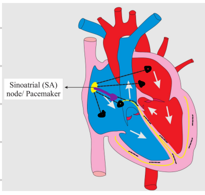
* 12-lead ECG
  - to get a 12-lead ECG we should use 10 electrodes
    - 4 limb
    - 6 chest

ECG machine

6 chest electrodes

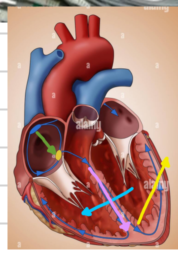
4 limb electrodes

* الdepolarization يتحرك بأكثر من اتجاه
في ال atria كلها لما بالنهاية
بتأخذ محصلة هاي الاتجاهات (vector)
وفي حالة ال SA node بتكون
المحصلة باتجاه AV node

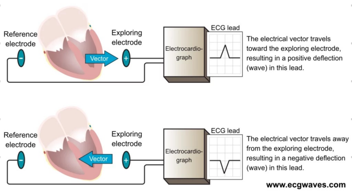


اتجاه محصلة ال electrical activity within atria (P-wave)

اتجاه محصلة ال electrical activity within ventricles



* داخل ال ECG machine في -ve / +ve electrodes



- vector of depolarization towards the +ve electrode within the machine, then the machine will give a positive deflection
- vector of depolarization to the (-)ve electrode → (-)ve deflection

one direction in the atria (P-wave)
three directions in the ventricles (QRS)

*when action potential reaches AV bundle then the two bundle branches, it enters the left branch more rapidly → left side of the interventricular septum will polarize before the right side → so the vector will be from the left to the right side
Q-wave

through out most of depolarization the vector will be from the base to the apex
R-wave

from the apex to the base
S-wave

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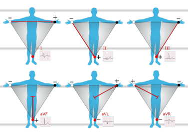
* the four limb electrodes will generate six leads
  - Bipolar limb leads → lead I / lead II / lead III
  - augmented unipolar limb leads (two limbs connected to (-)ve & high resistance electrode & the third limb to a (+)ve one) → lead avR / lead avL / lead avF



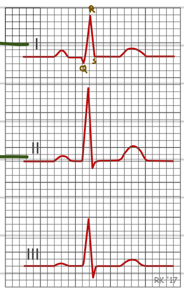
* هدول ال 7 ECGs بيحصلوا عليهم من اربع electrodes
لانه بيلي على ال right leg ما بنستخدمه
بال data analysis

* lead I : the machine considers the (-)ve electrode to be on the right arm & the (+)ve one on the left arm

* lead II : the right arm is (-)ve & the left leg is (+)ve

* lead III : left arm is (-)ve
left leg is (+)ve

بالنهاية ال three leads بيكون الهم نفس المدة الزمنية بس بيختلفوا بال voltage



has the lowest voltage (I)

has the highest voltage (II)

* تحكيناش most of the depolarization is from the base the apex so it's directed towards the (+)ve electrode → +ve deflection

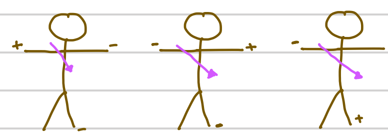
lead I
lead III (+)ve deflection
lead II (+)ve deflection

* avR : left arm & left leg connected to (-)ve electrodes and the right arm to a (+)ve one

* avL : left arm to the (+)ve
left leg & right arm to the (-)ve

* avF : left leg to the (+)ve
left & right arms (-)ve

remember ⇒ in the ventricle mainly from base to apex

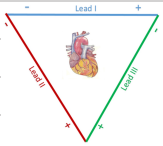


avR — (-)ve deflection
avL — somehow isoelectric but may be more (-)ve
avF — +ve deflection

Einthoven's triangle

- It's for the bipolar limb leads (the two arms & the left leg make the triangle)
- according to this triangle if we know the electrical potential of any two leads, then we can know the third one mathematically :-

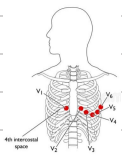
lead I voltage + lead III voltage = lead II voltage

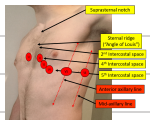


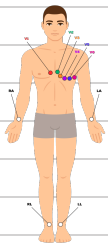
* notice lead II has the highest voltage

Chest electrodes

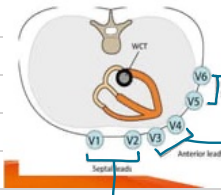
- we use 6 electrodes
- V_1 → 4th intercostal space, right side
- V_2 → 4th intercostal space, left side
- V_3 → between V_2 & V_4
- V_4 → 5th intercostal space, midclavicular line
- V_5 → 5th intercostal space, anterior axillary line
- V_6 → 5th intercostal space, midaxillary line
- we will end up with 6 leads







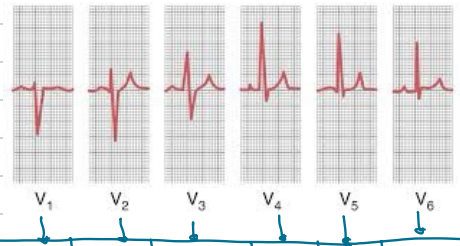
* the machine will consider the (-)ve electrodes to be on limbs & the (+)ve electrode on the chest
* the machine will give us the first lead considering V_1 on the chest to be (+)ve & limbs to be (-)ve, for the second lead the machine will consider V_2 as (+)ve & limbs (-)ve, until we end up with 6 leads
* remember that the limbs are connected to a very high resistance (-)ve electrodes, while the chest is connected (+)ve electrodes where data is moving from one chest electrode to another one, so that data is taken from the 6 chest electrodes



- V_5 & V_6 look at the left ventricle
- V_3 & V_4 are looking at the interventricular septum
- V_1 & V_2 are looking at the right ventricle

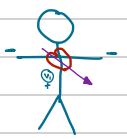
* V_4 may look at the septum or the left ventricle

بنه يختلف مكان القلب من شخص لشخص حسب الطول أو الوزن مثلاً



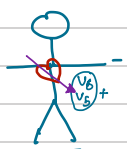
deflection: (-)ve | (-)ve | isoelectric | (+)ve | (+)ve | (+)ve

(depending on the direction of the vector)



the vector is away from the (+)ve electrode, so it's a (-)ve deflection

V_3 the vector is some how perpendicular to it, so it's isoelectric

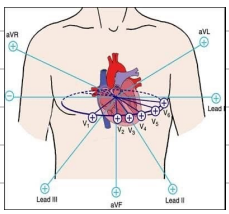


the vector is toward the (+)ve electrode, so it's a (+)ve deflection

- if V_3 is isoelectric V_4 will be (+)ve
- if V_4 is isoelectric V_3 will be (-)ve

12 lead ECG

view of heart	leads
inferior	II / III / avf
lateral	I / avL / V_4 / V_5 / V_6
anterior	V_1 / V_2
septal	V_3



we use leads to diagnose:

- arrythmias → study only one lead (arrythmia affect all leads the same way)
- structural abnormalities (myocardial infarction) → study 12 leads (each lead looks at a specific structure of the heart)

How to Perform an ECG??

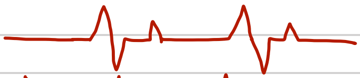
① tell the patient what you will do because the patient should not move any movement may be recorded by the machine, the patient should be worm (coldness causes shiver), semi-recumbent position (the bed is 45°), take off metalic stuff, shave the chest, clean & dry skin

② the speed in the machine: it has to be 25 mm/sec

③ voltage calibration: each large square is 0.5 mV

④ start recording

standared



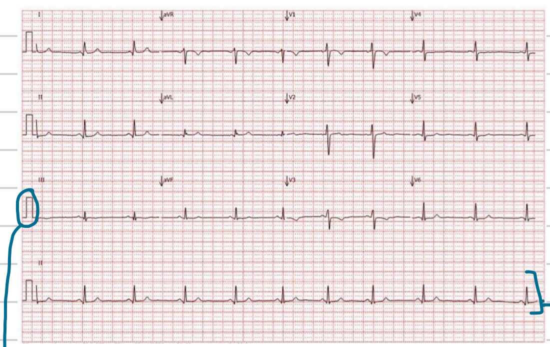
speed is more than 25 mm/sec

higher voltage carlibration than 0.5 mV for each large square

segments have spikes, so there was something electrical around (a mobile phone)

the patient is shivering

wondering base line: electrodes are not sticking well, patient moves, abnormal breathing



this is a rythm strip

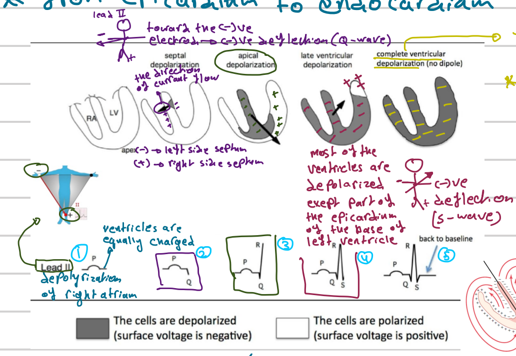
a (10 sec) recording from lead II

هاد المستطيل هدفه انه بفرجيك انه voltage calibration بساوي انه كل مربع كبار عبارة عن 1mV

بما انه اي تغير في ال standared speed / voltage calibration راح يأثر على شكل ال lead 6س بال machine بقدر اميز ال speed / voltage ؟؟ انا كان المريض عنده كمية كبيرة من الدهون ممكن ال waves تطلع مش واضحة فهون انا بعمل over calibration ال speed ممكن اخليها اعلى من 25mm/s في حال كان في tachycardia عشان ال waves تطلع أوضح

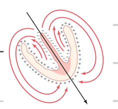
Vectoral analysis of ECG

* a vector is an arrow that points in the direction of electrical potential
* head of the arrow → points in a (+)ve direction
* length of the arrow → proportional to voltage potential
* the most important one is vector of depolarization in ventricles ⟸ when we talk about cardiac axis
* from epicardium to endocardium



→ flat line (ST-segment)

* the last area that depolarizes is the left ventricle on the base side of the heart

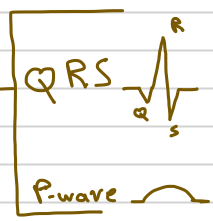


most of depolarization from the (-)ve to the (+)ve charge, from base to apex

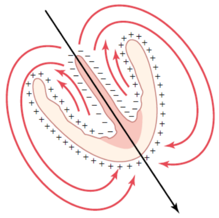
the final vector will be ↘

(+)ve deflection (R-wave)

توضيح كيف رسمناهم



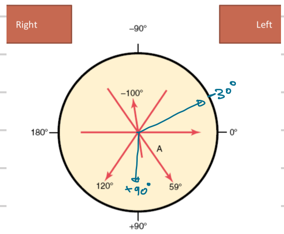
* polyrized → (+)ve / depolyrized (-)
* when ventricles are completely polyrized / depolyrized the ECG machine will draw a straight line (equally charged)
* the signal reaches the left bundle faster than the right one, so the left side of interventricular septum become depolarized, while the right one is still polarized



- when we talk about vector of depolarization we talk about the main one (through out most of depolarization)

هاض الخطي احامن هون — in most people vector of depolarization is 59°

اتفاق ↓



* horizontal to the left = 0°

وبعدين بنمشي clock wise بتزيد الزاوية

* horizontal to the right = 180°

وبعدين كل ما مشينا clock wise بنحط اشارة سالب

* we have to know the degree of each vector

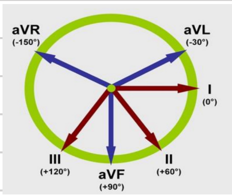
* the main vector in most people is 59° but some people vary, so a degree (+90° to -30°) is normal

Hexagonal reference system

* it helps us determine cardiac axis
* related to limb leads which look at the heart from different sides & each lead has it's own axis

- Bipolar: I / II / III
- unipolar: aVR / aVL / aVF

* How do we know the axis of the lead? from the center of the circle towards the (+)ve electrode of that lead



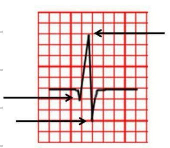
* Normal cardiac axis is (-30° - 90°) mostly 59° the difference is according to age, body build, Purkinje distribution or muscles

* each two leads are perpendicular to each other (I & aVF / II & aVL / III & aVR)

* thin & tall person → more vertically positioned heart, axis ↓
* obese & short person → more horizontally positioned heart, axis ↘

* the main vector of depolarization is 59° so it's very close to the axis of lead II, that's why the QRS complex in lead II is the most prominent

* to know cardiac axis from ECG we should know what's called QRS potential (defferent from voltage)

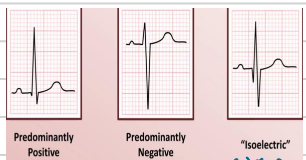


Net deflection = 0.5-0.3-0.1
= + 0.1 mV OR 1mm

يلي منخفضة أكثر

* voltage = Peak of R to the bottom of S or Q
voltage = 8 × 0.1 = 0.8 mV
عدد المربعات الصغار ← ← كل مربع 0.1

* net deflection = (+)ve deflection − (−)ve deflection
net deflection = 0.5 mV − 0.1 mV − 0.3 mV = 0.1 mV
- 0.5: +ve deflection (R-wave)
- 0.1: (−)ve deflection (Q-wave)
- 0.3: (−)ve deflection (S-wave)



QRS complex is mostly (+) · QRS complex is mostly (−) · (+) & (−) deflection are equal

* we know cardiac axis by ① quadrant method ② isoelectric lead

① Quadrant Method (Qualitative)

Lead I	Lead aVF	AXIS
Positive	Positive	Normal
Positive	Negative	Left Axis Deviation or Normal ,we know using lead II
Negative	Positive	Right Axis Deviation
Negative	Negative	Extreme Axis Deviation

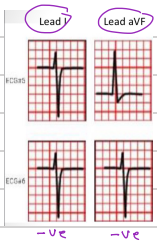
+ve → normal axis
-ve → left axis deviation

normal person

+ve deflection | +ve deflection

right axis deviation

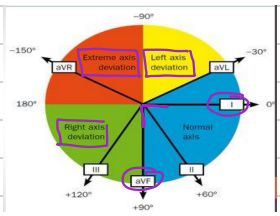
-ve | +ve



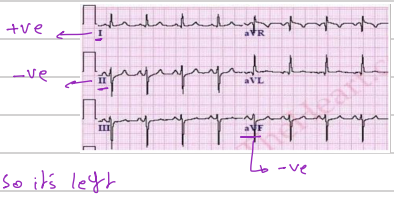
-ve | -ve

extream axis deviation

* in quadrant method we know cardiac axis using lead I & lead avf



axis between I & avf is normal (remember -30°-90° is normal)

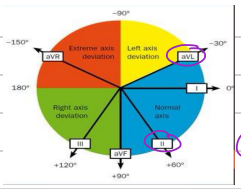


-ve

So it's left axis deviation

② isoelectric lead: -ve & +ve deflections are equal it also could be a flat line

① See, the most isoelectric lead in this ECG is aVL



② determine the perpendicular lead to aVL, it's lead II

③ go back to the ECG & see the deflection of lead II
- if QRS-complex is +ve → cardiac axis is in it's direction ↘
- if QRS-complex is -ve → cardiac axis is in the opposite direction ↗

④ since QRS-complex in lead II is +ve then the axis is normal

① the most isoelectric is aVR
② lead III is perpendicular to aVR
③ QRS is lead III is -ve deflected
④ the cardiac axis is opposite to lead III ↗ = left axis deviation

يعني الطريقتين بنعرف اذا هو normal/ left/ righ بس ما بنعرف الـ degree of deviation deviated heart

Mathematical method

* to know the degree of deviation
* use lead I & aVF, deflection & net potential for each

① the net potential is → lead I → 5mm / avf → 10mm

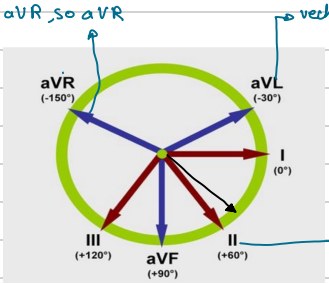
②


④ بيستخدم قوانين رياضيات
وبطلع الزاوية بتطلع 60°
↳ normal cardiac axis

③ arrow head of cardiac axis

(I & avf نقطة التقاء رأس سهم)

vector of depolarization is opposite to aVR so aVR will be -ve deflected

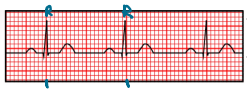


vector of depolarization is perpendicular to aVL so aVL will be isoelectric

vector of depolarization is close to lead II, so lead II will have prominent large deflection

Heart rate

* normally 60-100 beat/min
* RR interval represents a single heart cycle
* Heart rate = 60/time in RR interval in seconds
* Heart rate = 300/number of large squares in RR interval
* Heart rate = 1500/number of small squares in RR interval



HR= 60/0.8= 75 B.P.M
HR= 300/4=75 B.P.M
HR=1500/20=75 B.P.M

Heart rythm

* normal heart rythm is when conduction of electrical potential from SA node to the entire heart goes in the normal way

* rythm strip: used to know if the rythm is normal or not

↳ الجهاز بسجل بال 12 limb leads معلومات من كل lead لمدة ٢ ثواني وآخر اشي بسجل ١٠ ثواني من lead II

↳ هاي هي rythm strip الـ

How to know it's a normal sinus rythm?

① electrical activity starts in SA node
② before each QRS-complex we should have a P-wave and this P-wave should be in the same shape in the same lead
③ little variation in RR interval

How do I know?
- بجيب ورقة صغيرة و بحطها و بجد عليها حدود RR interval من اول و بعدين بعيد أترك الورقة على باقي الـ RR intervals لرؤية الاختلاف ما يكون اكثر من ٢ مربعات صغار

Is this a normal rythm? ① can't see a P-wave before each QRS
② it's clear that we have a huge RR-interval variation
....so, abnormal heart rythm

what is the heart rate? it's hard to know RR interval so we use the 6 second method → ① 6 sec = 30 large squares

② number of R waves in the 30 large squares it's 9

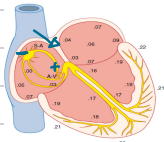
③ 6sec → 9 R waves multiply 9 by 10, it's 90 so heart rate is 90

باختصار: بحسب عدد المربعات الكبار خلال ٦ ثواني بشوف كمان عدد الـ R waves فيهم وبضربه بـ ١٠

P-wave

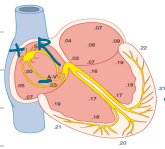
- it's the atrial depolarization
- the axis of atrial depolarization is 70° (from SA to AV node)
- lead II has the clearest P-wave (usually)
- maximum hight is 2.5-3 mm
- duration shorter than 0.12 sec (less than 3 small squares)

P-wave ⌒ (+)ve deflected because → depolarization starts in SA node which becomes (-)ve with respect to AV node



depolarization

T-wave ⌣ (-)ve deflected because → repolarization will start in SA node which becomes (+) where AV node is experiencing depolarization (-)ve

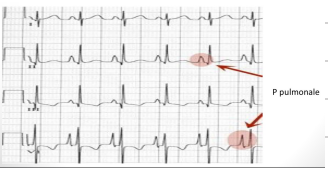


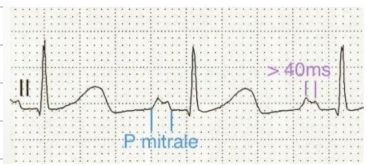
repolarization

* remember: T-wave is masked by QRS, because repolarization of atria takes place when depolarization of ventricles it taking place

P-wave abnormalities

- P Palmonale
  - higher & narrower than normal P-wave (Peaked)
  - Seen in right atrial enlargement
- P mitral
  - Prolonged, notched (has 2 peaks)
  - Seen in left atrial enlargement





PR-interval

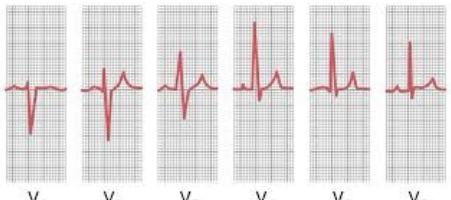
* from the beginning of P-wave to the beginning of QRS-complex
* it's the time from which depolarization of atria happens until the signal reaches ventricles
* normally, it's 0.12-0.22 seconds

abnormal PR-interval

- Short
  - no delay in AV node & another conduction pathway between atria & ventricles
- long
  - long delay (heart block)

QRS-Complex

* Duration is 0.06 – 0.1 second ← width
* voltage of QRS in the 3 standared bipolar limb leads is 0.5 – 2 mV, if the sum of voltages in the 3 limb leads is more than 4 mV, then it's a case of high voltage ECG



Deflection: +ive | +ive | isoelectric | +ive | +ive | +ive

* in QRS-complex the isoelectric chest electrode should be V_3 or V_4, isoelectric lead represents the anatomical position of interventricular septum, so when the isoelectric lead is other than V_3/V_4 then the person might have ventricular enlargement

* QRS-complex abnormalities:

① Increase width: cardiac hypertrophy or dilatation / Bundle branch block
↑ mass
right bundle block → the signal will go to the right bundle through the left ventricule muscle (so, longer time)

② low voltage: old myocardial infaction (MI) / pericardial or Pleural effusion
↓ muscle cells
decreased conductivity

③ high voltage: cardiac hypertrophy
↑ muscle mass

T-wave

* repolarization of ventricles
* in ventricles repolarization is from epicardium at the apex to endocardium & it ends in the base

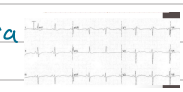
* vector of repolarization is from the base to apex (opposite to atria)

* the T-wave deflection should be the same direction as QRS-complex [QRS +ve → then T +ve; QRS −ve → then T −ve]
  → in avR & V1 normal inversion of T-wave because QRS is −ve deflected
* longer duration than QRS-complex (repolarization is slower than depolarization)
* T-wave hight → limb leads → not more than 5mm; chest leads → not more than 10mm

* T-wave abnormalities: ① inversion: mild ischemia / ventricular hypertrophy / Bundle branch block / Digoxin toxicity

② Peaked & tall: early stage MI / hyperkalemia

③ Flattened: Hypokalemia / ischemia

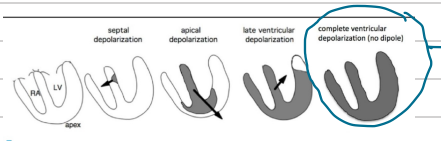


QT-interval

* the beginning of QRS to the end of T-wave
* represents ventricular depolarization & repolarization
* time ≈ 0.43 sec
* be carefull it's affected by heart rate (↑heart rate → short time of QT interval), so we correct QT to solve this issue
* QT corrected = QT measured / √RR interval } → should be less than 0.43
* It's prolonged in: hypokalcemia / hypokalemia / hypothyroidism

ST-segment

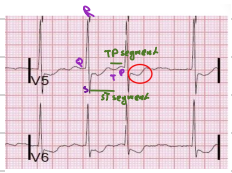
* from the end of QRS to the beginning of T-wave



→ this stage is ST-segment
complete depolarization → straight line

* could be → depressed → below the base line
  → elevated → above the base line
  → we know this using TP-segment (end of T to the beginning of P)

* it's depressed or elevated in ischemia & IM
* we should check it in all leads (it may be affected only in one lead)



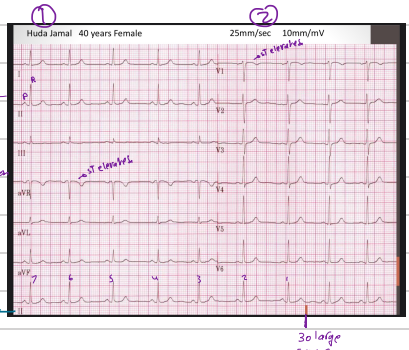
ST segment is depressed compared to TP segment

elevated ST

* to consider it as significant elevation / depression it should be more than 1 mm of ST elevation / depression in 2 contagous or adjacent limb leads or in one chest lead } → because it may be elevated / depressed in normal conditions

How to report an ECG??

1. Patient's name / age / gender
2. ECG speed & voltage calibration (check them)
3. heart rate
4. cardiac rythm
5. cardiac axis
6. description of (P-wave / QRS / T-wave / ST segment / QT interval / PR interval)



④ rythm: there is R wave before each QRS & P waves have the same shape & no big RR variation

⑤ cardiac axis: quadrant method (lead I & lead aVF) are (+) → Normal axis

⑥ P-wave: duration = 0.8 sec / hight = 2mm } → normal, we used lead II
QRS: duration = 0.8 sec / hight ≈ 1mV // (V1 → (-)ve / V2 → (-)ve / V3 → isoelectric / V4, V5, V6 → (+)ve) } → normal, we used lead II
T-wave: deflection = +ve in all leads exept V1 & aVR it's (-)ve / voltage = within normal limits } normal
PR-interval: 0.16 sec
QT-interval: 0.36 → corrected = 0.39 ← we used average RR interval

ST-segment: should be isoelectric in all leads
It is isoelectric in all leads exept aVR & V1 but it's not significant

③ heart rate: 6 seconds rule = 10 * RR in 30 large squares (intervals ≈ cycles)
10 * 7 = 70 beats/min

So this ECG is normal

Arrythmias

* abnormal heart rythm
* abnormal rates or regularity of beats
* normal heart rate is 60-100/min
* abnormal rythm → defect in conduction pathway

* conduction abnormalities: ① Pacemaker
② shift of Pacemaker from sinus node to another place (usually AV node will become the pacemaker)
③ Blocks at different points
④ abnormal pathway
⑤ spontanous generation of spurious impulses at any part of the heart

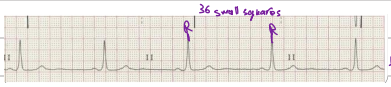
* Sinus tachycardia:

- rythm starts in SA node, but faster than normal
- on ECG → ↑ heart rate
- seen in → ① Physiological stress (sympathatic activity, exercise, emotions)
② fever, Pain, dehydration, anemia, hypovolemia

1500/9 = 170 beats/min
the rest of the ECG is normal

* Sinus Bradycardia:

- slower than normal SA node firing rate
- caused by increased parasympathatic activity
- seen normally in athletes at rest



1500/36 = 40 beats/min
the rest of the ECG is normal

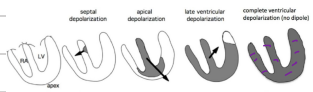
* Sinus Arrythmia:

- heart rate normally → increases → inspiration
→ decreases → expiration
} so RR deviation won't exceed 0.12 normally

- when the RR variation is more than 0.12 → there is a big difference in heart rate between inspiration & expiration and this is what's called sinus arrythmias
- it occurs in young healthy people (benign)
- the rythm starts in SA node

more than 0.12 sec variation between RR intervals

* Phynomenon of re-entery



all the muscle mass is depolarized & still in refractory period, so the signal now has no place to go, so it dies

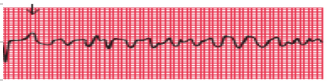
* in some pathological conditions the signal won't die & it will continue stimulating the same muscles this is what's called phenomenon of re-entery

- causes: ① the pathway through which the signal has to travel is longer than normal (dilated heart) & the point will be out from refractory period
② decreased rate of conduction (a point will get out from refractory period, so it can be stimulated) like from blockage in Purkinjie
③ Shortned refractory period

- it leads to ventricular fibrillation

* Ventricular fibrillation:

- it not stopped within 1-3 min, it's fatal (ineffective blood pumping)
- excitation of ventricle is not coordinated → blood flow is not coordinated



- bizzare wares don't know it its P/T/R wave..
- different durations & voltages usually around 0.5 mV, and then almost a flat line

Causes: ① electrical shock of the heart
② ischemia of cardiac muscle or conductive system
③ other forms of arrythmias

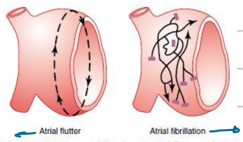
*Atrial fibrillation:

- mechanism is the same as ventricular fibrillation
- caused by atrial enlargement
- usally the disorganized impulse orginate from the root of Pulmonary veins
- not as deadly as ventricular fibrillation because we only lose 30% of blood that should enter ventricles

- no definative P-wave, because there is no coordinated atrial excitation (normally both atria are excited together)
- * wavy base line (continuous atrial excitation → no isoelectric line)
- * QRS → we see it, but at irregular times
- * T-wave → hard to see

*Atrial flatter:

- from re-entery, but same signal goes in a circular way and keep exciting atria
- atrial rate will be high (300 beats/min), ventricles can't contract at this rate because AV bundle can't conduct all of these to ventricle, it conducts 150 beats/min in ventricles, so the ratio is 2:1



only one signal (circular direction) ← Atrial flutter
Atrial fibrillation → more than one signal (many directions)

atria ↲ ↳ ventricle

- very strong P-waves (saw tooth apperance)
- we calculate atrial rate using P-waves distance between 2 P-waves (it's 1 large square)
  300/1 large square = 300 beats/min
- ventricular rate = distance between 2 R-waves = 70 beats/min → ratio is common to be 2:1 but it's not always like this
  ratio → 4:1
  in each 4 P-waves we have one QRS-complex

when there is a block between atria & ventricle, it will take time from ventricle to depend on other pacemaker, so the ventricle will stop beating for some time where the patient faints

*Atrioventricular (AV) block:

- causes: ① ischemia of AV node or bundle
  ② compression of AV bundle
  ③ inflammation of AV node or bundle
  ④ extreme stimulation of the heart by the vagus nerve

no ventricular beats

↑
3rd degree heart block but goes & comes with time (block may last for seconds or weeks)

المريض بجيك طبيعي بس بتكيلات بغيب طبعاً لحا
تعمل ECG ممكن يطلع normal
فنحتاج ال Portable ECG

↑
Stock adams syndrome

Types

1st degree heart block

PR interval is > 0.22 sec

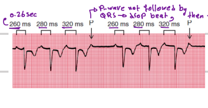
Causes: • coronary heart disease
• acute rhematic carditis
• digoxin toxicity
• electrolyte disturbace

2nd degree heat block

- PR interval increase 0.25 – 0.45 sec
- sometimes action potential pass to ventricles and sometimes it doesn't
  → this is called a drop beat
- devided into:

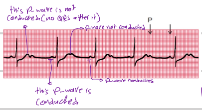
Type 1

Prolonged PR interval until failur of conduction of an atrial beat



Type 2 (fixed ratio block)

fixed number of non-conducted P-waves for every QRS-complex
(one P-wave passes, one P-wave doesn't pass or one P-wave passes, 2 P-waves don't pass ... and so on)
→ we have a specific pattern

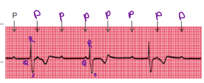


according to this ECG in each 2 P-waves we have one QRS → so we have a ratio of 2:1

3rd degree heart block

بطون ال atria بشتغل لحال
وال ventricles لحال بلا أي علاقة
بينهم

- block of impulse from atria to ventricle (non of atrial signals will pass to ventricles), so ventricles will make their own signals (in AV node, bundle, Purkinje) rate of depolarization in these is less than SA node
- * regular → PP & RR intervals (normal SA node)
- * P-wave & QRS no relation between them



① abnormally shaped & prolonged QRS ventricle لأنه من ال
① equally distributed P-waves
② no relation between P-wave & QRS (no ratio)
③ atrial rate higher than ventricular rate
دائماً راح يكون ventricular rate أقل من atrial rate
P-wave rate is 90/min
QRS rate is 36/min

الحد هون امراض ال arrythmia

* Ventricular causes of axis deviation :-

- causes : ① change in the position of the heart in the chest
② hypertrophy of one ventricle
③ Bundle branch block

①

- causes of left axis deviation : - Deep expiration
- lying down
- obesity

→ the diaphragm will push the heart

- causes of right axis deviation : - Deep inspiration
- standing up

② hypertrophy of one ventricle : - left ventricle hypertrophy → left axis deviation
- right ventricle hypertrophy → right axis deviation

- hypertrophy → more muscle mass & more time to depolarize

→ left ventricle hypertrophy so the right ventricle will be depolarized & -ve when the left ventricle is still +ve, so the heart will be deviated to the left

③ Bundle branch block :
- if the left branch is blocked, then the signal will only go to the right one so the right ventricle is depolarized -ve when left ventricle is +ve so → left axis deviation

لما الـ ventricles ما بتنقبض مع بعض هاض الإشي راح بأدي إلى انه QRS تكون wider

---

* ECG Changes in MI & angina :-

*angina = ischemia of cardiac tissue
pain comes & goes

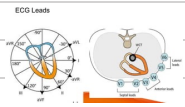
*MI = death of tissue
severe pain

* MI : ① earliest → ST segment depression or elevation in certain leads (depending on the affected part of the heart) that will go back to normal with time

② T-wave inversion

③ Pathological Q-wares (permenant)

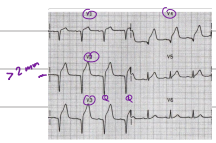
- if the problem is in the lateral wall of the heart lead (aVL / I V_5 / V_6) will be affected
- if in the inferior wall lead (III / aVF / II) will be affected
- anterior wall, leads (I / II / III) → sometimes



* Angina : ① ST segment (depression / elevation), seen only when the patient is having pain, so we make what's called stress ECG (وهو التريدمل ECG بركض)

* Pathological Q-wave : ongoing or prior MI mostly

- duration > 0.04 sec
- depth > 2 mm
- > 25% of depth of QRS



Summarized by : Nasam Masadeh

Reference : Dr. Tamara Alqudah's lectures