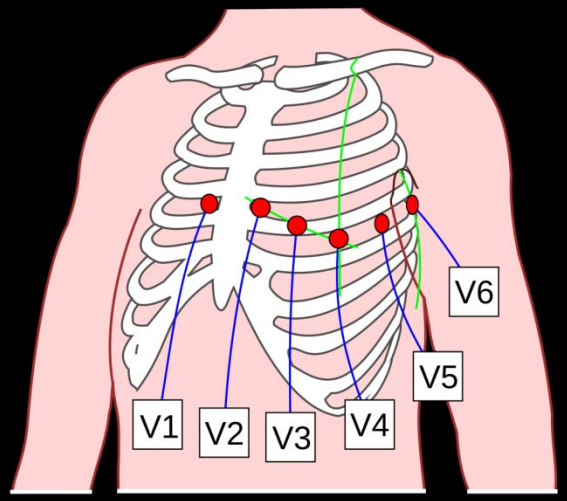
Электрокардиография – ЭКГ
Electrocardiography - ECG

Normal ECG



Электрокардиогра́фия

definition

- a technique for recording and studying the electric fields generated during the work of the heart.

Hystory

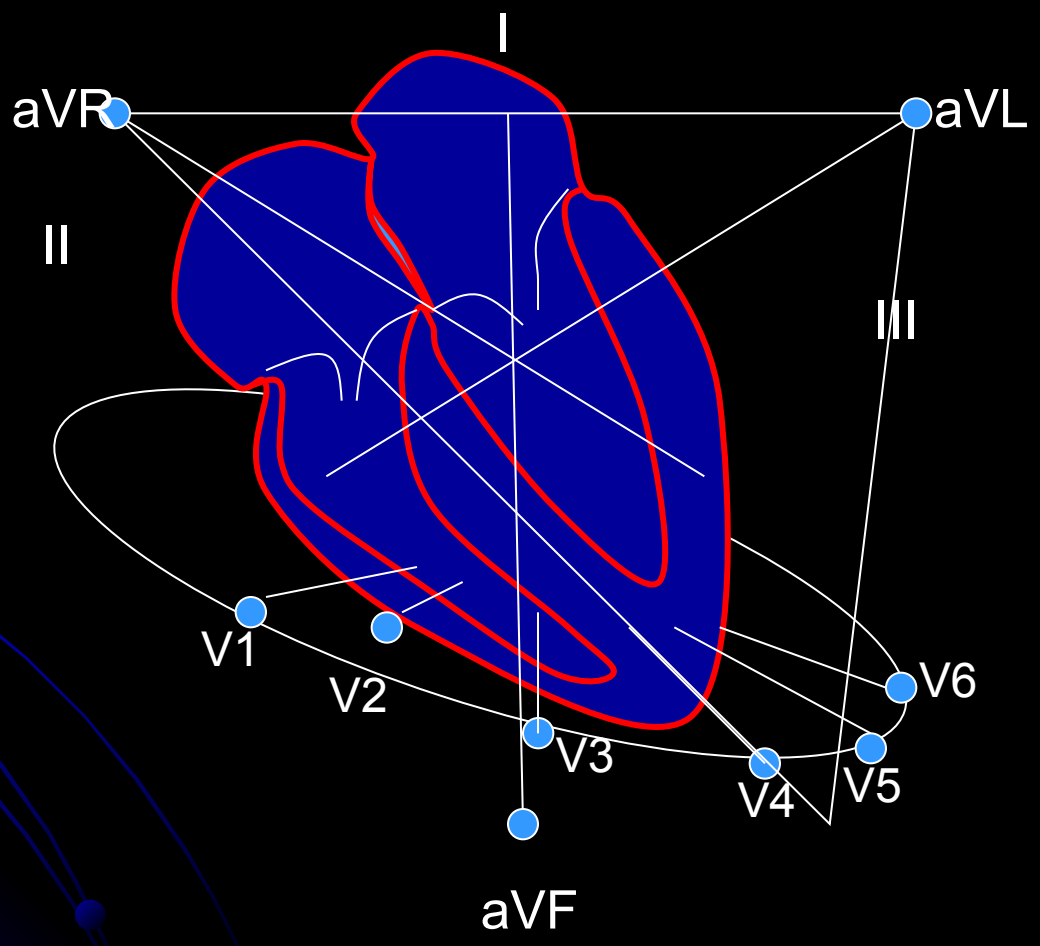
В 1901 году Виллем Эйнтховен, работавший в Лейдене (Нидерланды), использовал струнный гальванометр: первый практический ЭКГ-аппарат.

1906 г. Эйнтховен издает первое в мире руководство по электрокардиографии.

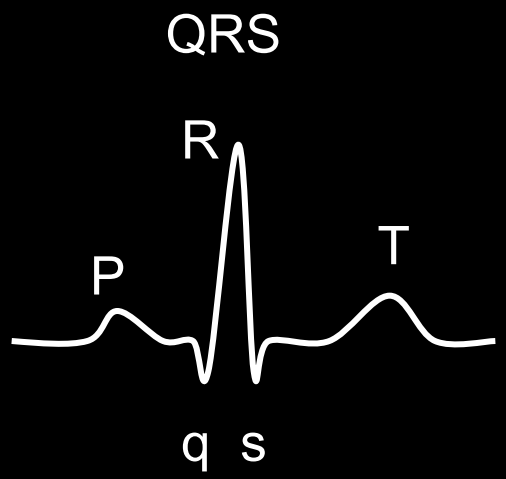
В 1924 году Эйнтховен был удостоен Нобелевской премии по медицине за

Awarded the Nobel Prize

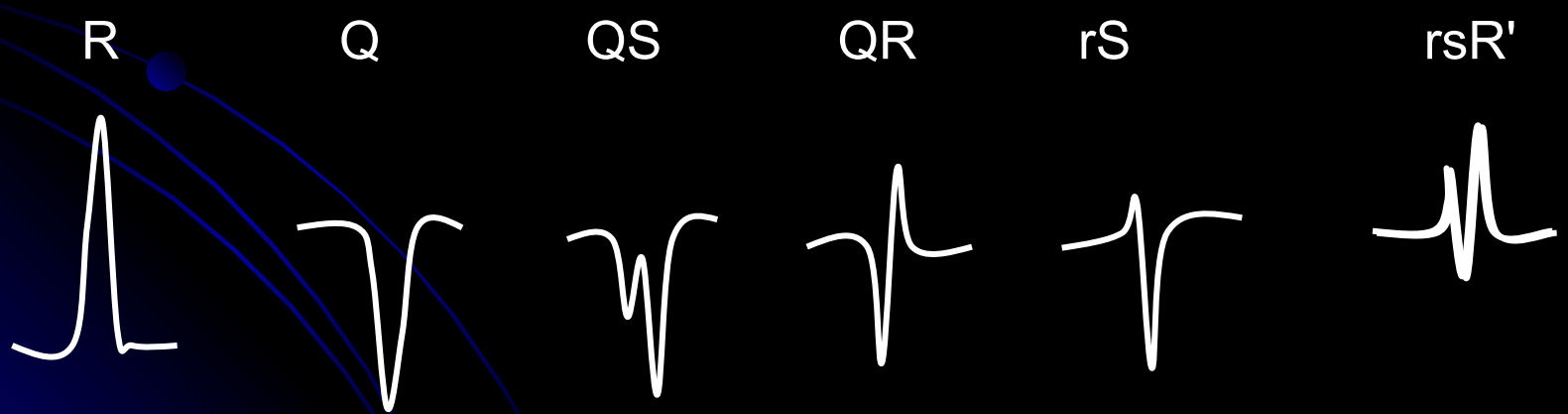
Leads ECG



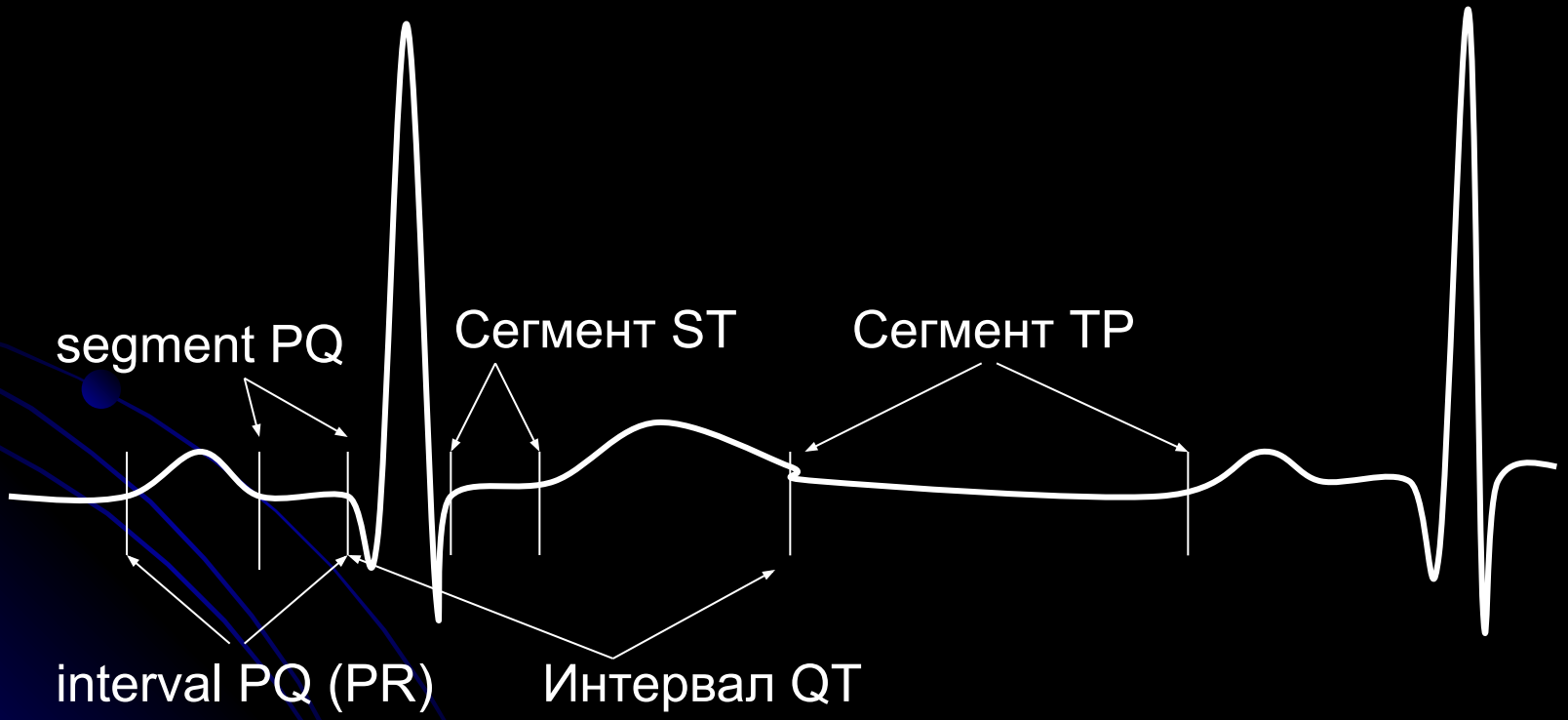
Waves of ECG

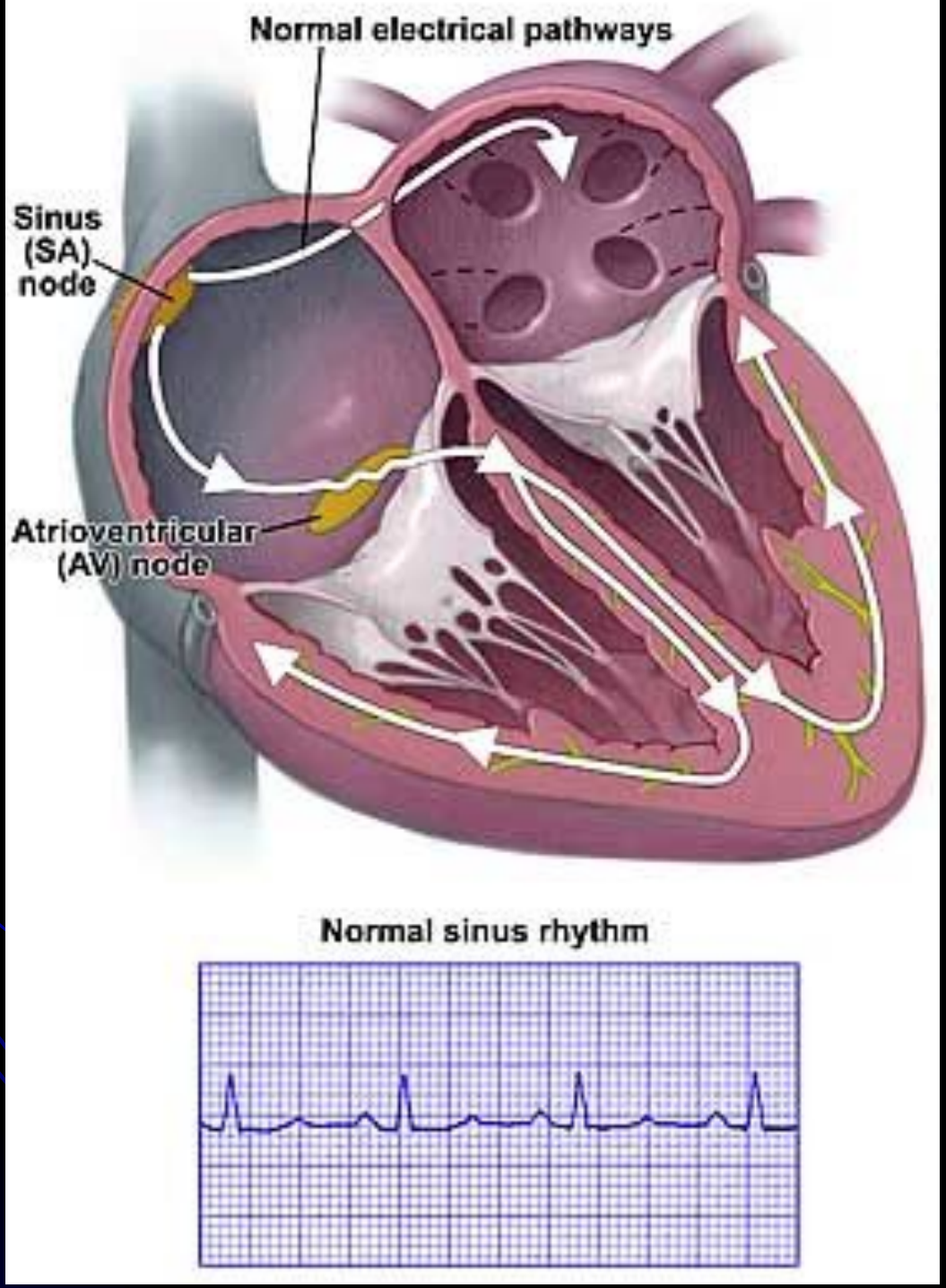


1 mV =10 мм
1 мм = 0,1 mV



Intervals and segments




Normal electrical pathways
Sinus (SA) node
Atrioventricular (AV) node
Normal sinus rhythm

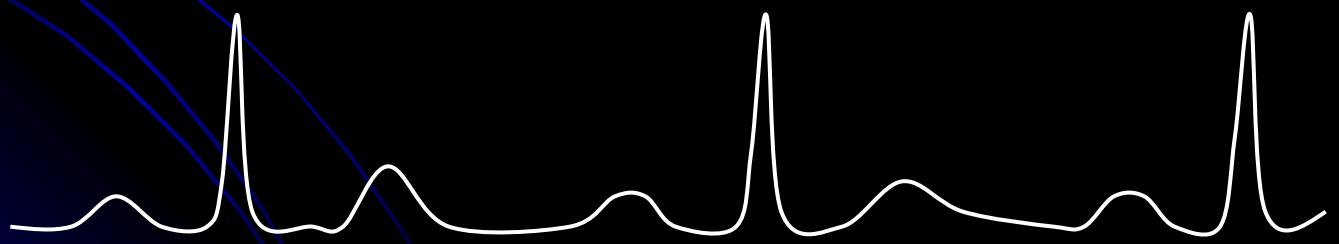
ECG description outline

1. Heart rate / сердечный ритм

Sinus rhythm criteria :

- P (+) II

- behind each *P QRS*
- constant form o*f P*
- PQ > 120 мс



2. Frequency and regularity of rhythm

25 мм/с – 1 мм – 0,04 sec

50 мм/с – 1 мм – 0,02 сек

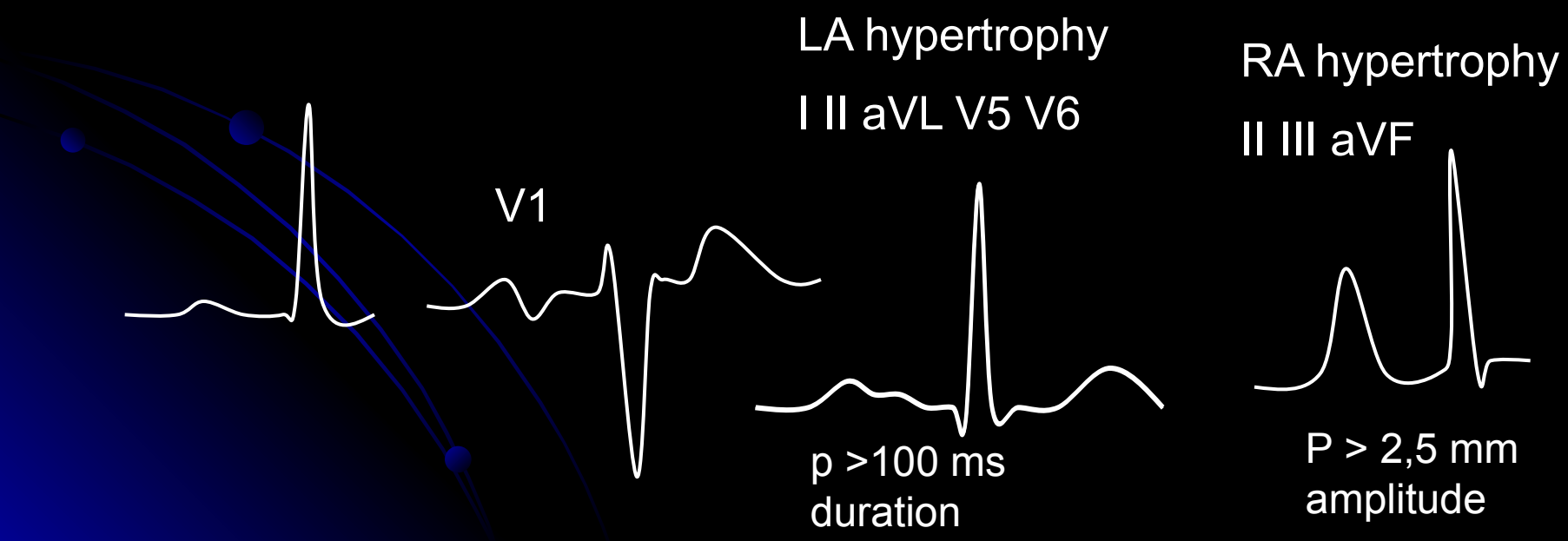
60/(R-R)c (bradycardia <60 (55) bpm, tachycardia> 90 (80*) bpm)

ΔRR < 10% (>10% - sinus arrhythmia)

Частота ритма=60/(20*0,04)=75

3. p wave (зубец)

- The shape, duration (<100 ms) and amplitude (<2.5 mm) of the p wave in leads II, V1 are analyzed to detect an increase in the left and right atria



4. Interval PQ

- N 120-200 мс
- >200 ms – AV block

5. QRS

5.1. QRS duration <100 ms

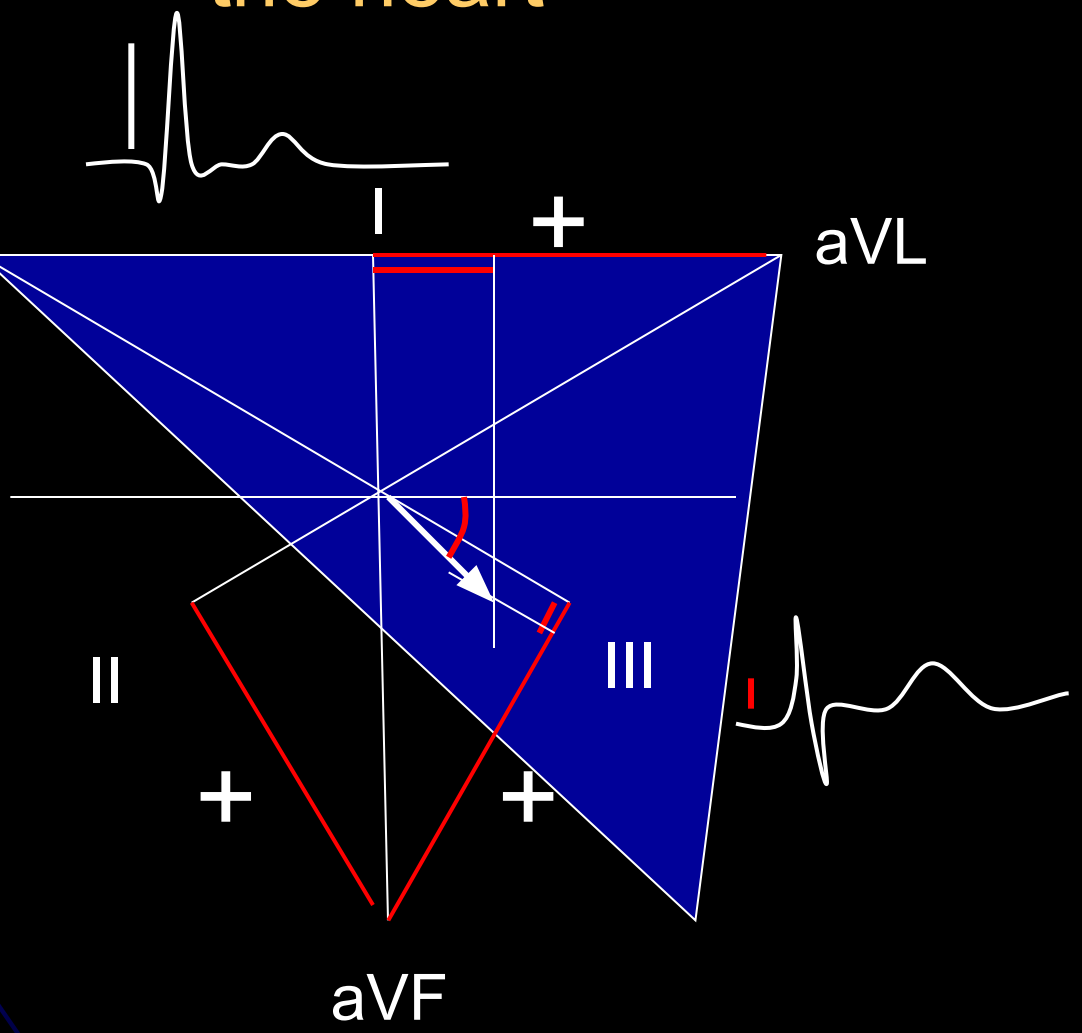
If the sinus QRS width is more than 100 ms , then a blockade of the His bundle branch (HBBB) is diagnosed: incomplete (100-120 ms) or complete (≥120 ms)

- 3 reasons of QRS widerning: HBBB, ventricular origin, WPW syndrom

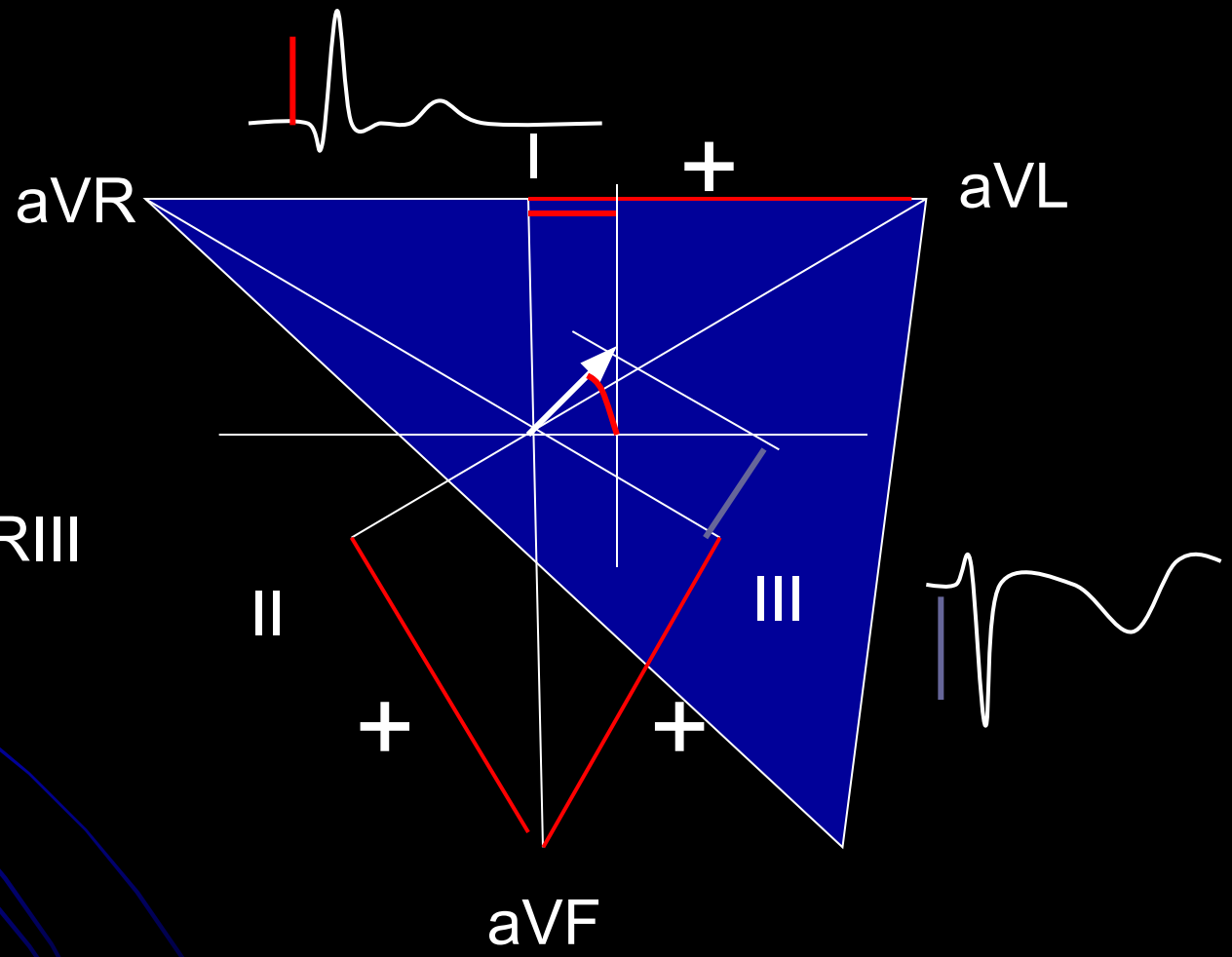
5.2. Determination of the electrical axis of the heart

- N axis 0-90º

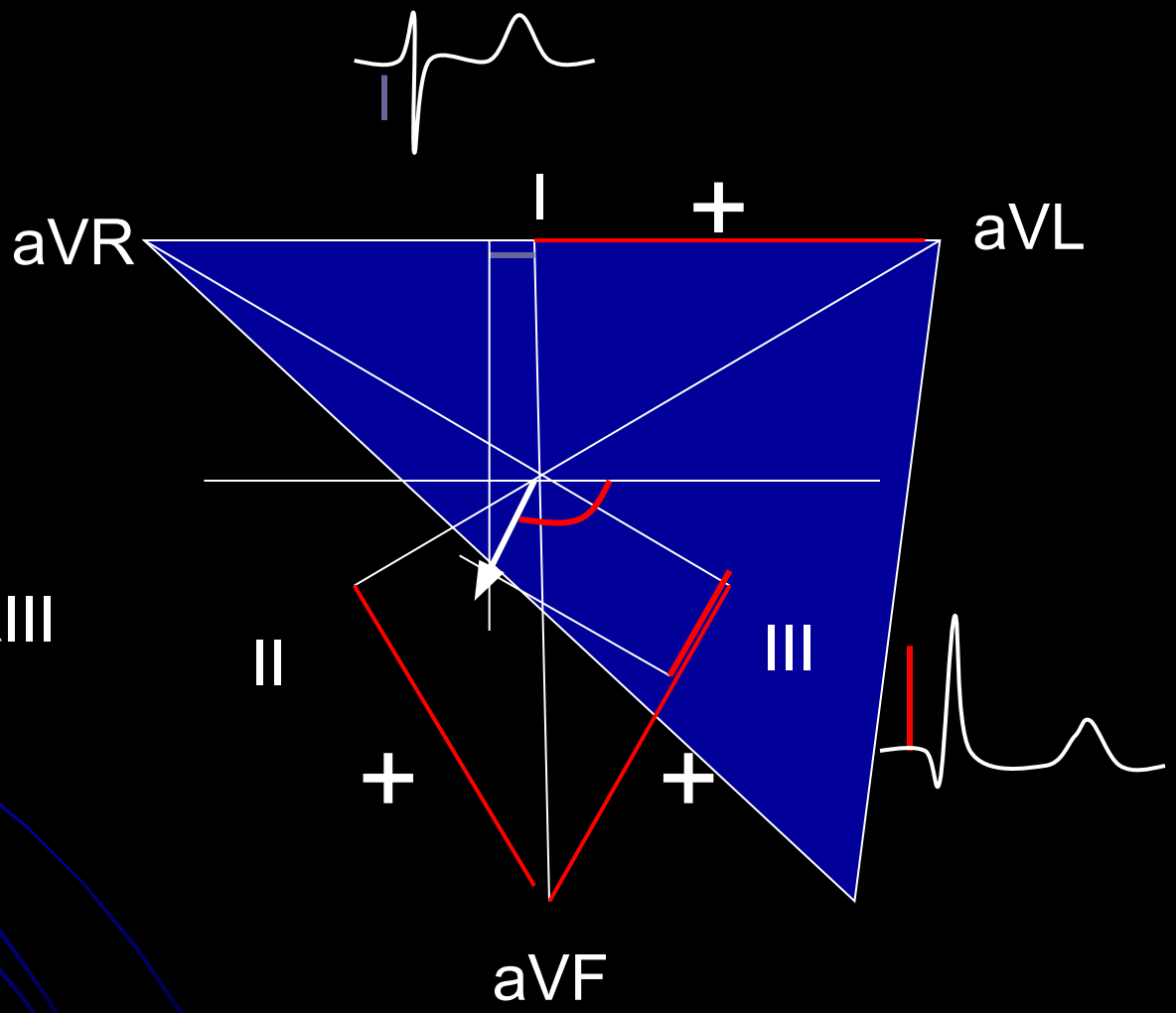
RII > RI > RIII

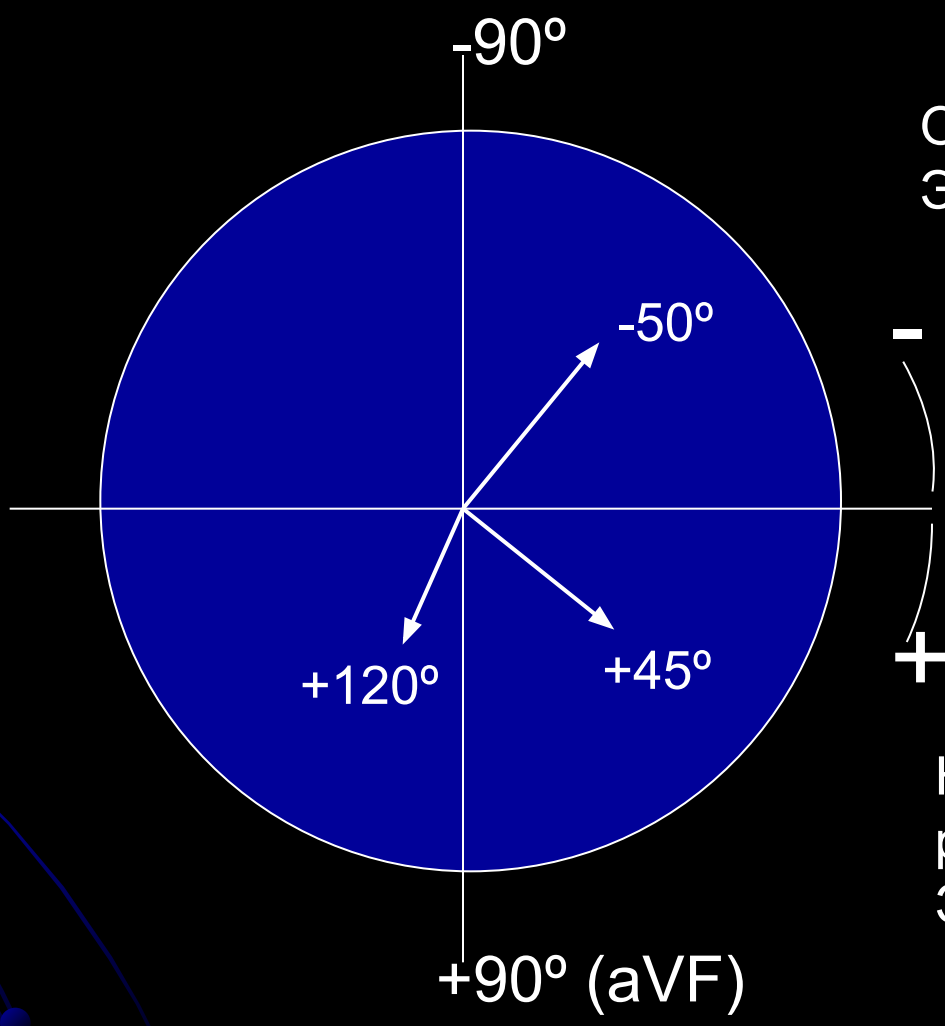


Deviation of the axis to the left



Deviation to the right





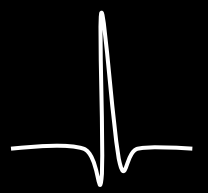
Отклонение ЭОС влево

Отклонение ЭОС вправо

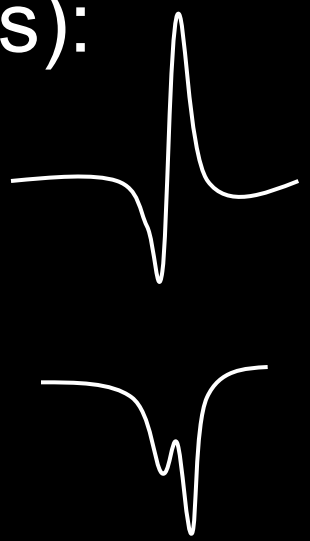
Нормальное расположение ЭОС

5.3. Q wave– along or preceding negative wave in QRS

- A normal q wave is recorded in V4-V6,
  - in I and aVL with horizontal EAH,
  - in II, III, aVF with vertical EAH.



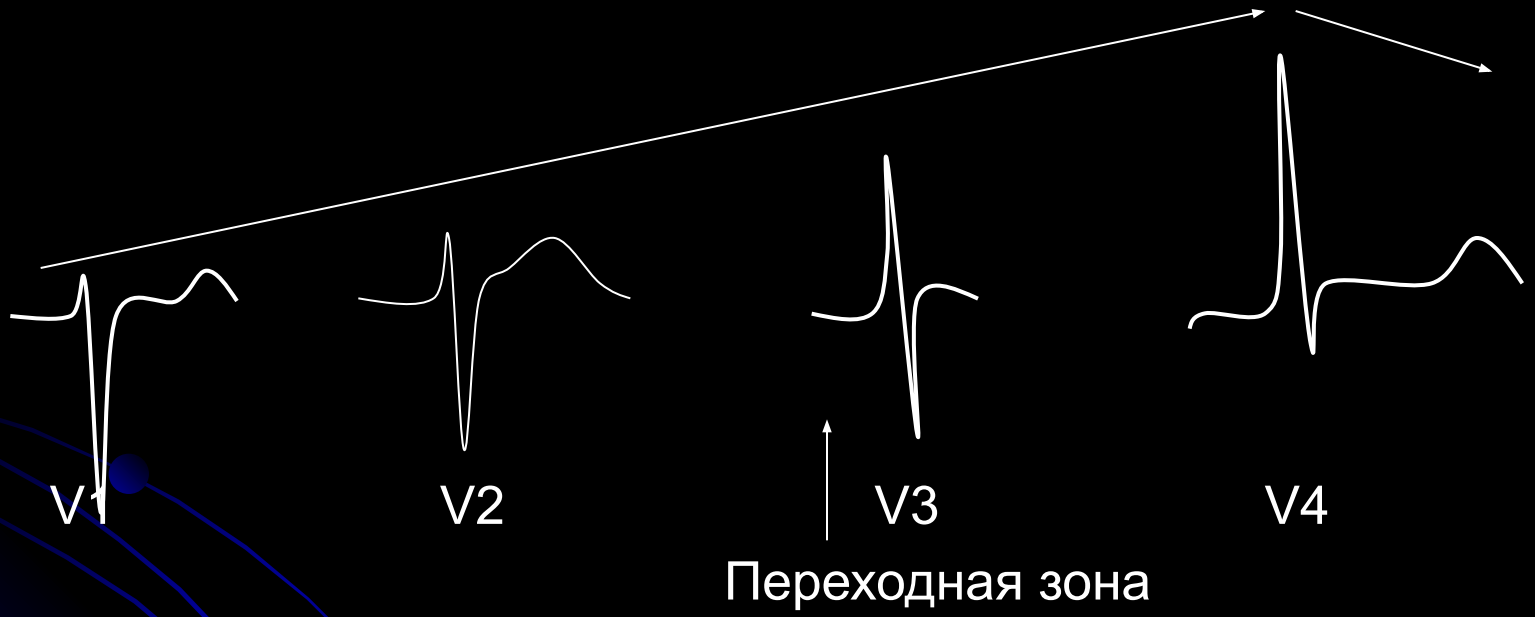
- Pathological q wave (sign of necrosis):
  > 30 ms width
  > 2 mV (20 mm) or > 25% R
  (> 15% R V4-V6)



5.4. R and S waves

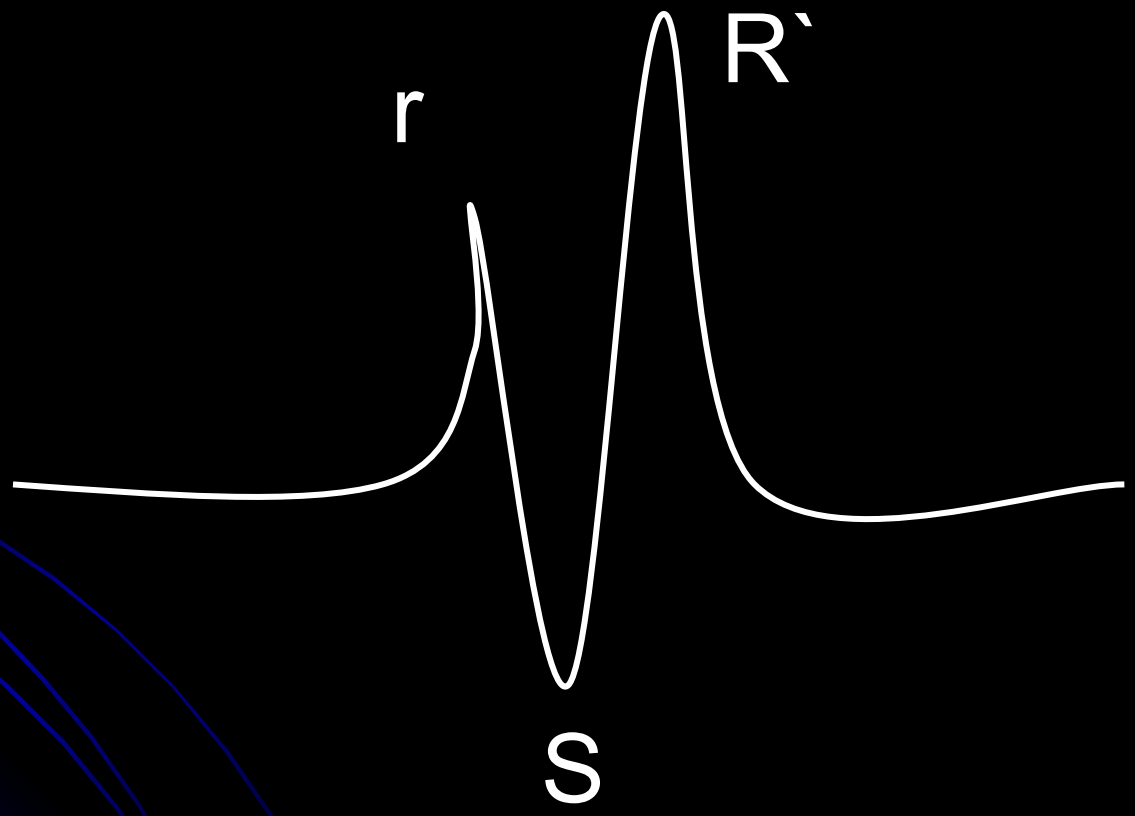
- All positive waves of QRS complex are R waves

The R wave should grow from V1 to V4



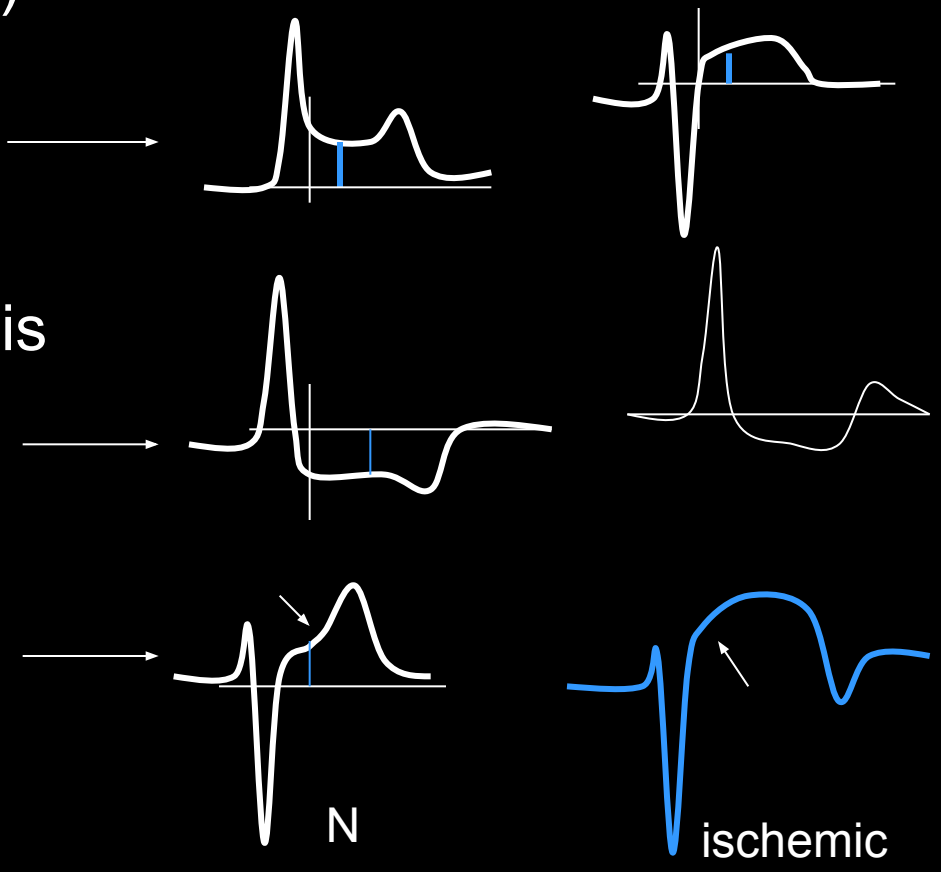
- S -subsequent negative wave of QRS complex

S should decrease from V1 to V4


r
R`
S

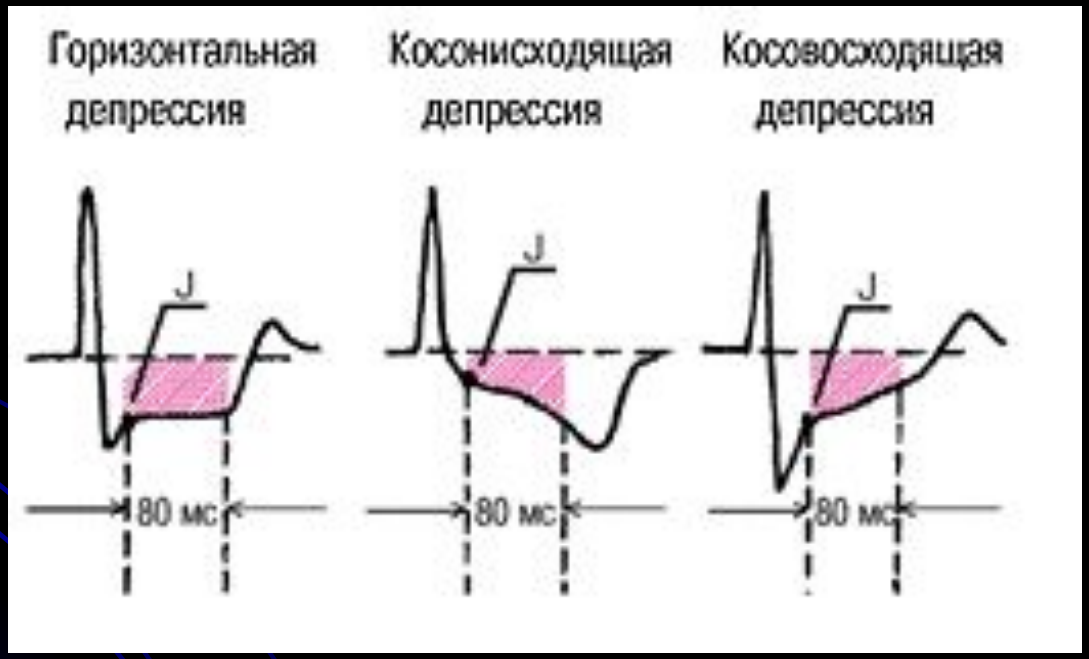
6. ST segment

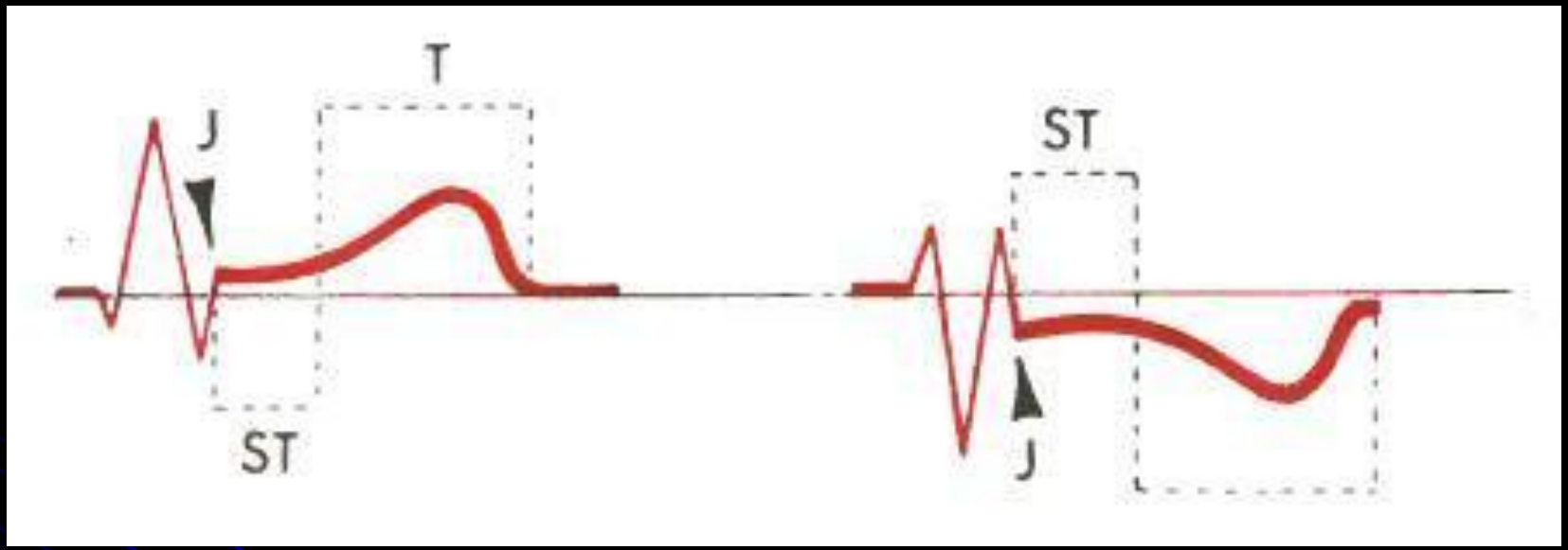
- The ST segment must be on the isoline (a deviation of 0.5 mm is permissible)
- The elevation of the ST segment is estimated in 40 ms from point j
- ST segment depression is assessed in 60-80 ms from point j
- In V1-V3, it is normal for ST elevation up to 2.5 mm with a bulge downward



J -point

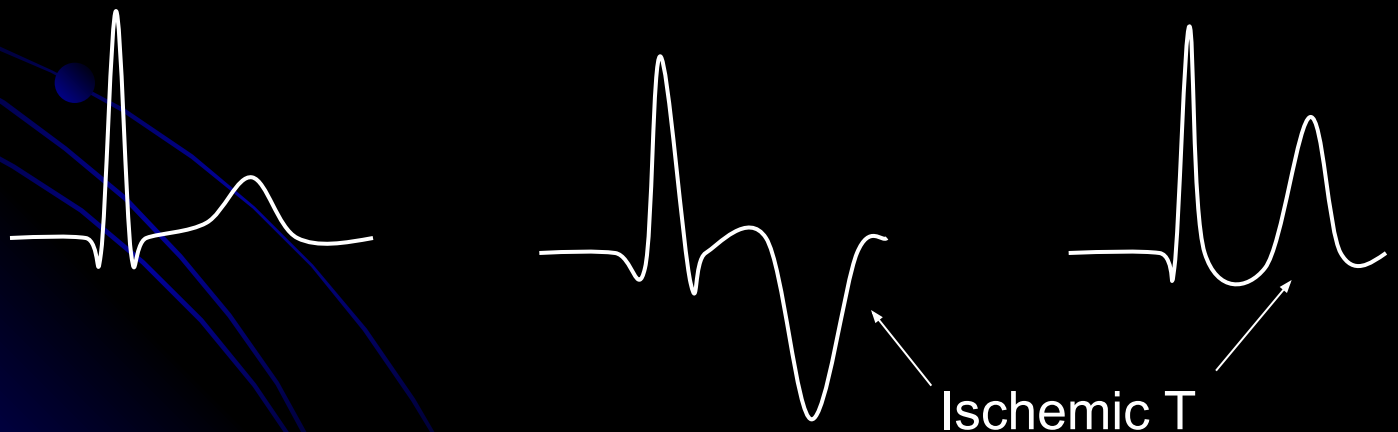
- Point j is the place of the visible end of the QRS complex!




T
J
ST
ST
J

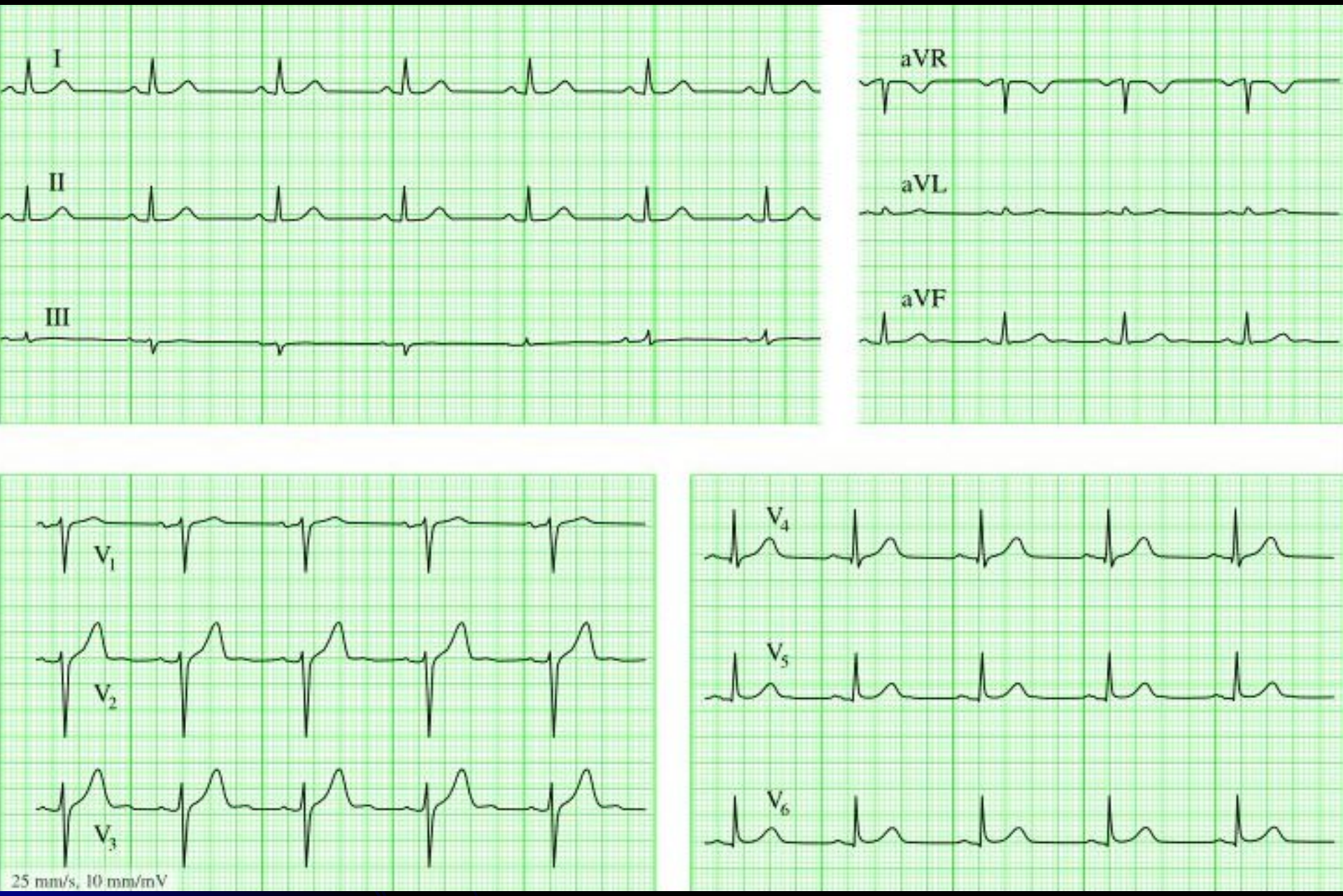
7. T wave

- Analysis of the shape and amplitude of the T wave in all leads
- The most informative, when analyzing dynamics



8. QT interval

- N 450 ms
- QT has a significant direct dependence on the duration of the RR interval (or inversely from the heart rate)
- QTc - corrected QT
- Bazett's formula QTc = QT: √RR
- Causes of lengthening: Long QT syndrome, medication (amiodarone, antibiotics, antihistamines)


I
II
III
aVR
aVL
aVF
V1
V2
V3
V4
V5
V6
25 mm/s, 10 mm/mV

вдох