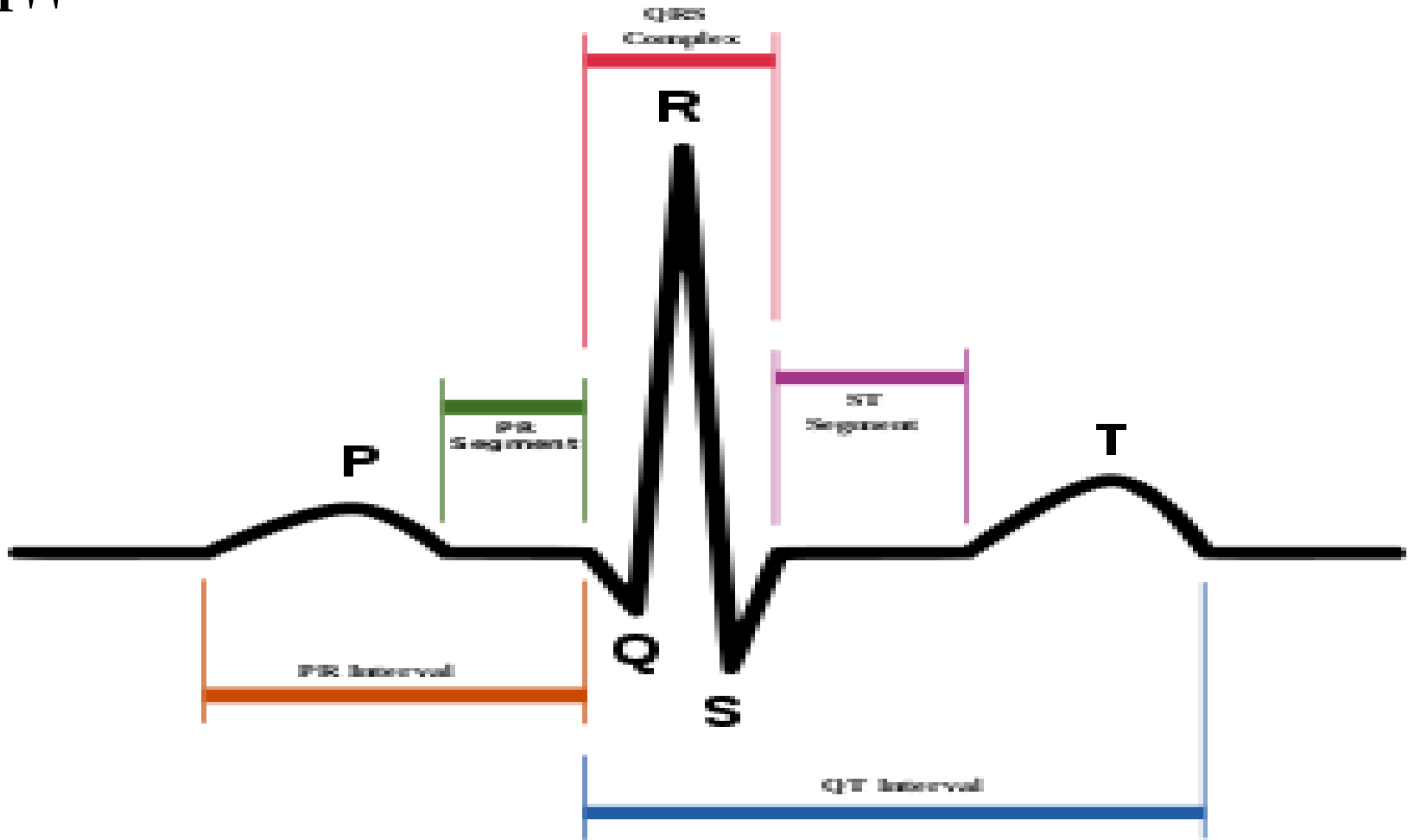
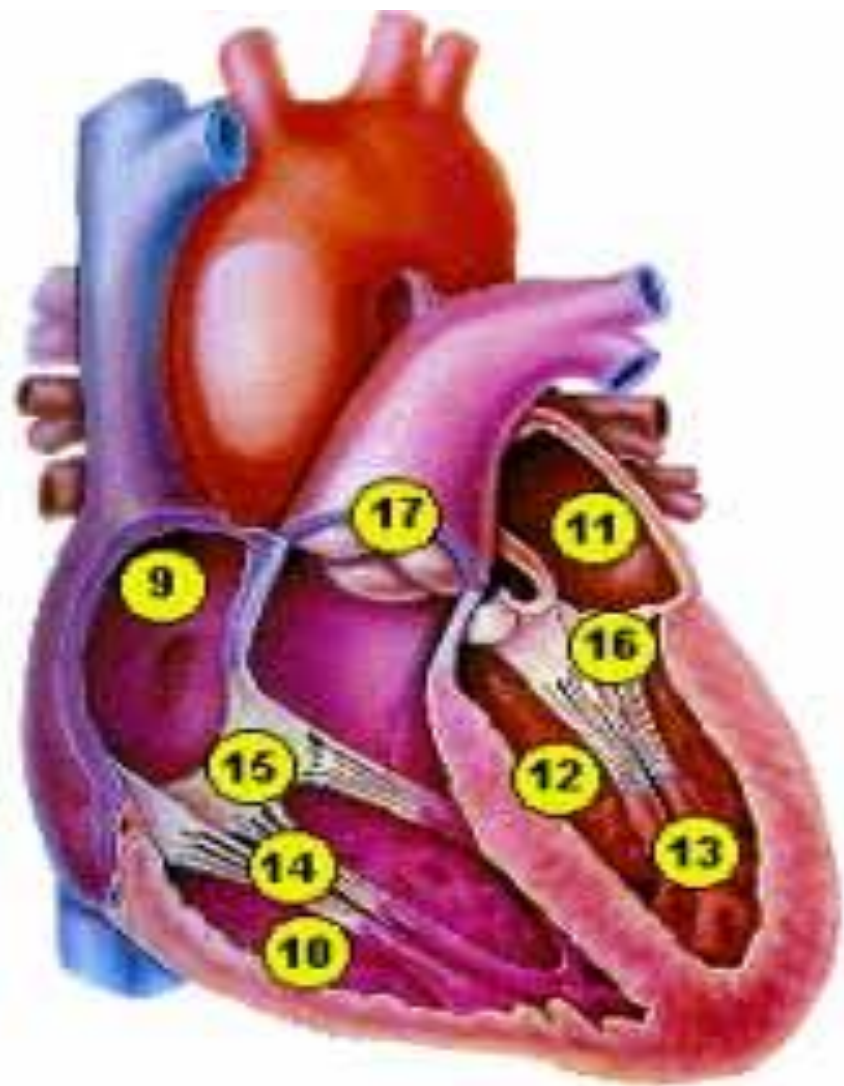
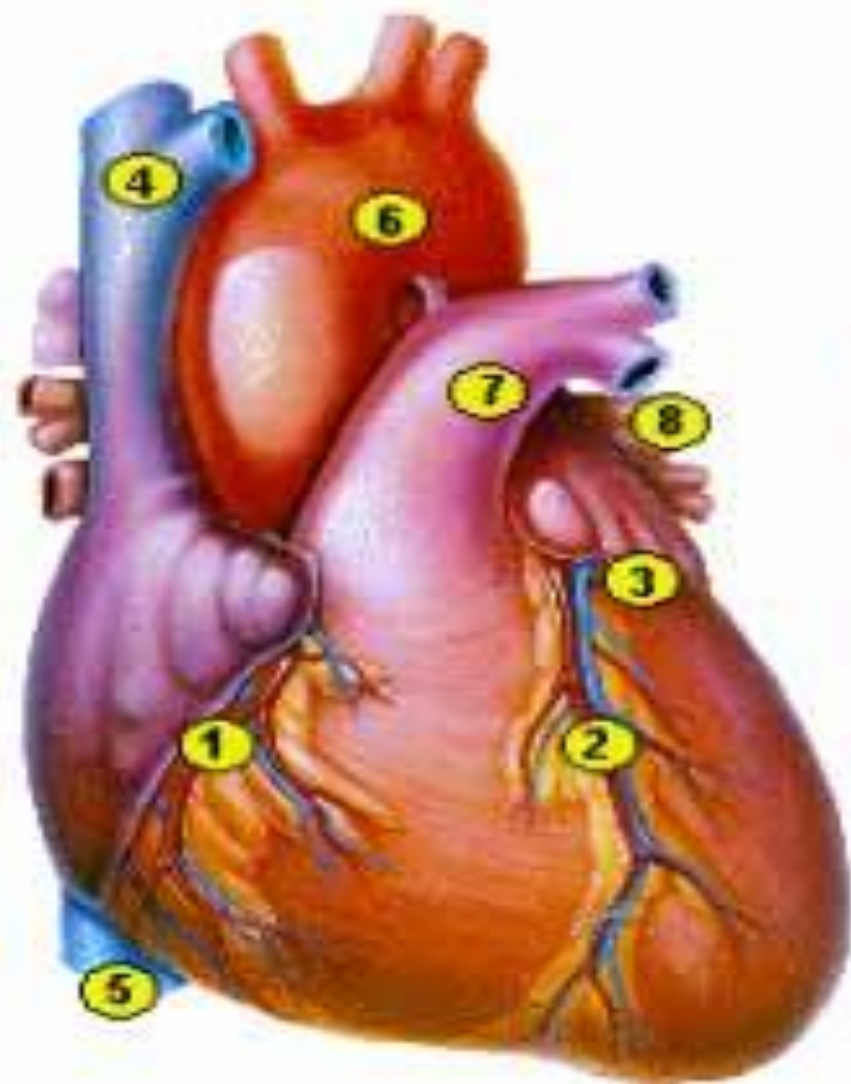


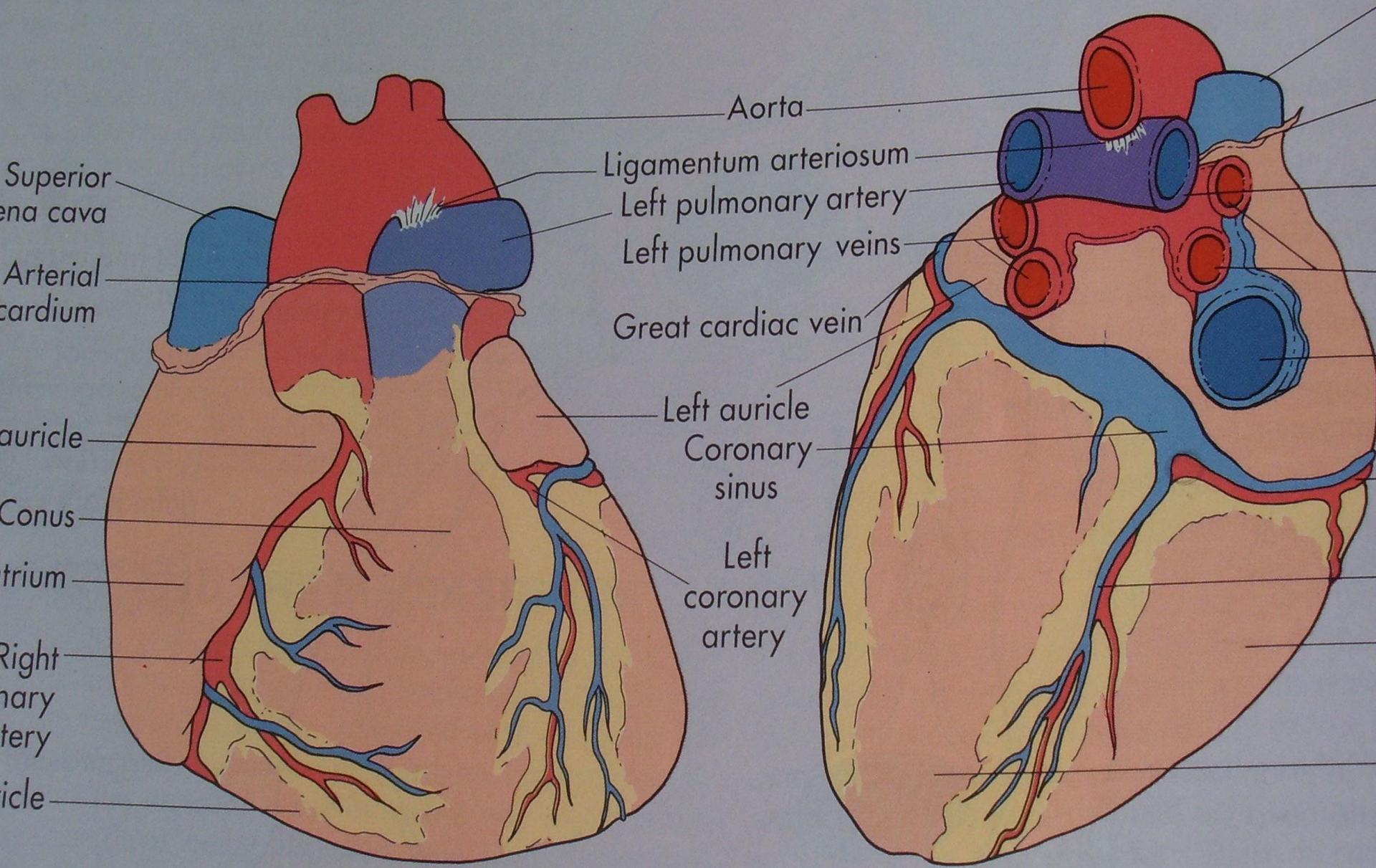


НОРМАЛЬНАЯ ЭКГ

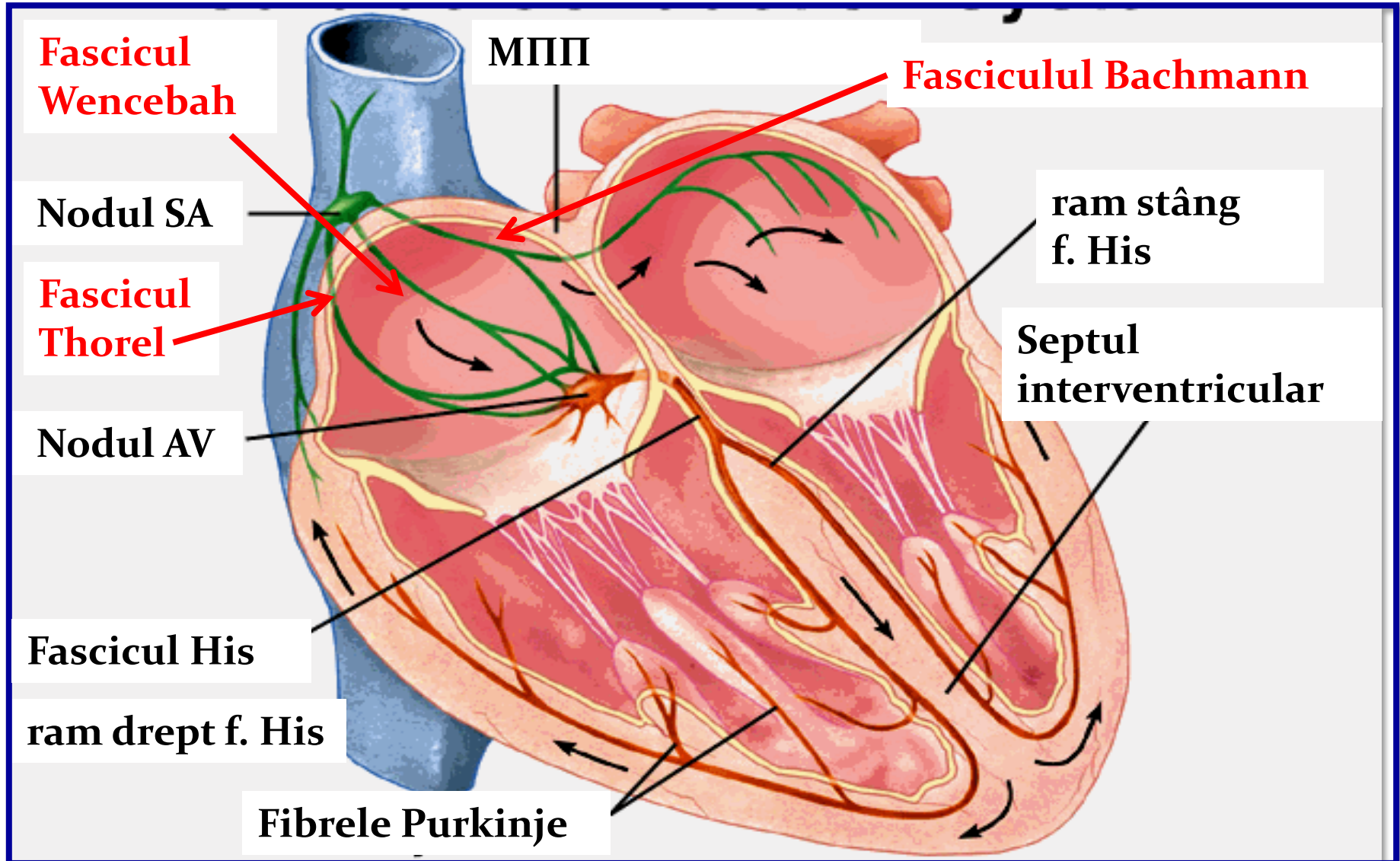
ЭКГ, история которой насчитывает более 100 лет, бросает вызов времени и остается одним из самых популярных и полезных инструментов в современной кардиологии.







Система автоматизма и проведения сердечного импульса



SA узел
(синусно-
предсердный)

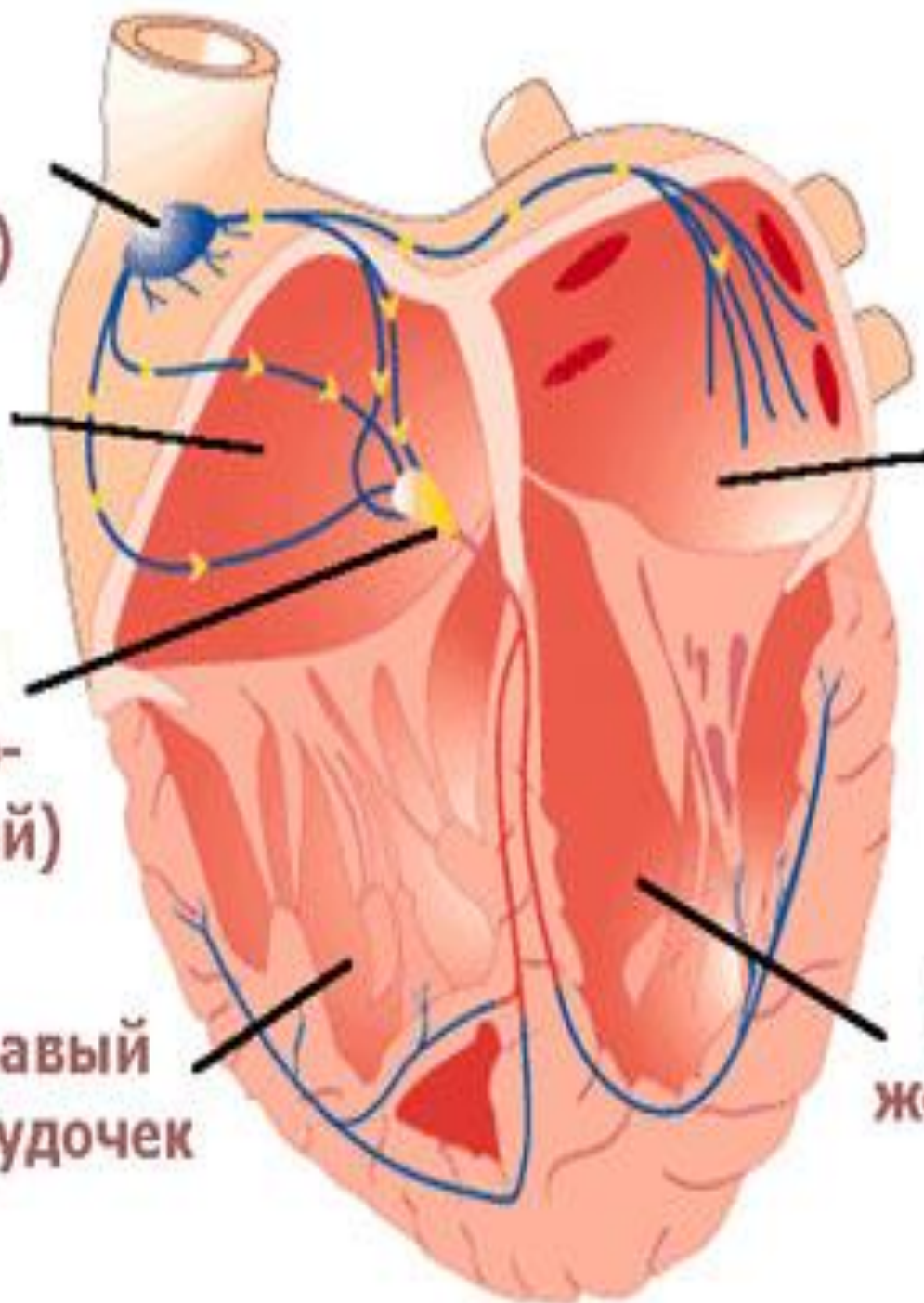
Правое
предсердие

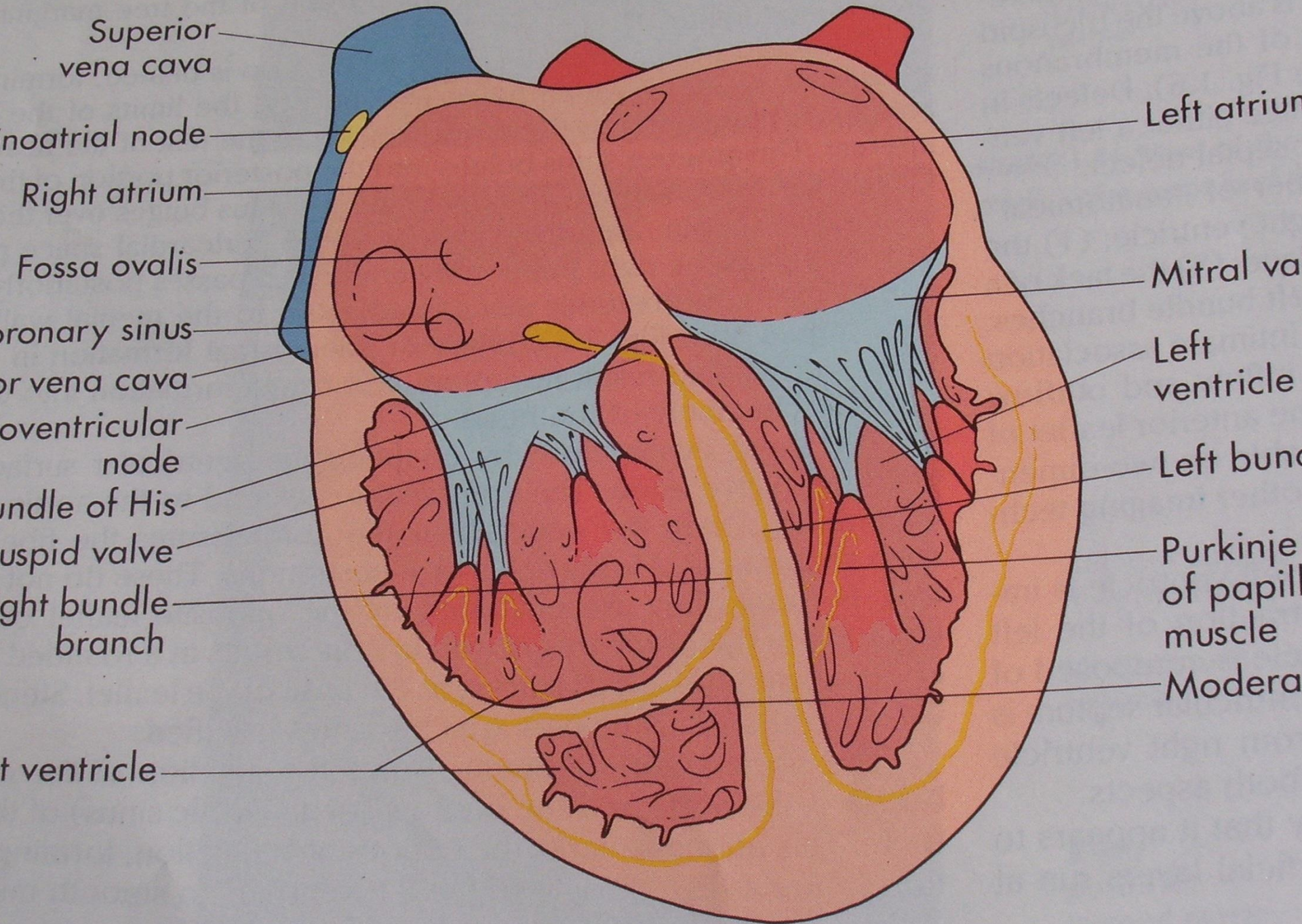
AV узел
(предсердно-
желудочковый)

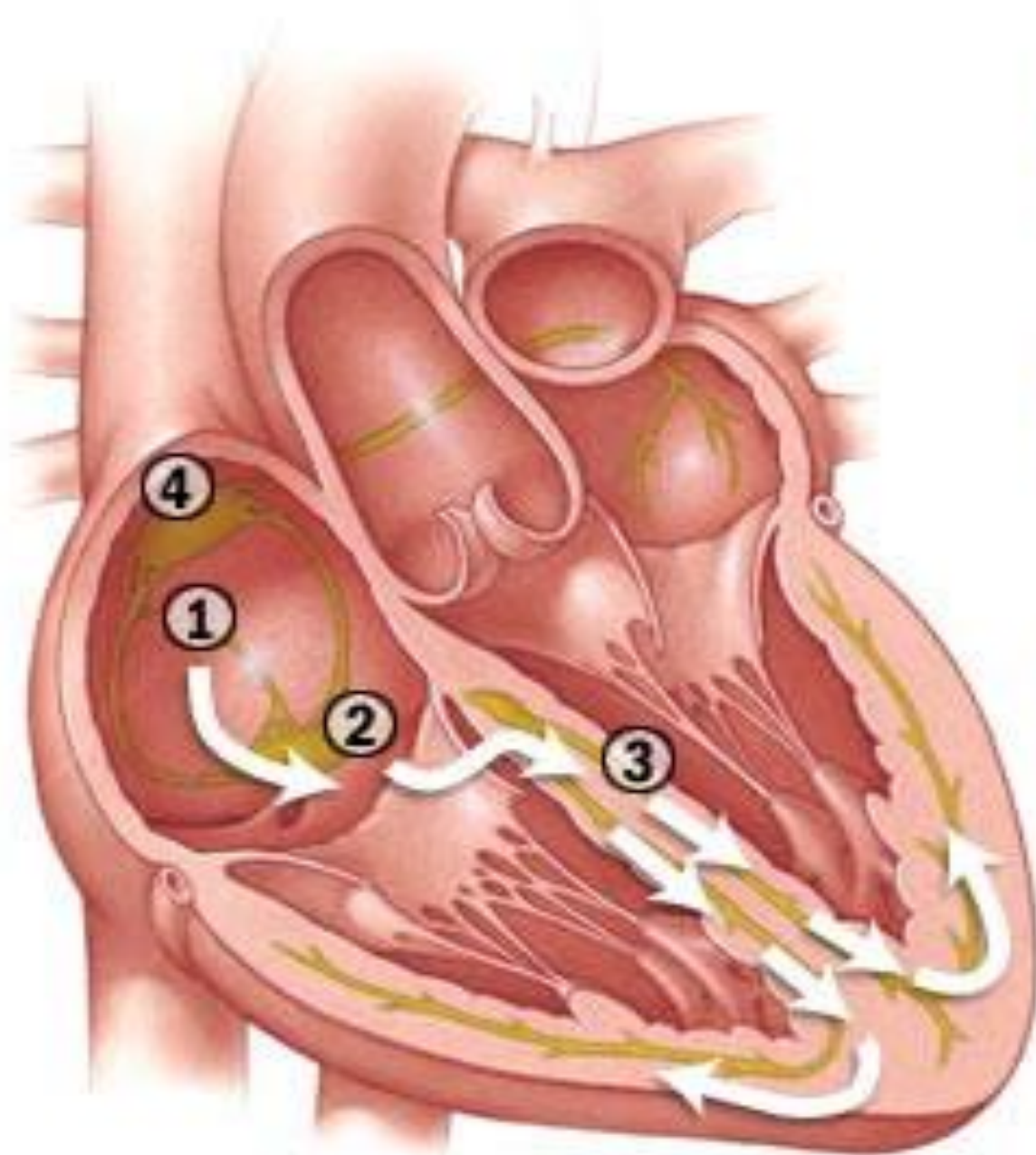
Правый
желудочек

Левое
предсердие

Левый
желудочек







1.
Sinus node
impulse



2.
Impulse passes
through
atrioventricular
node

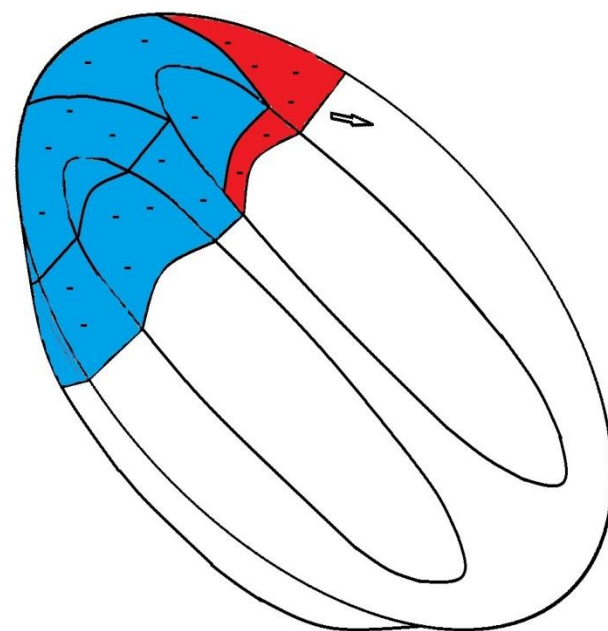
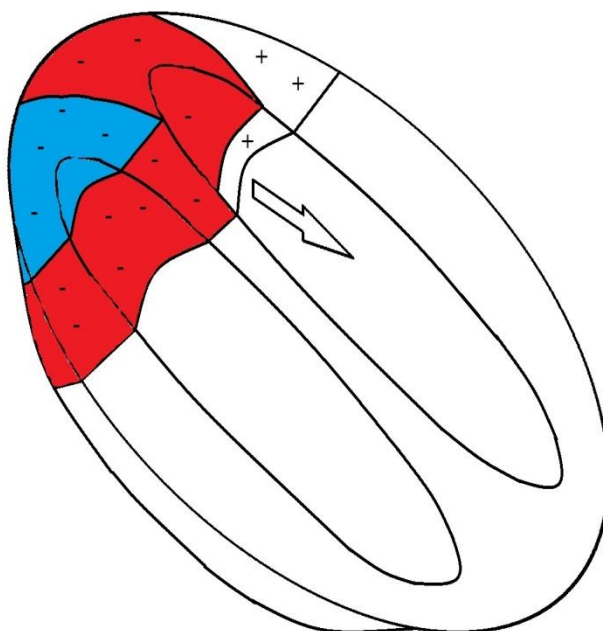
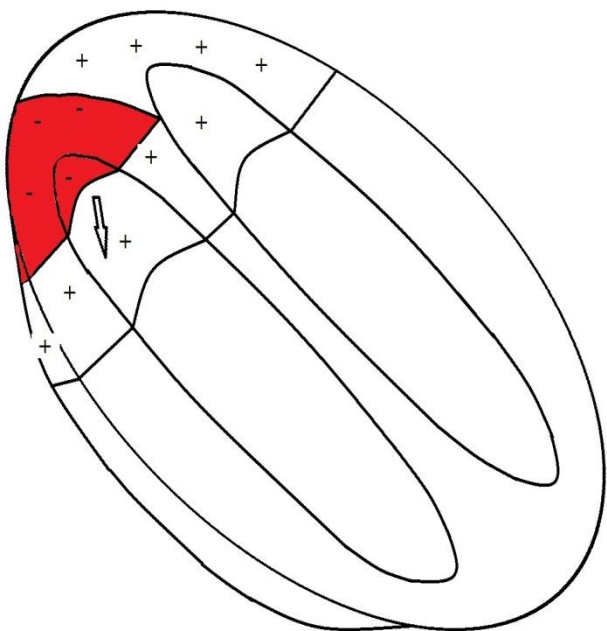


3.
Ventricular
impulses

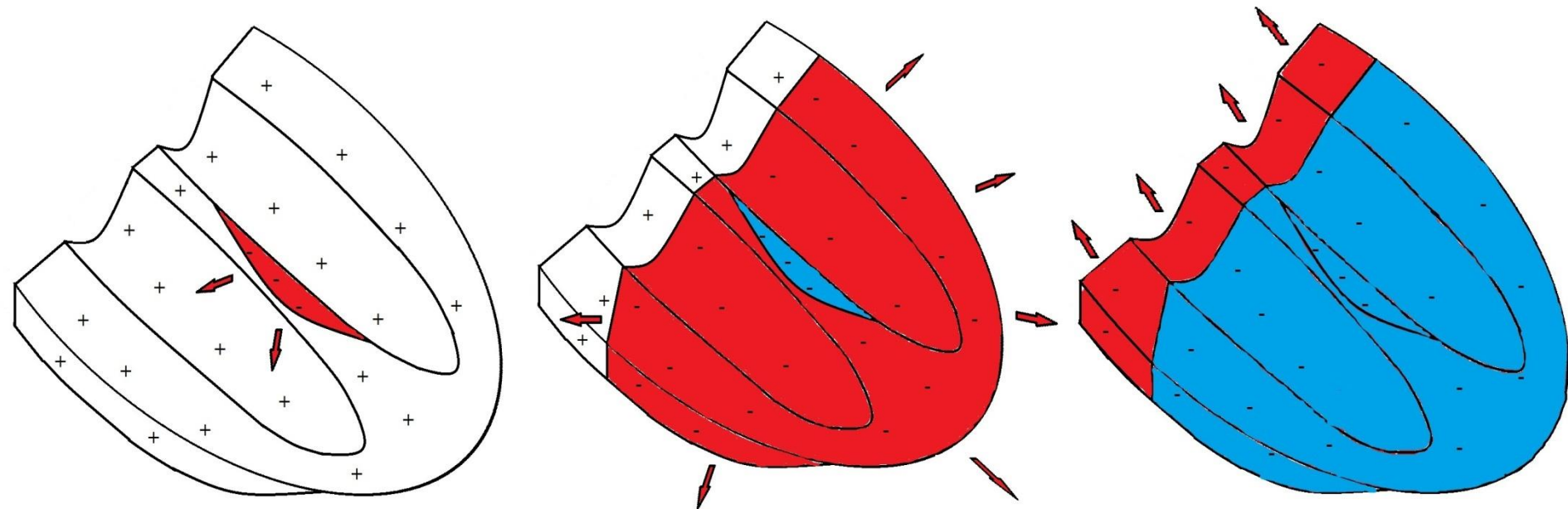


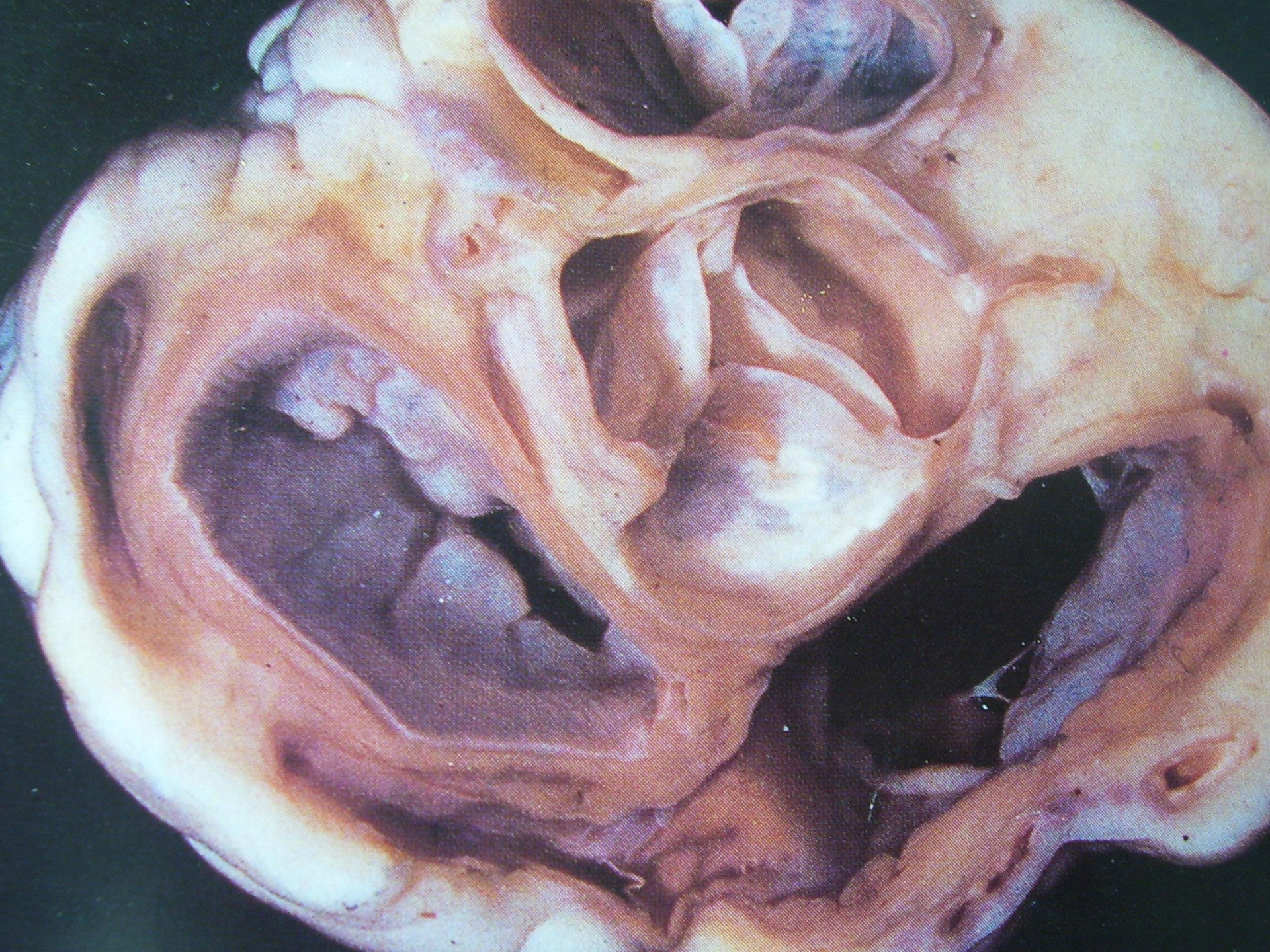
4.
Recovery

Проводимость

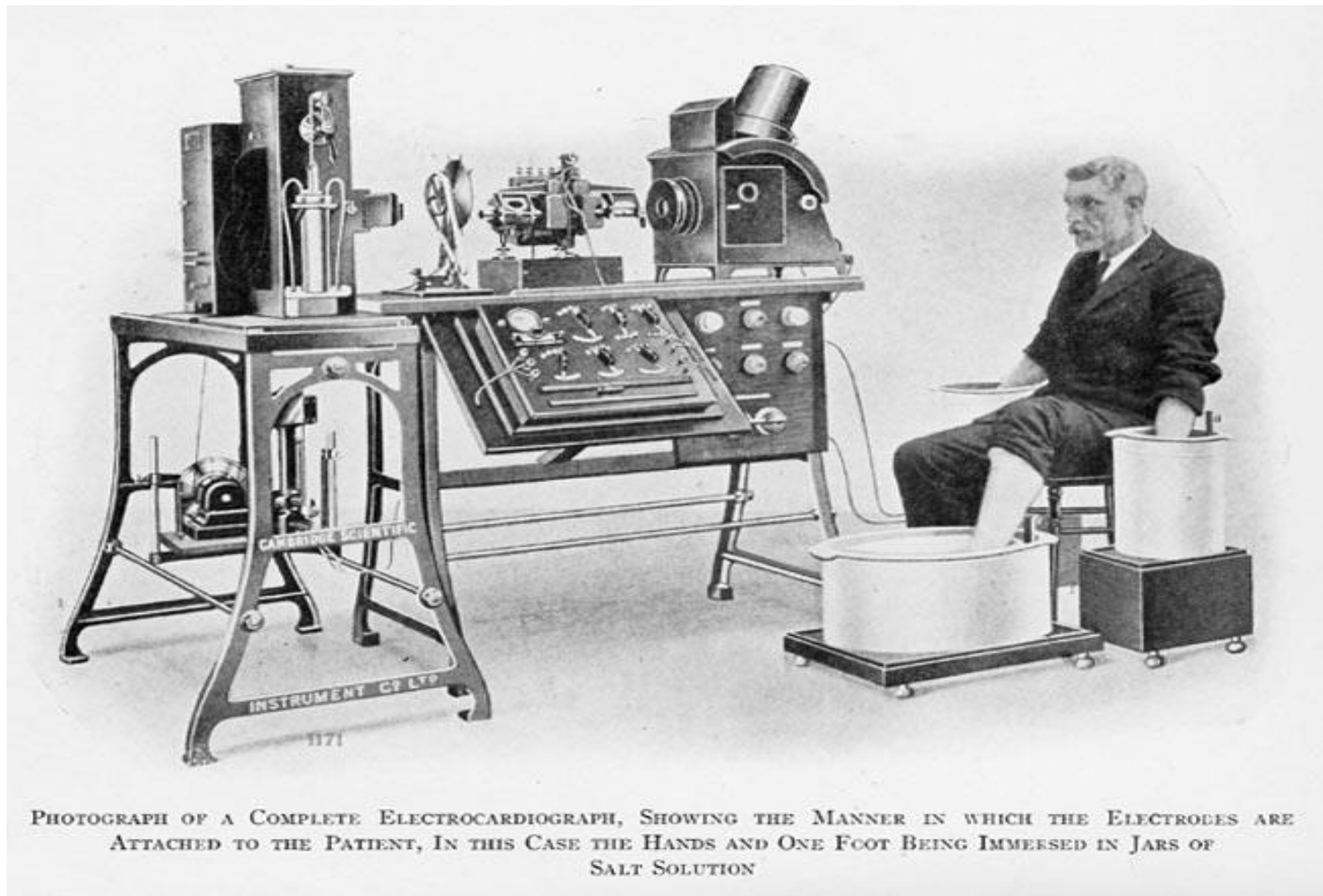


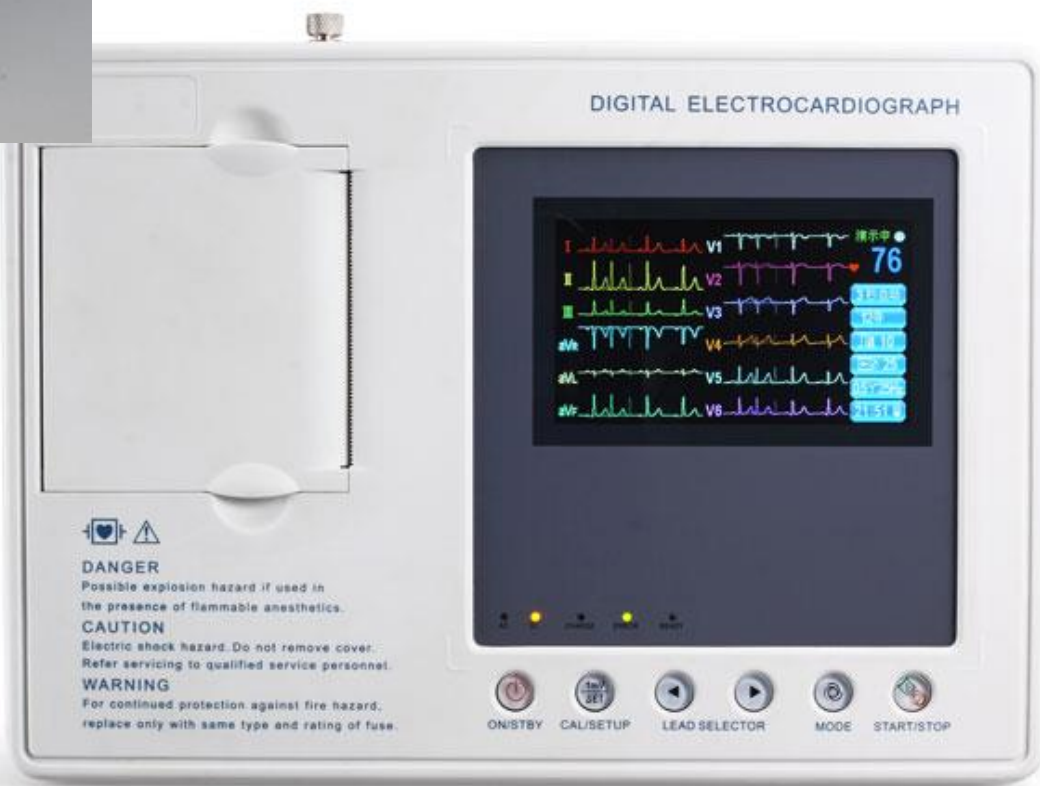
Проводимость

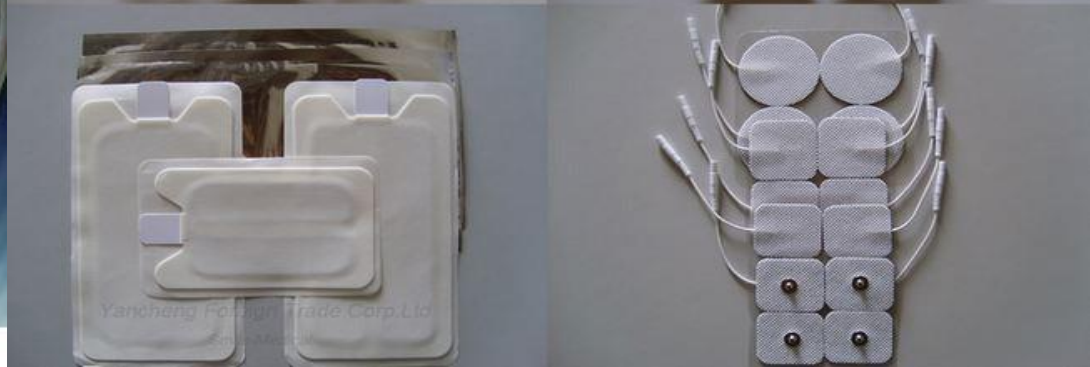
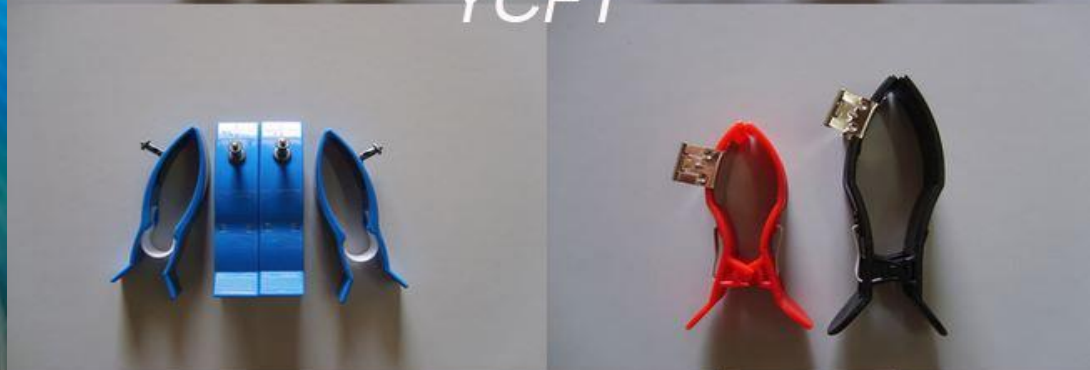




ЭКГ

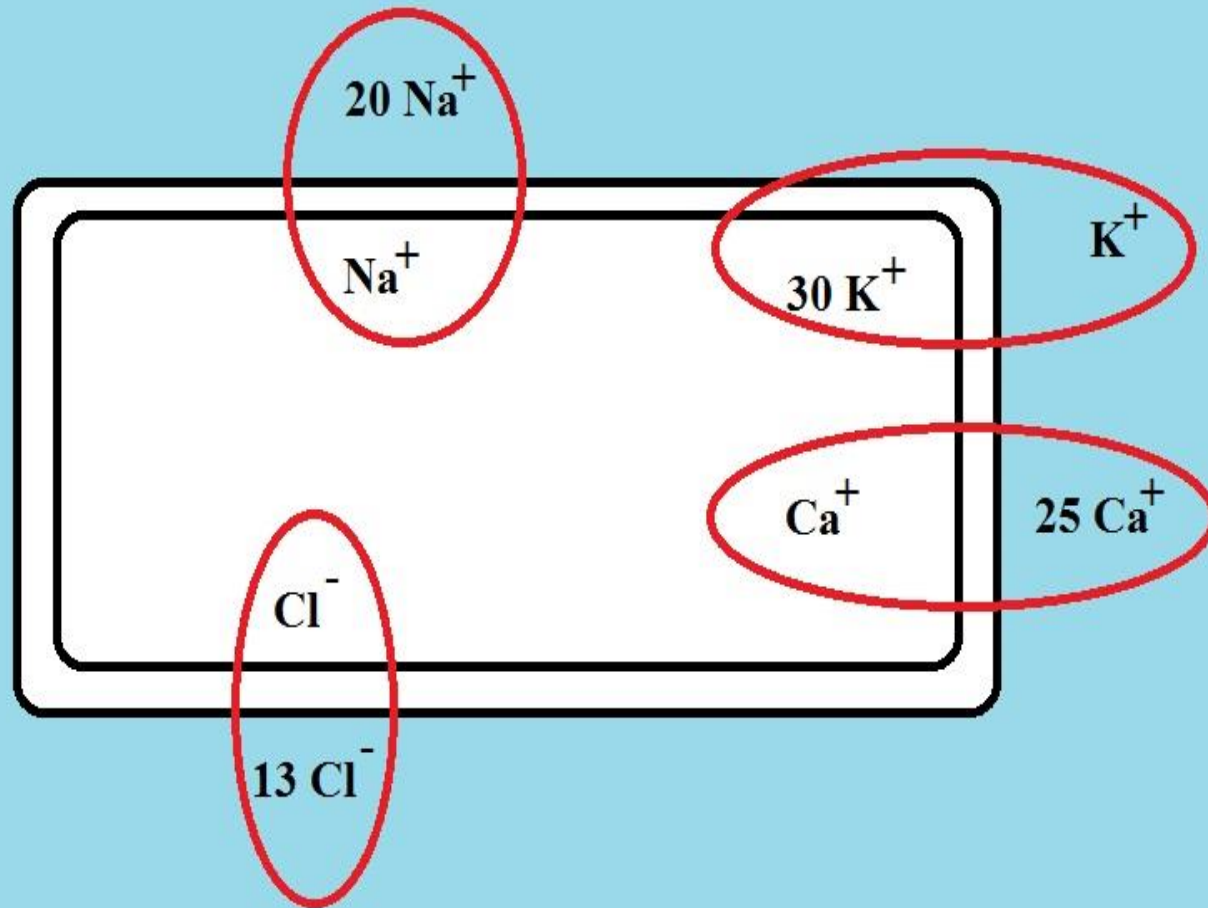




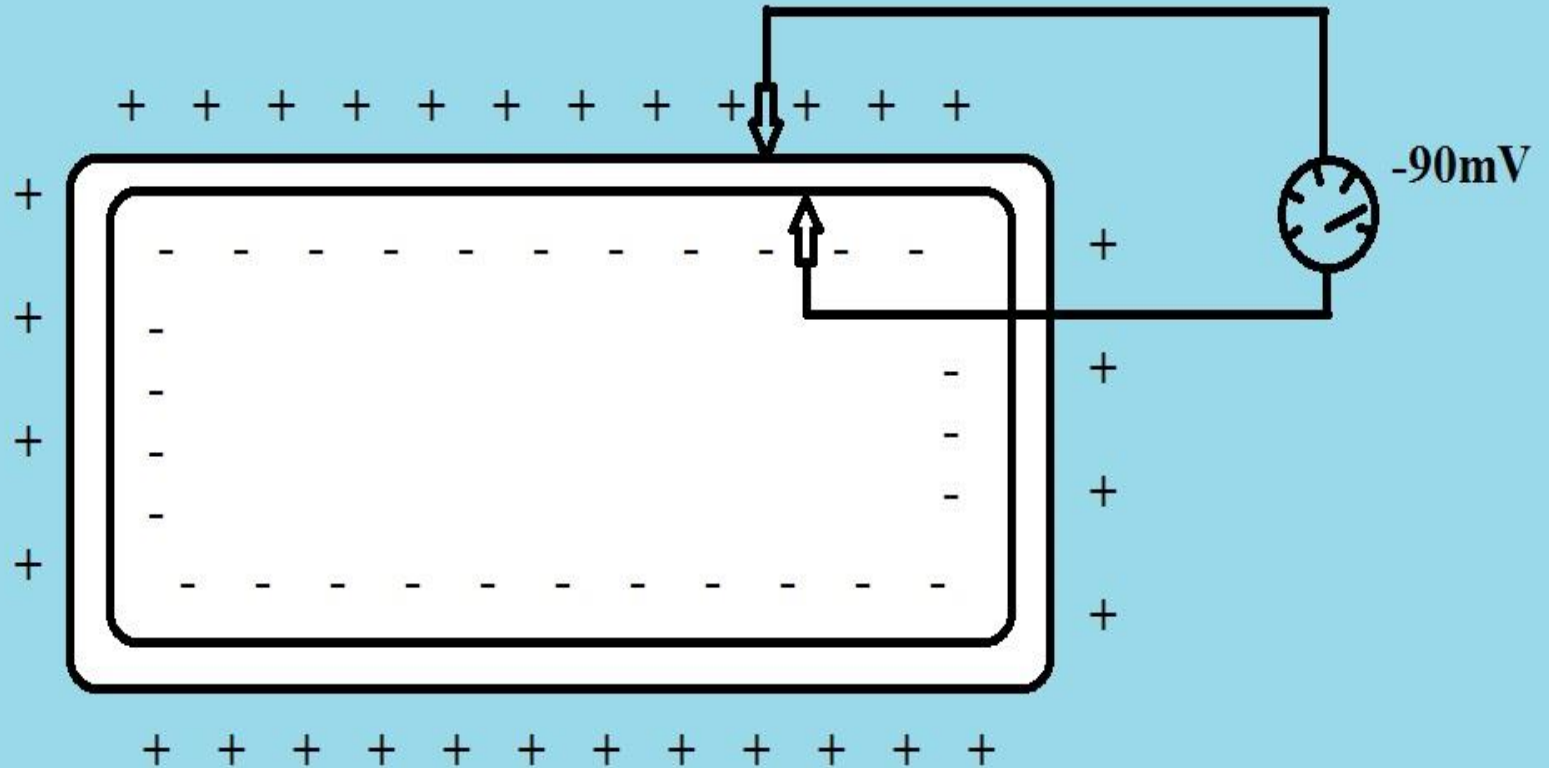




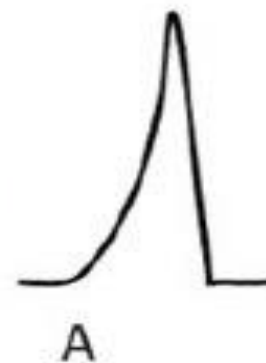
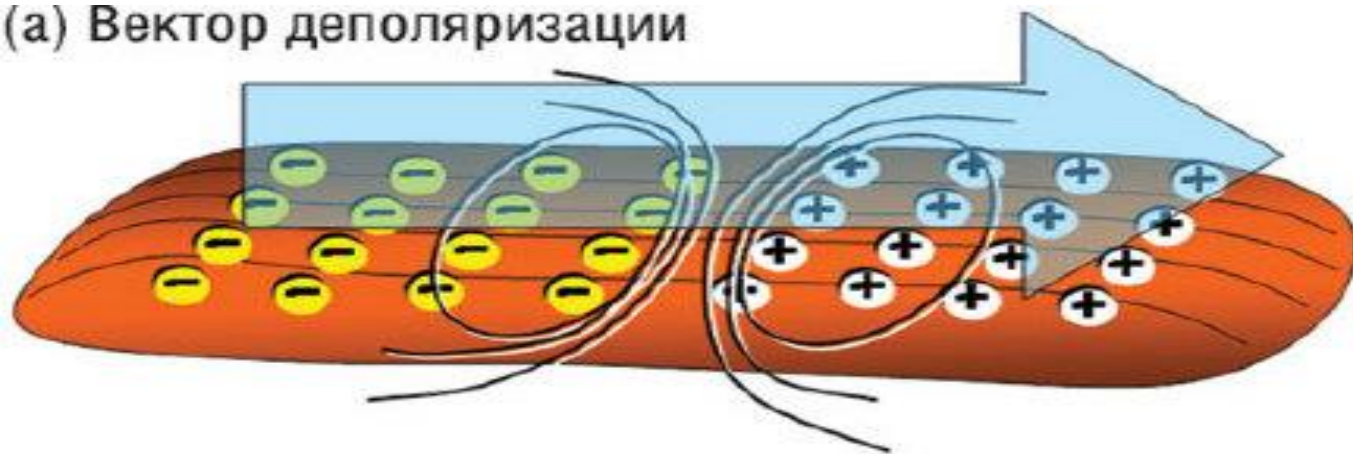
Потенциал покоя



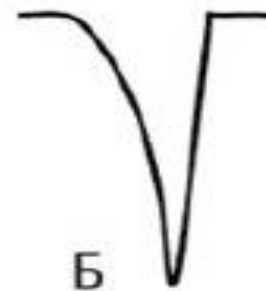
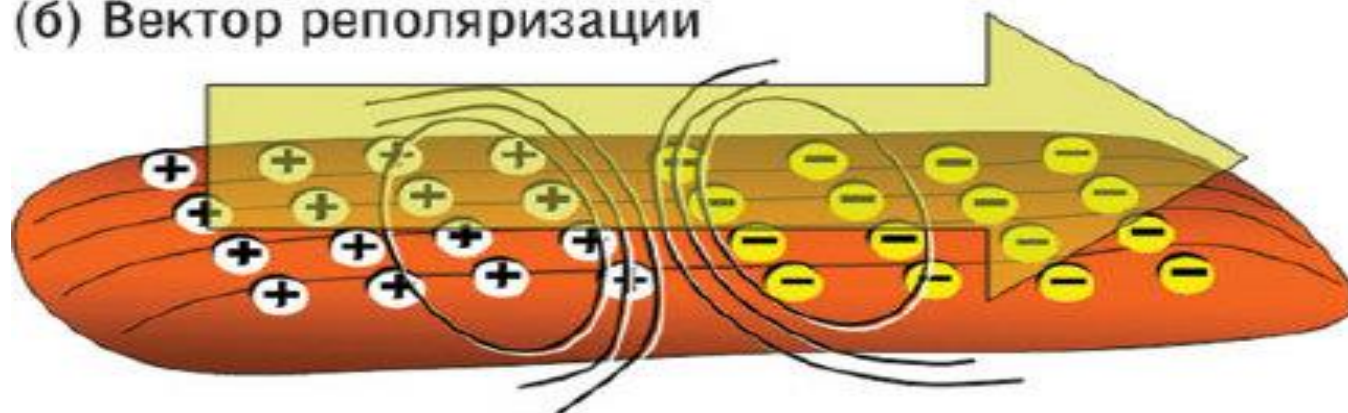
Потенциал покоя



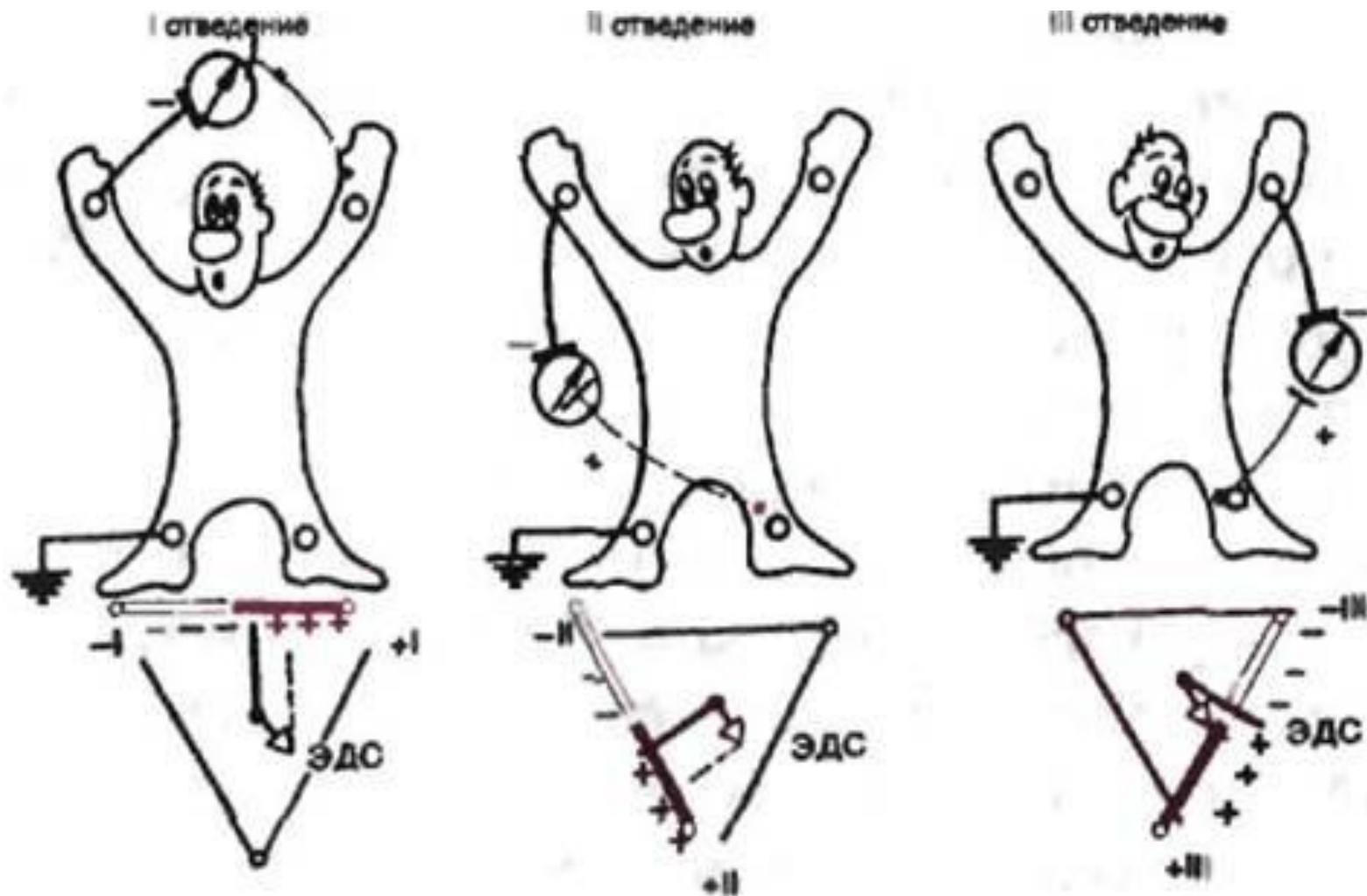
(а) Вектор деполяризации



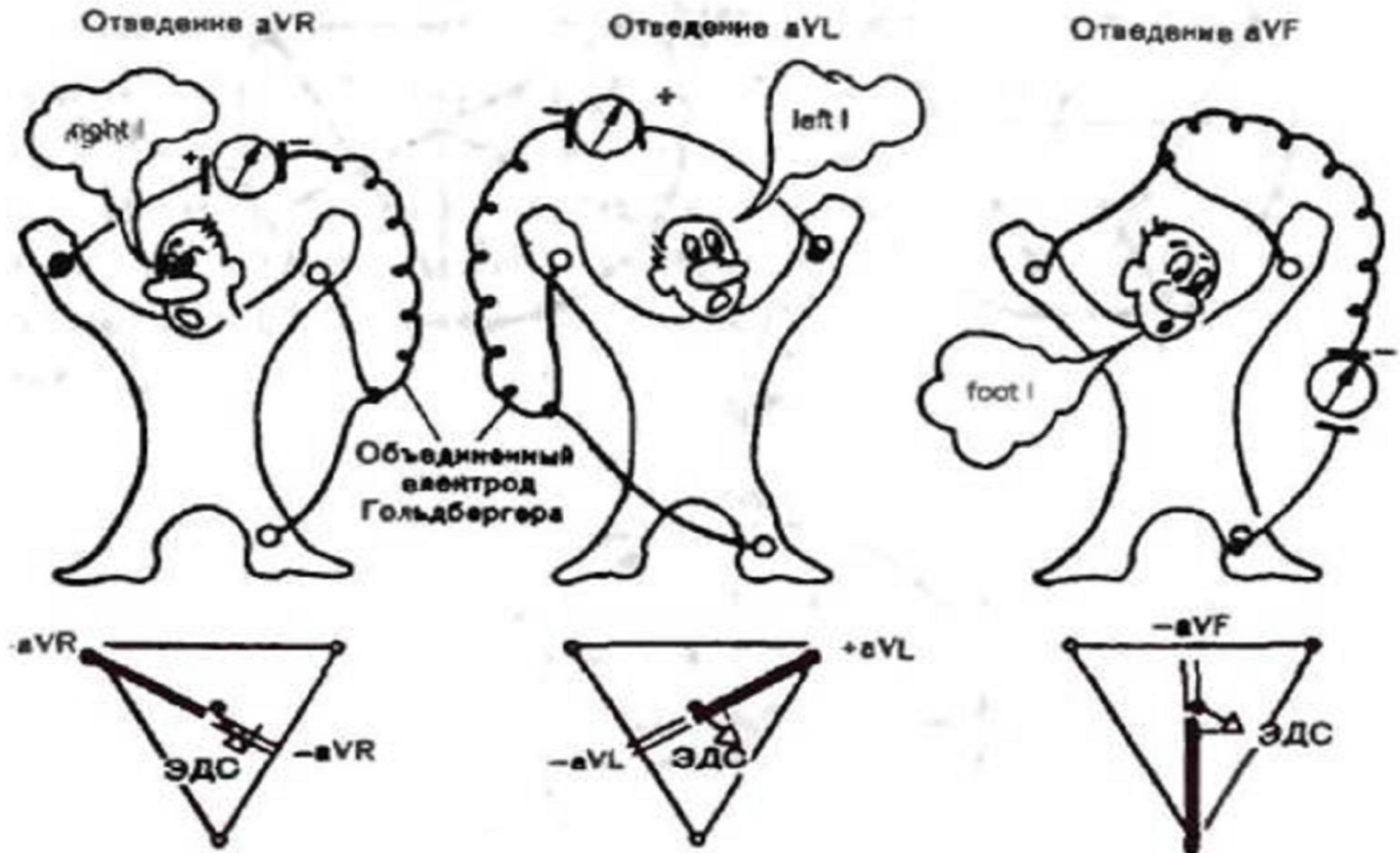
(б) Вектор реполяризации

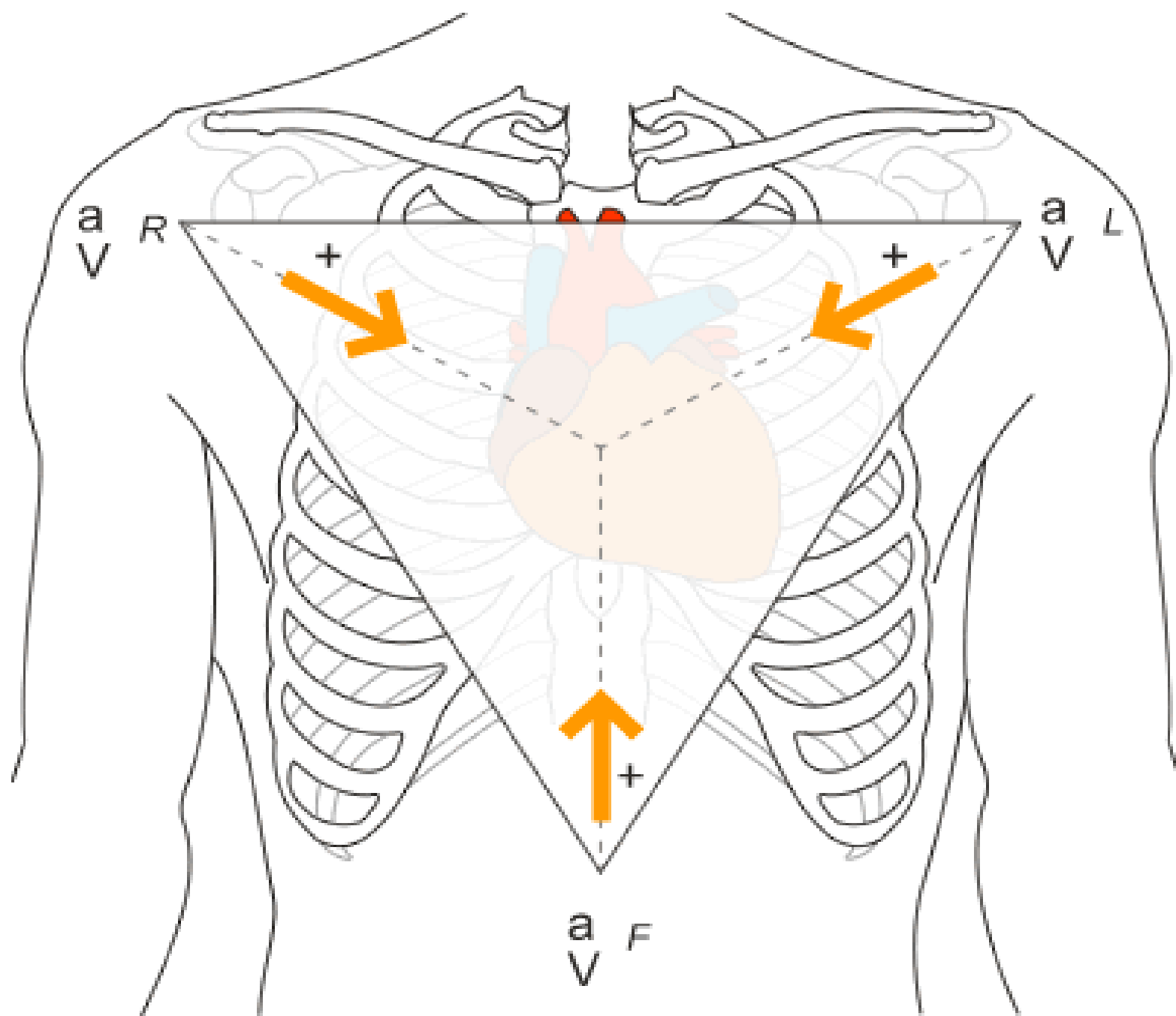


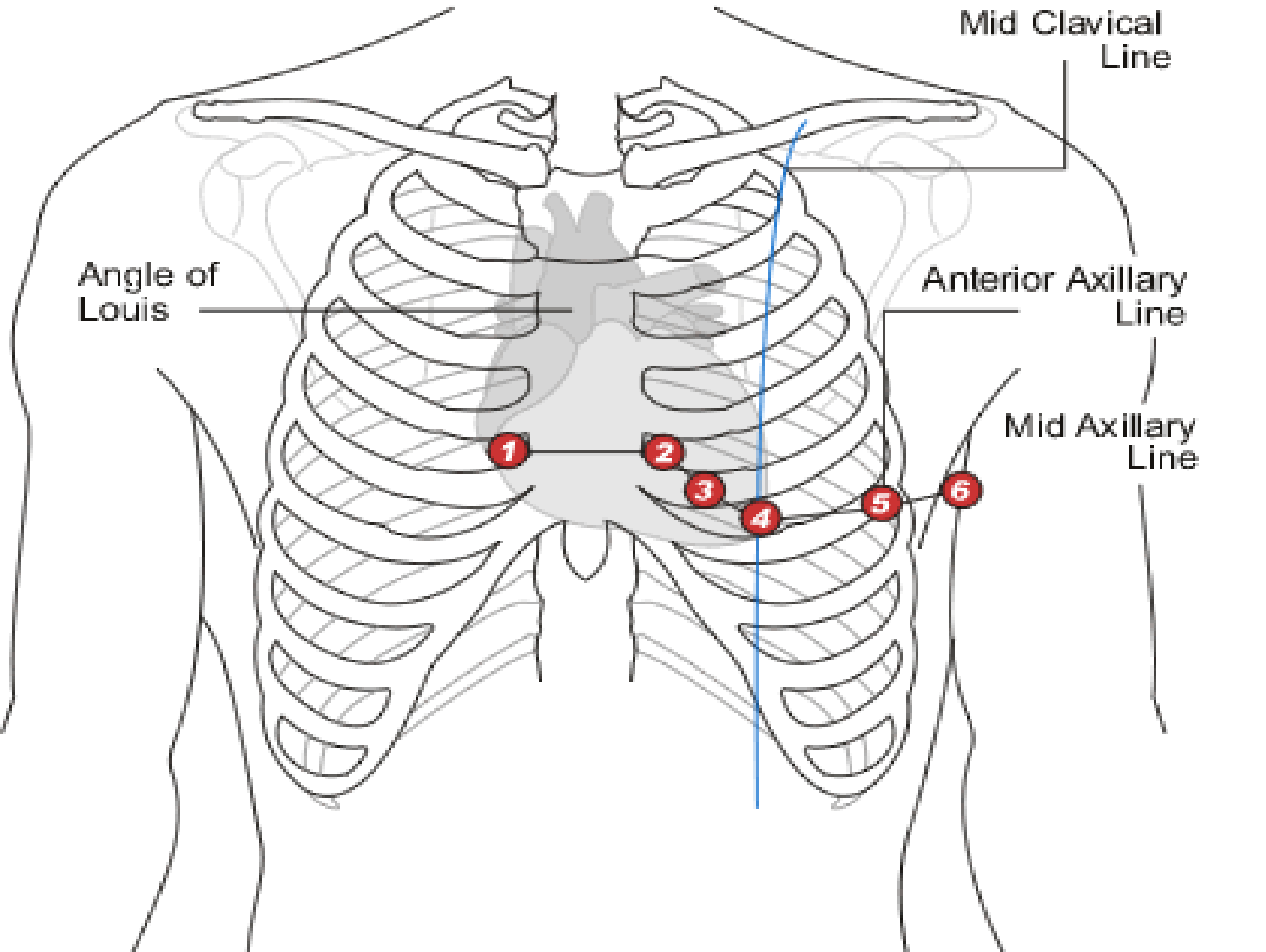
**Биполярные стандартные отведения I, II и III были
введены в мед. практику Эйтховеном.**

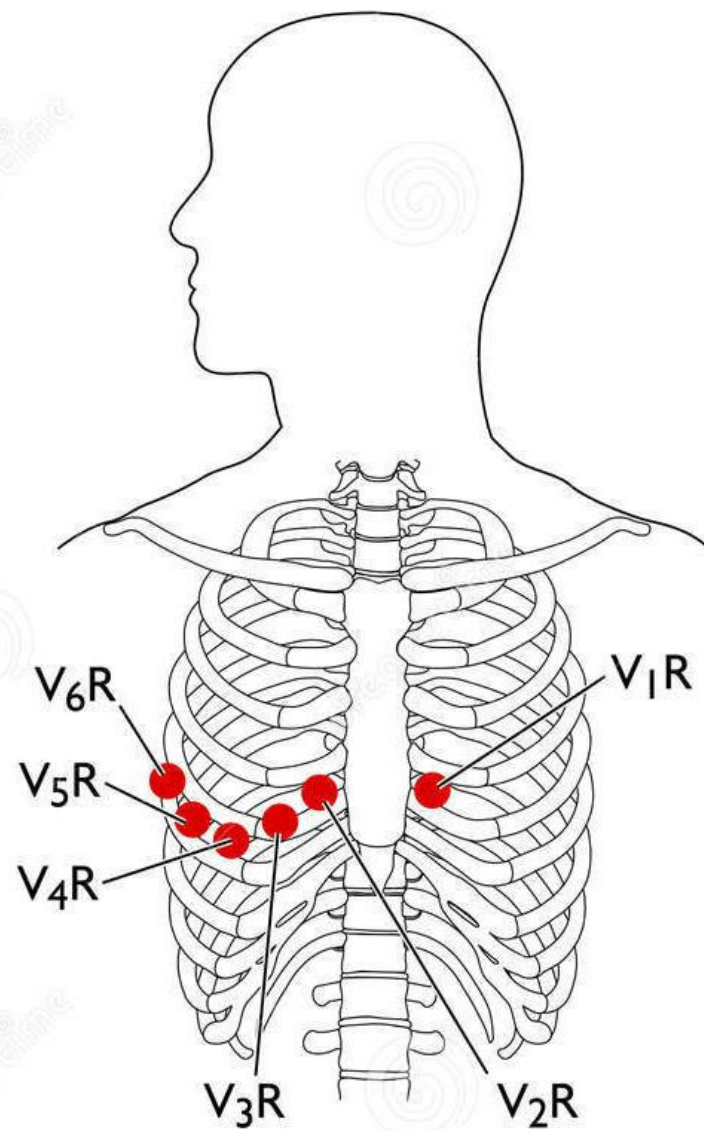
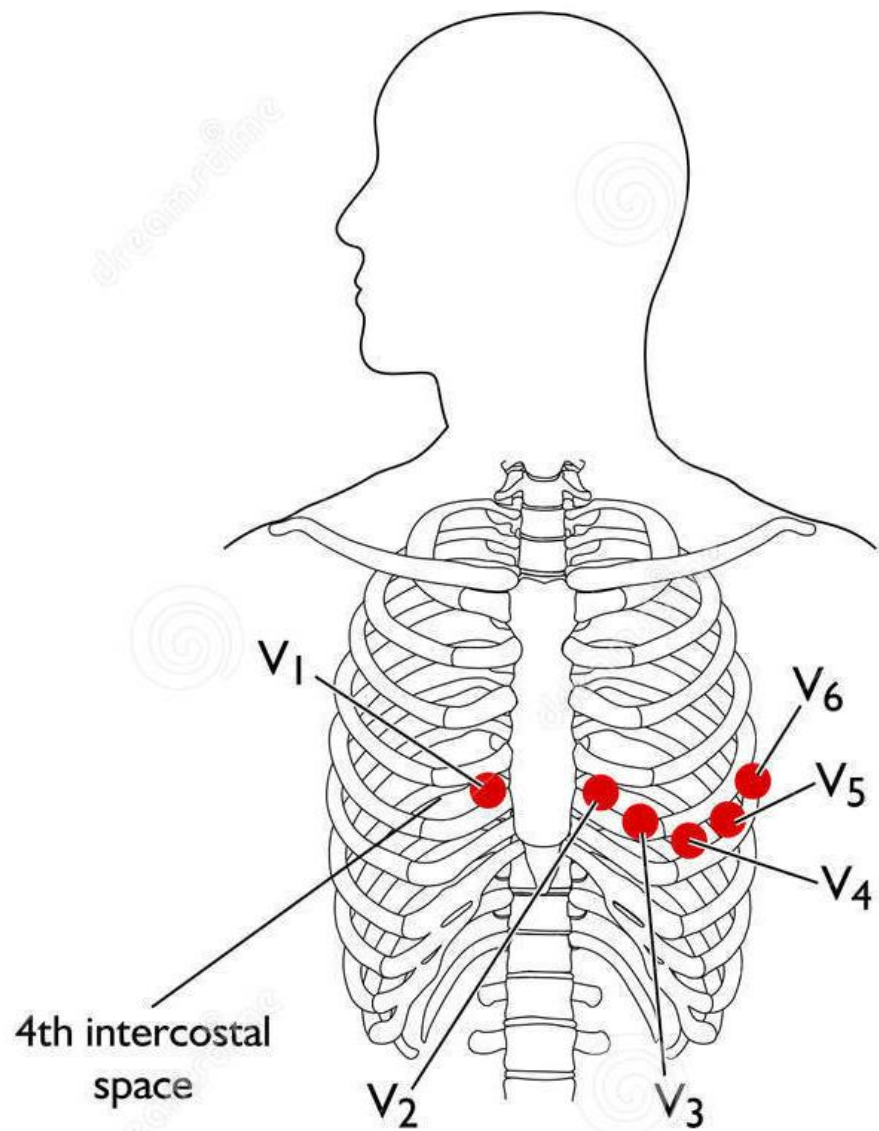


Однополярные добавочные отведения AVR, AVL, AVF введены Голденбергом в 1942.

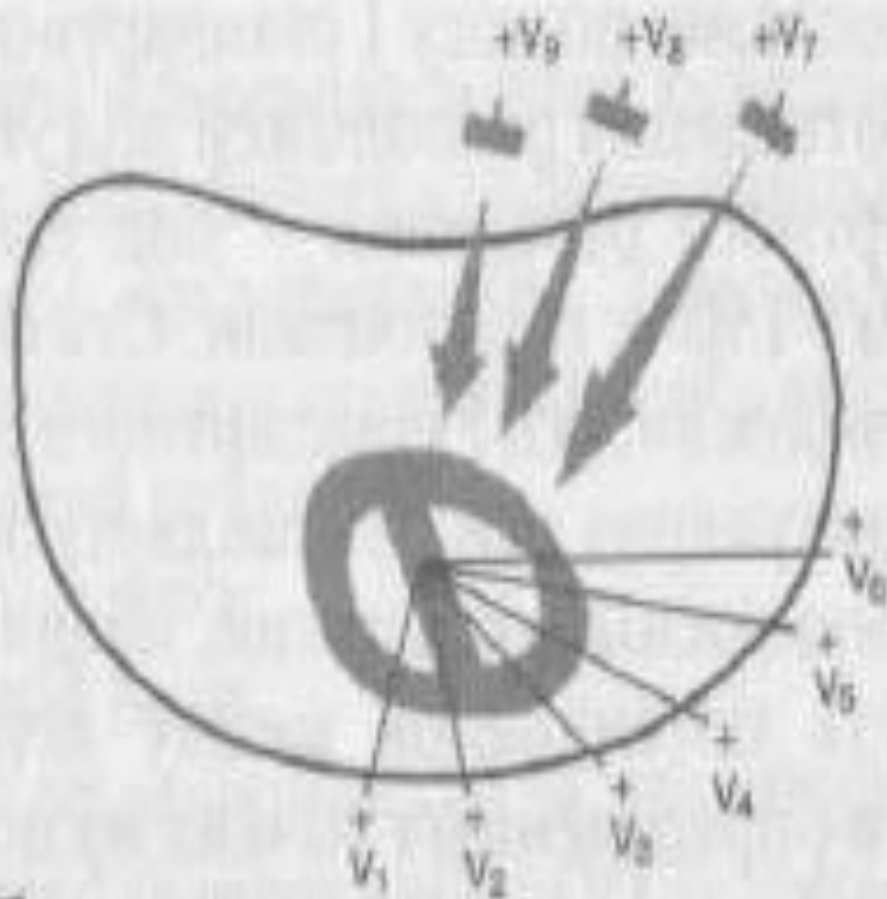








Дополнительные грудные отведения V7-V9.

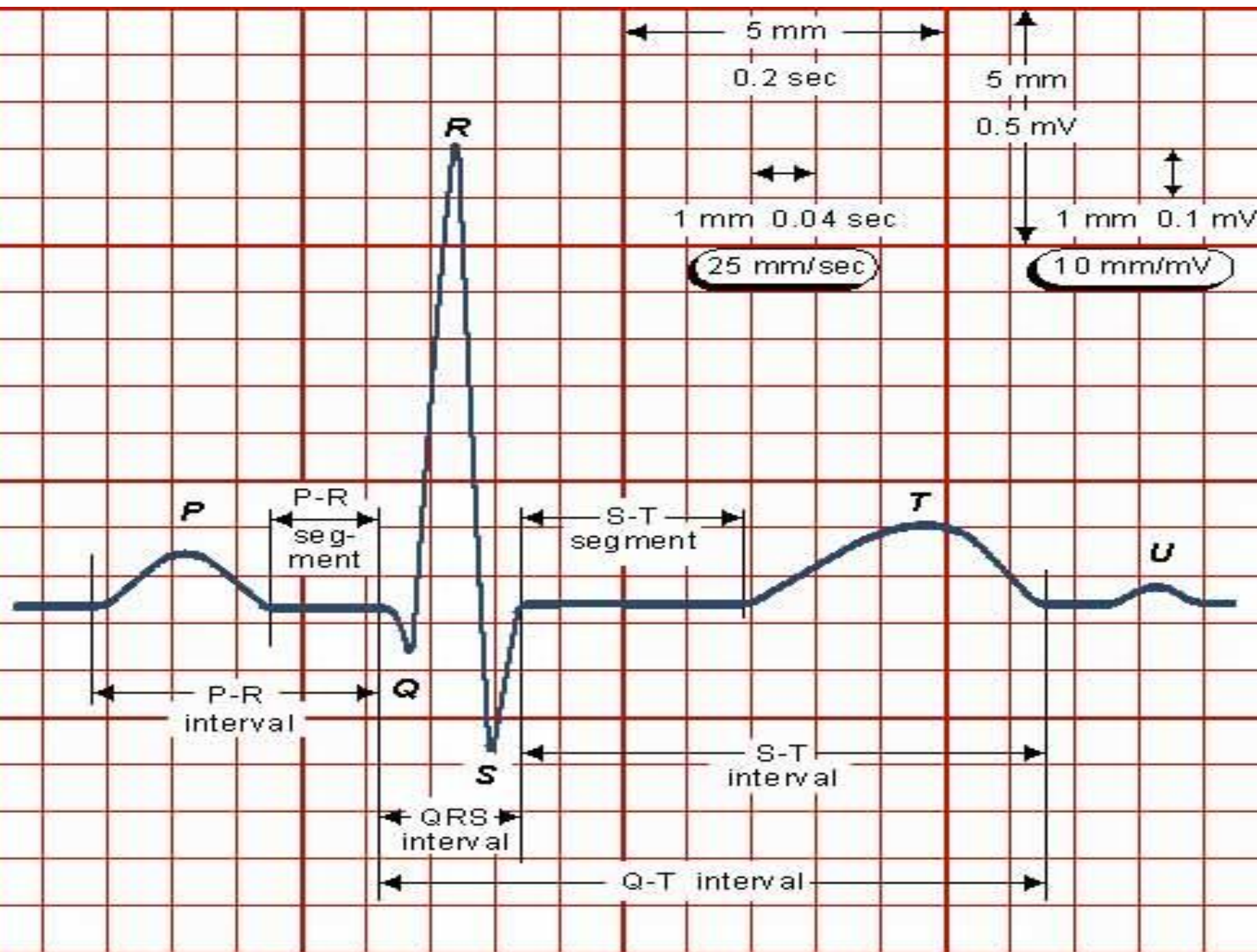


а

б

АЛГОРИТМ ЭКГ

- 1. Паспортные данные**
- 2. Волтаж**
- 3. Ритм**
- 4. ЧСС**
- 5. ЭКС**
- 6. Анализ каждого зубца и интервала:
зубец P, сегмент PQ, интервал PQ,
зубец Q, зубец R, зубец S, зубец T
интервал QRS, интервал QRST**



5-25

1 mm
0.04 second

PR segment

ST segment

P

T

Q₁

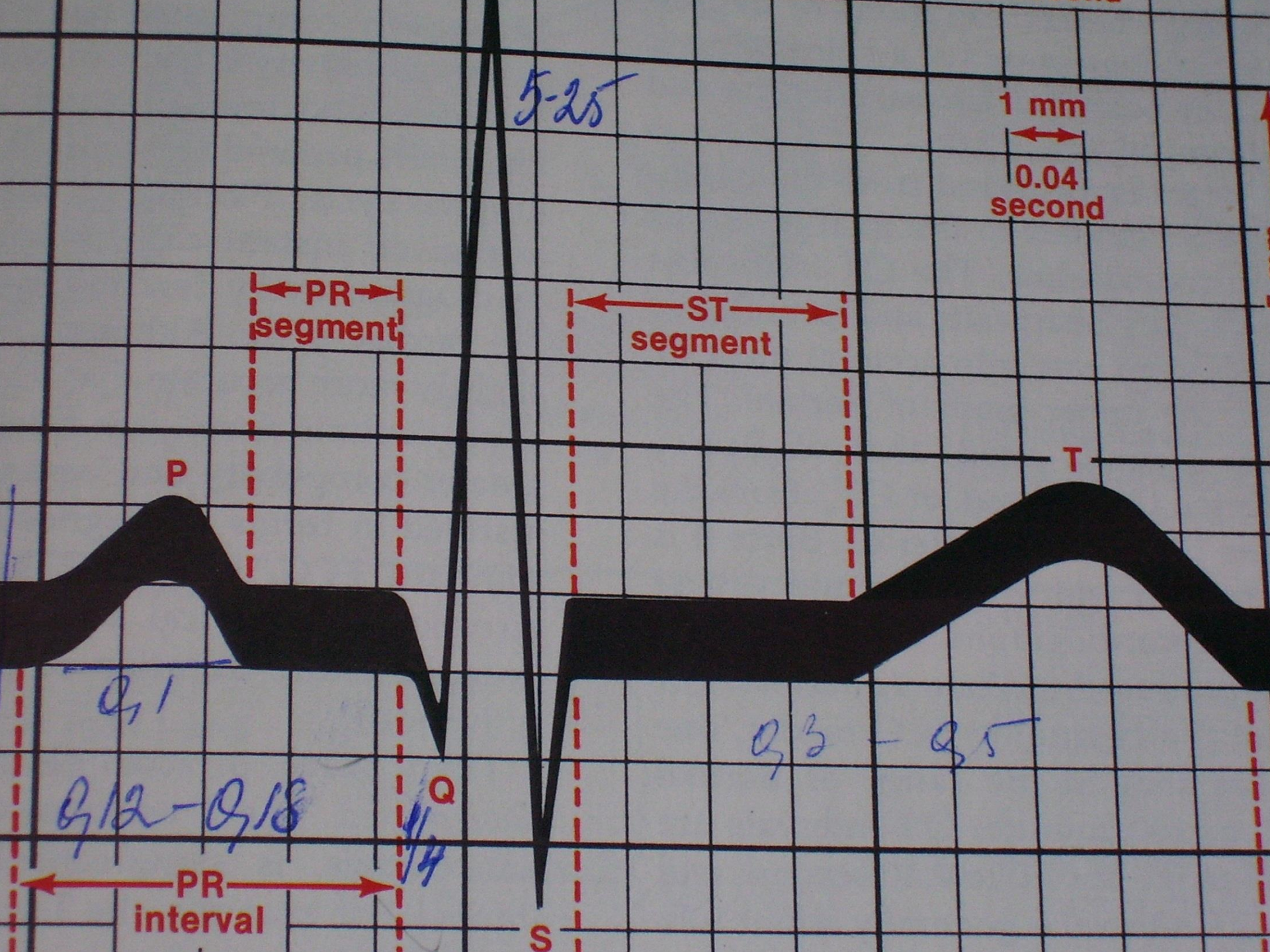
Q₁₂ - Q₁₈

Q

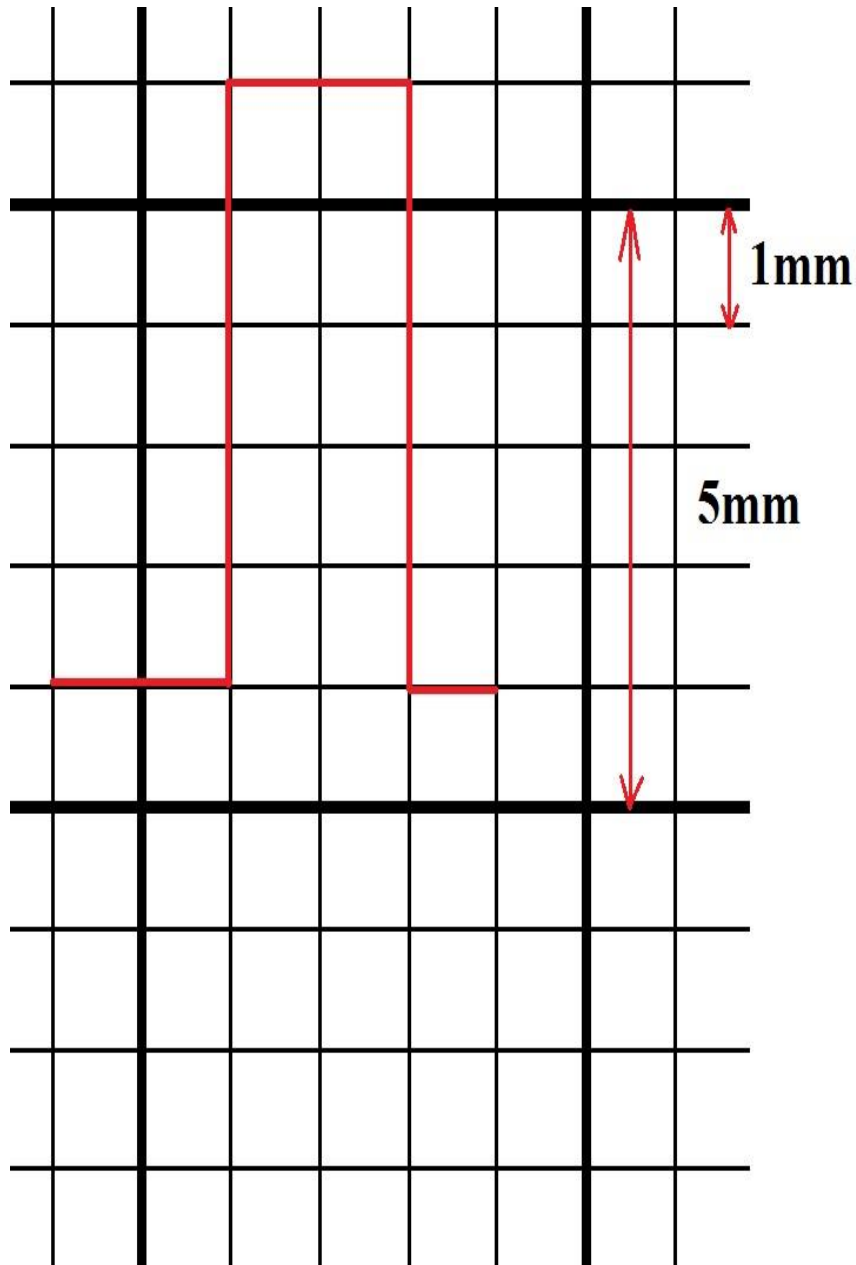
Q₂ - Q₅

PR interval

S



Регистрация ЭКГ



2 скорости

25mm/sec, 50mm/sec;

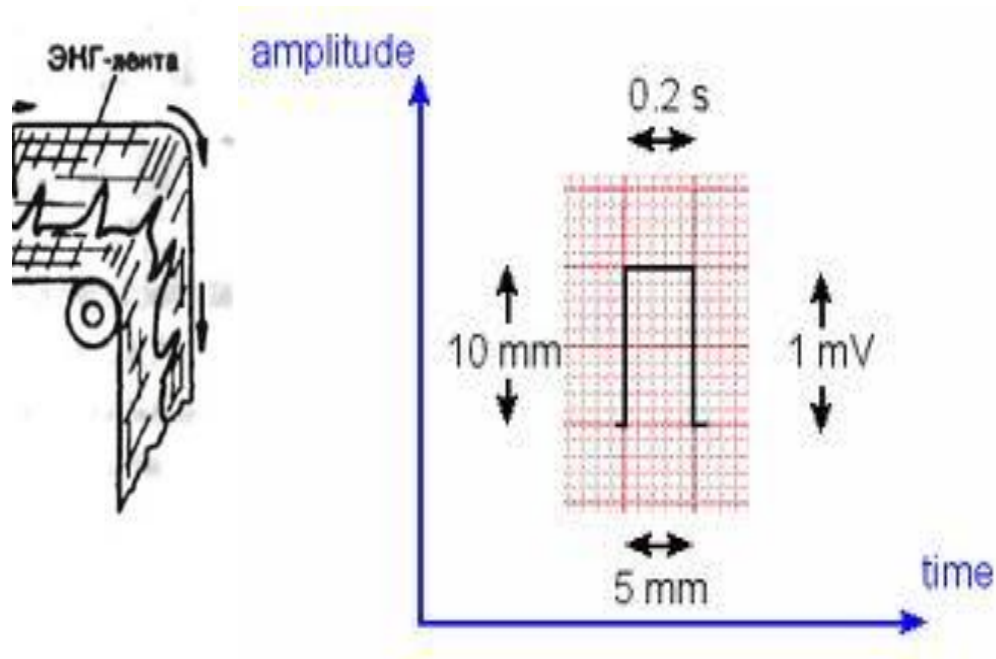
1mV = 10mm;

mm = 0,02sec la

50mm/sec;

mm=0,04sec la

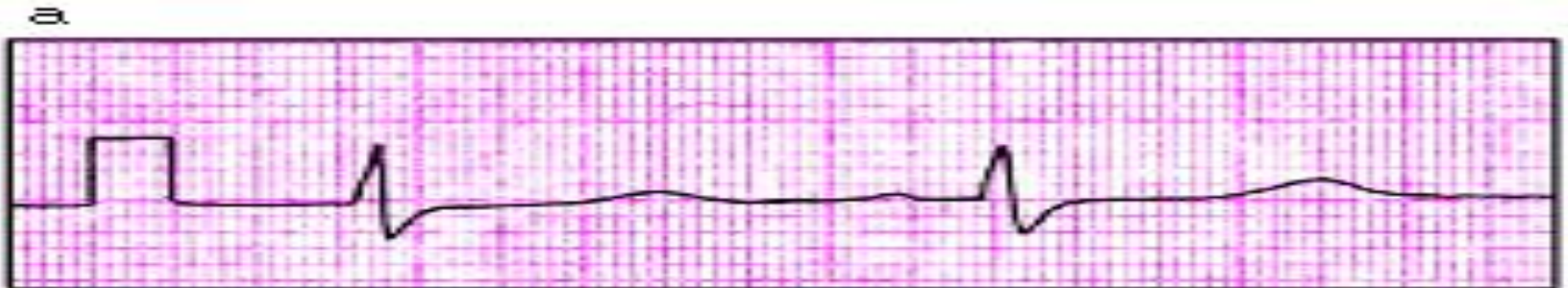
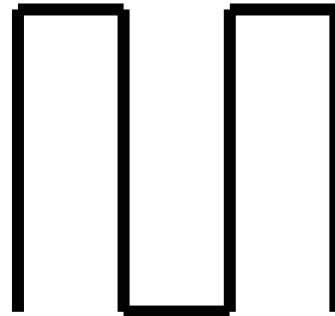
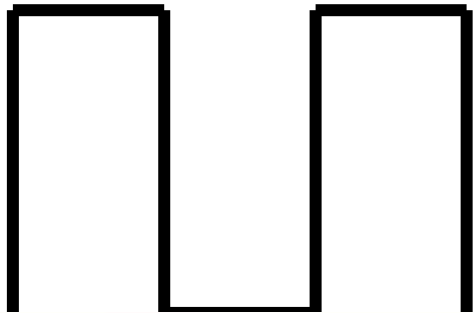
25mm/sec



ВОЛЬТАЖ

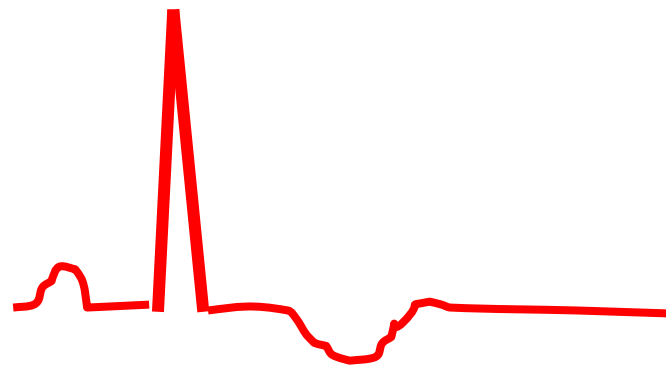
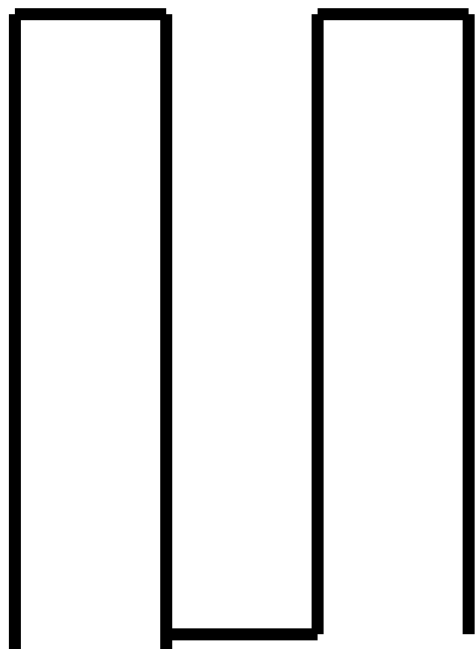
50 mm/sec

25 mm/sec



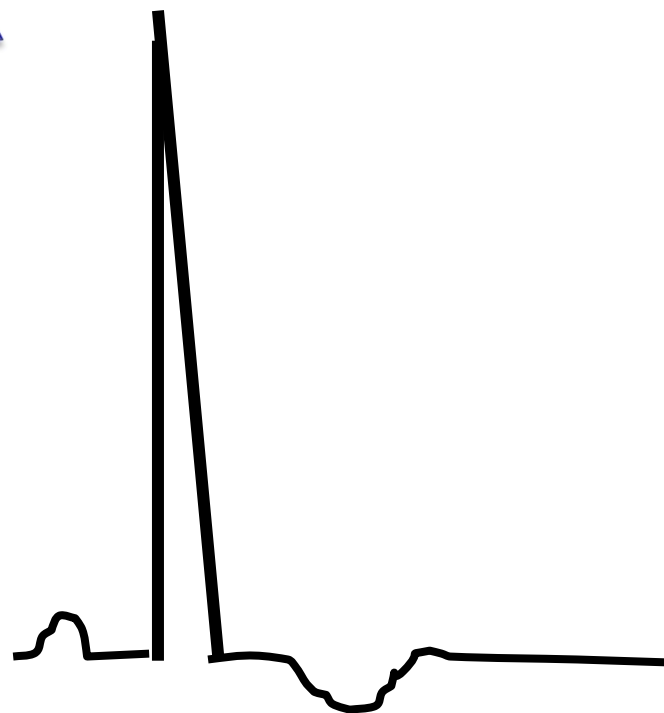
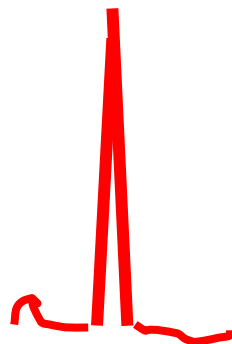
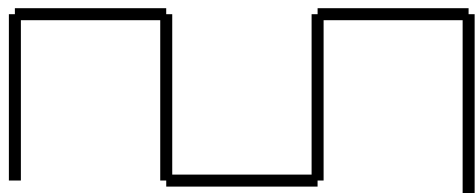
ВОЛЬТАЖ

2/1



ВОЛЬТАЖ

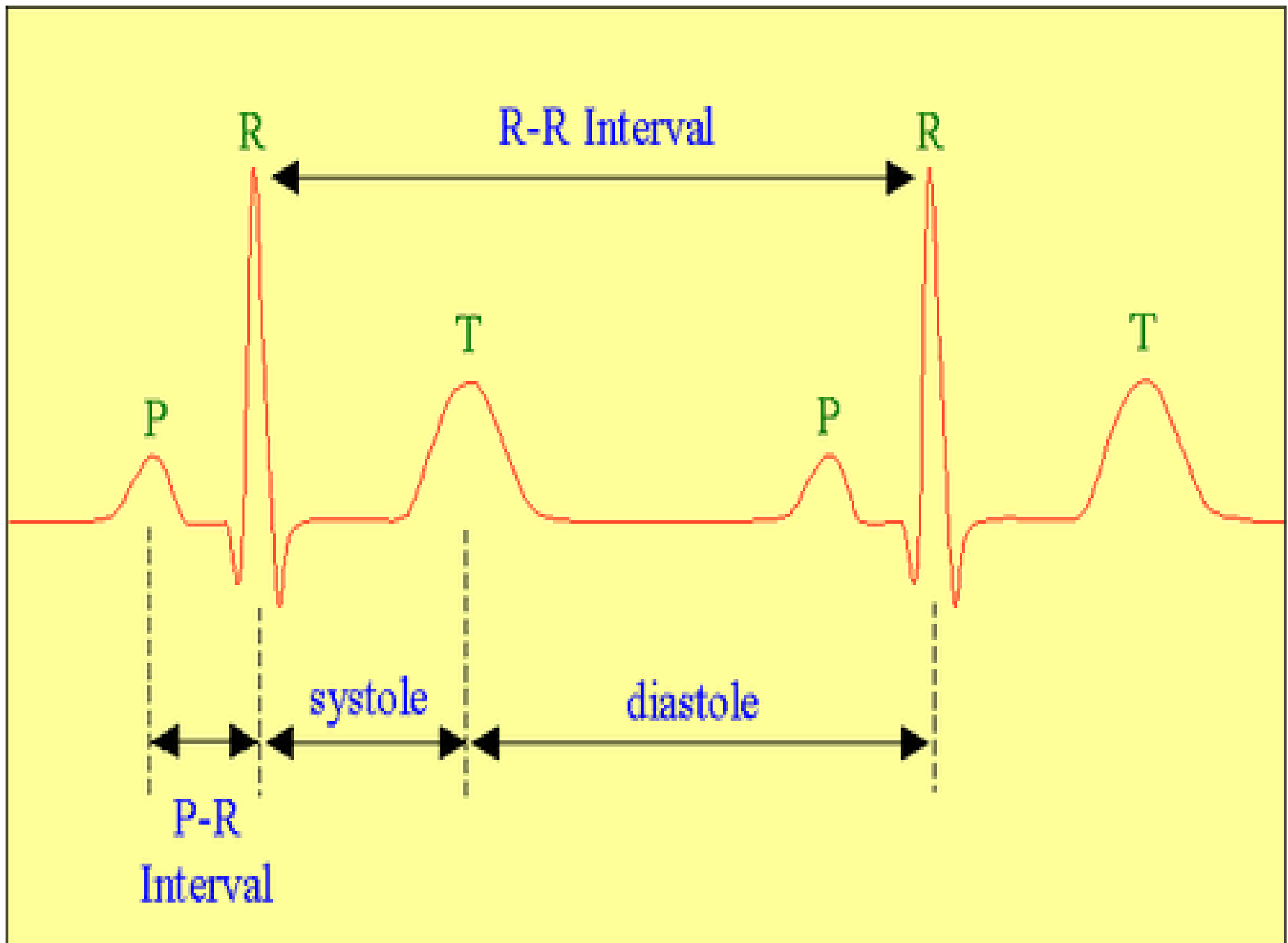
1/2



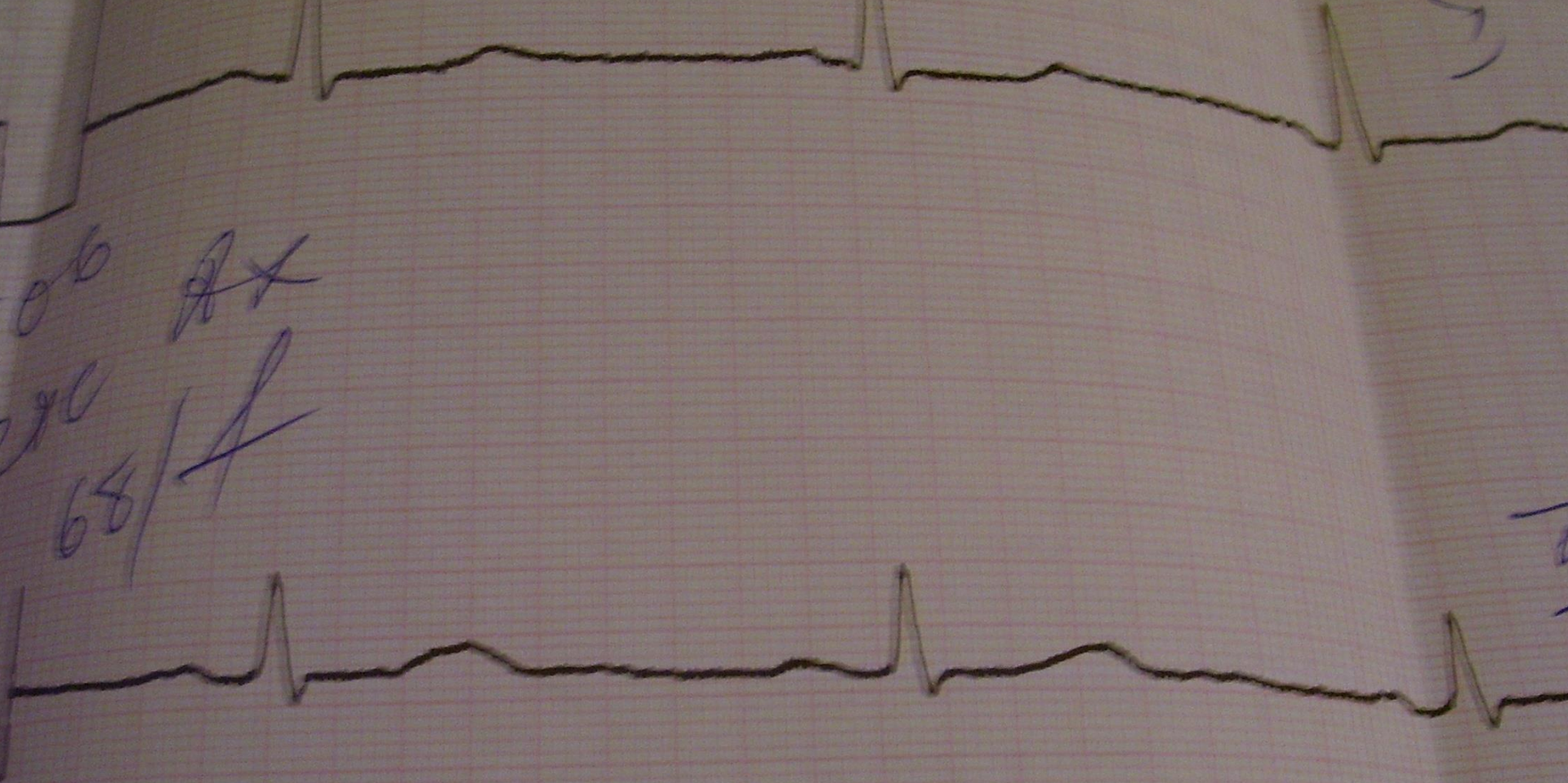
Ритм

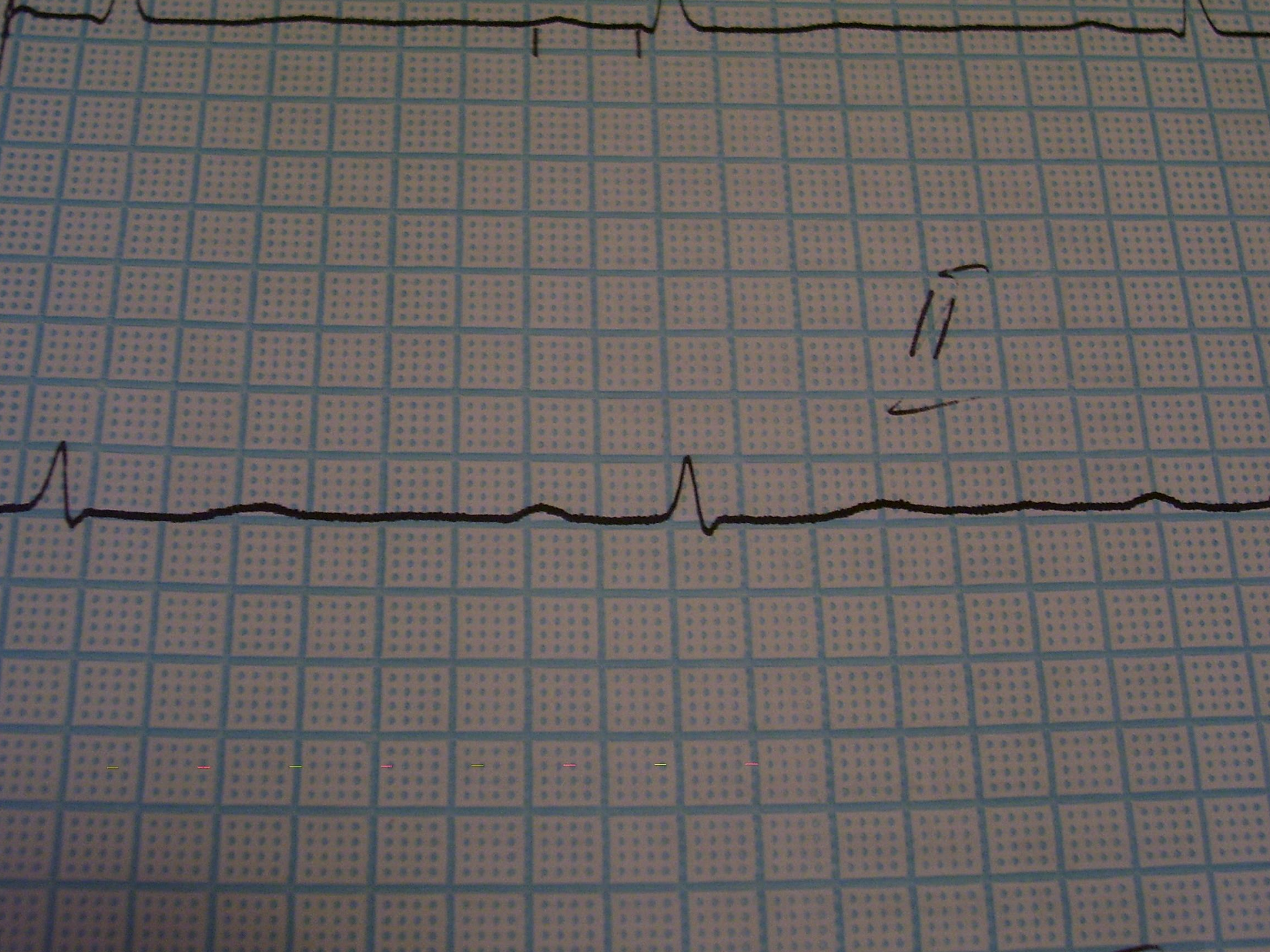
синусовый

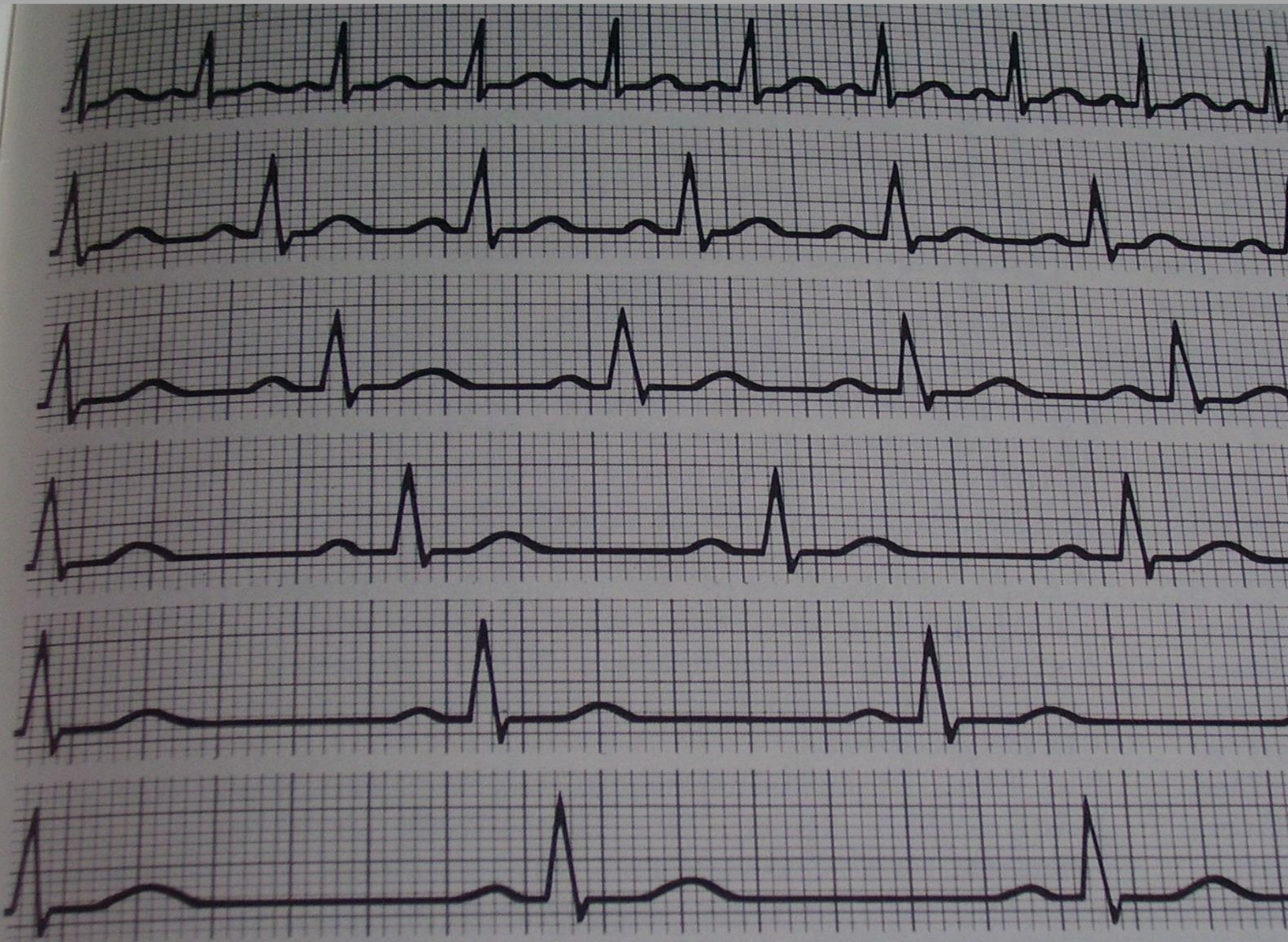
1. Расстояния RR равные
2. Зубец Р положительный во всех отведениях
3. Зубец Р отрицательный в AVR
4. Зубец Р перед каждым интервалом QRS
5. ЧСС в пределах от 50 до 100



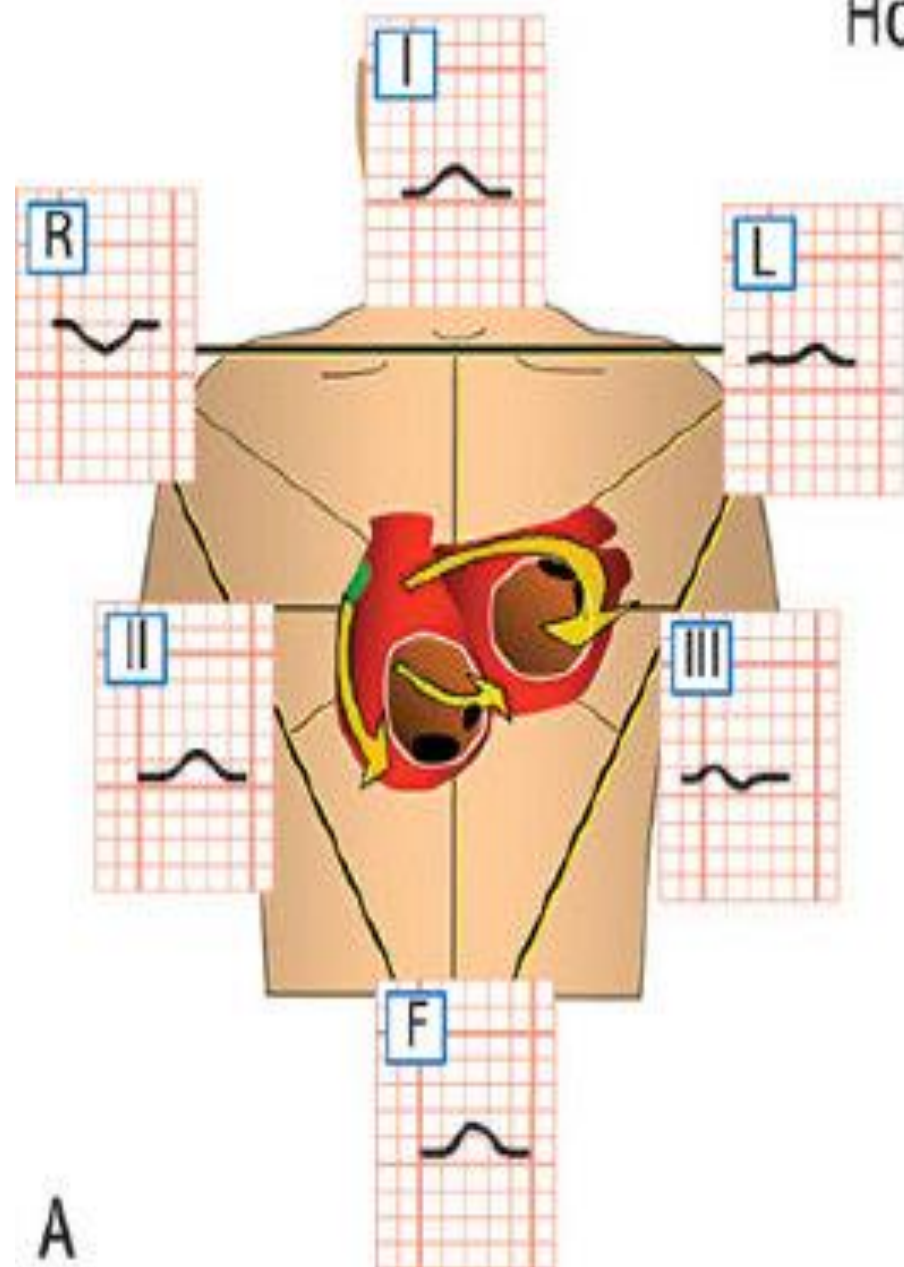
ob Rx
70
68/1



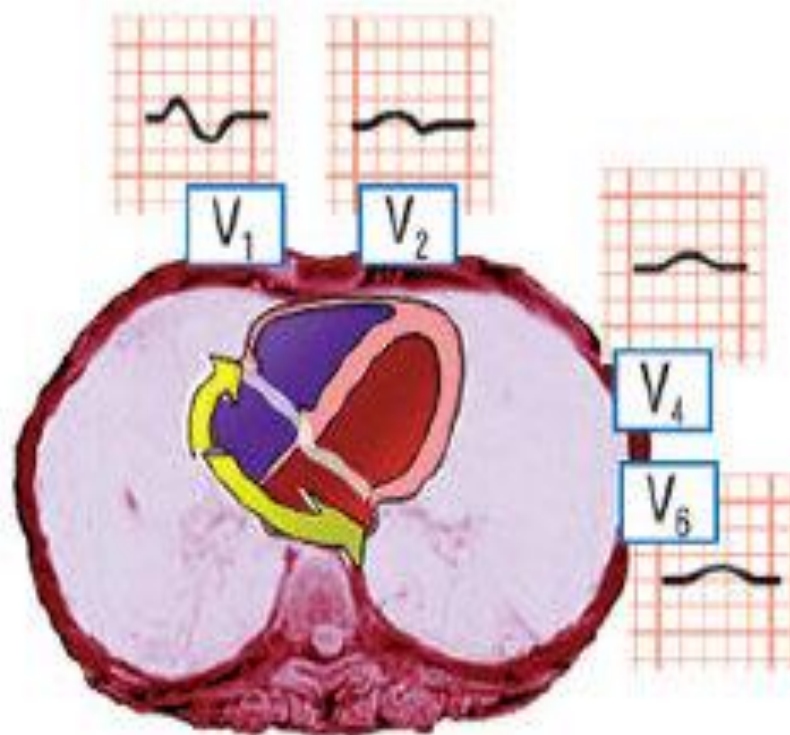




Нормальный зубец Р

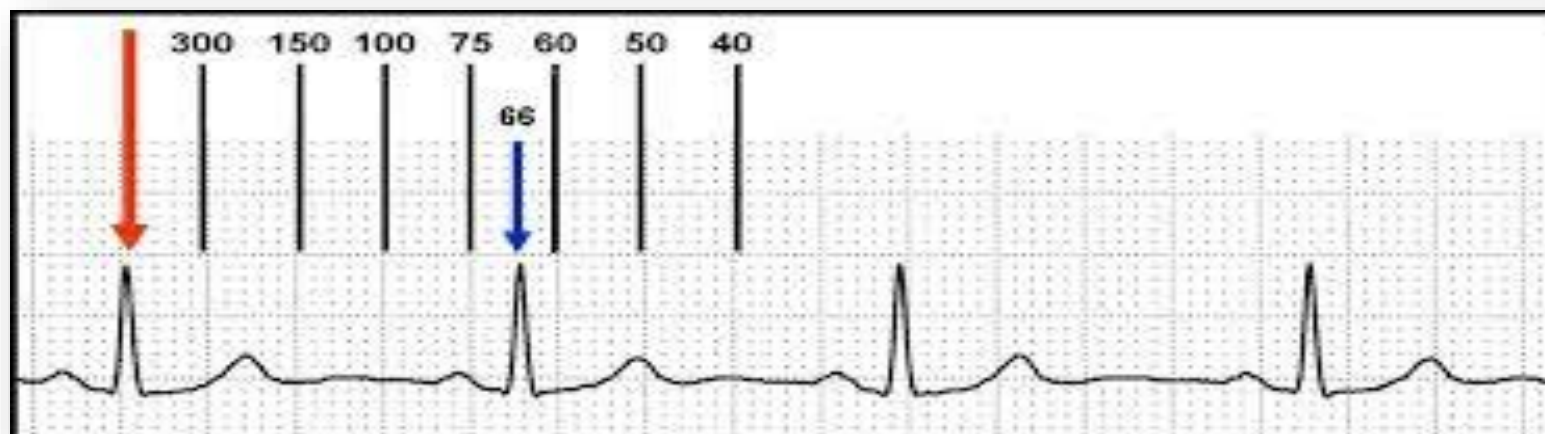


А



Б

Методы подсчета ЧСС

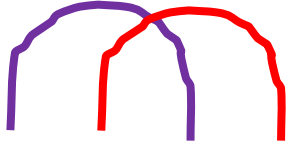


зубец Р

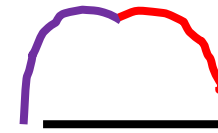
norma

ПП

ЛП



1,5 – 2,5 mm



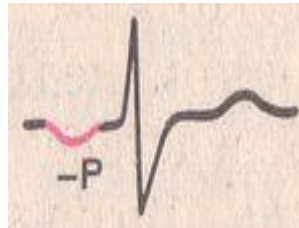
0,1 mm/sec



Отведения I, II, III, AVL, AVF, V3-V6

зубец Р положительный

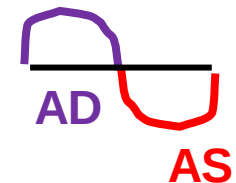
Отведения AVR



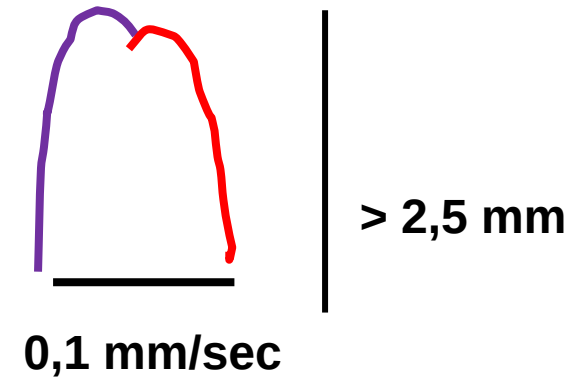
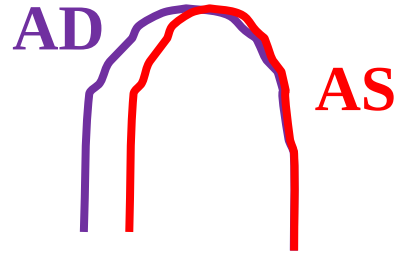
зубец Р отрицательный

Отведения V1, V2

зубец Р ±

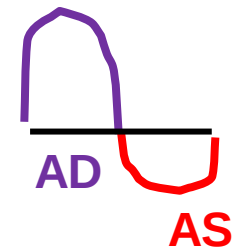


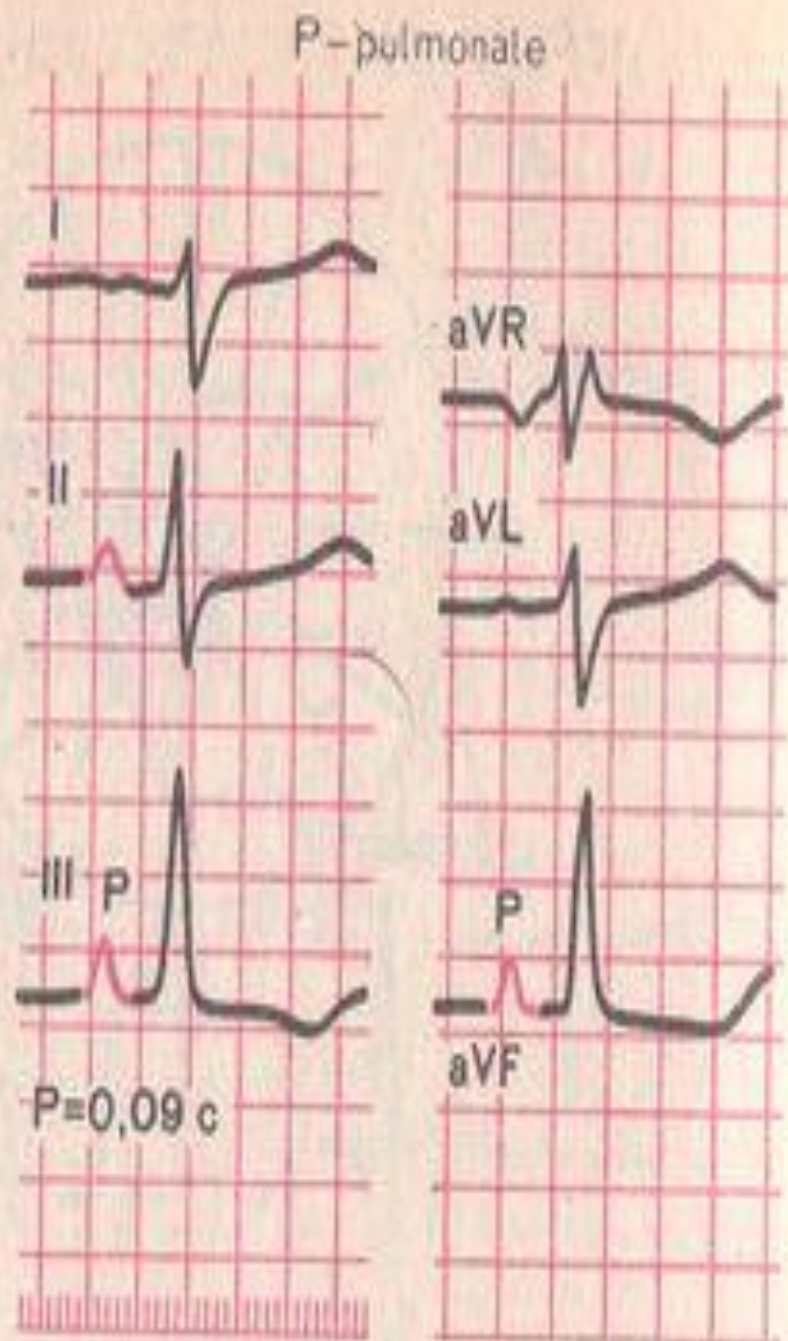
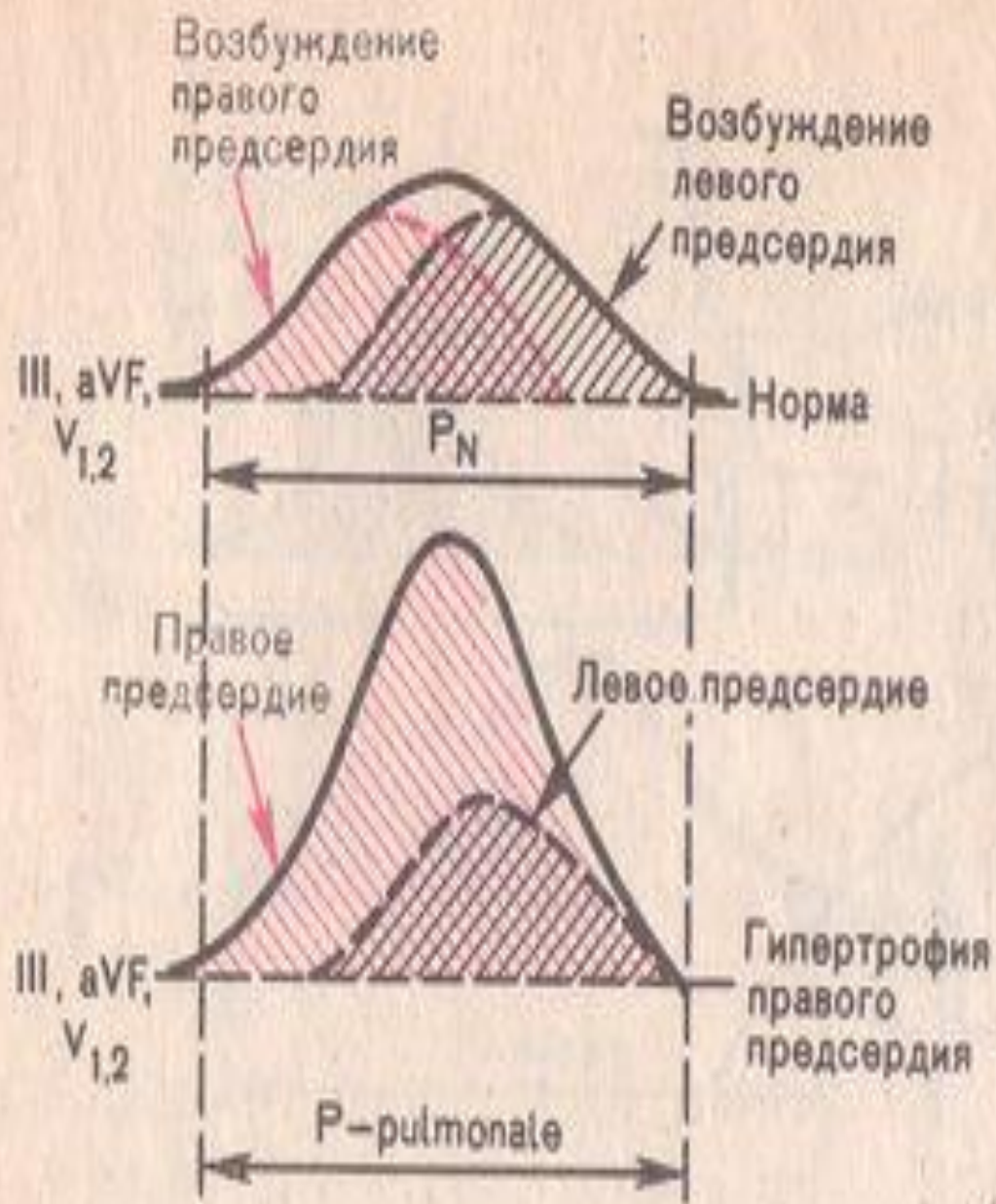
Зубец Р гипертрофия ПП



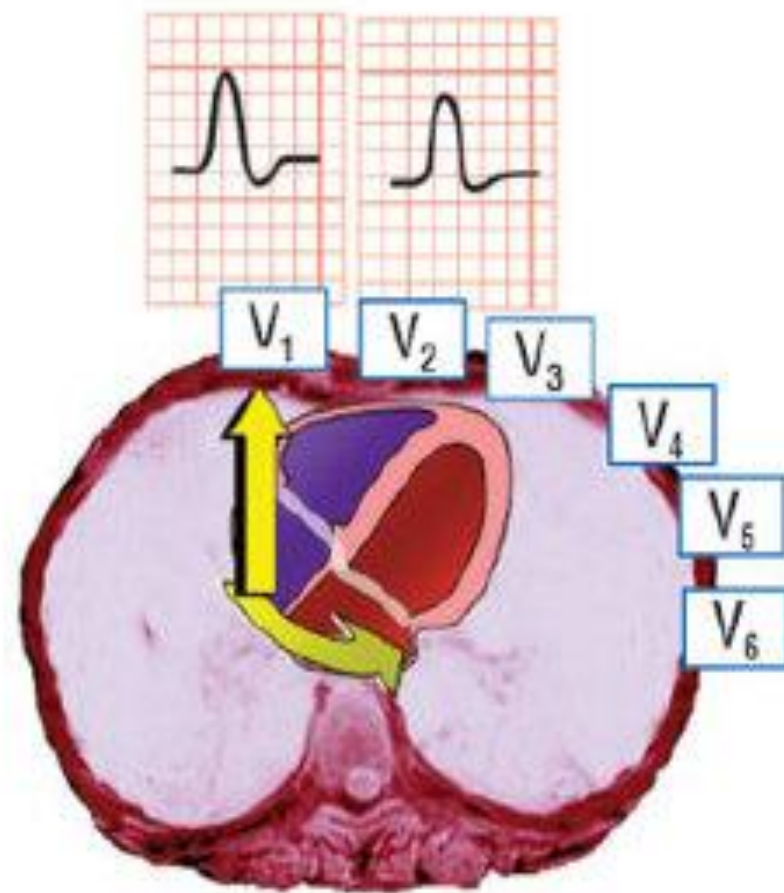
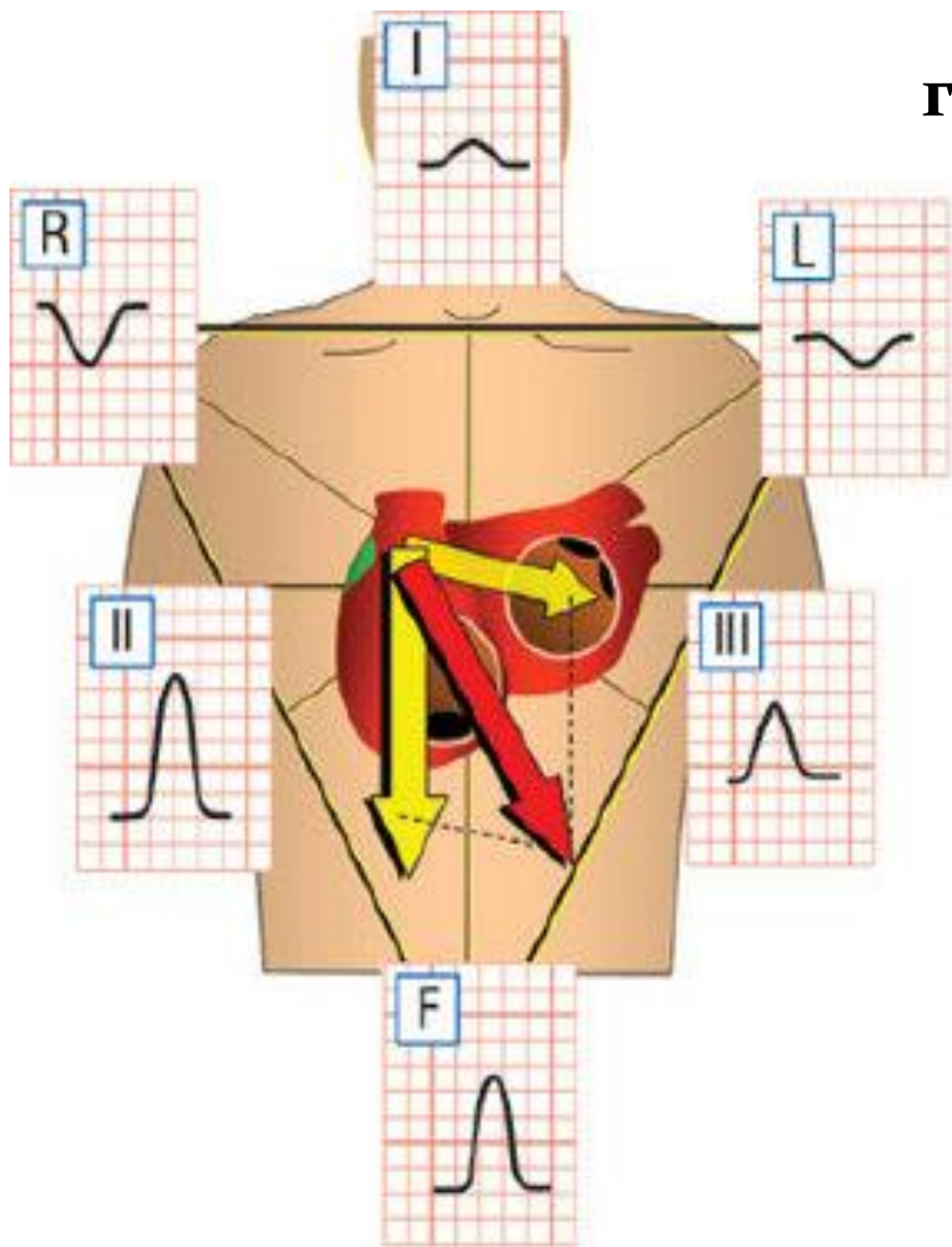
Отведения V₁, V₂

зубец Р ±

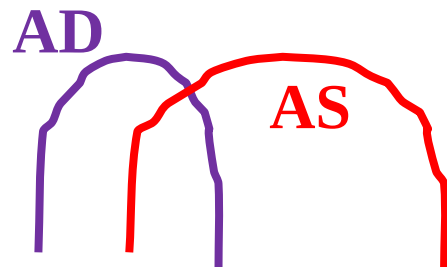




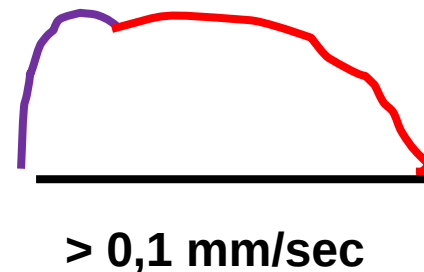
гипертрофия ПП Р pulmonale



зубец Р

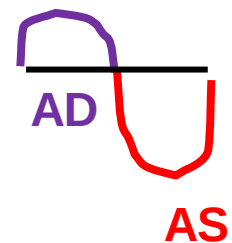


гипертрофия ЛП

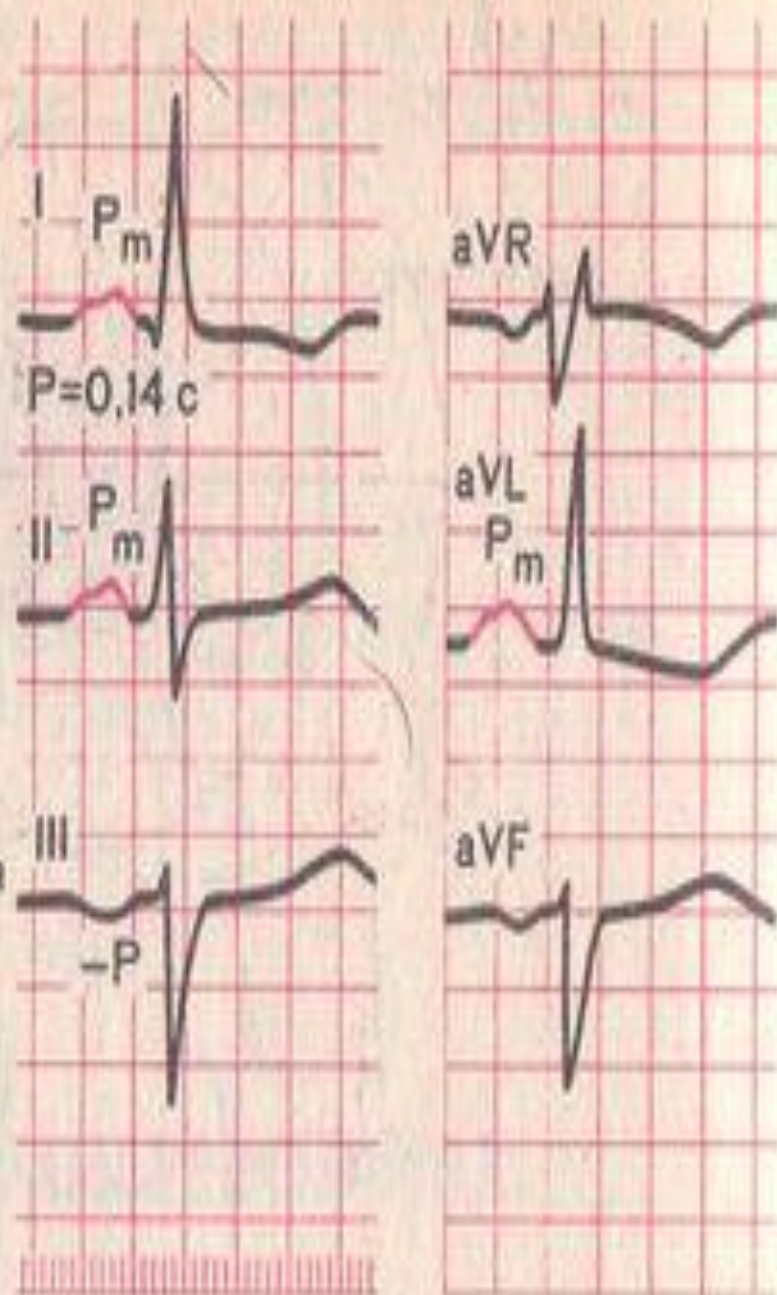
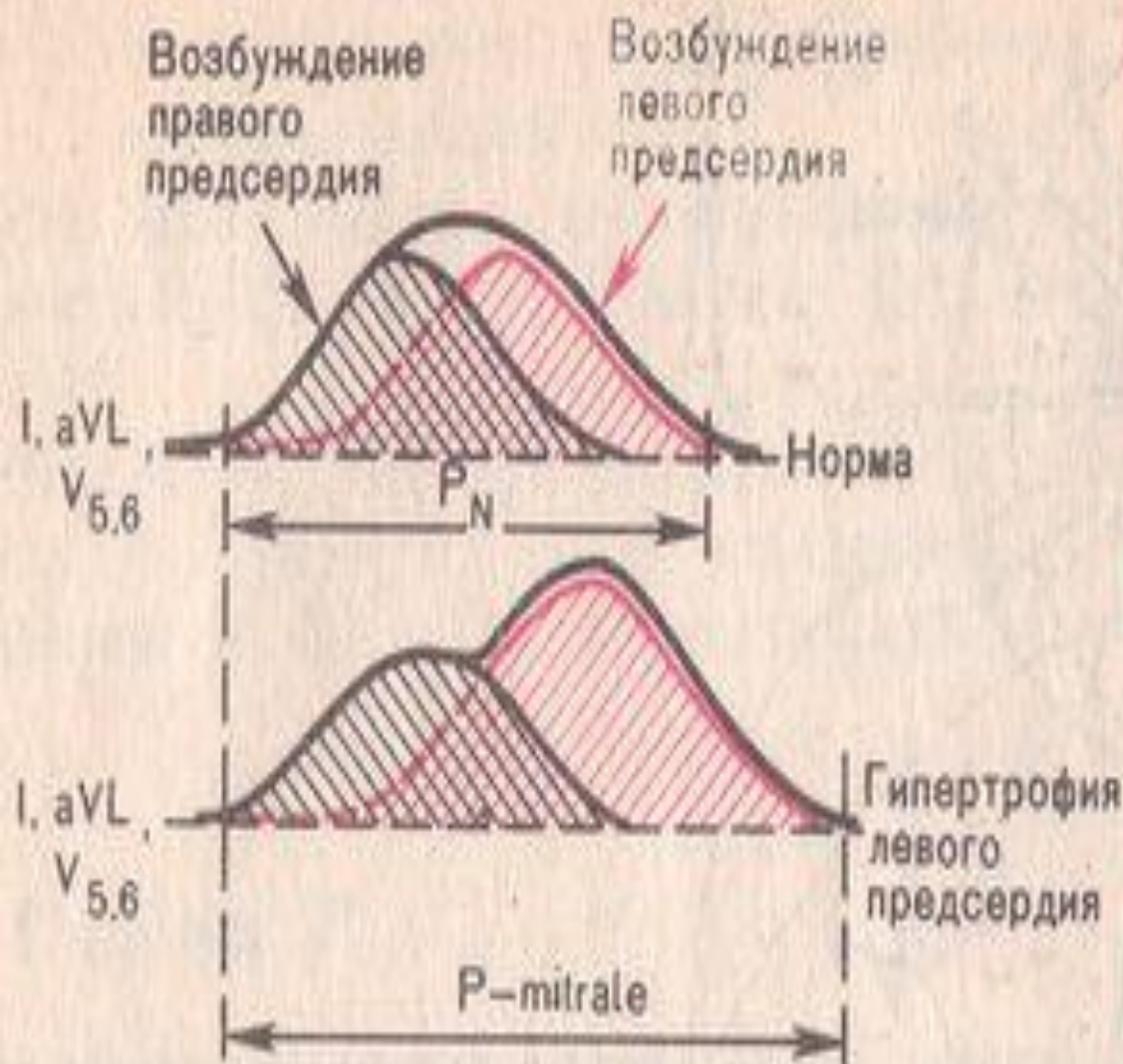


Отведения V₁, V₂

зубец Р ±

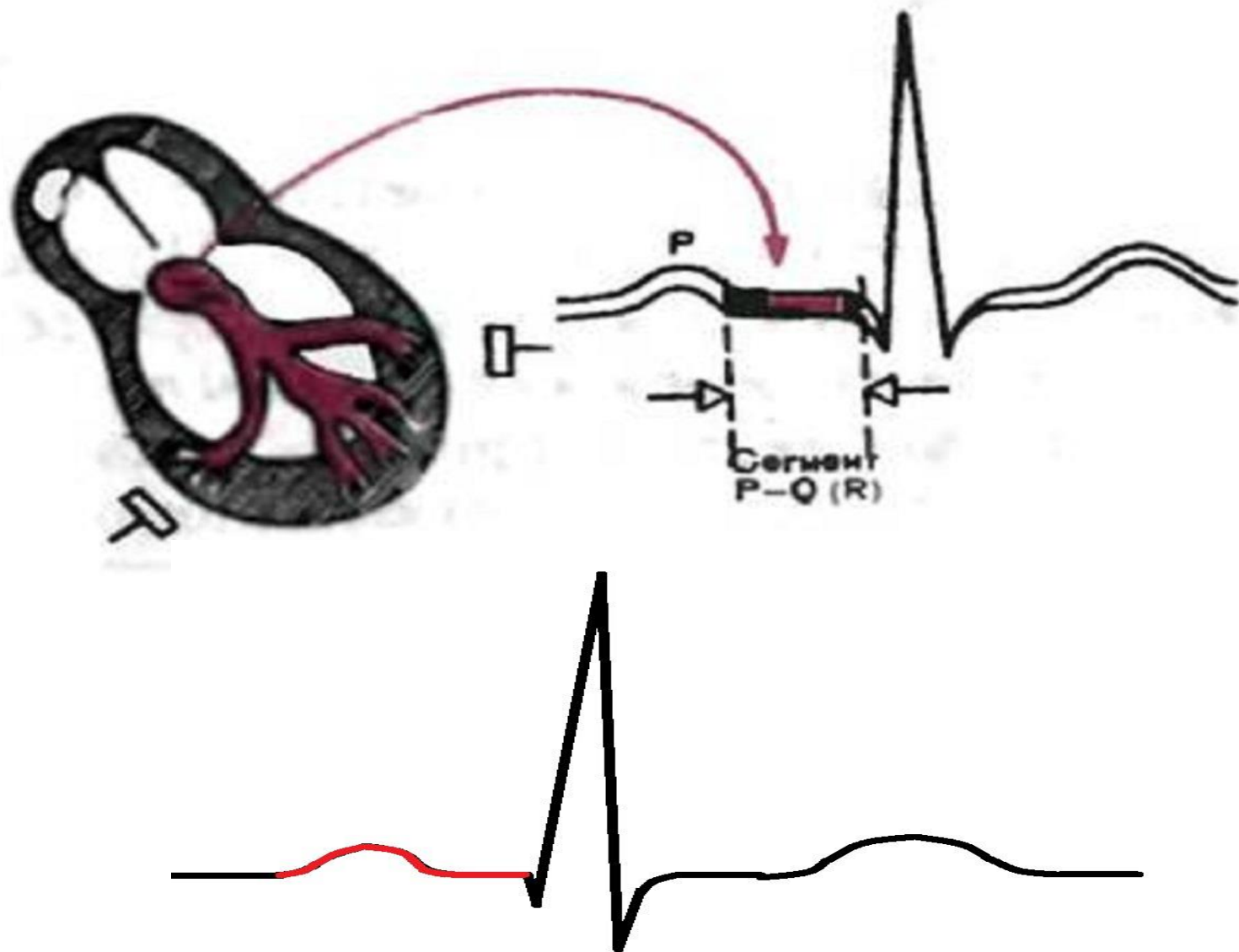


P-mitrale

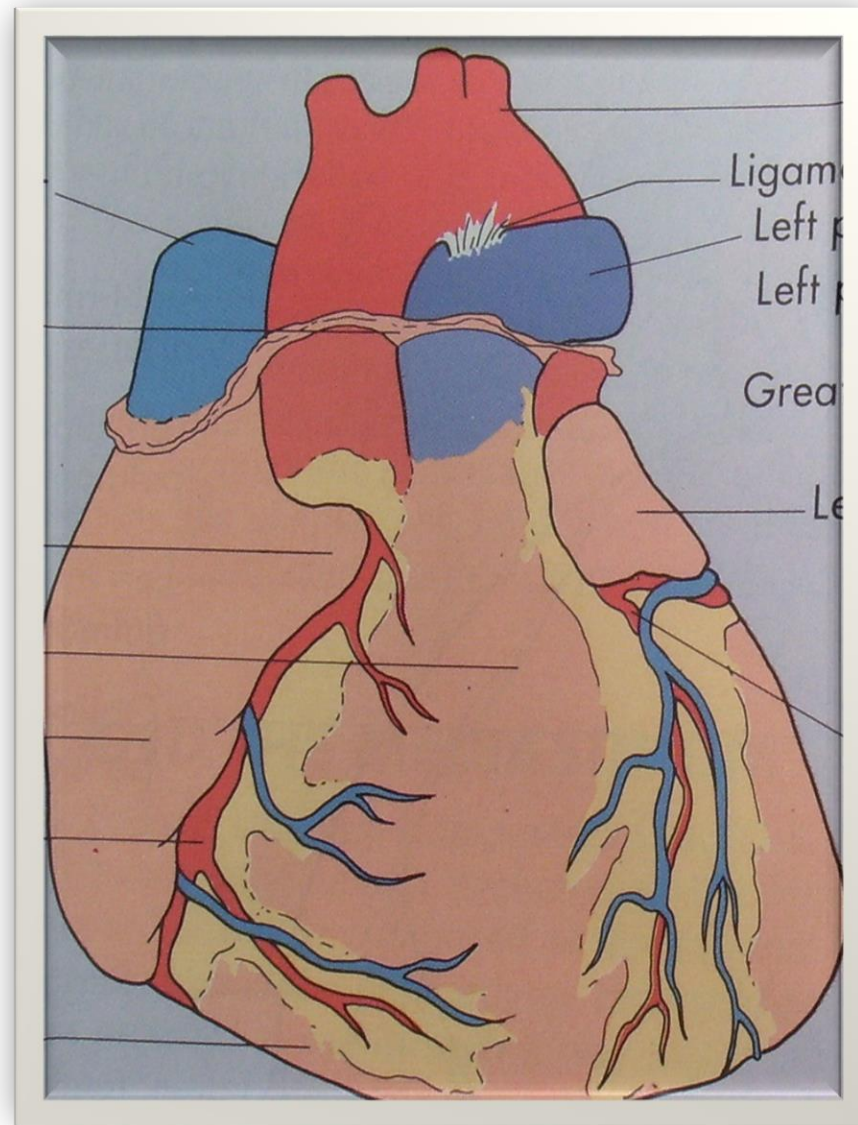
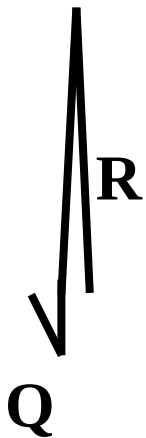


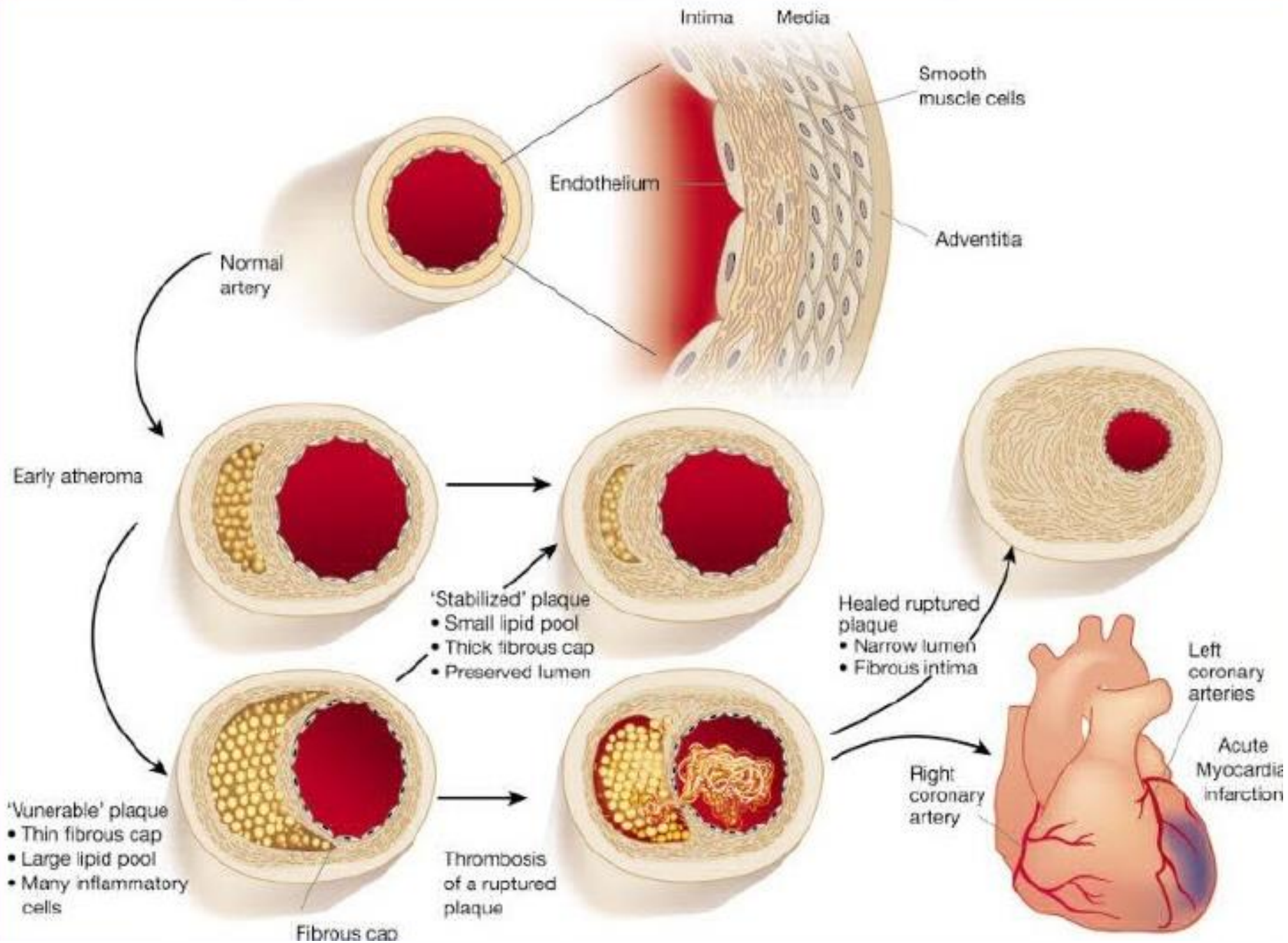
Деполаризация АВ узла

P-Q (R)



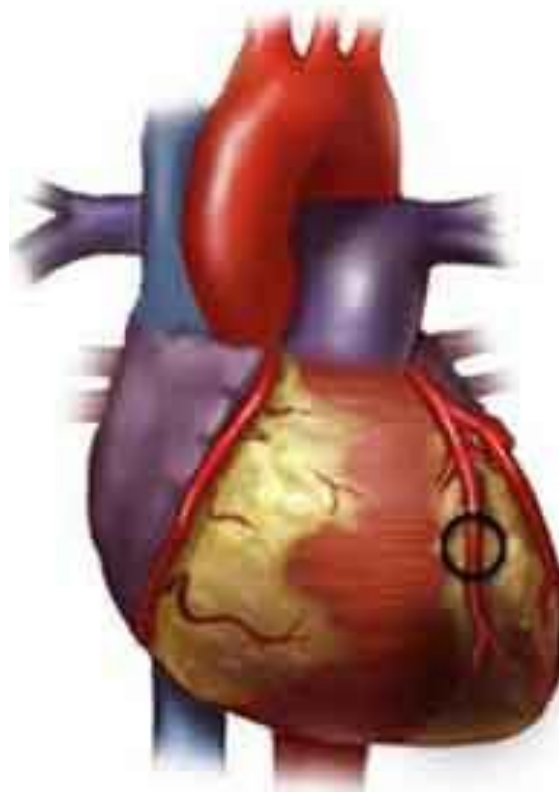
зубец Q в норме





патологический зубец Q

Q R



Normal coronary artery



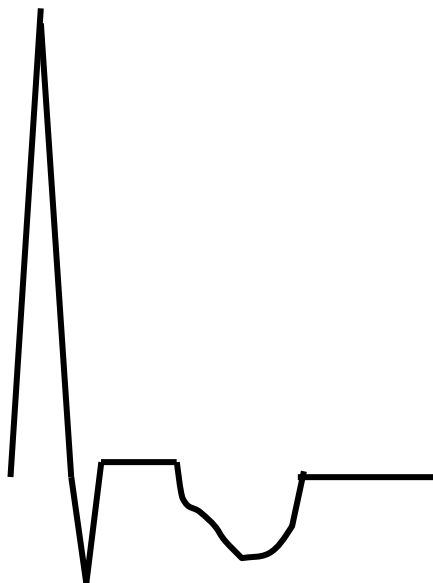
Atherosclerosis



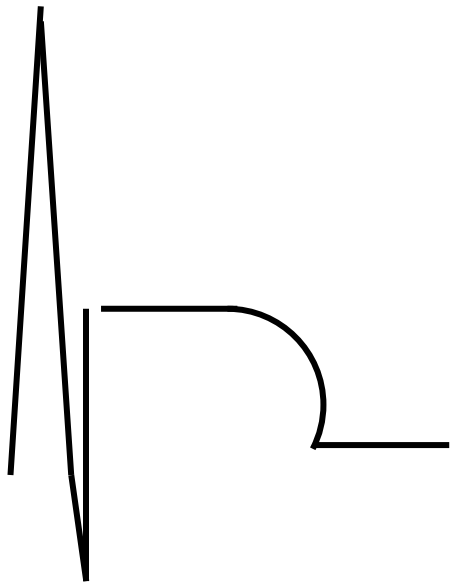
Atherosclerosis with blood clot



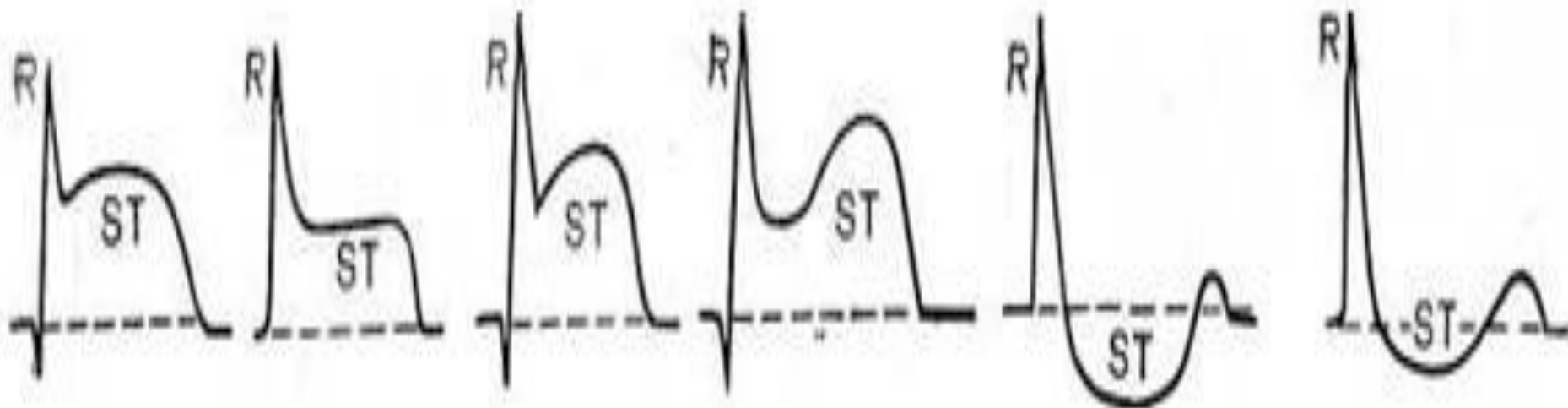
Отрицательная волна Т - ишемия



Элевация ST – повреждение



Варианты смещения сегмента **ST** при повреждении



Депрессия ST-сегмента



Ишемия (субэндокардиальная ишемия)



Корытообразный сегмент ST (при дигиталисной интоксикации)

Подъем ST-сегмента



Острый инфаркт миокарда (трансмуральная ишемия)



Перикардит

"Коронарная" T-волна

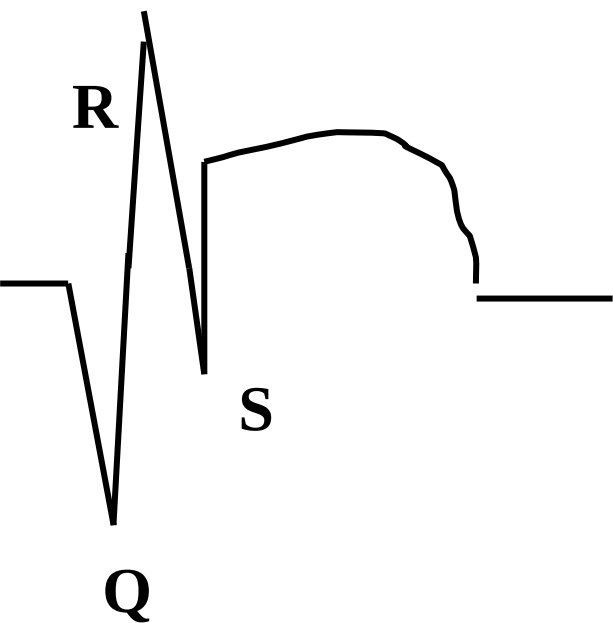


Субэндокардиальный инфаркт

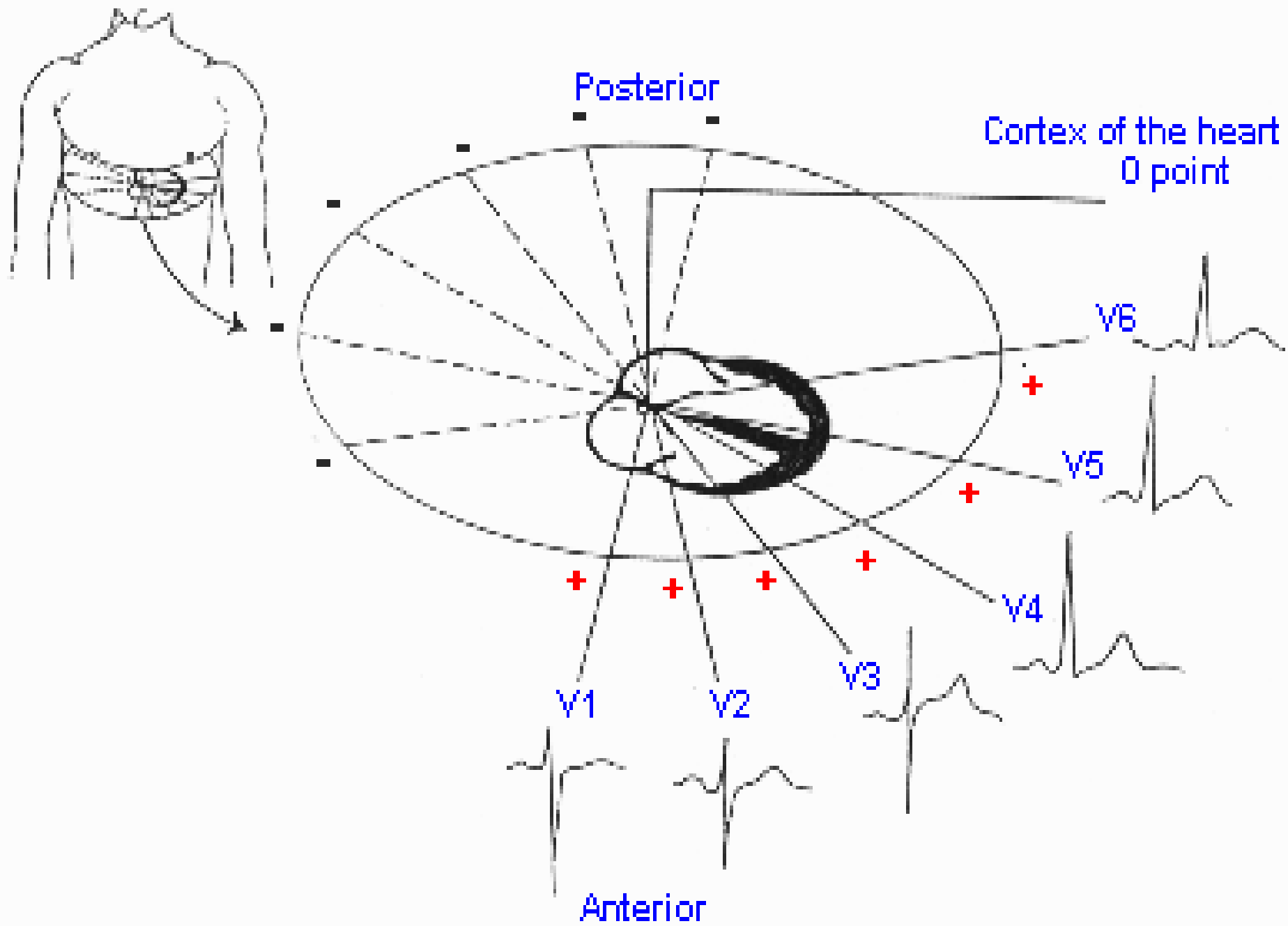


Гиперкалиемия

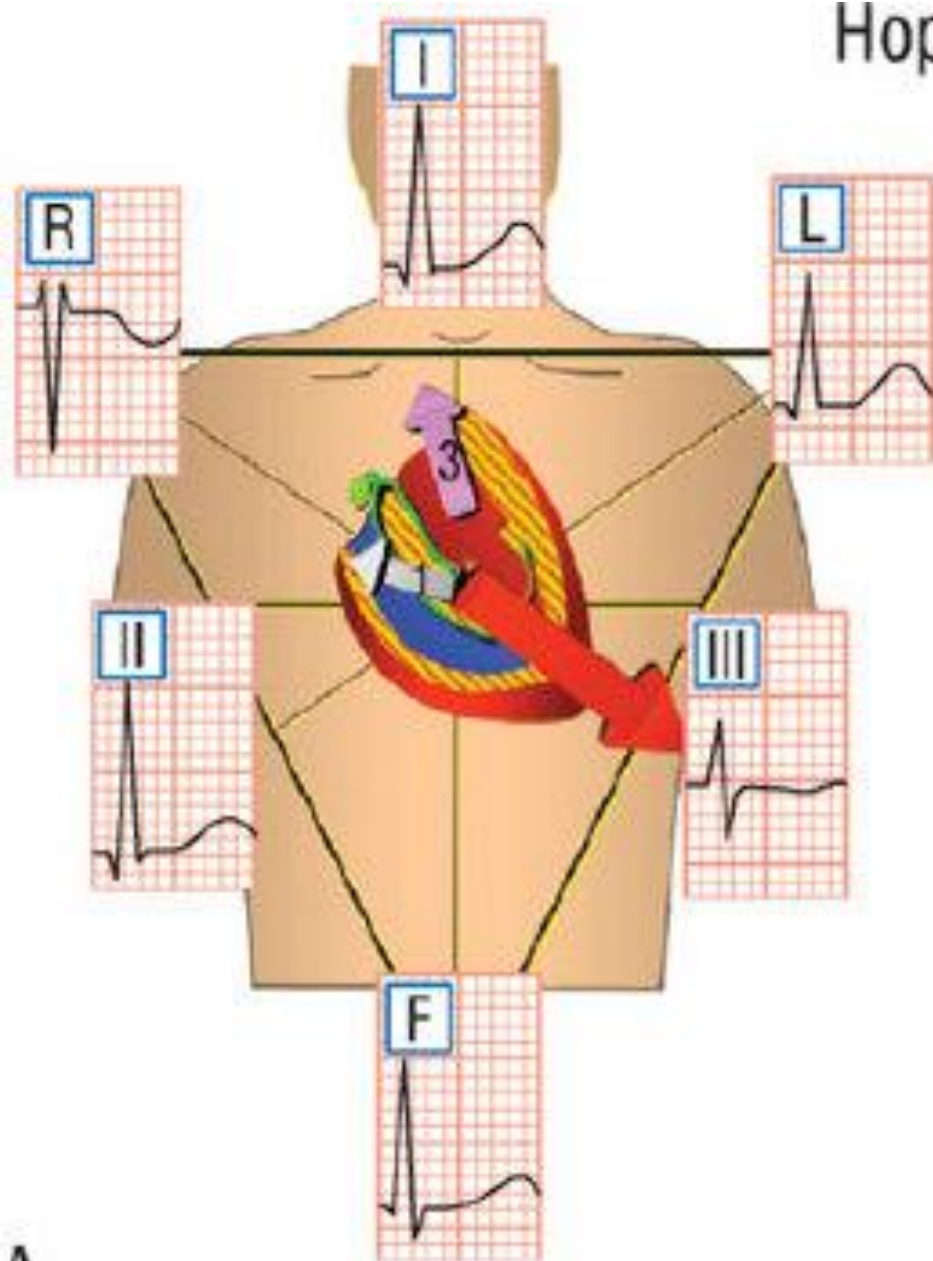
патологический зубец Q – некроз



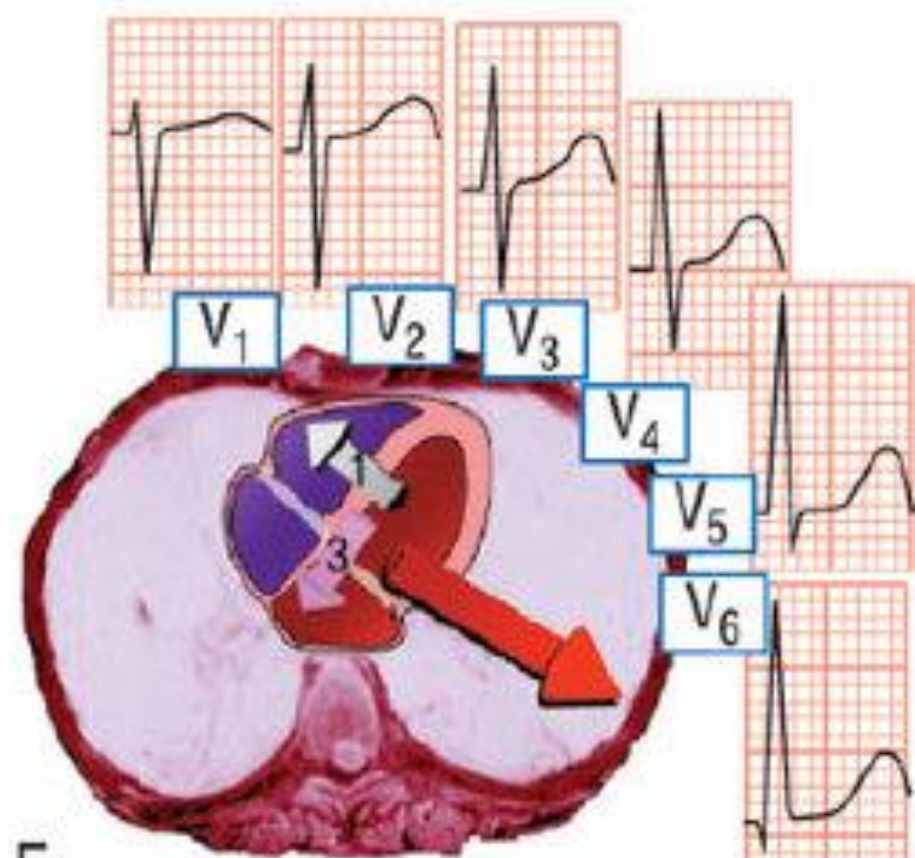
Horizontal Plane



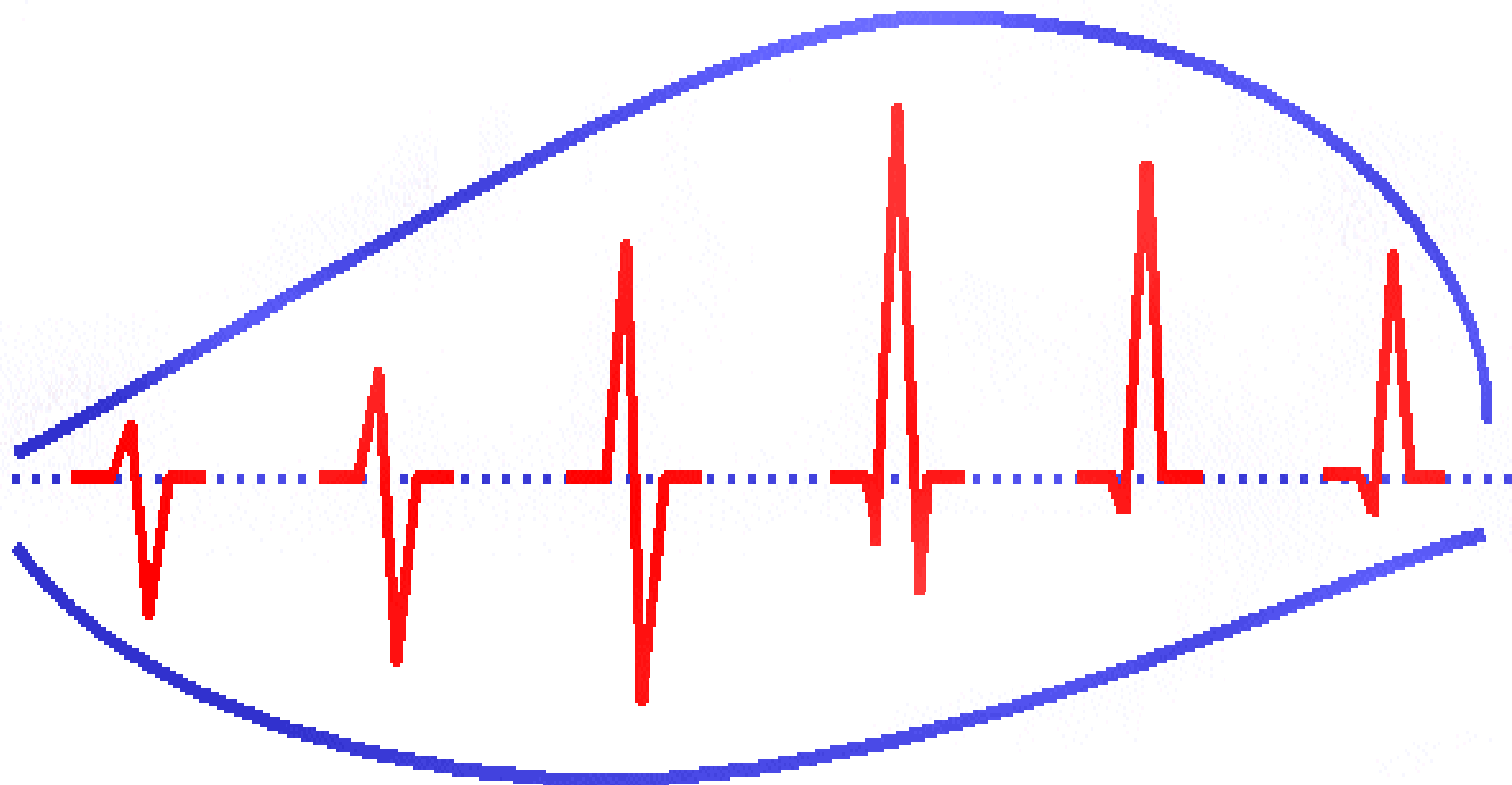
Нормальный комплекс *QRS*



A



Б



V1

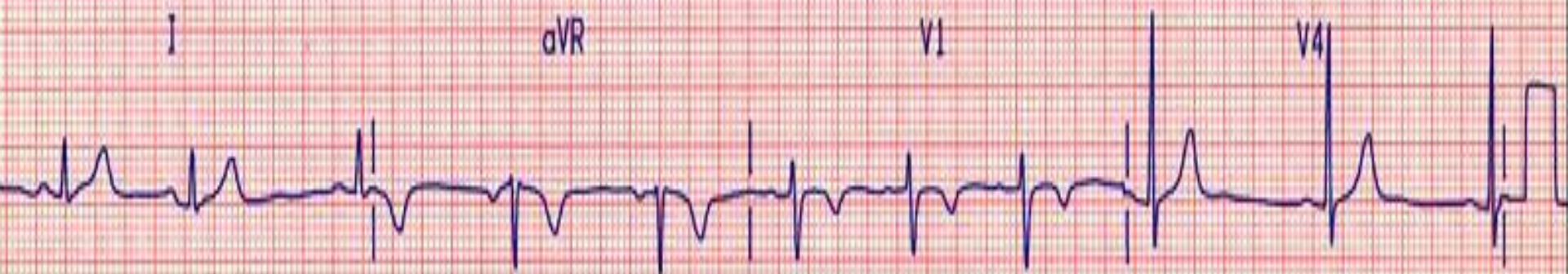
V2

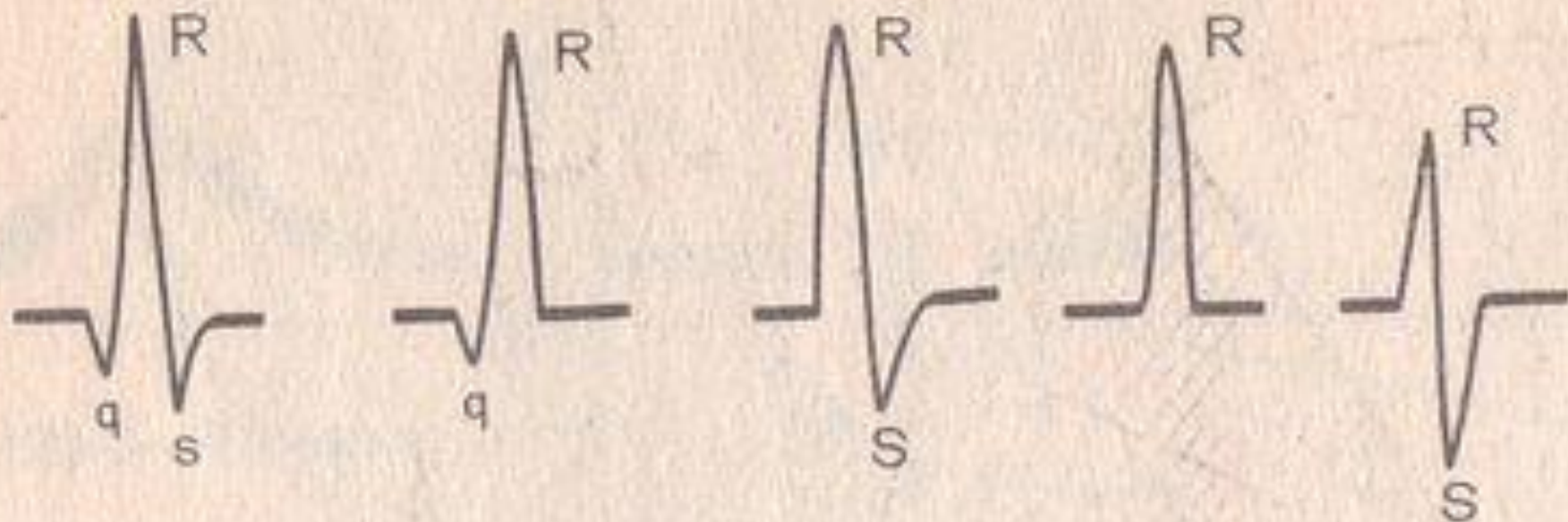
V3

V4

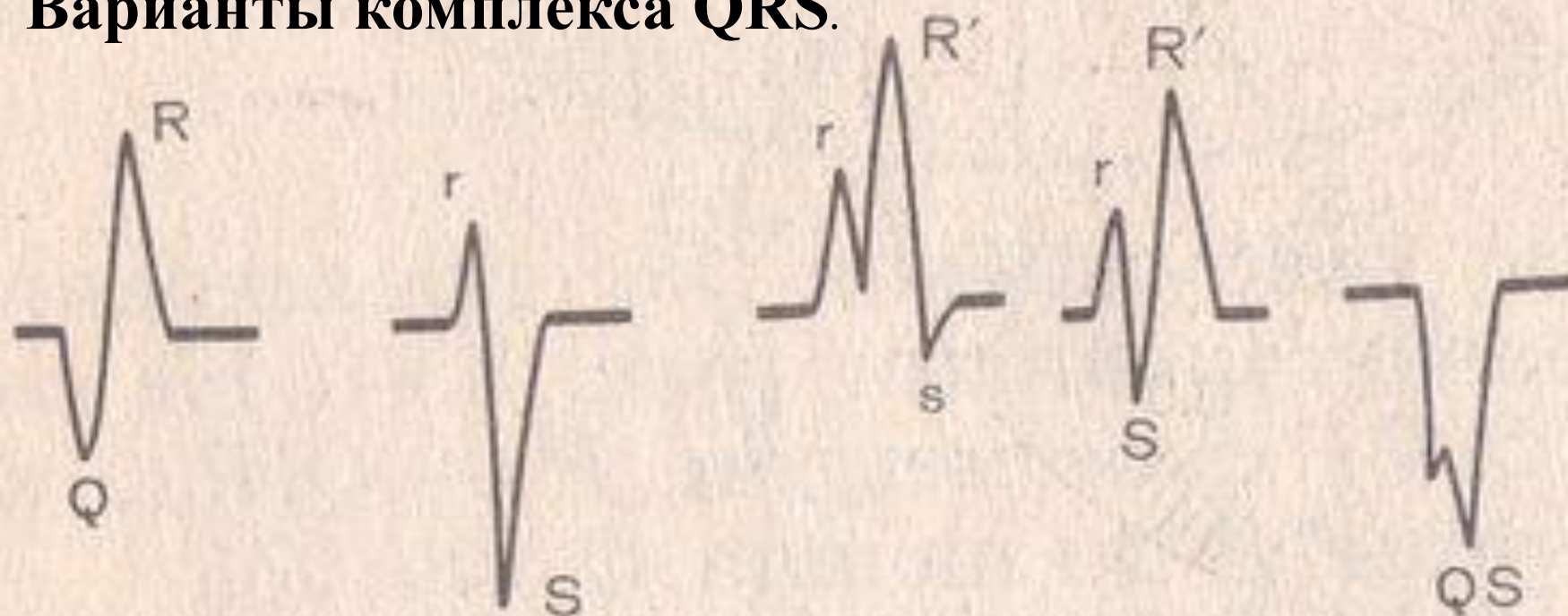
V5

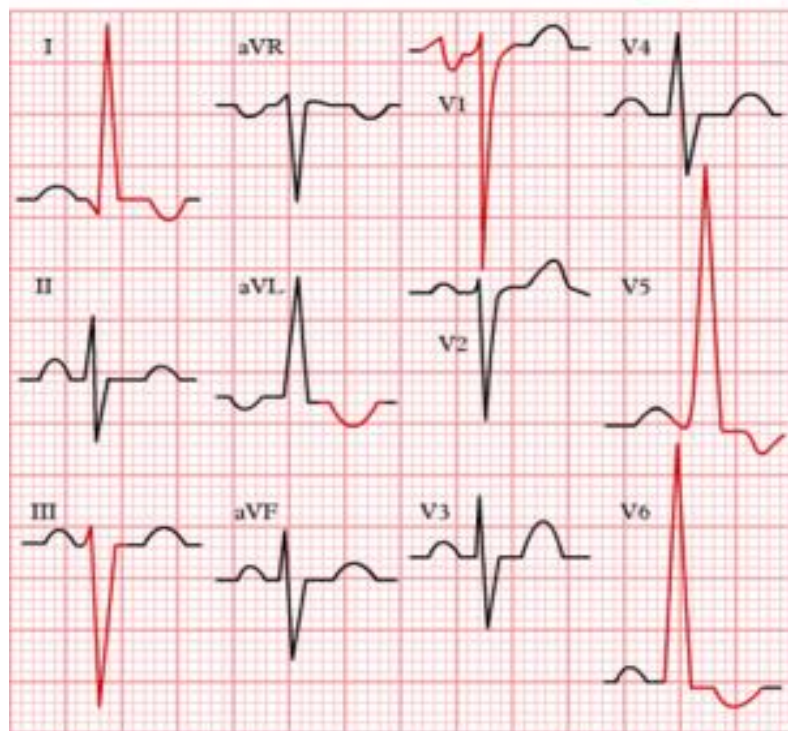
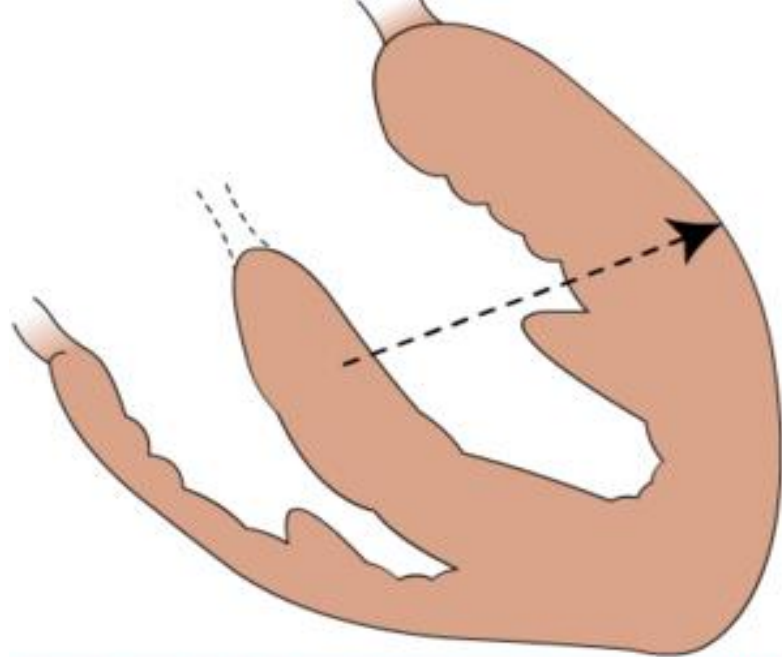
V6



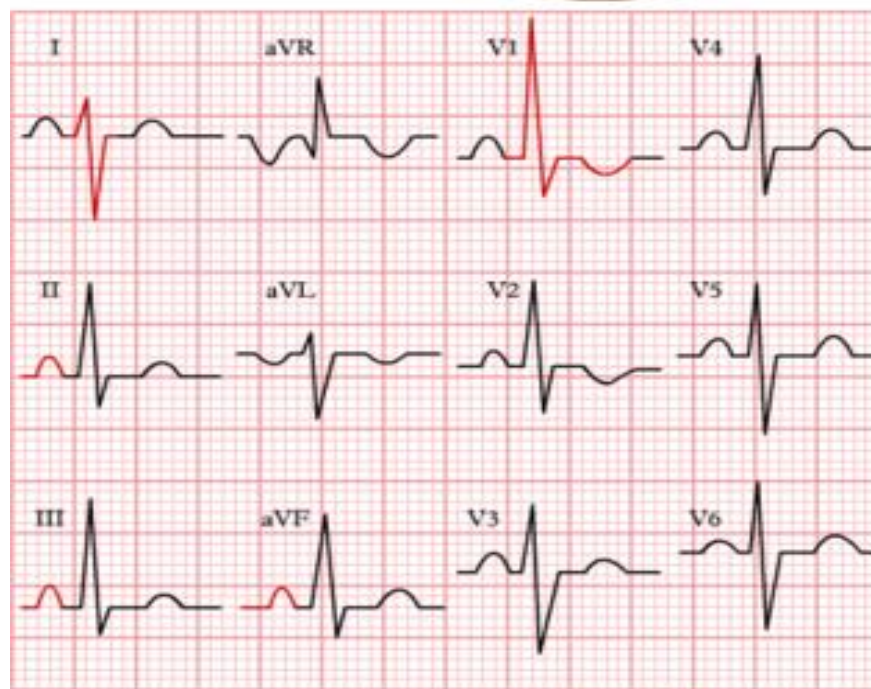
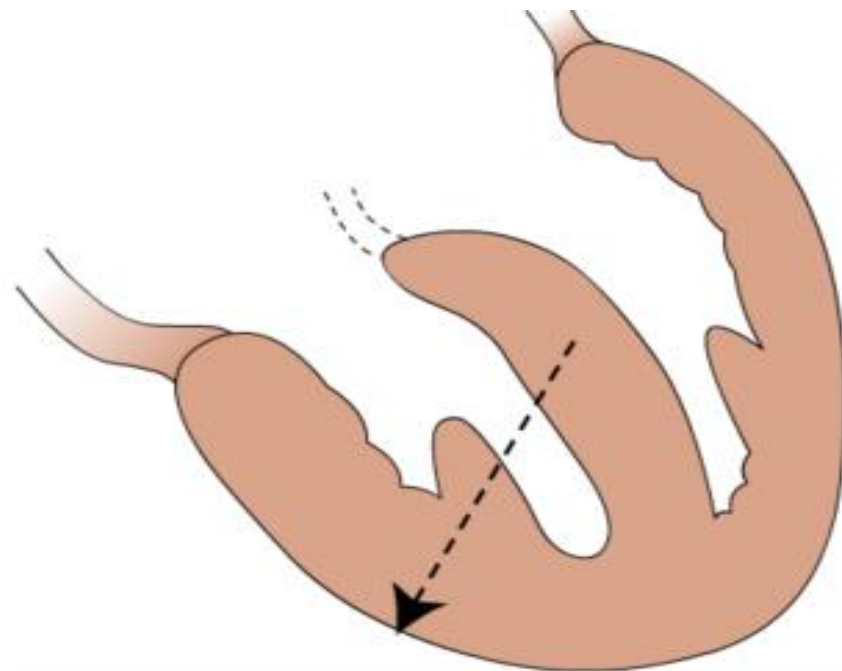


Варианты комплекса QRS.



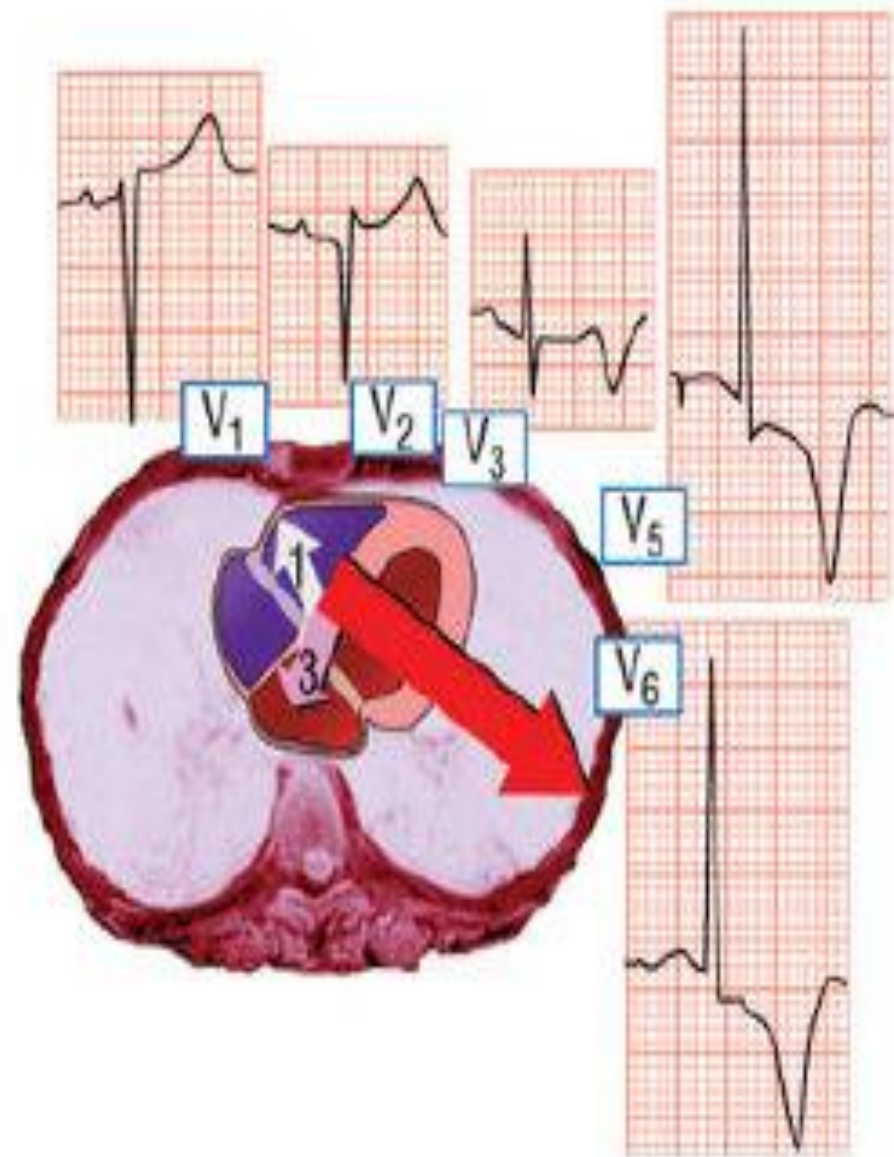
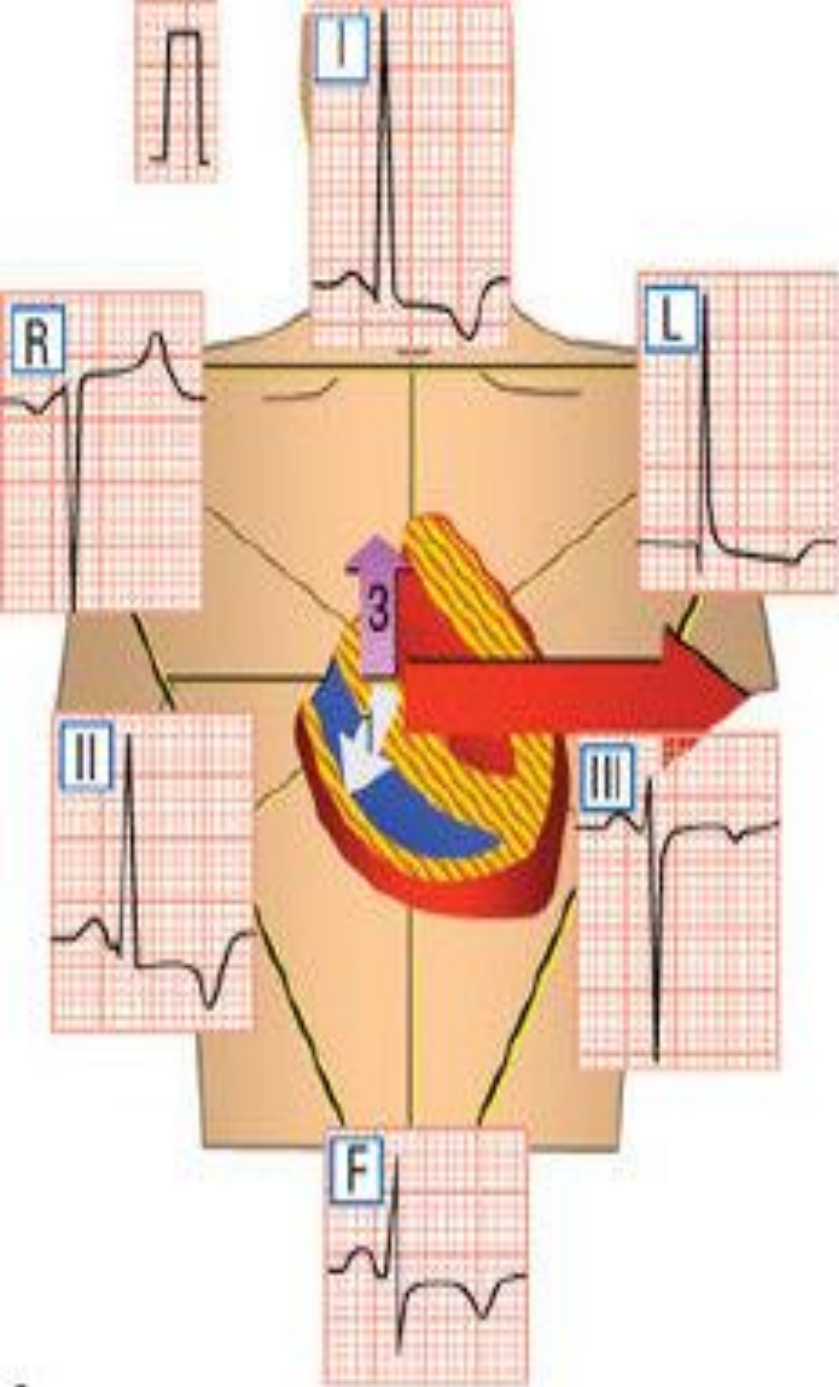


left ventricle hypertrophy



right ventricle hypertrophy

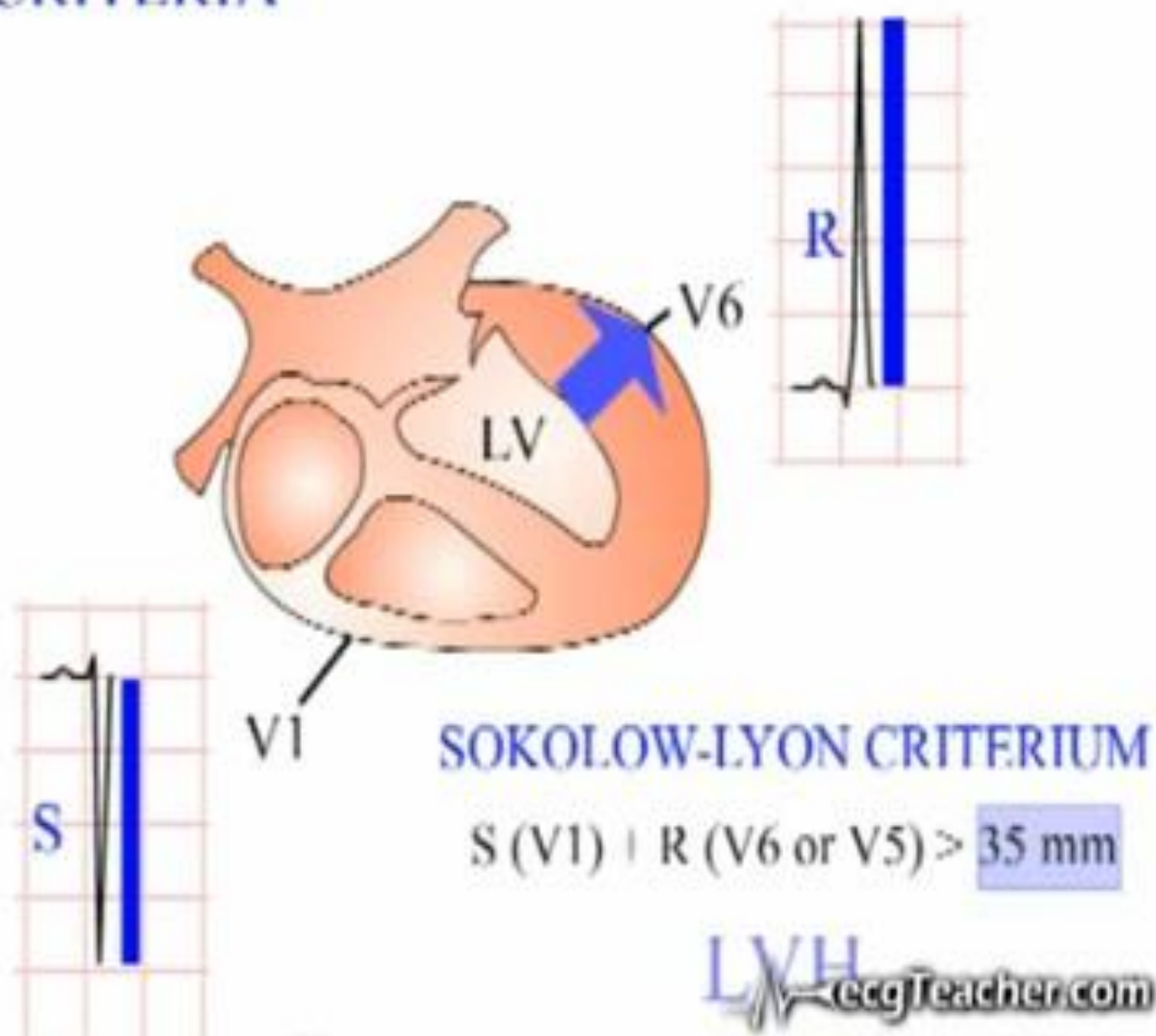
Гипертрофия ЛЖ

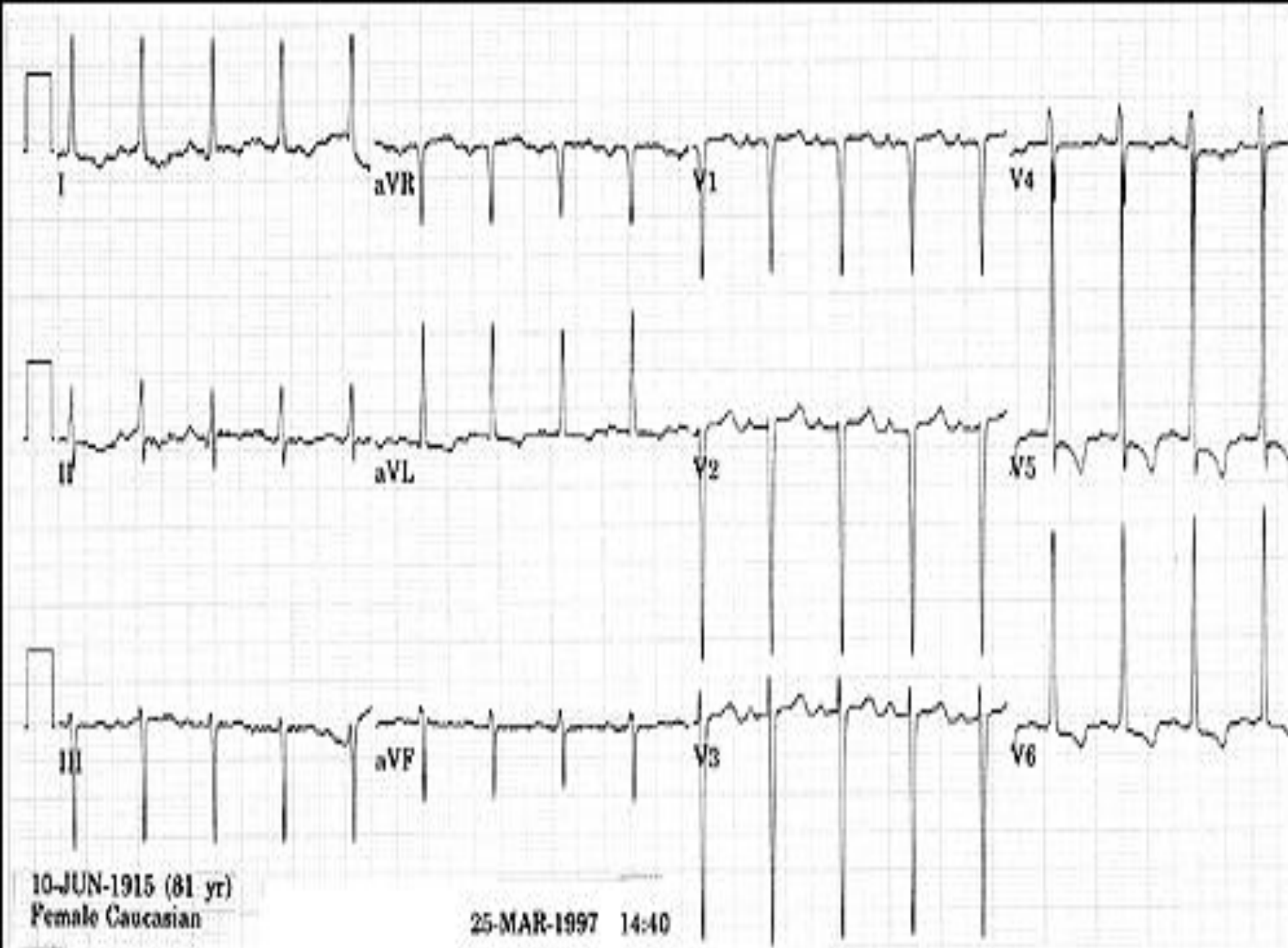


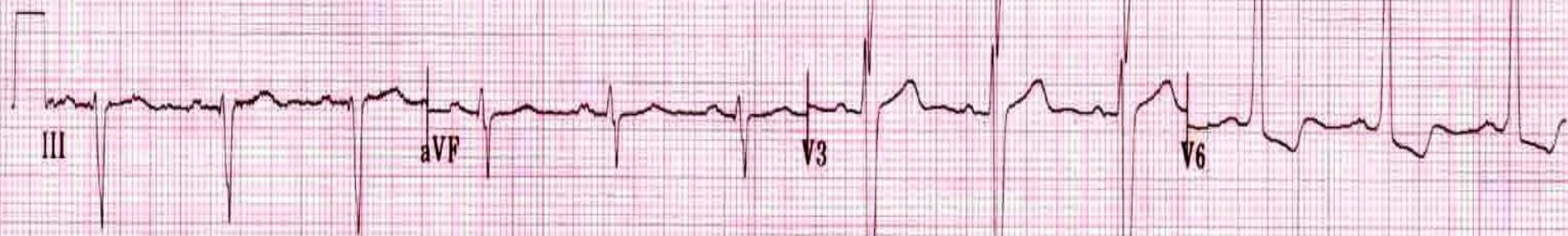
А

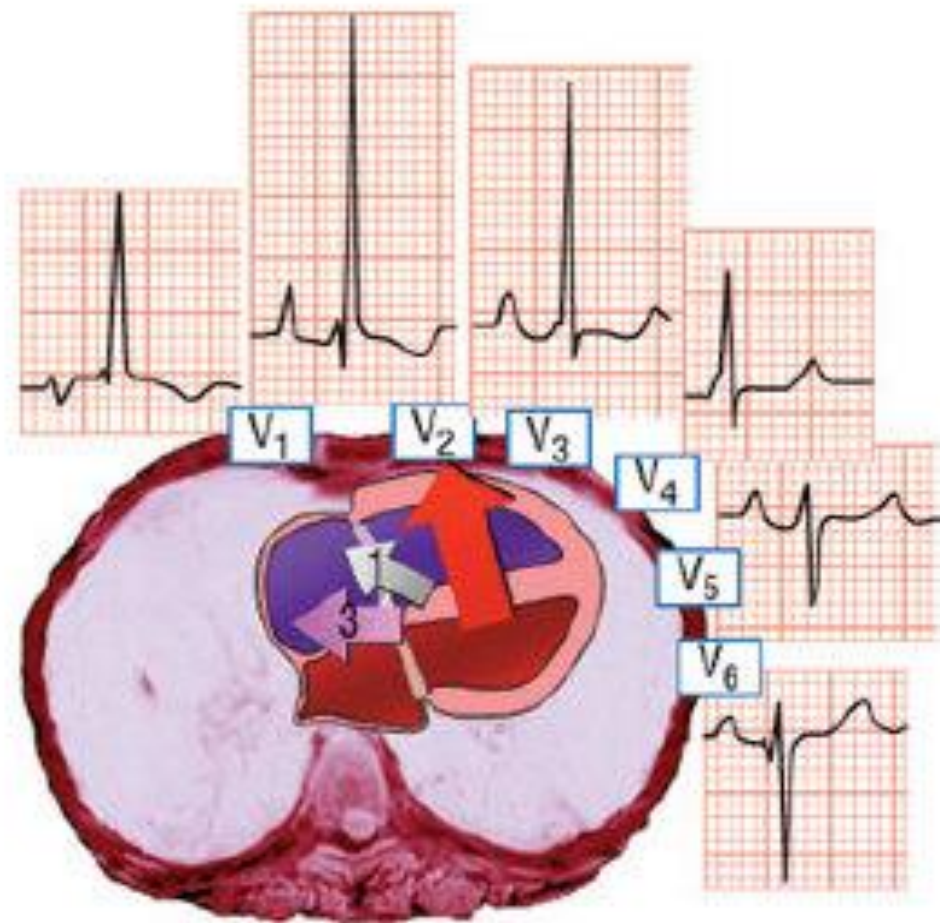
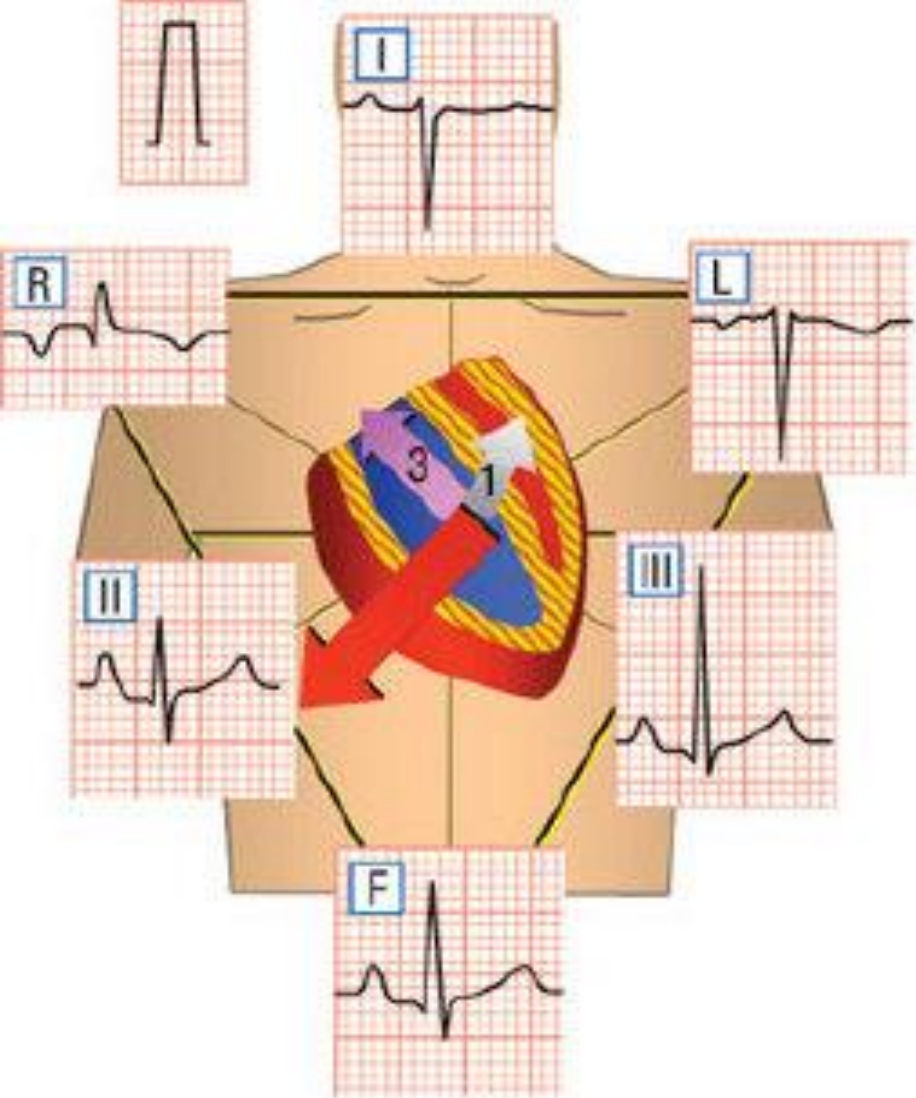
Б

'VOLTAGE CRITERIA'

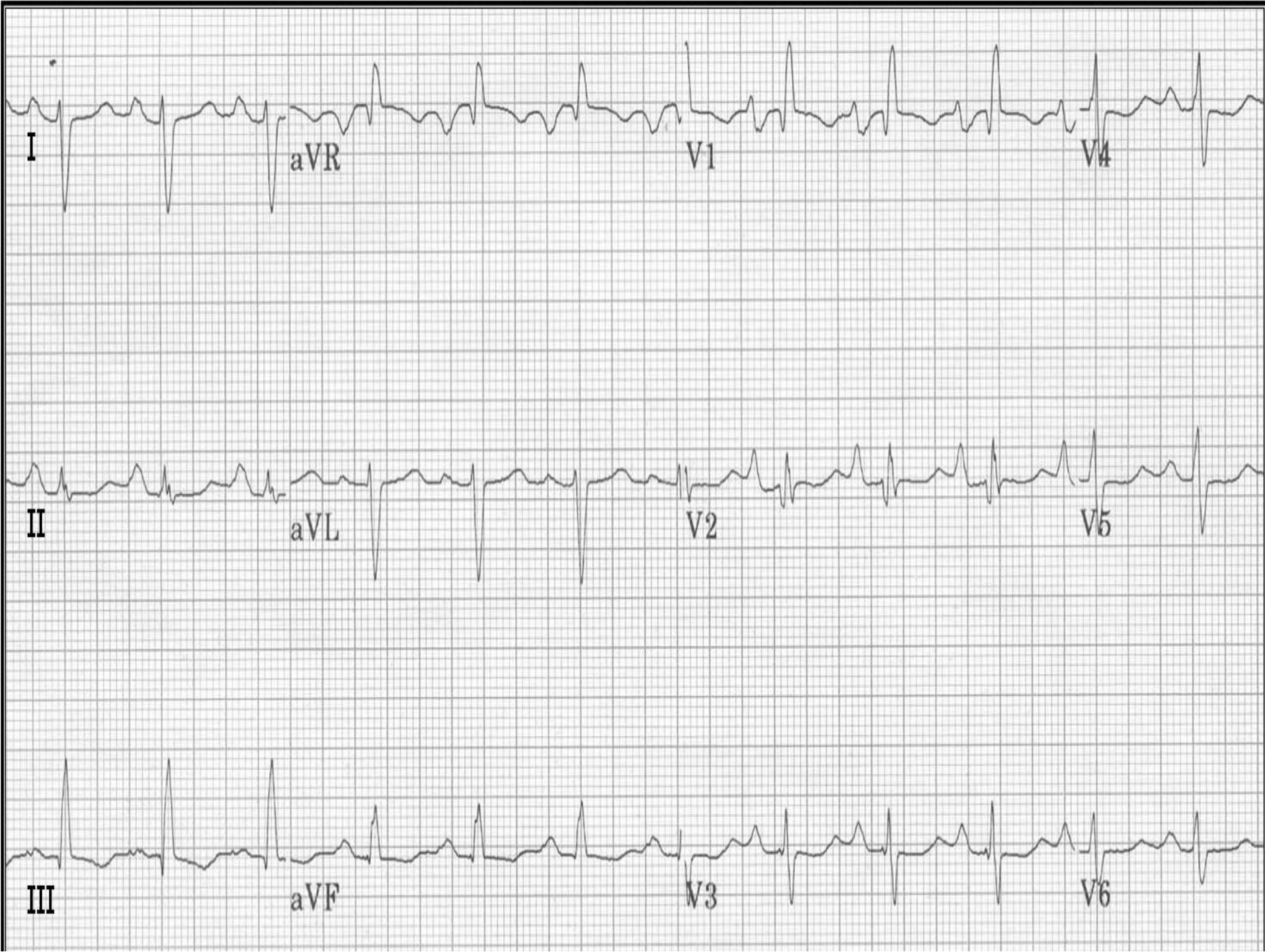


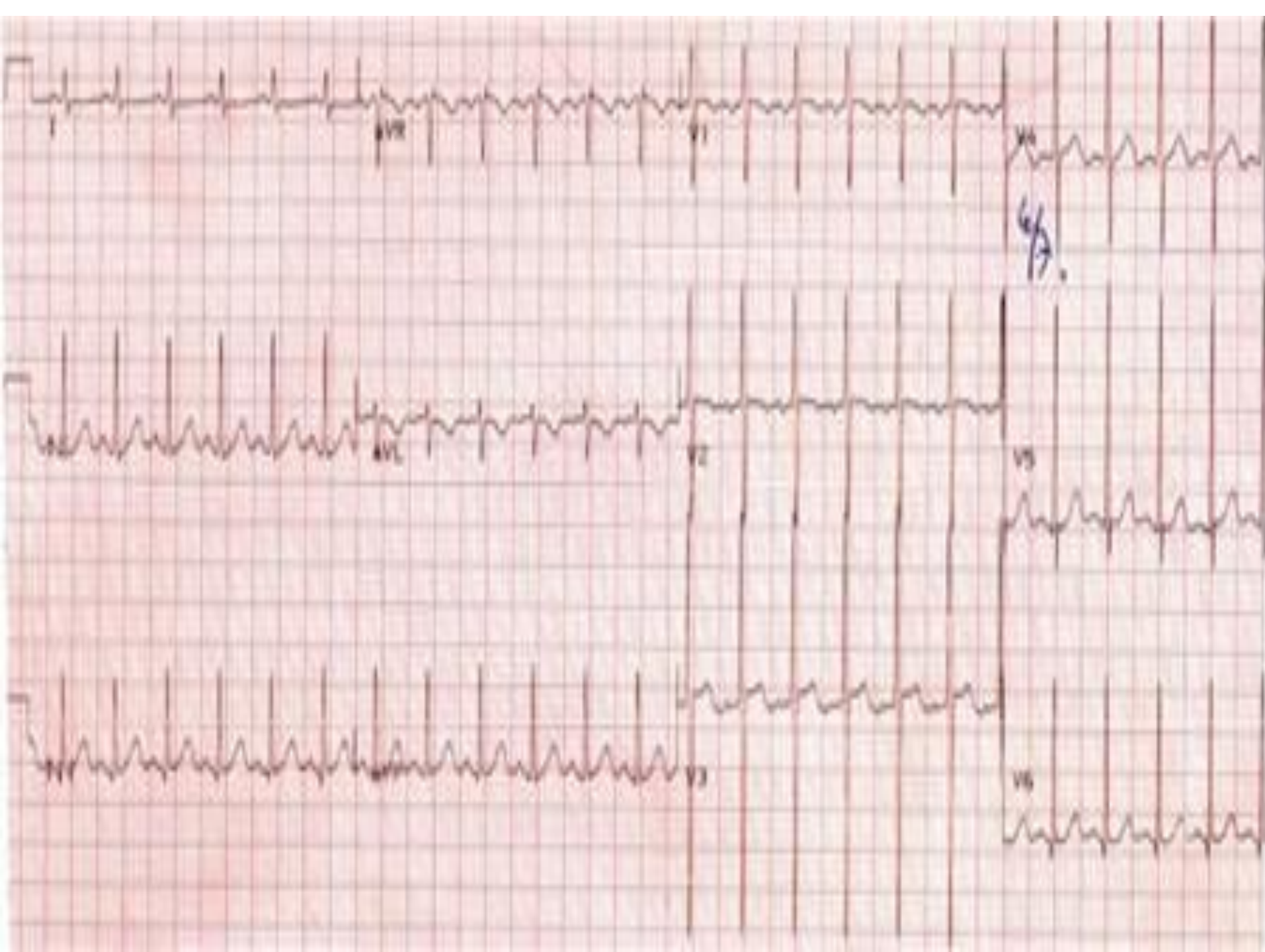




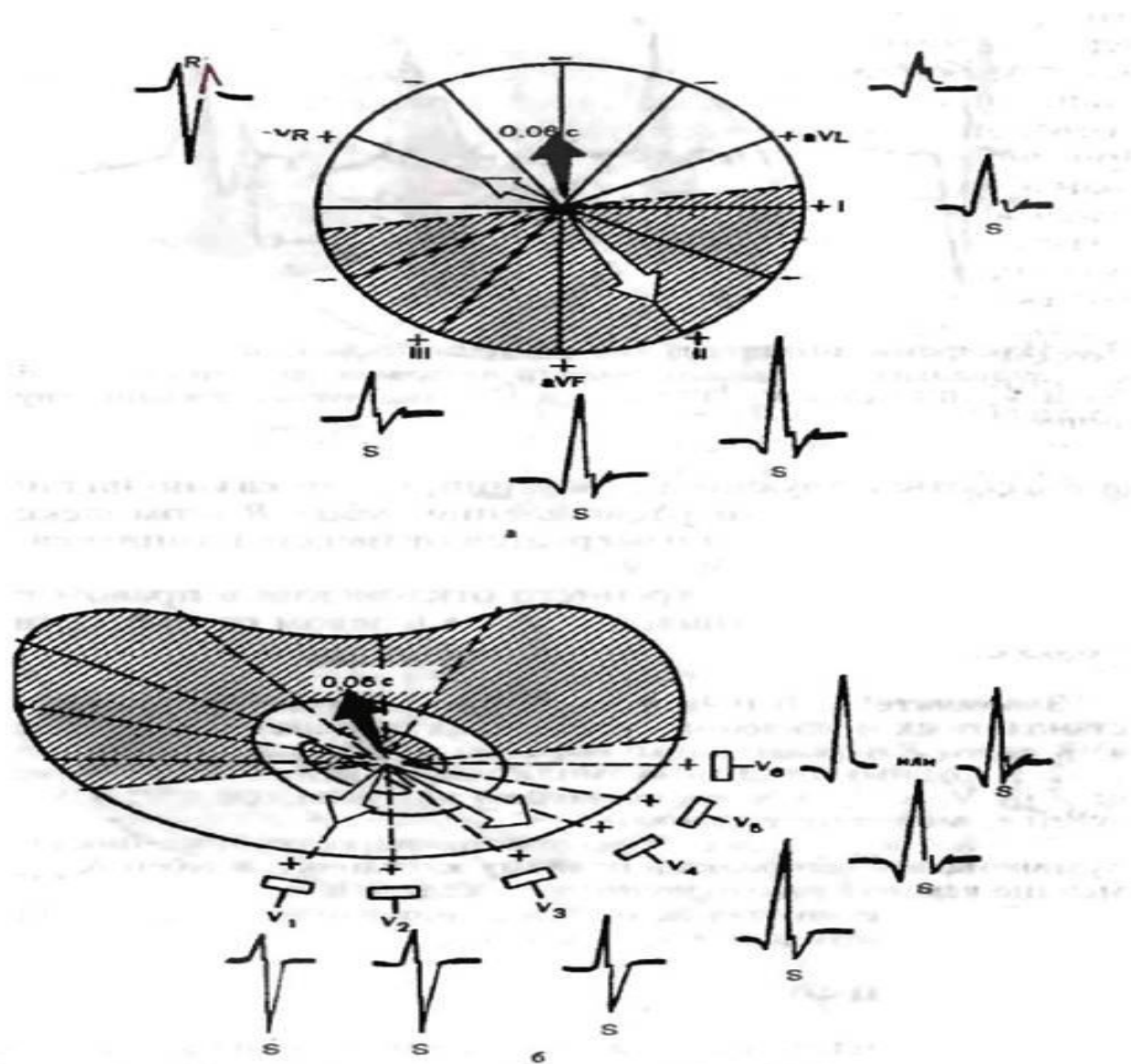


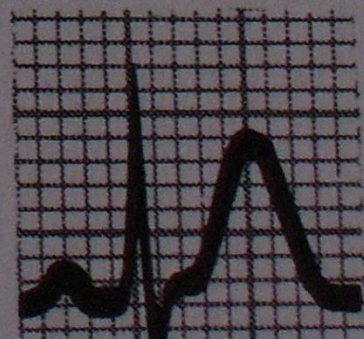
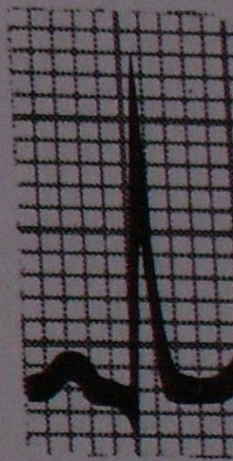
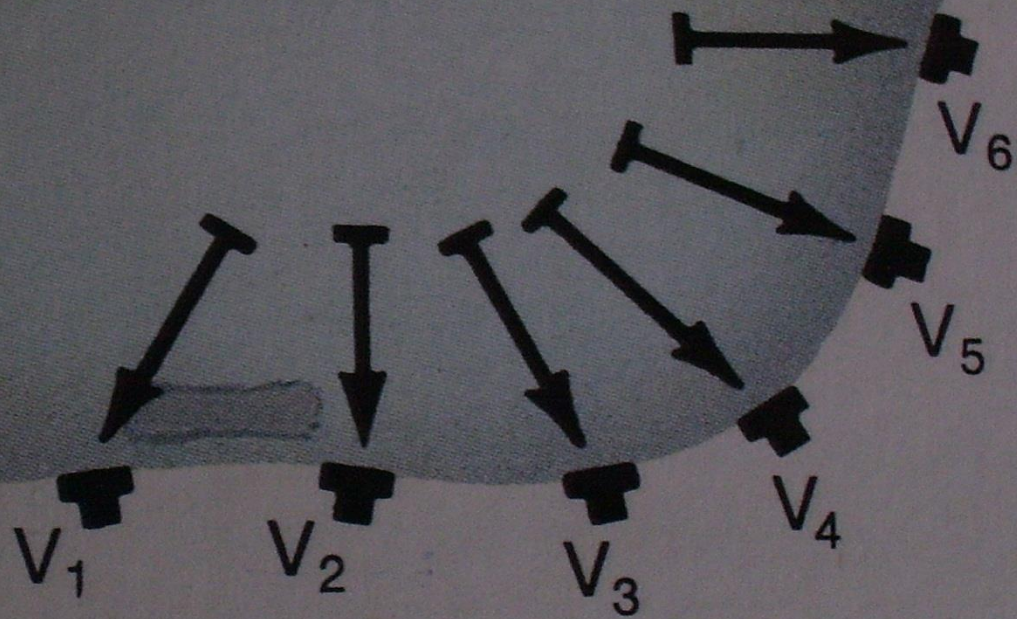
**Увеличение правых предсердия и желудочка
при стенозе ЛА.**





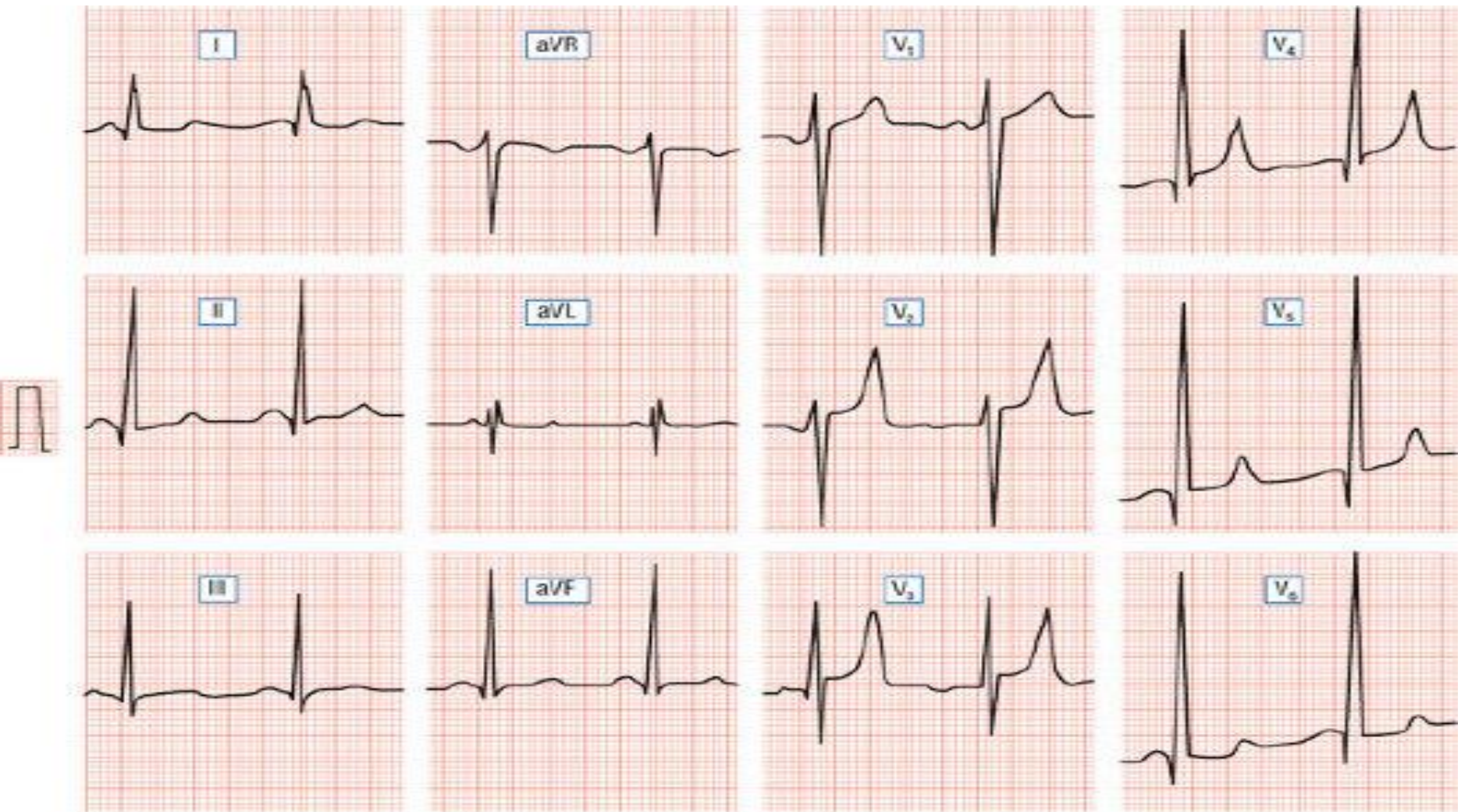
Характеристика зубца S





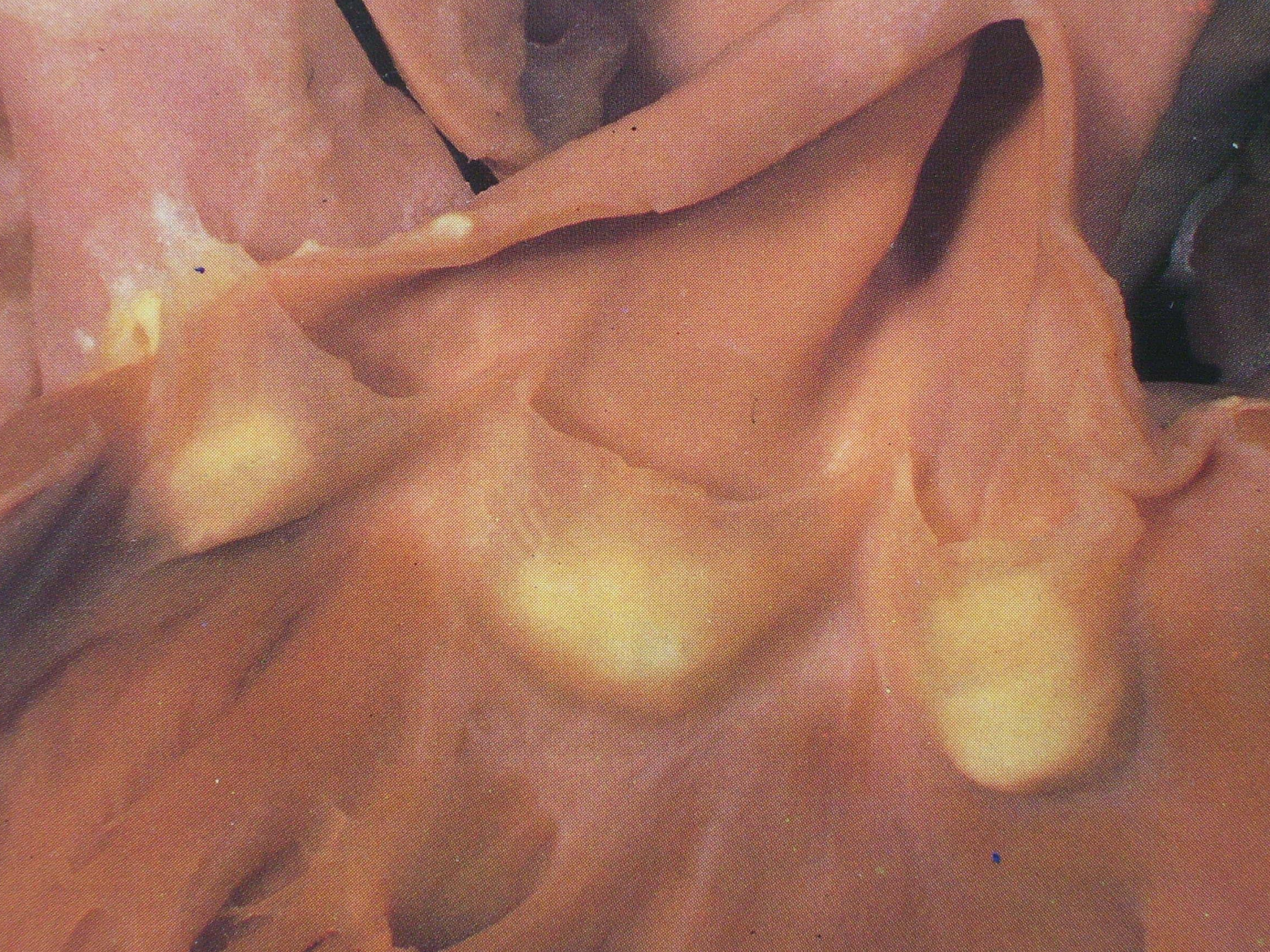
Netter
M.D.

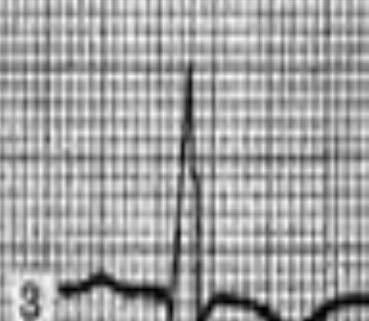
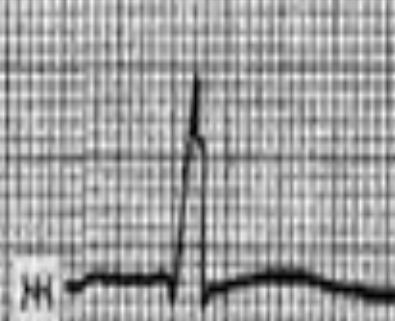
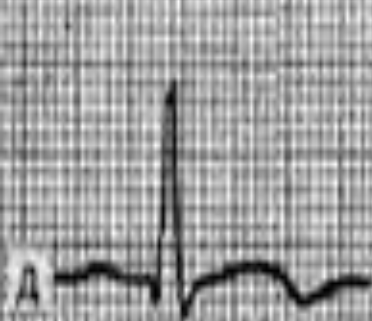
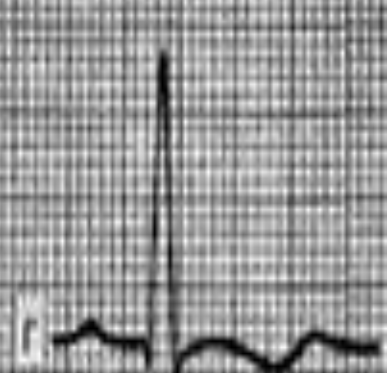
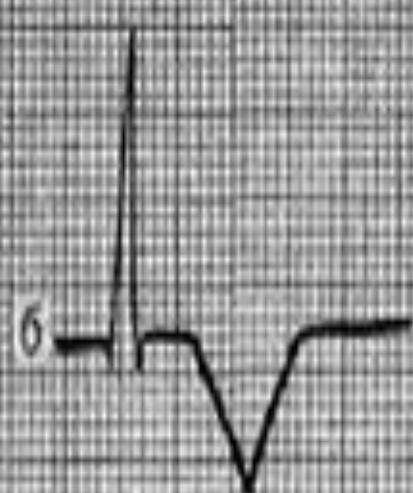
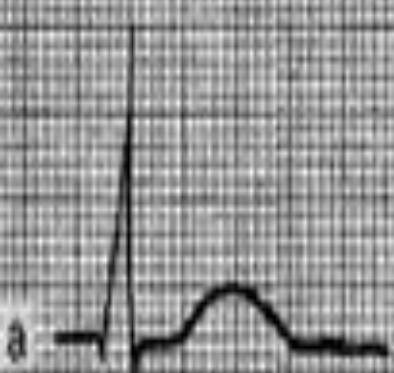
Признаки диастолической перегрузки ЛЖ у больного с тяжелой аортальной недостаточностью.

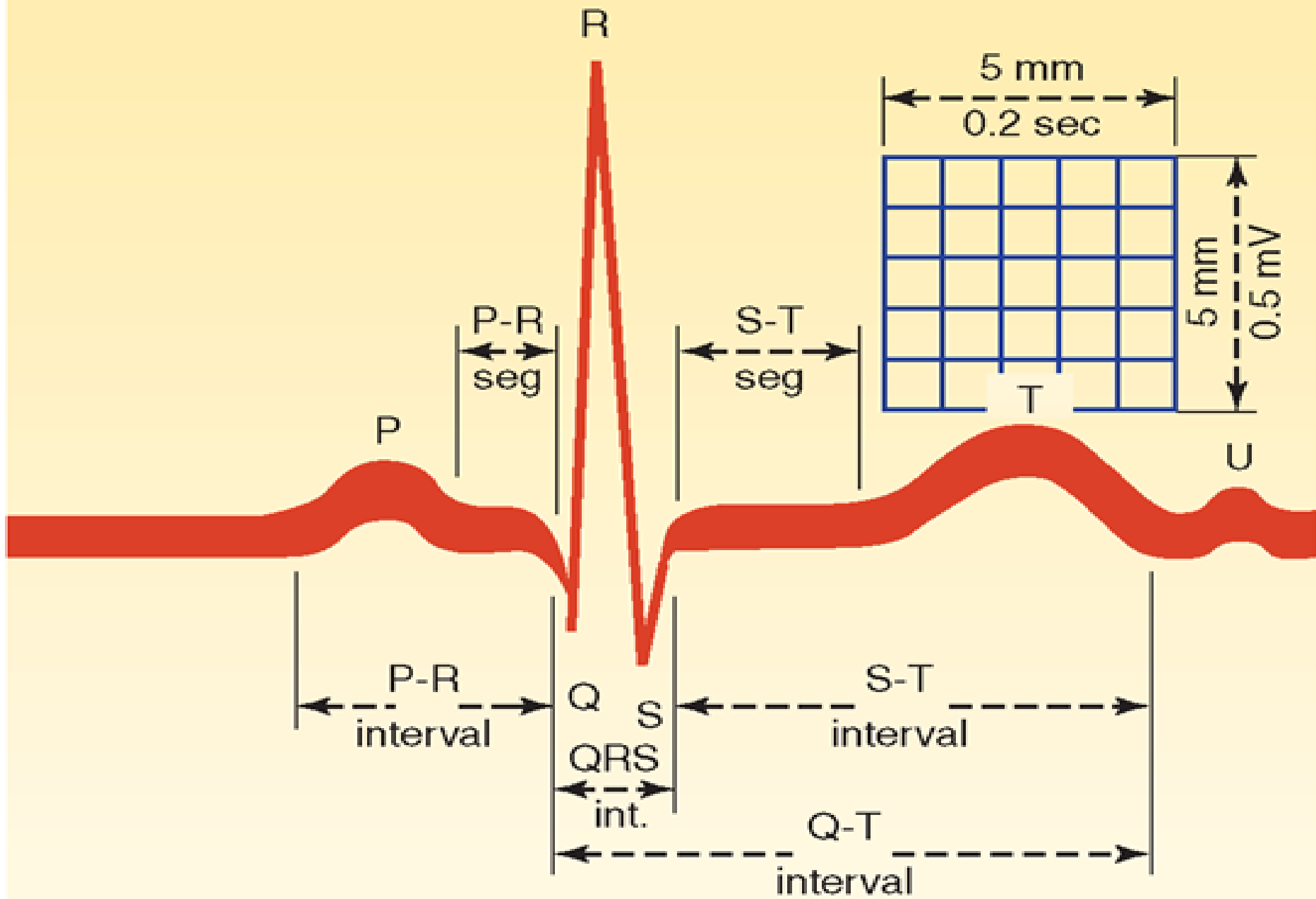


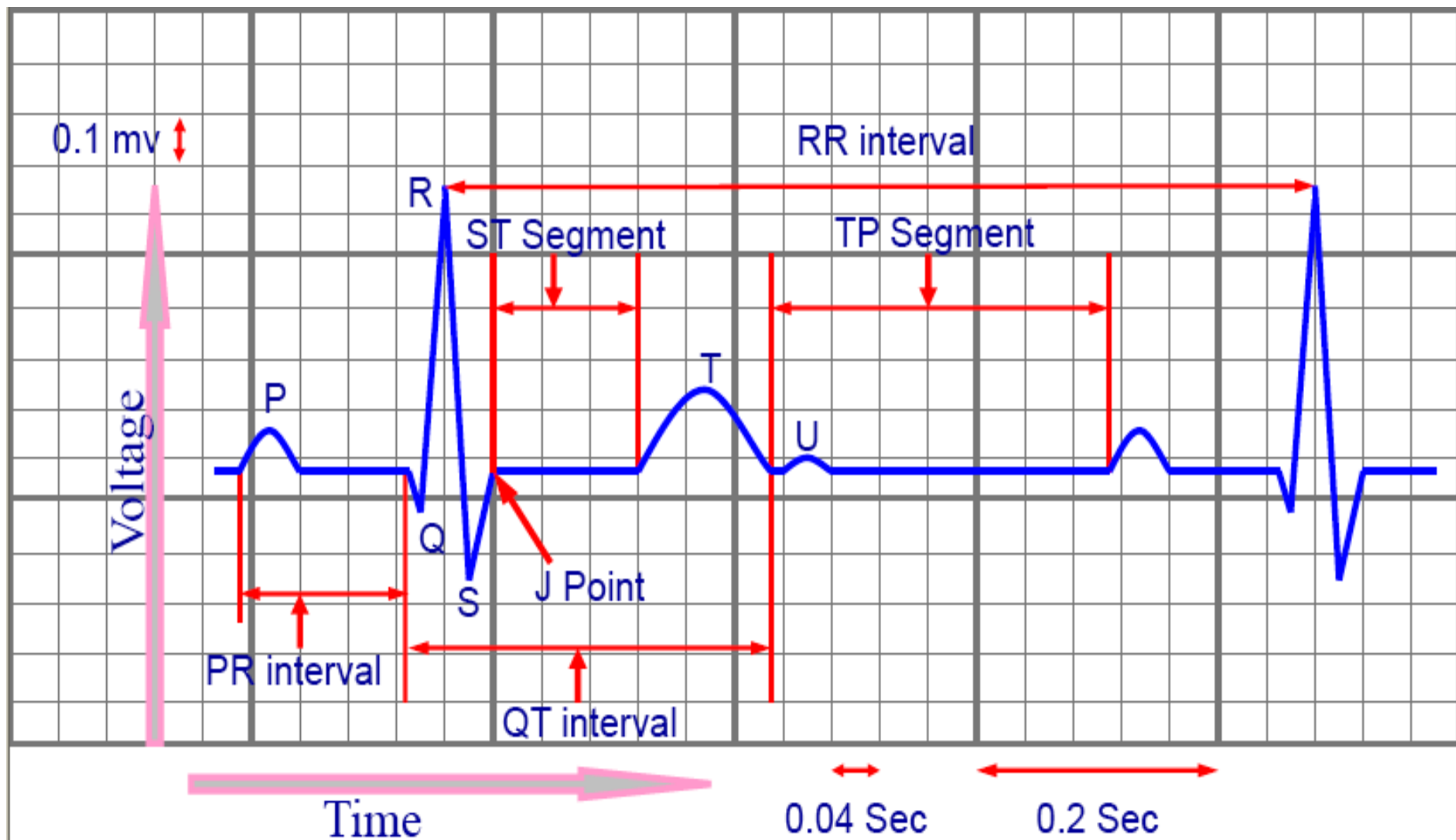
глубокие узкие зубцы Q в отведениях V5-V6
и прямые узкие зубцы T.





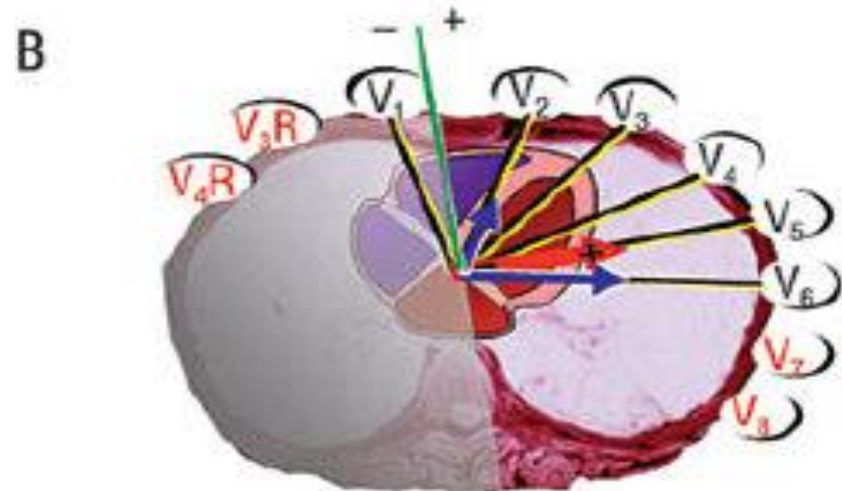
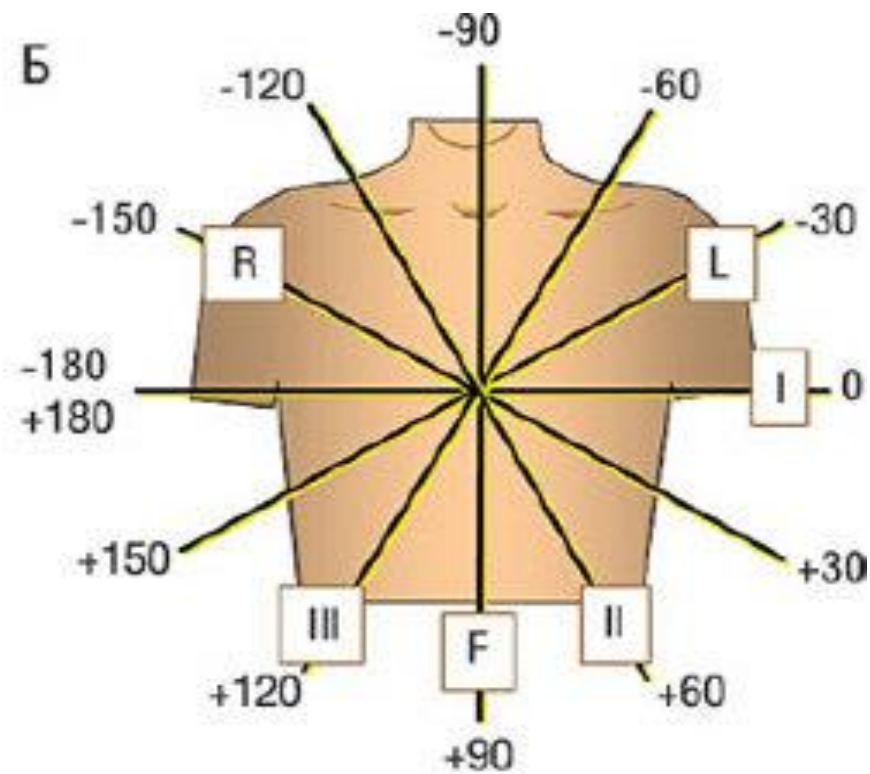
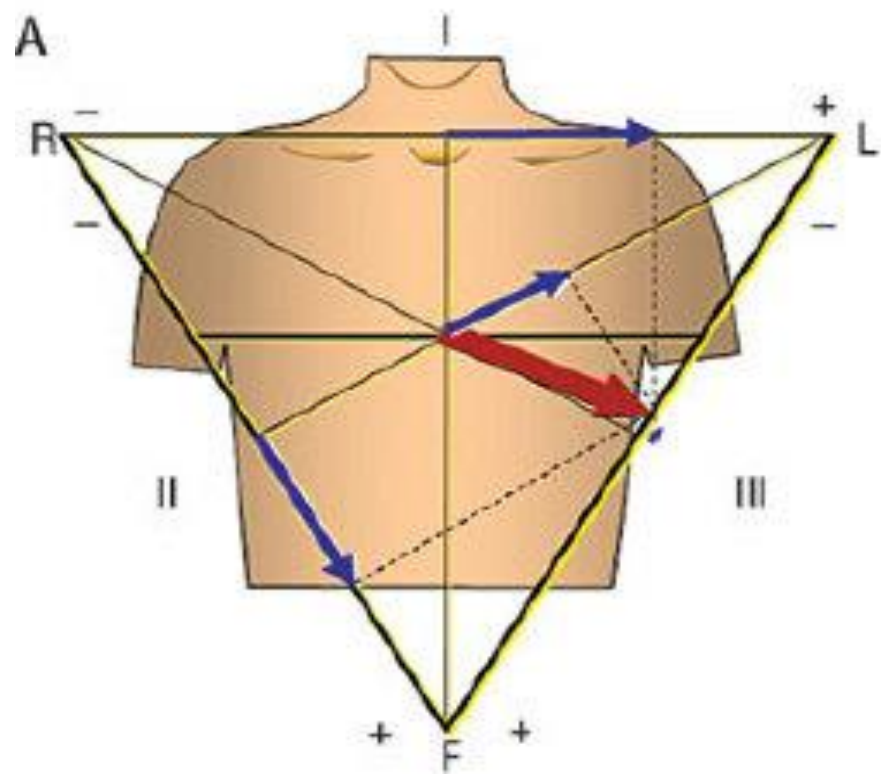


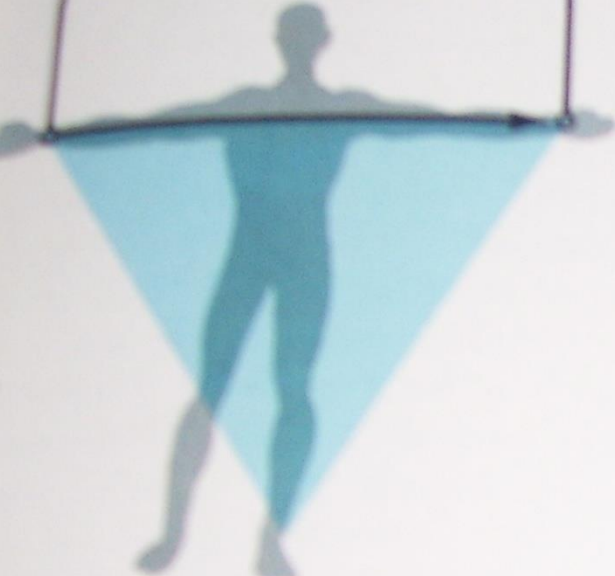




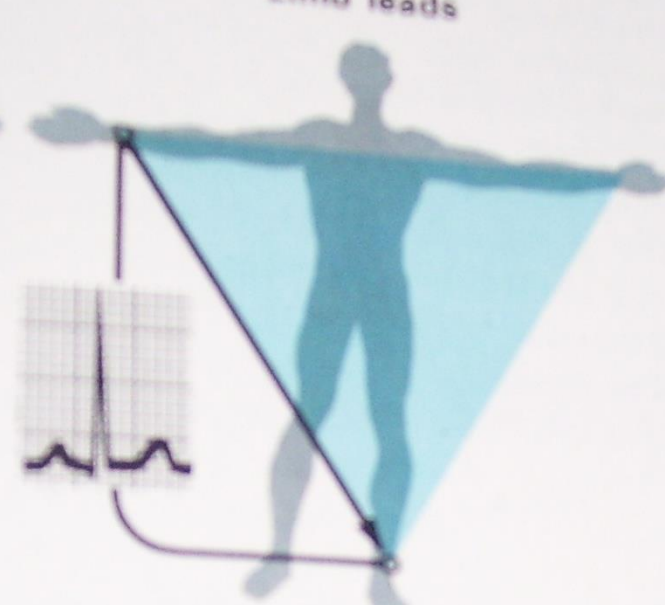
- PR interval 0.12 – 0.20 sec
- QRS duration 0.08 – 0.10 sec

- QT interval 0.4 – 0.43 sec
- RR interval 0.6 – 1.0 sec

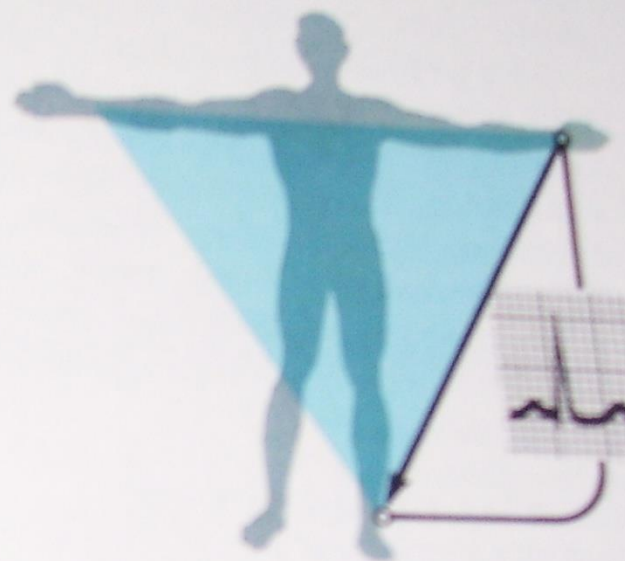




Lead I

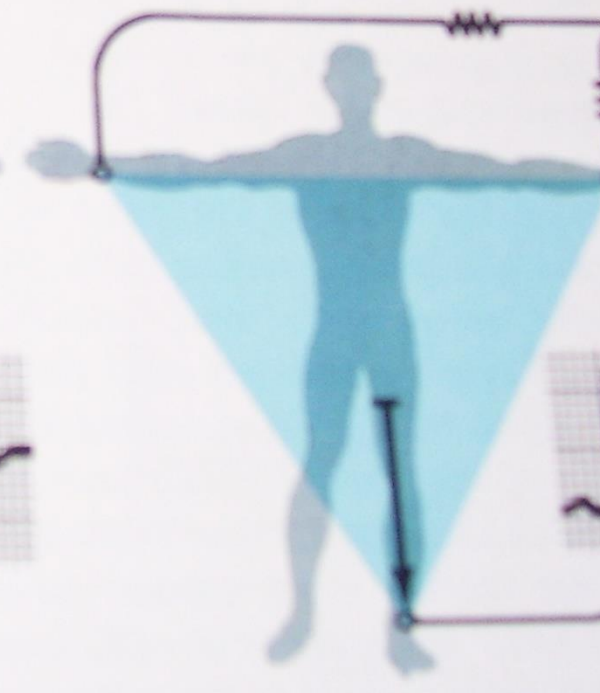
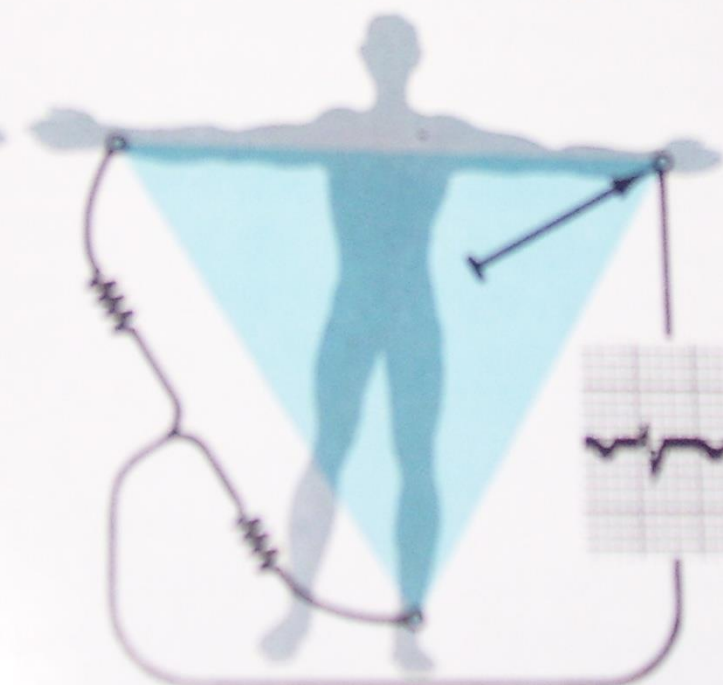
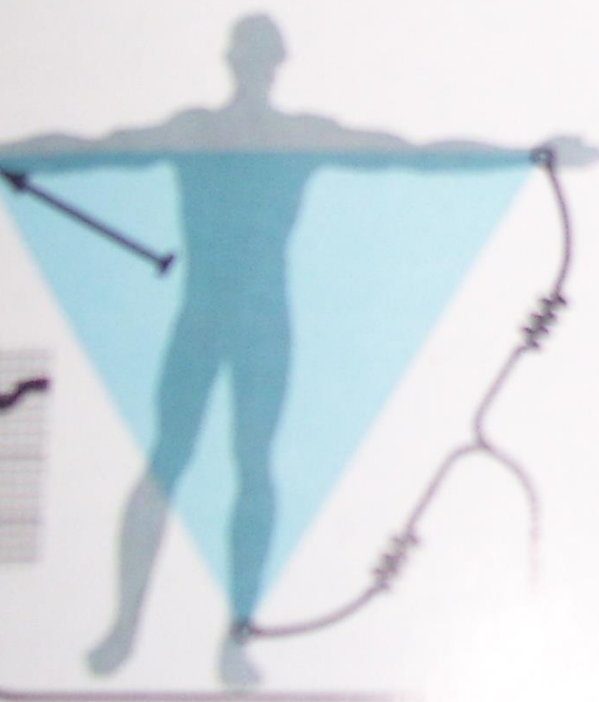


Lead II

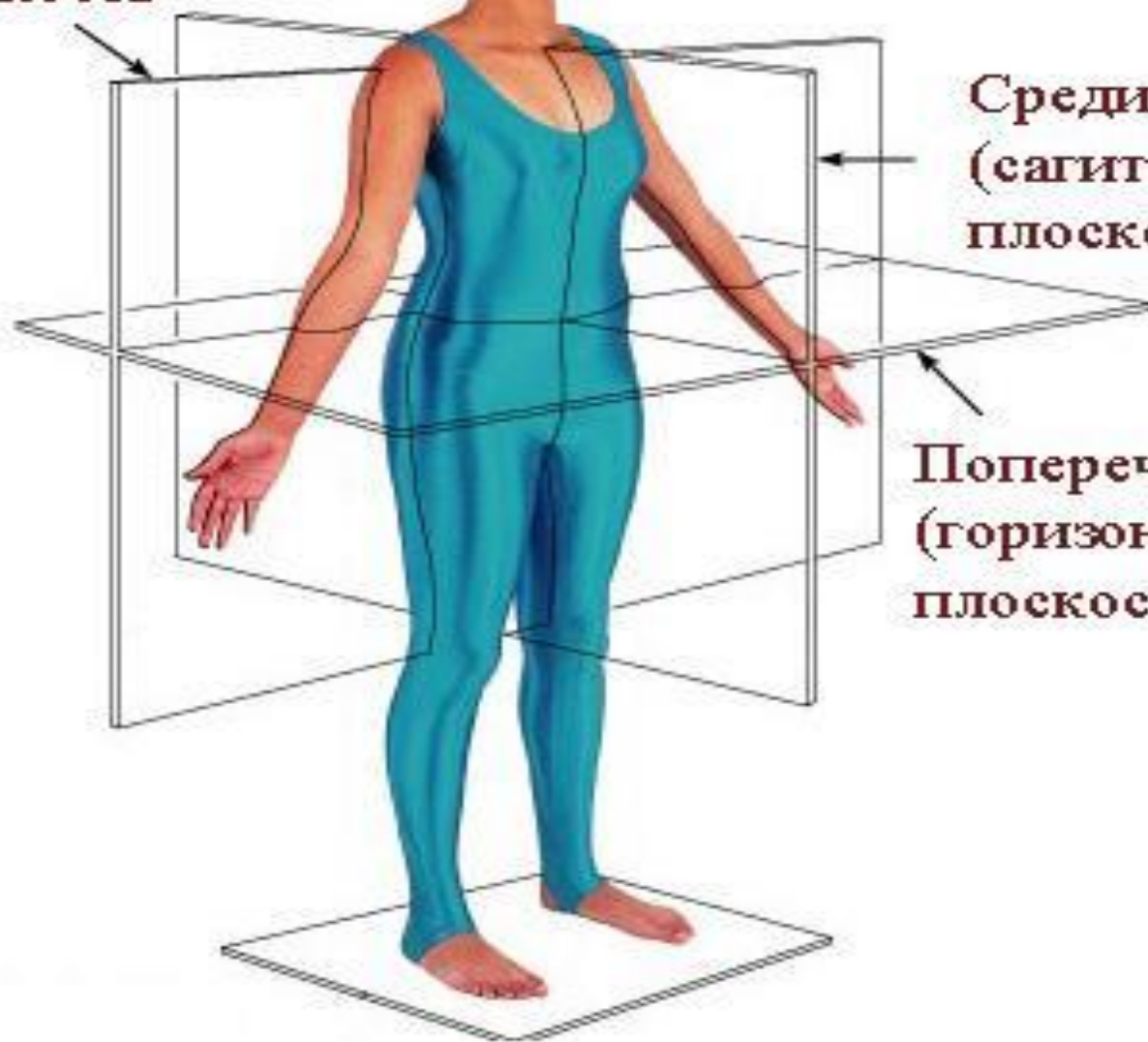


Lead III

Augmented limb leads

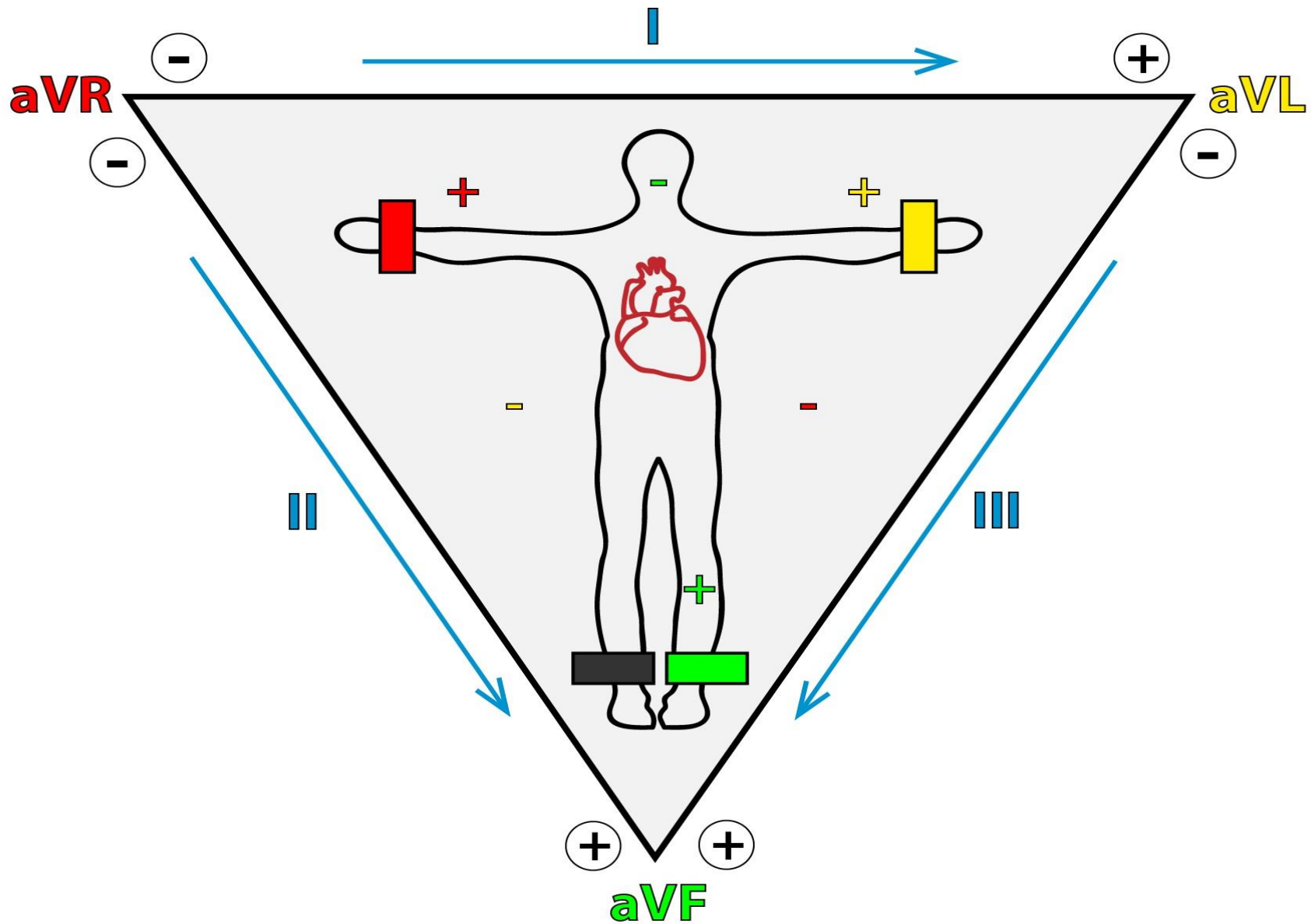


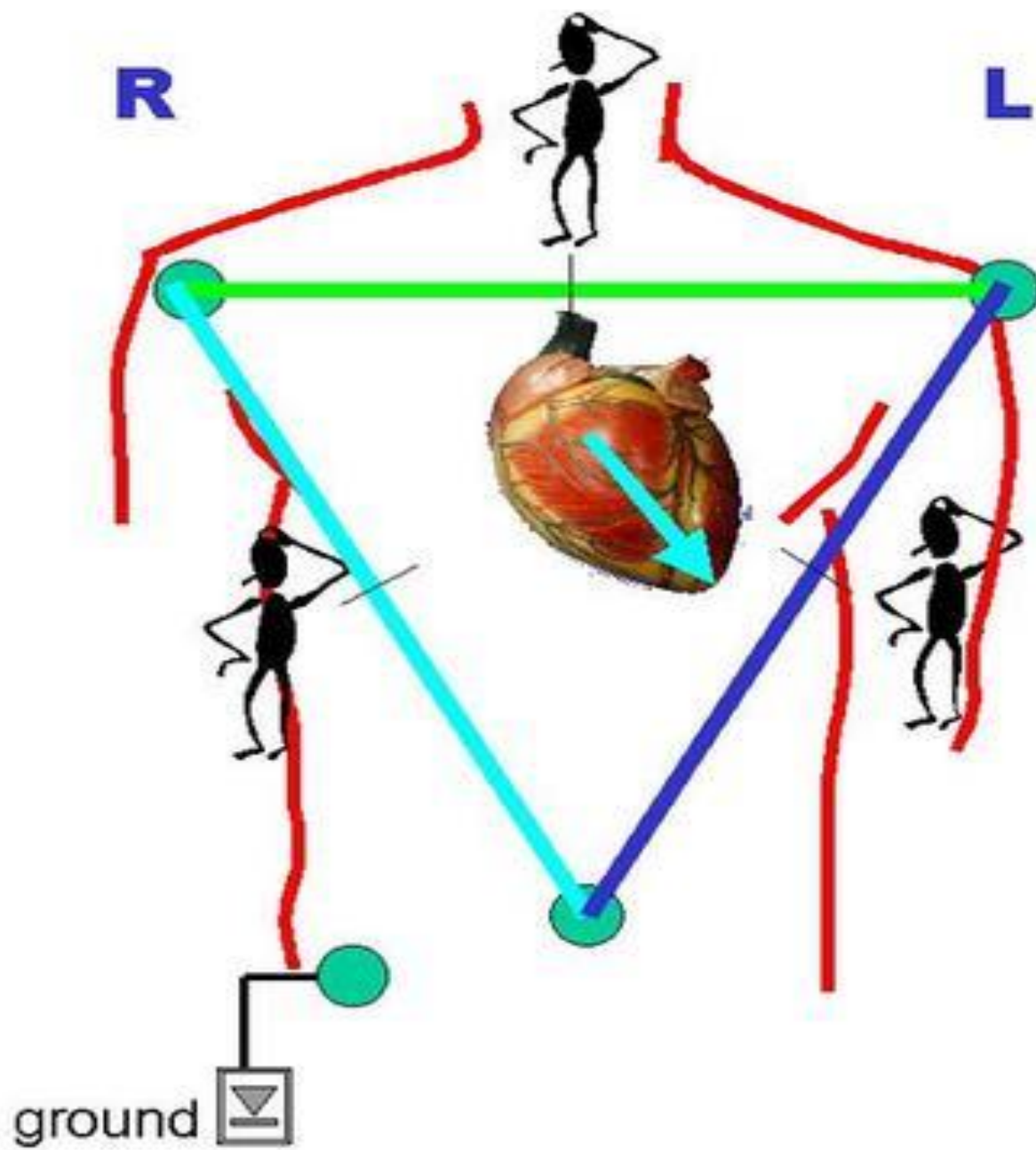
**Фронтальная
плоскость**



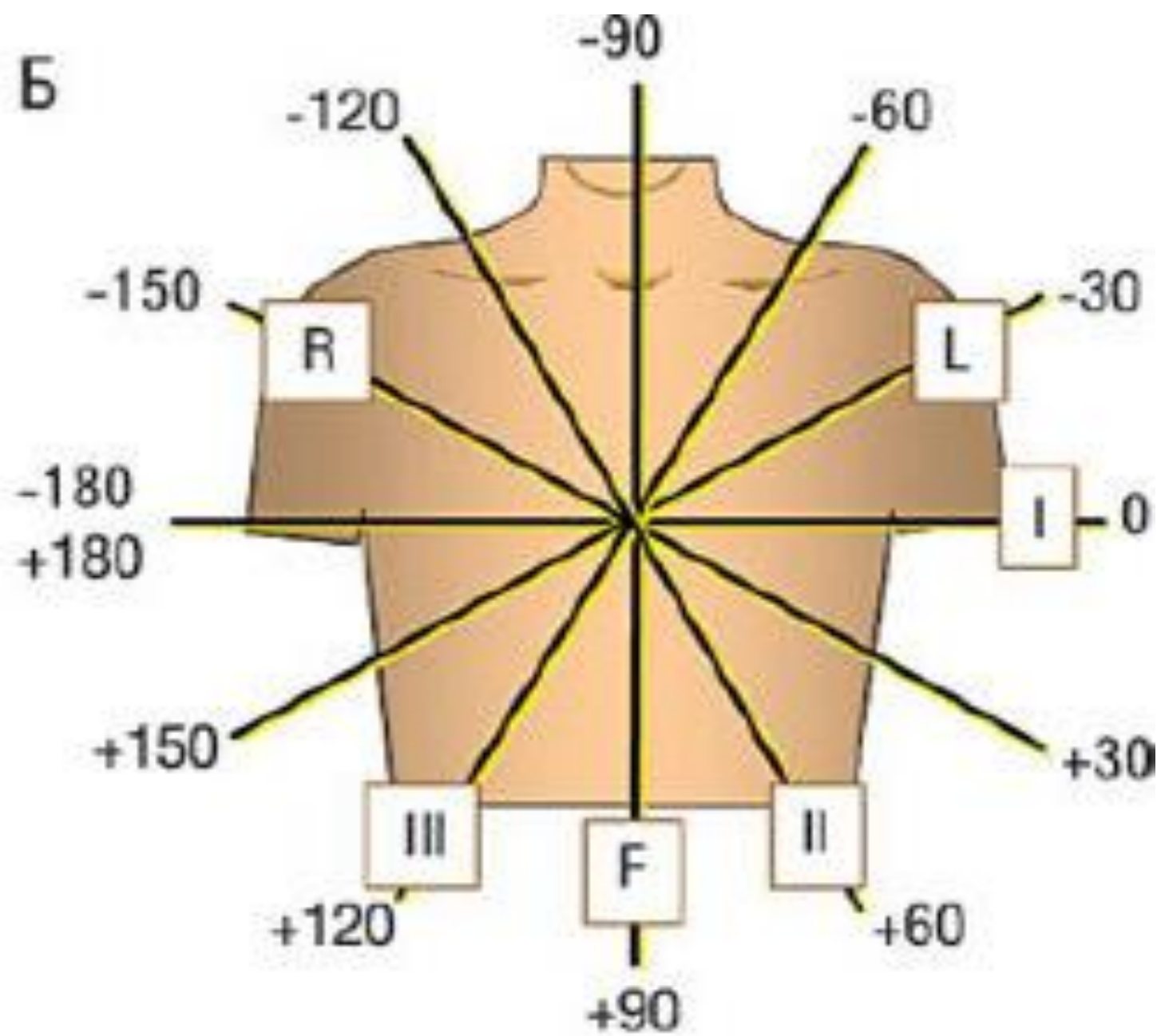
**Срединная
(сагиттальная)
плоскость**

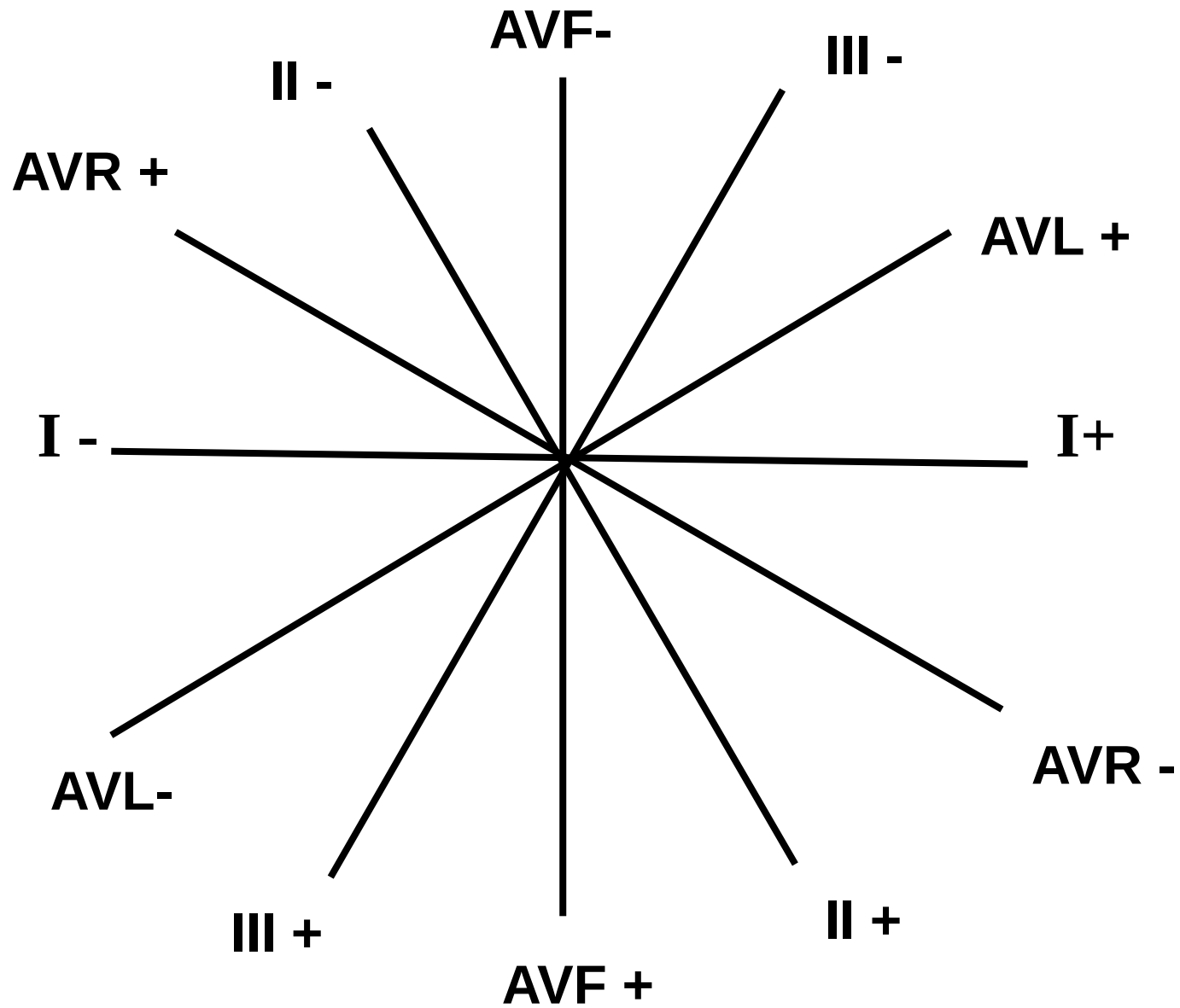
**Поперечная
(горизонтальная)
плоскость**



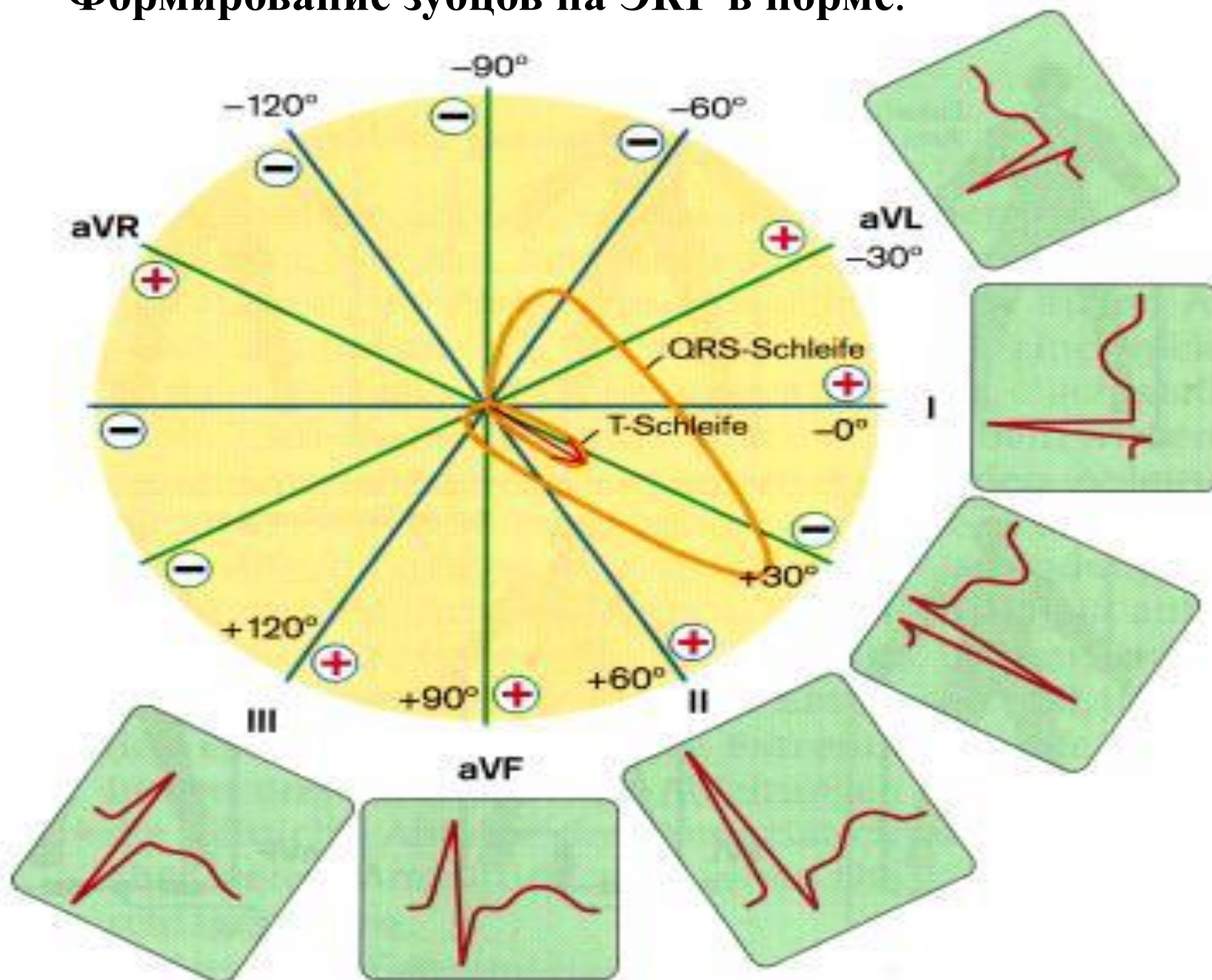


Б



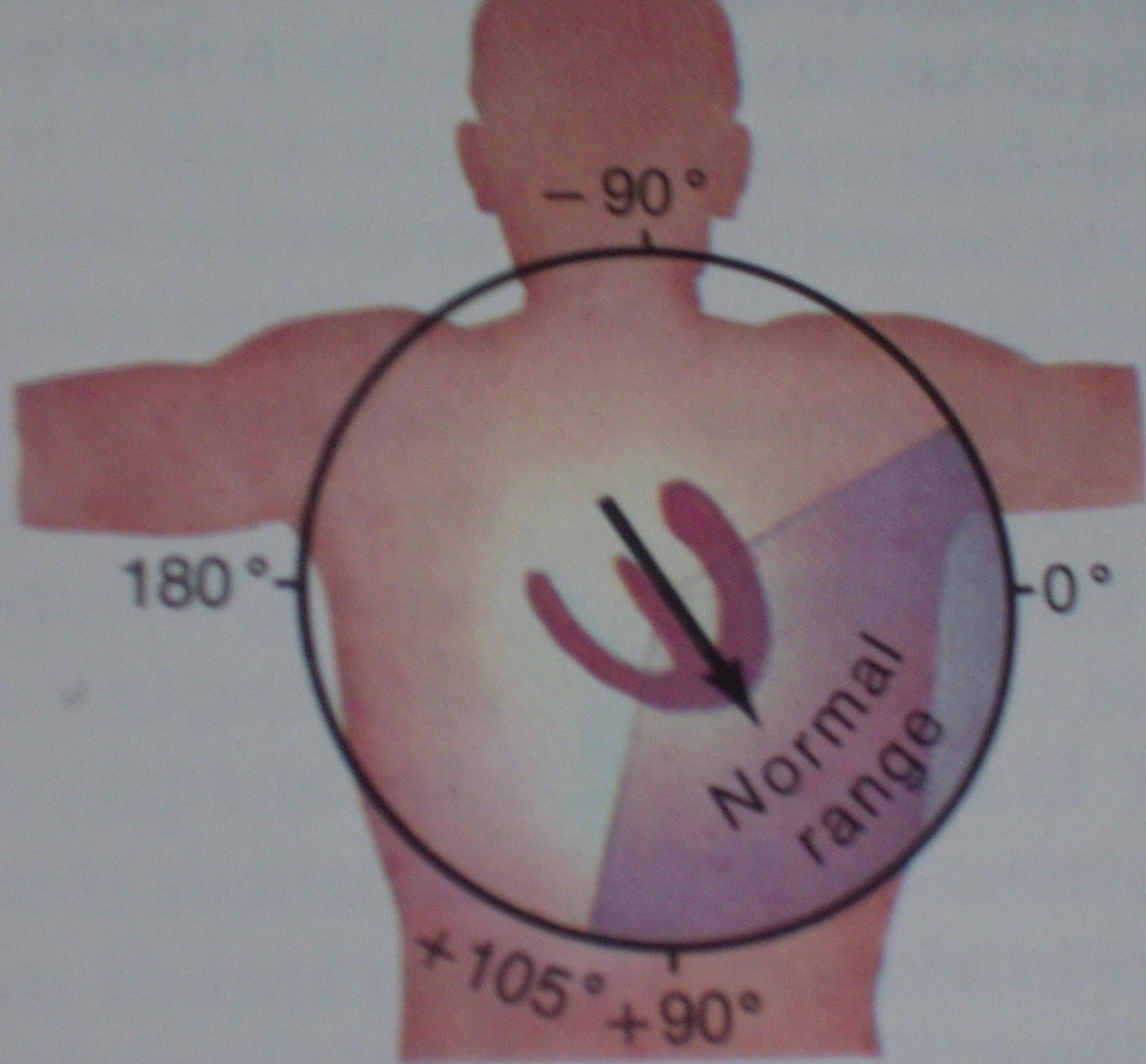


Формирование зубцов на ЭКГ в норме.



Варианты расположения электрической оси сердца во фронтальной плоскости.

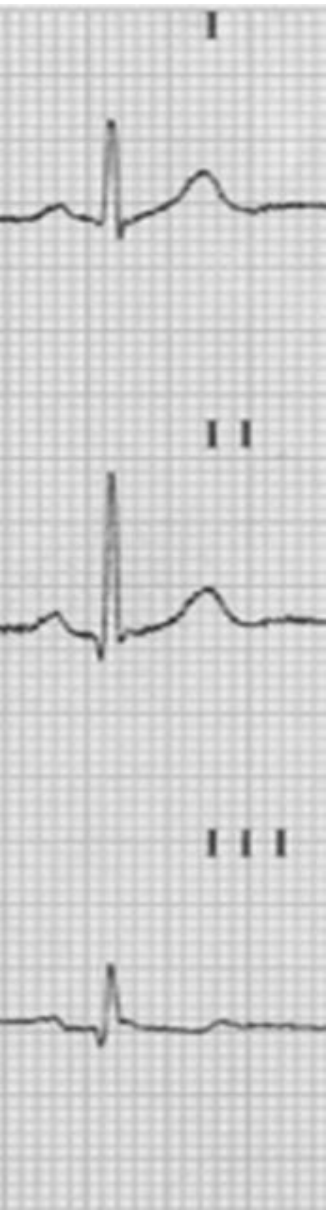




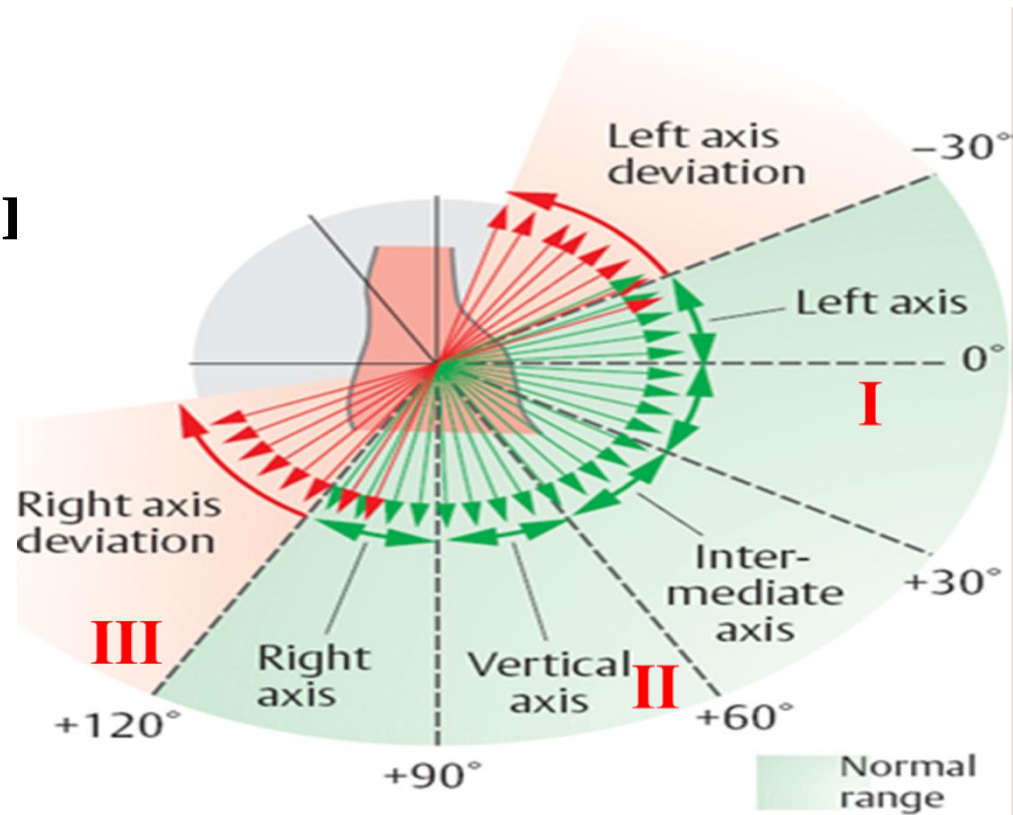
Let

Нормальная ЭОС

+ 30 – + 70

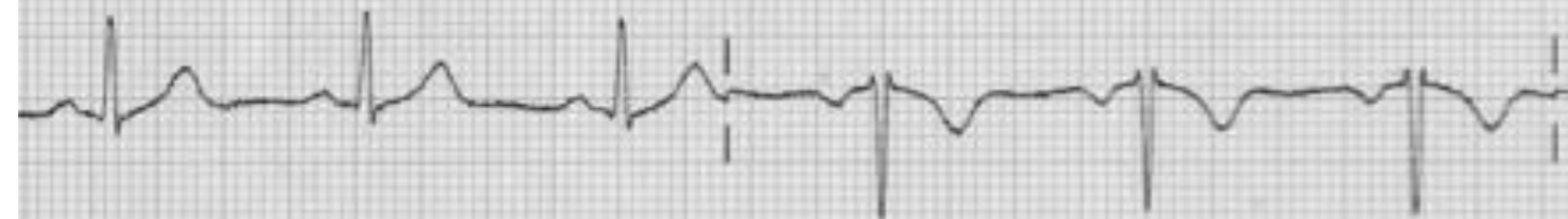


$$R_{II} > R_I > R_{III}$$



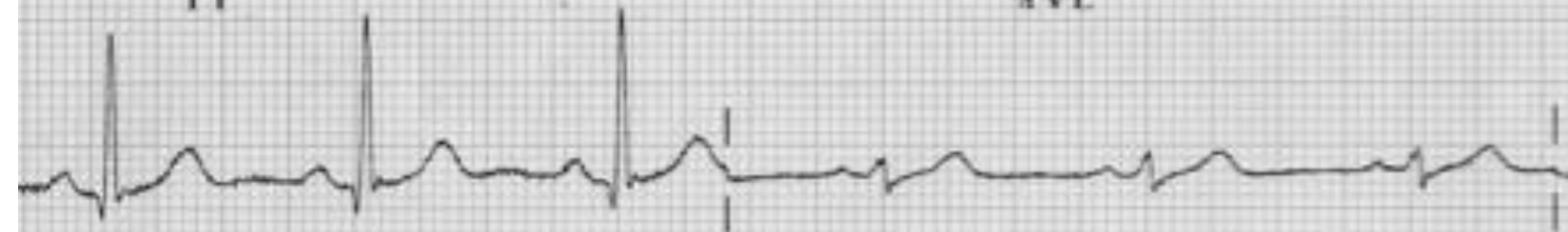
I

aVR



II

aVL



III

aVF



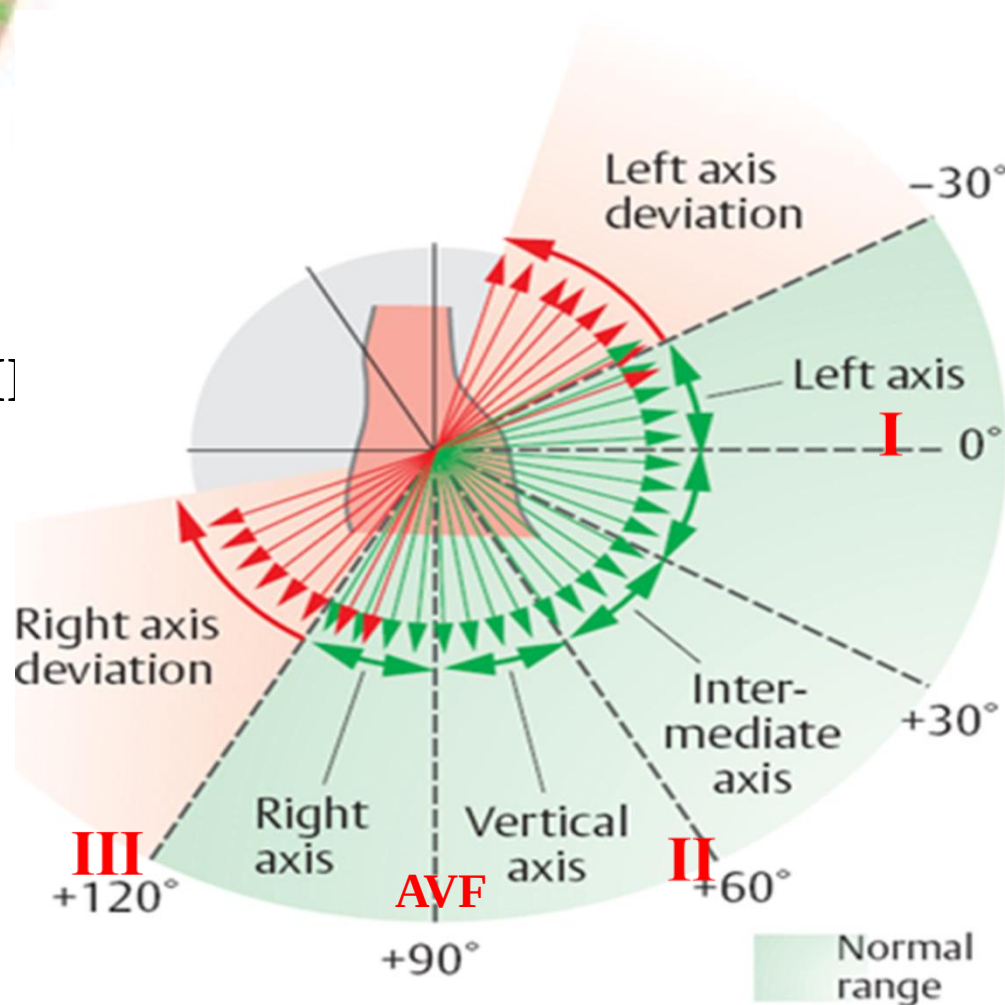
Горизонтальная ЭОС

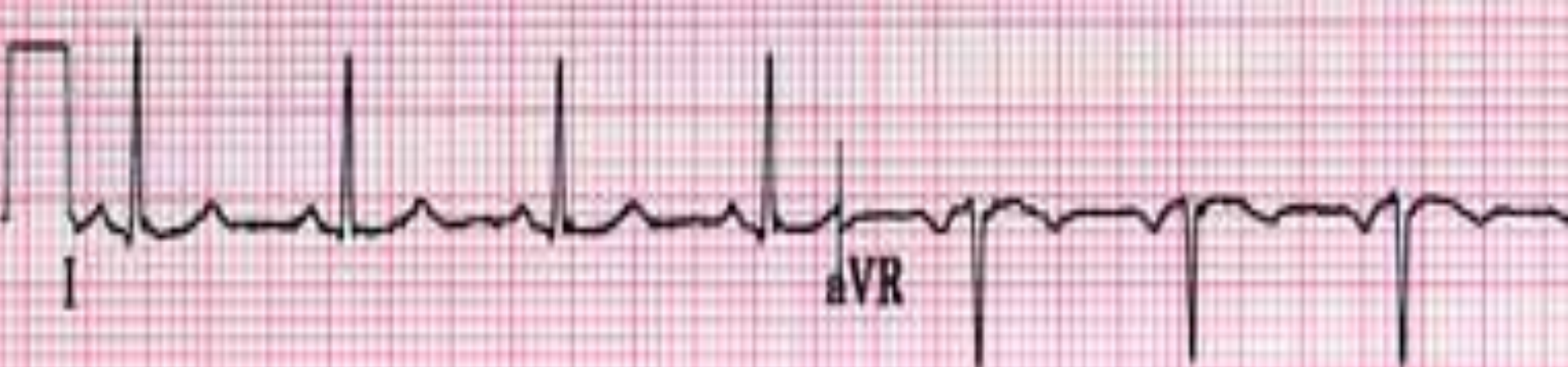
- 10 – + 30

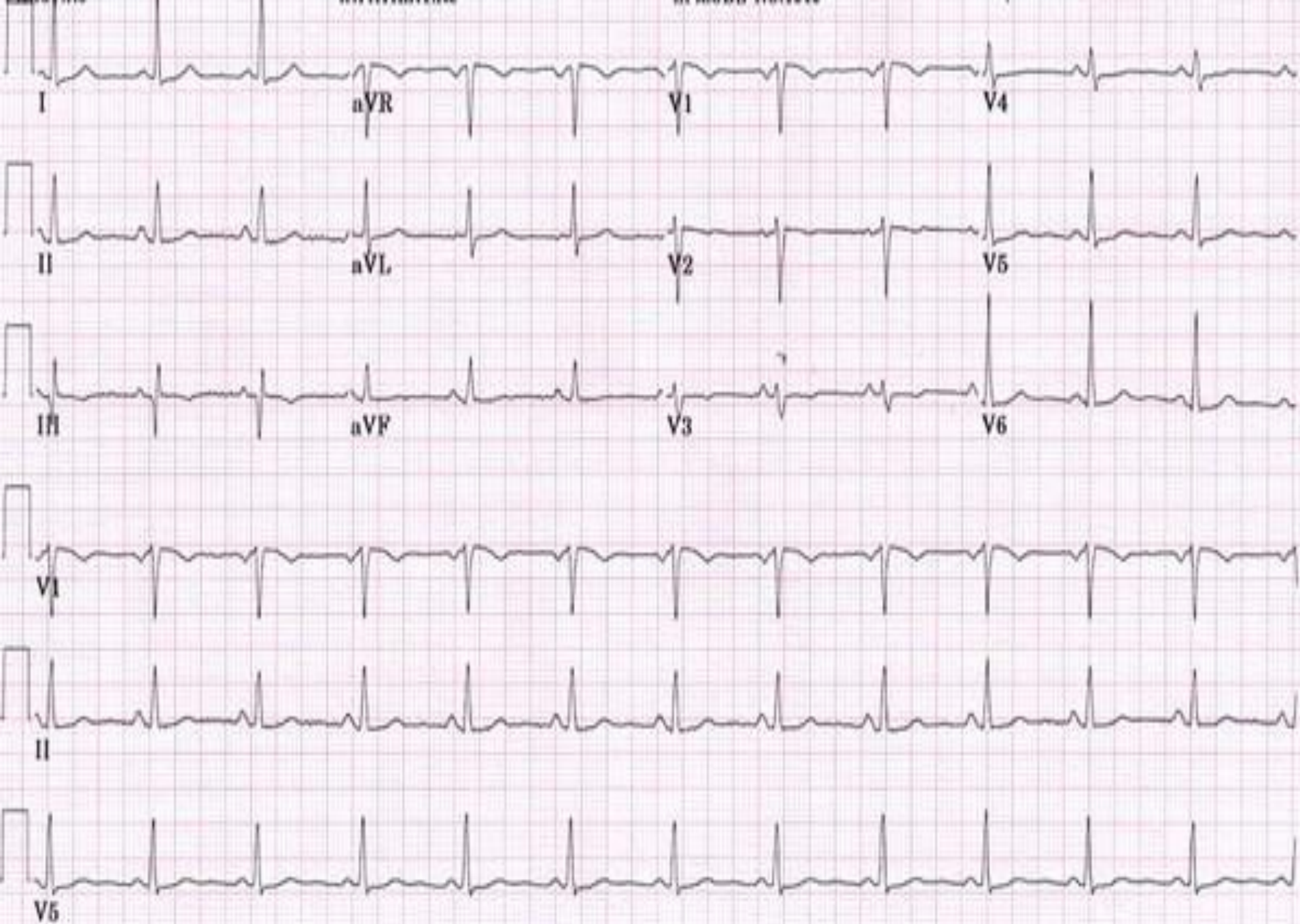


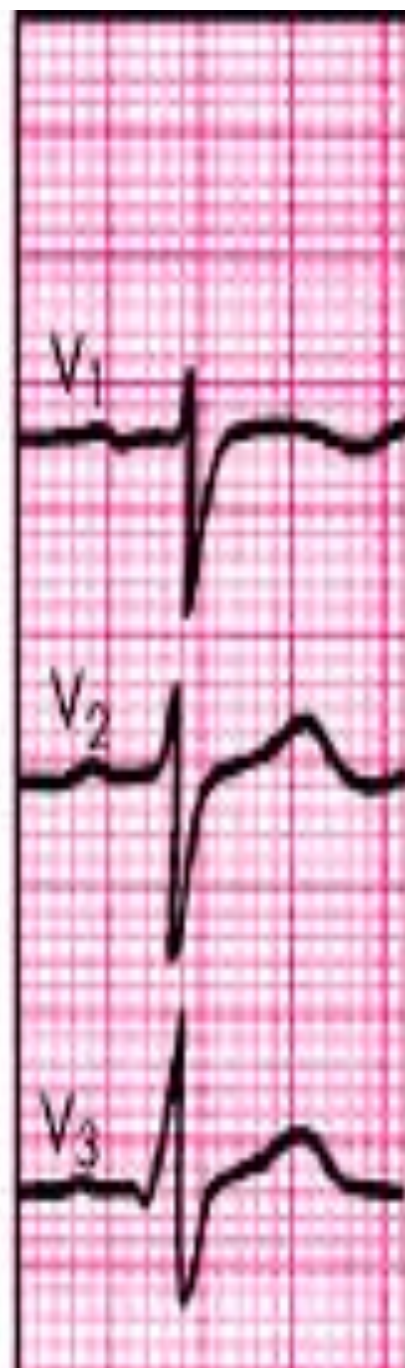
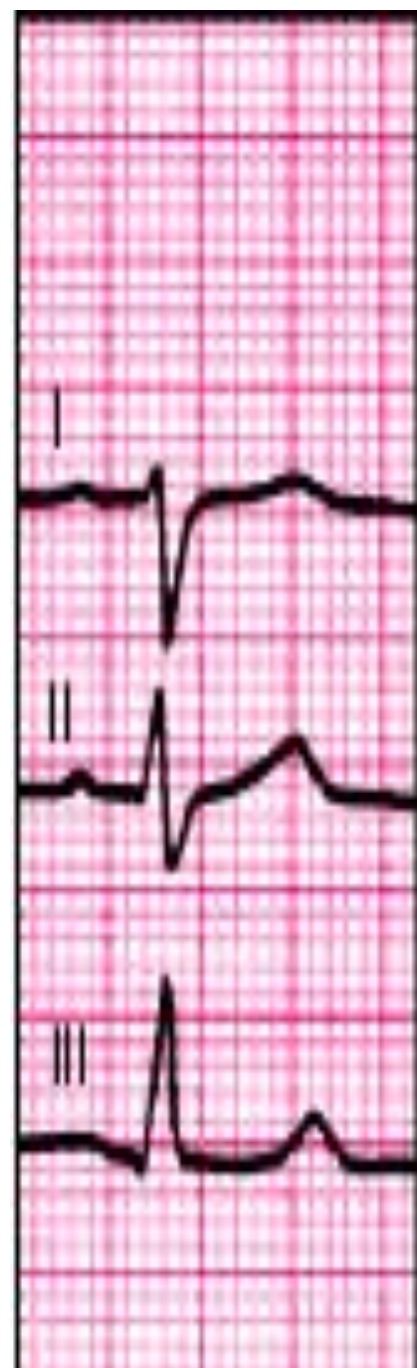
$$R_I > R_{II} > R_{III}$$

$$R_{AVF} > S_{AVF}$$



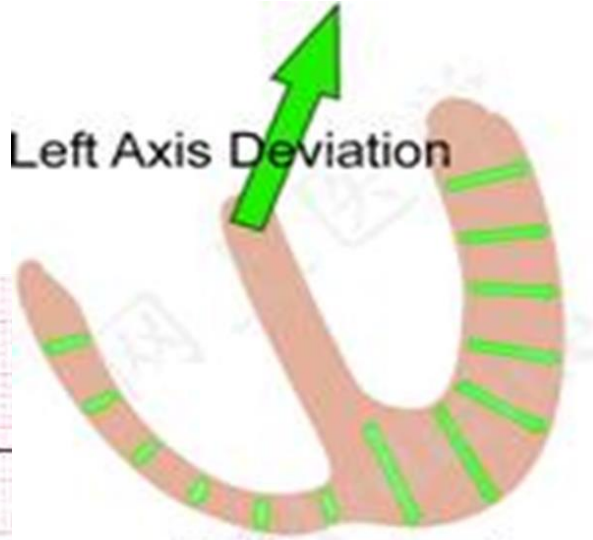






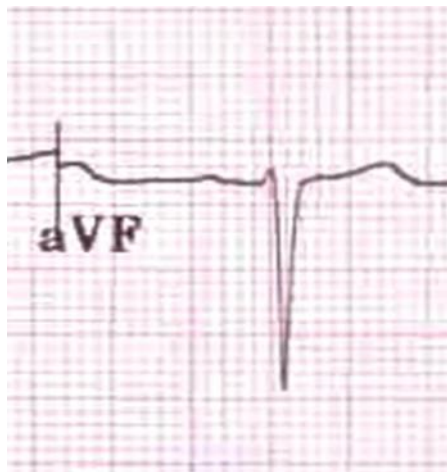
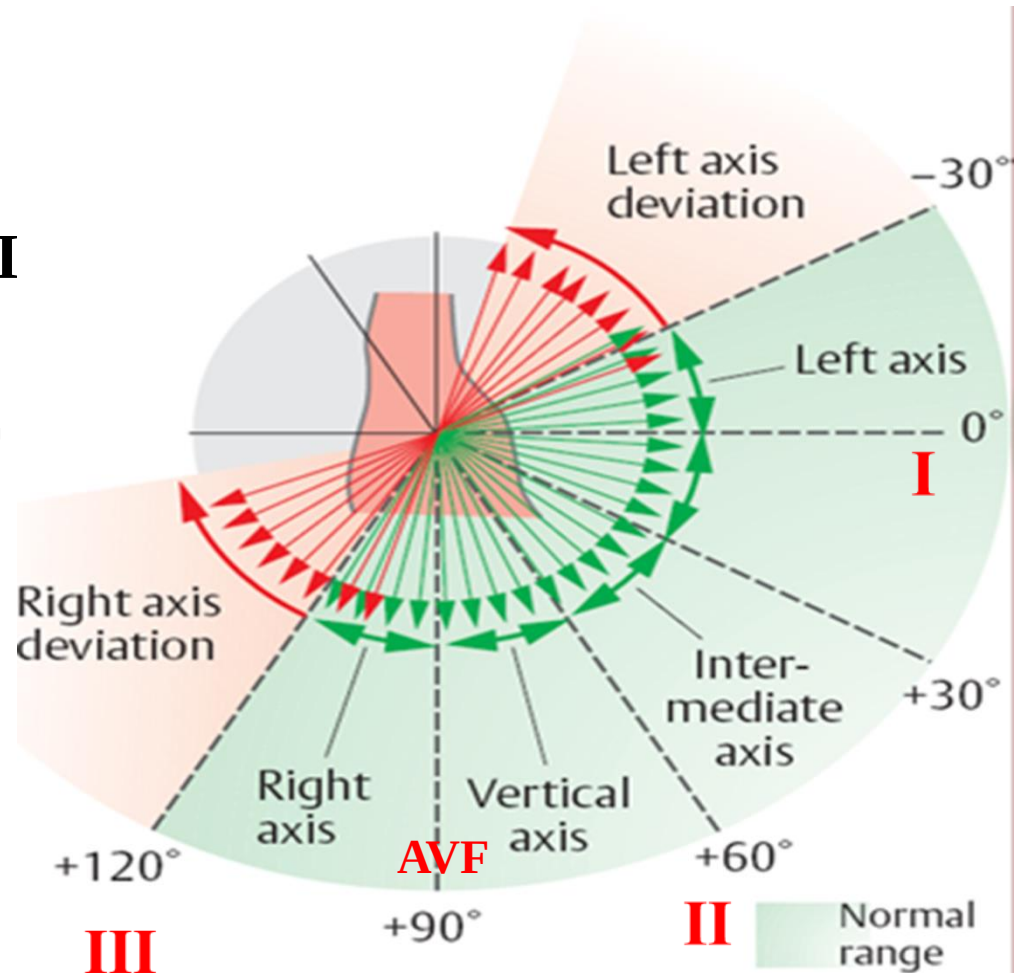
Отклонение ЭОС влево

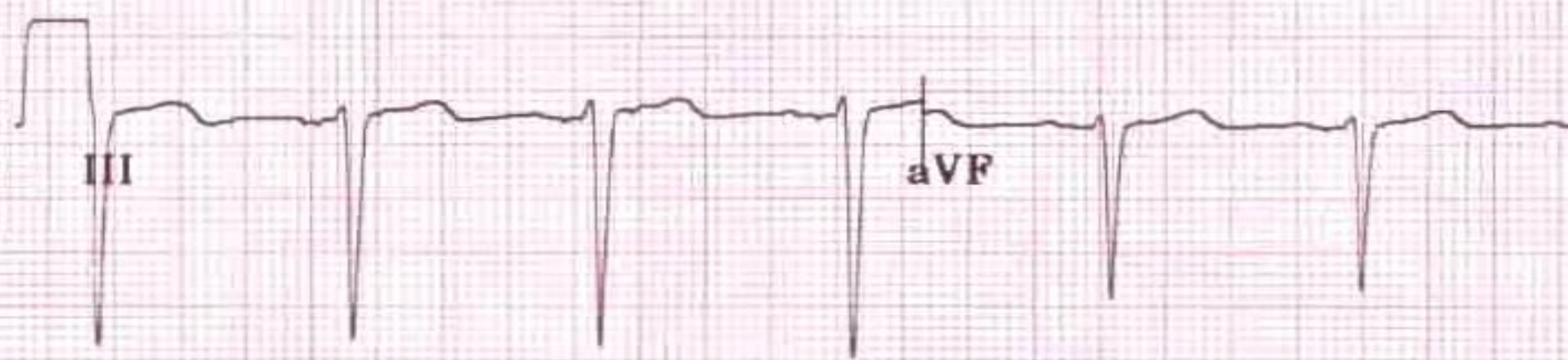
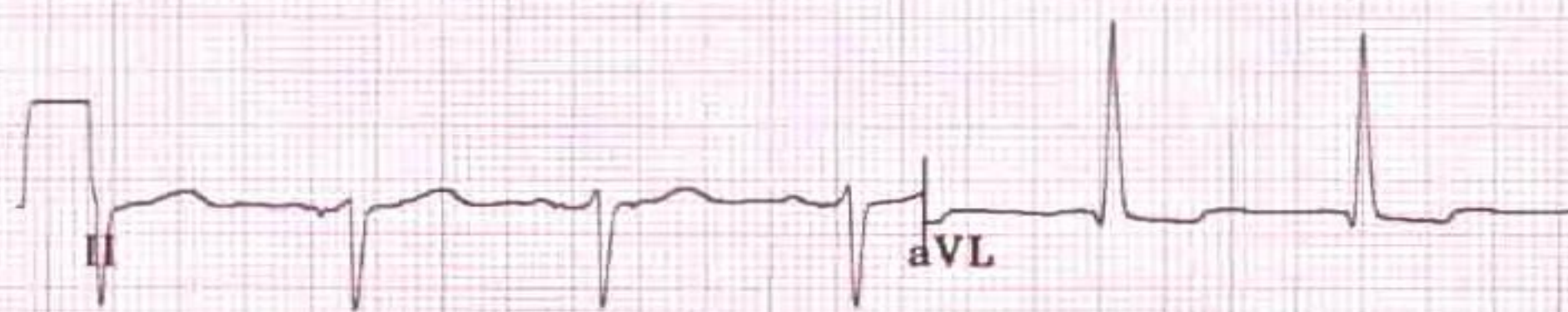
+ 30 – - 50

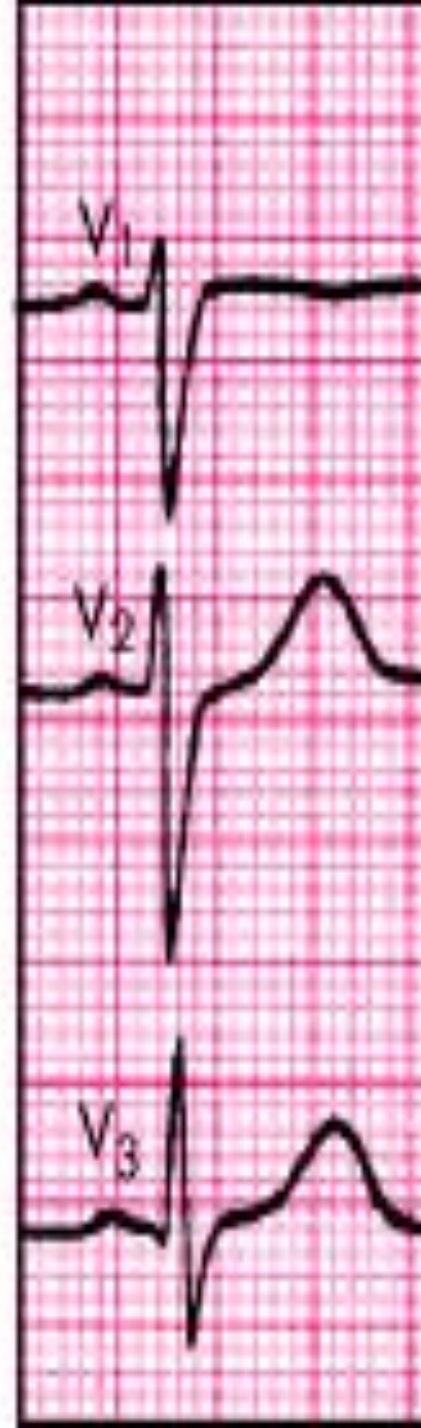


$$R_I > R_{II} > R_{III}$$

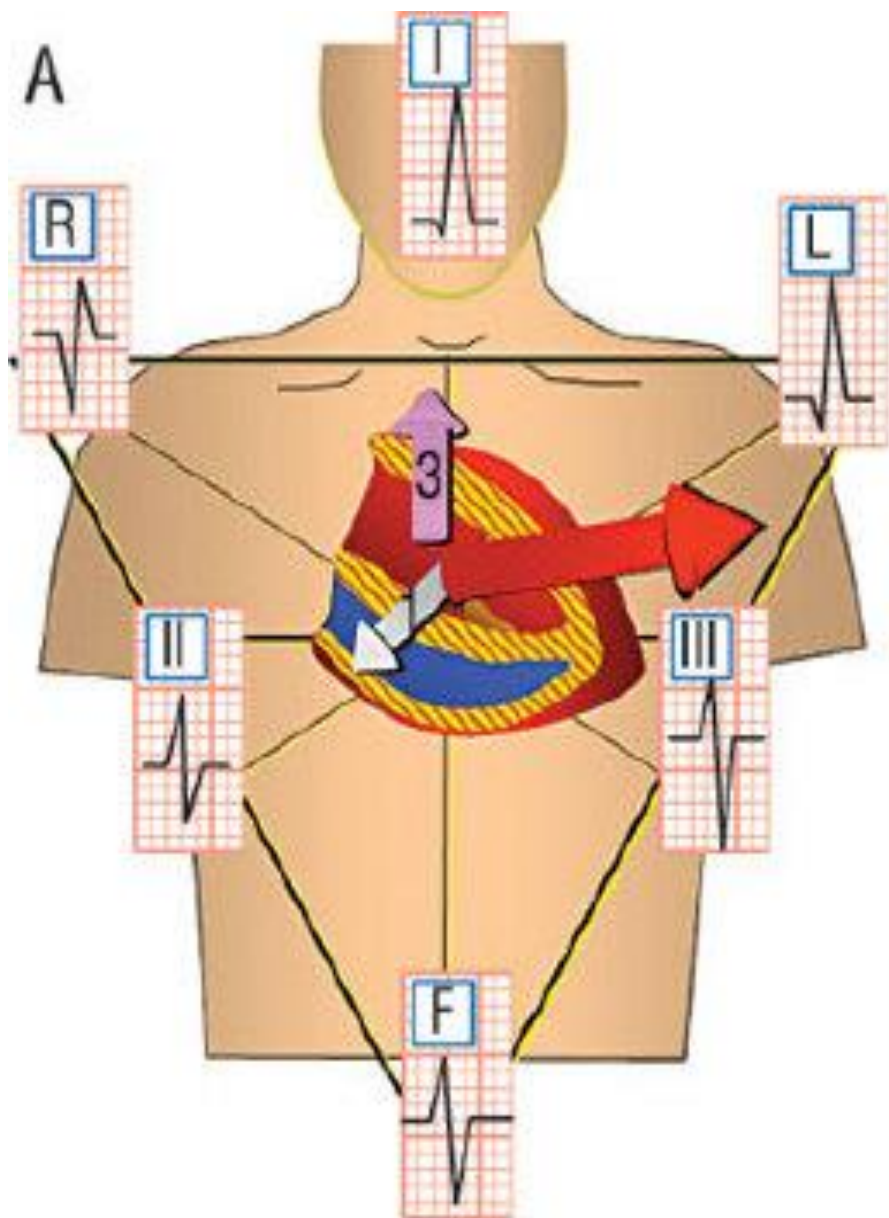
$$S_{AVF} > R_{AVF}$$





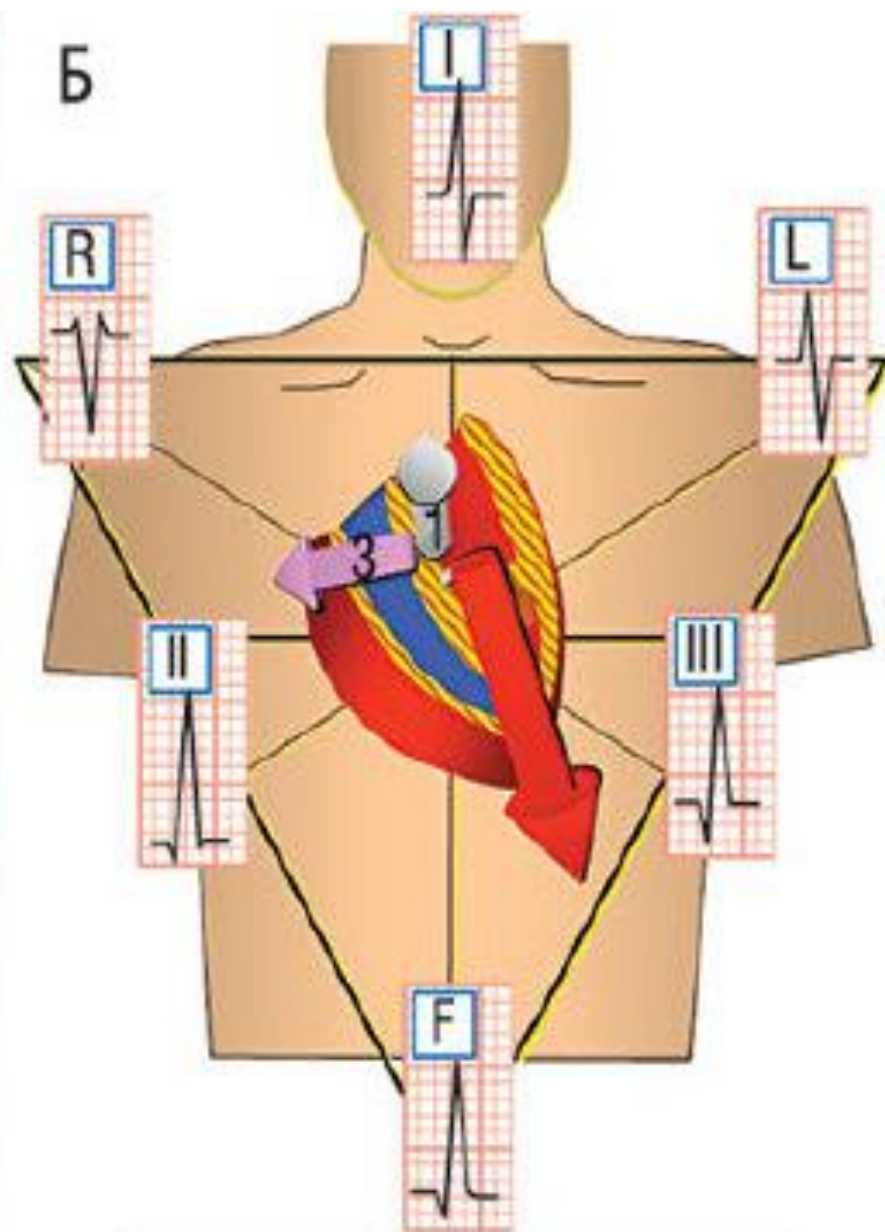


A



Горизонтальная позиция

Б



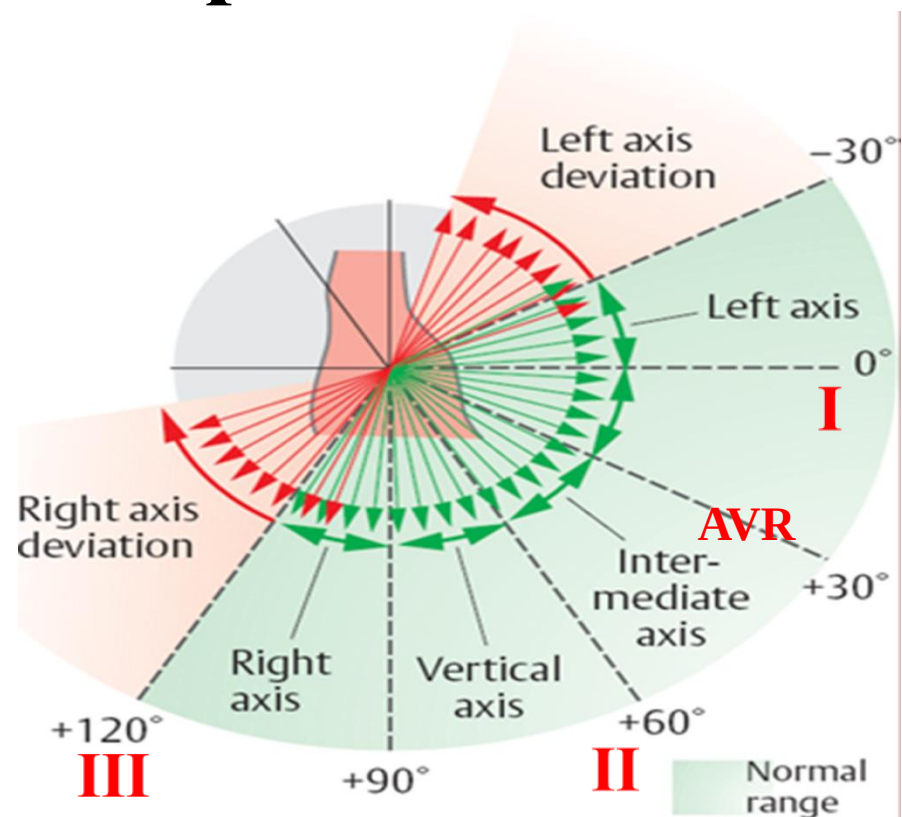
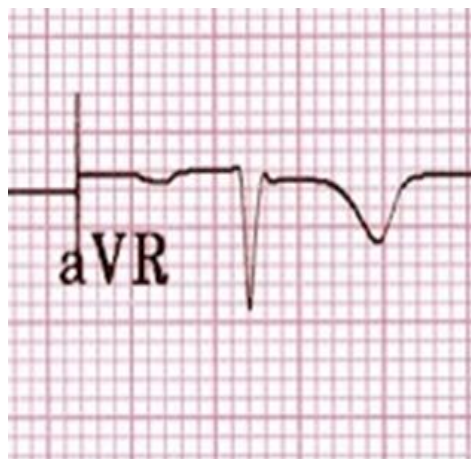
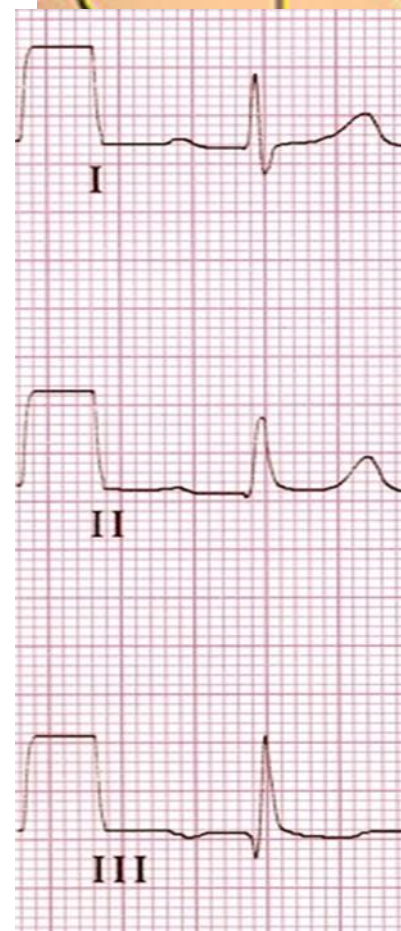
Вертикальная позиция

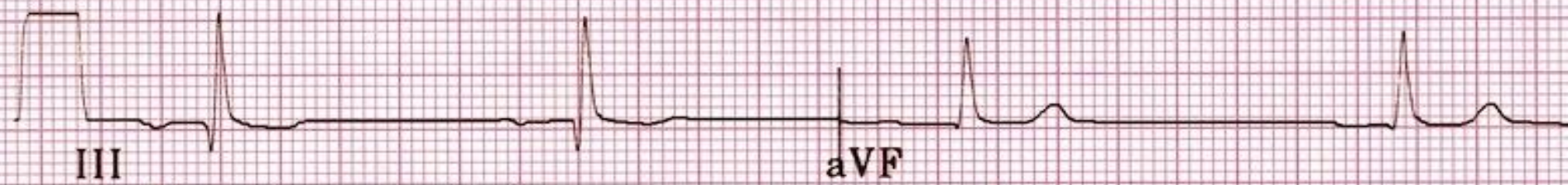
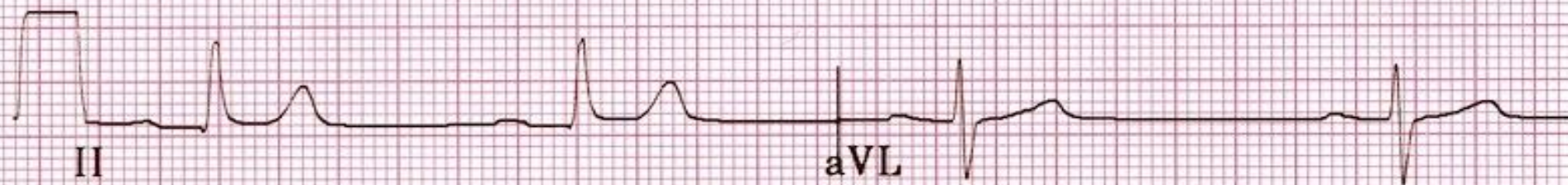
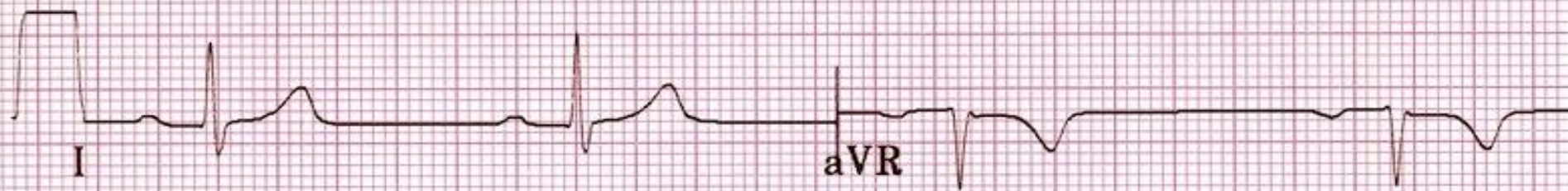
Вертикальная ЭОС

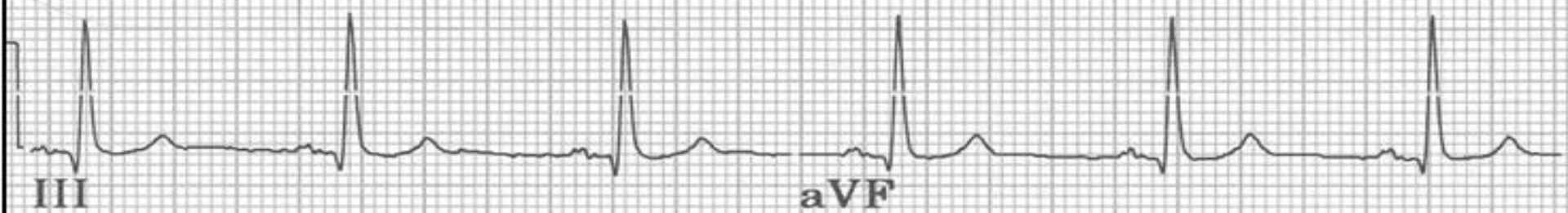
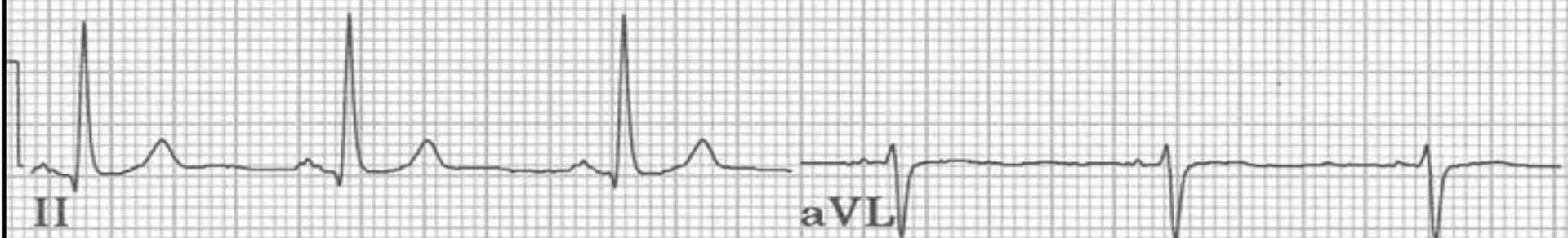
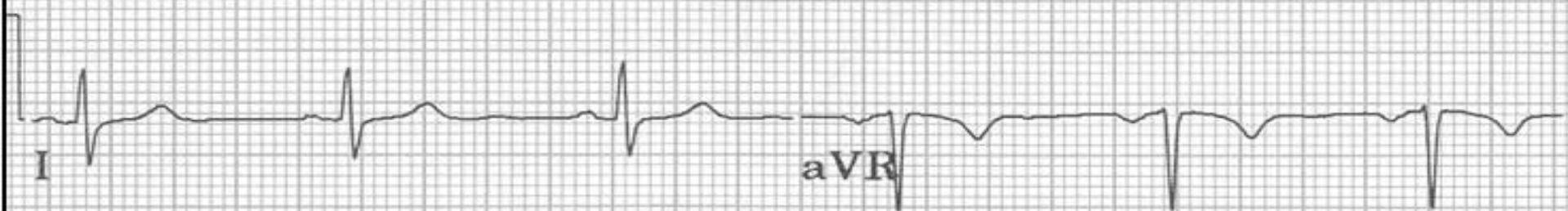
+ 70 – + 110

$R_{III} > R_{II} > R_{III}$

AVR P отр., rS

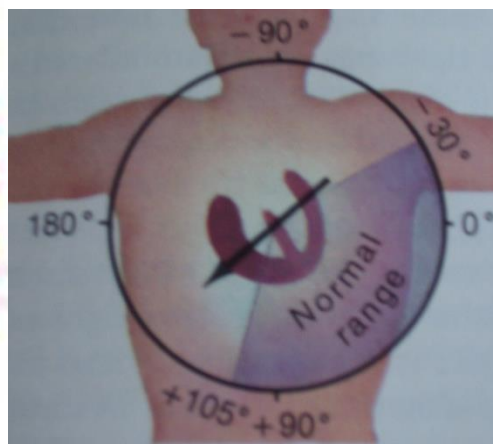








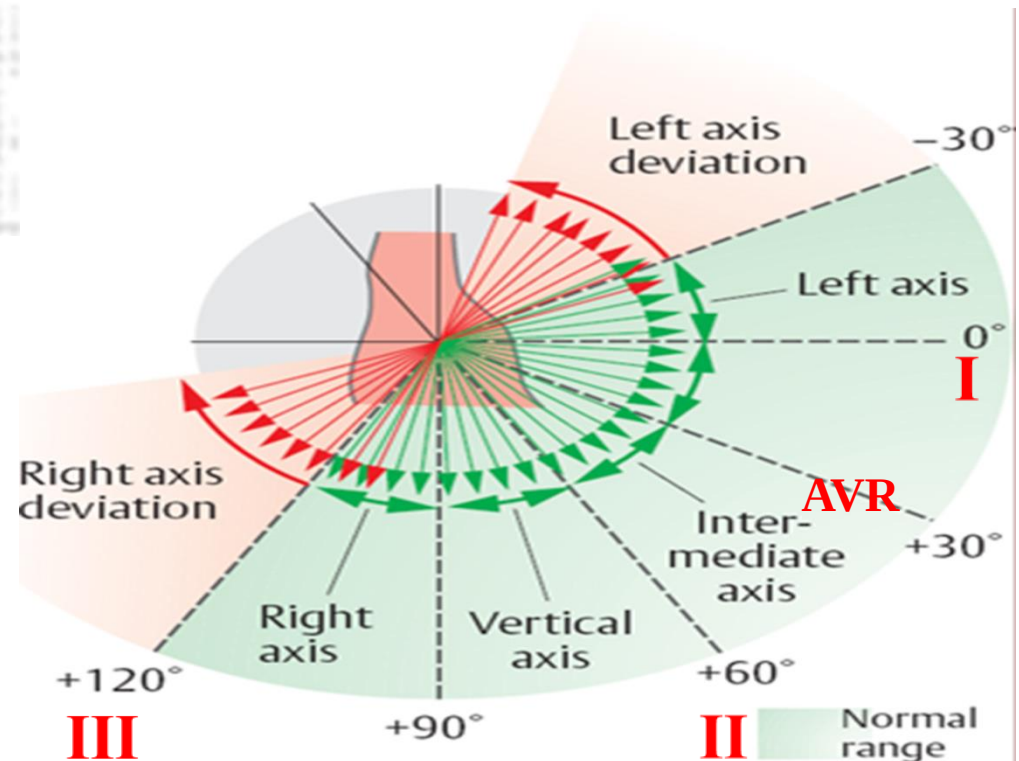
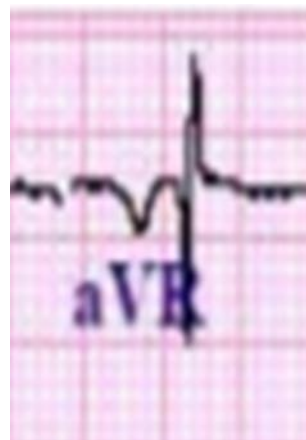
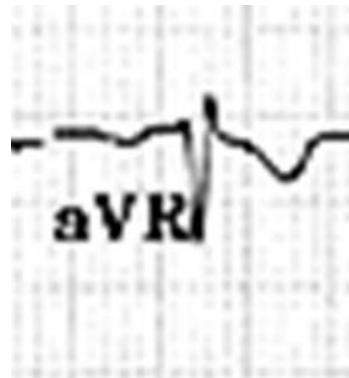
Right Axis Deviation

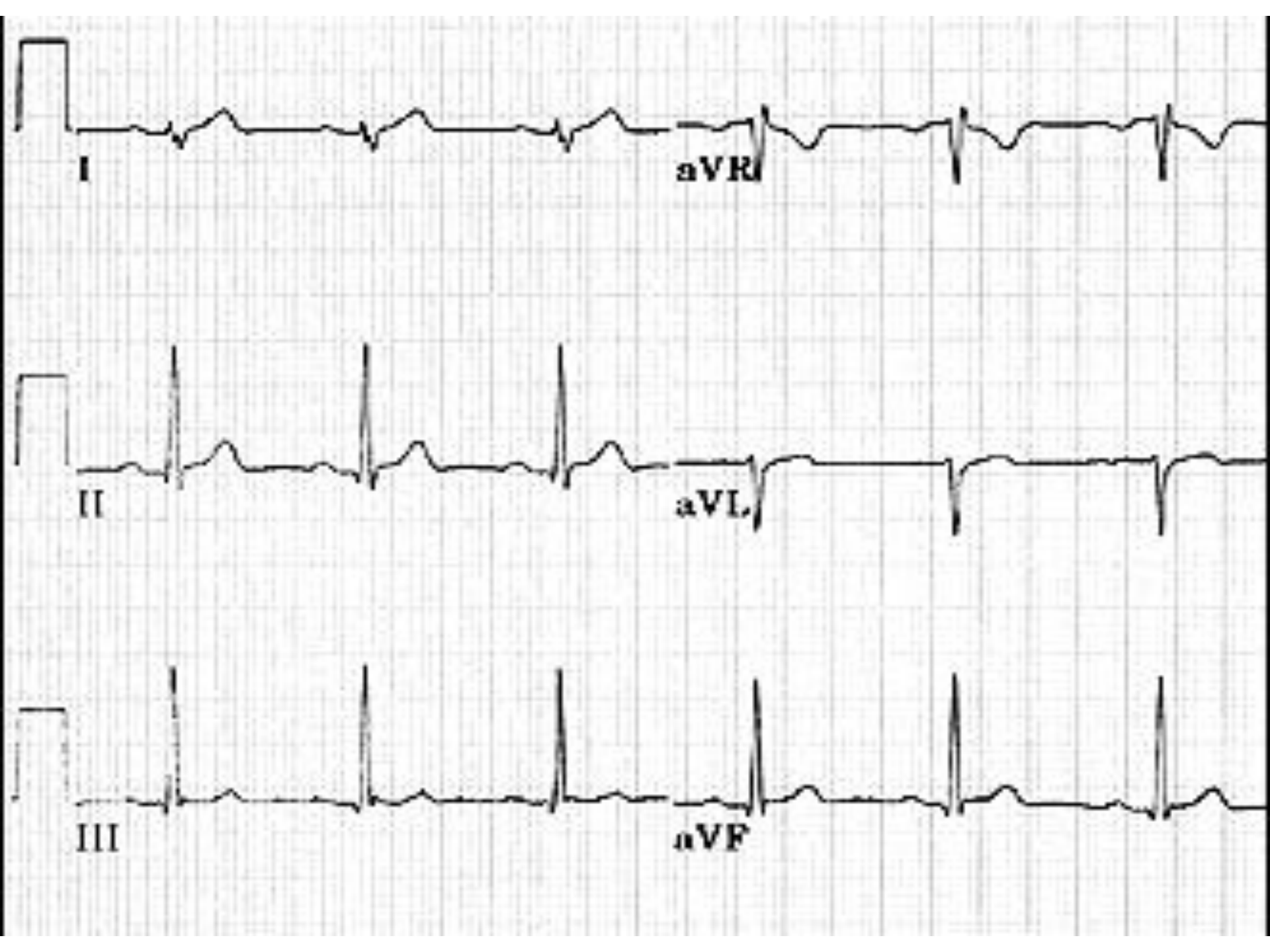


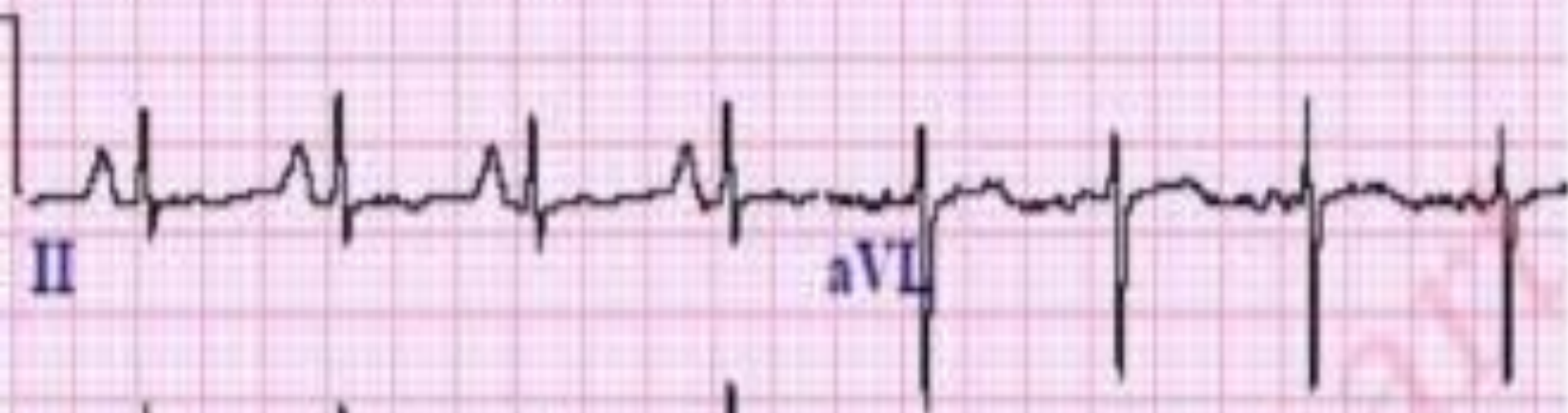
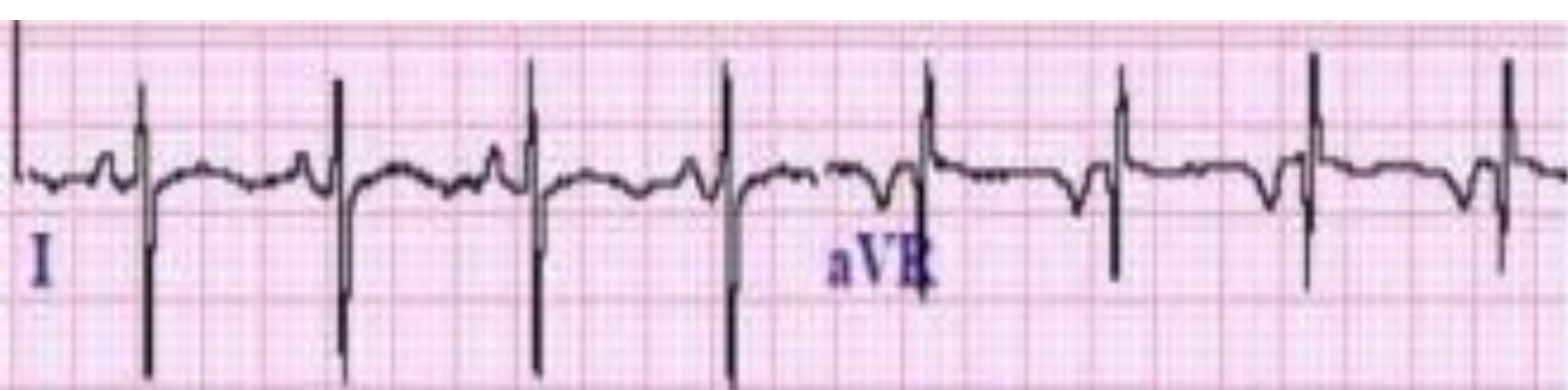
+ 70 – + 140

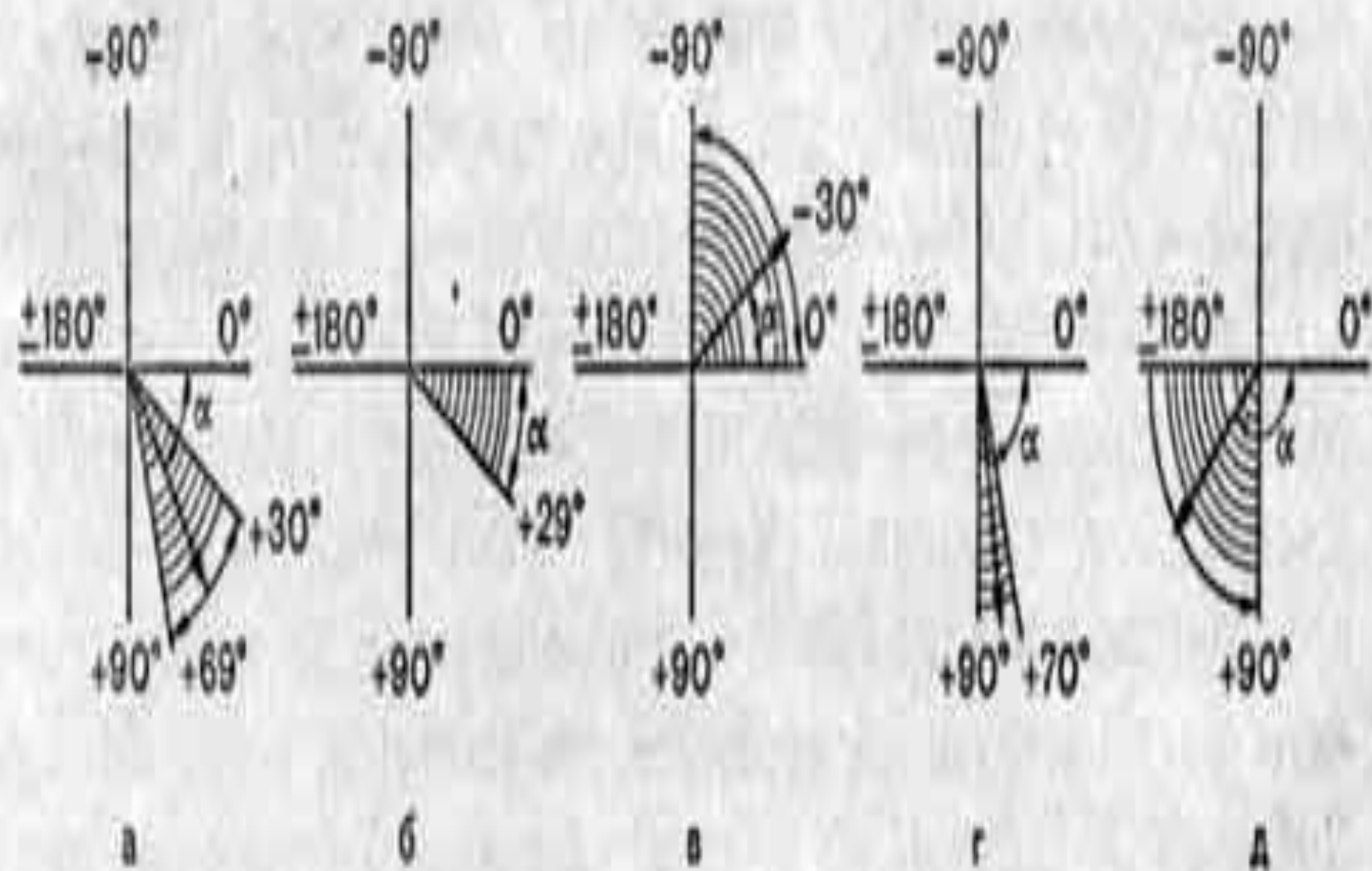
$$R_{III} > R_{II} > R_{III}$$

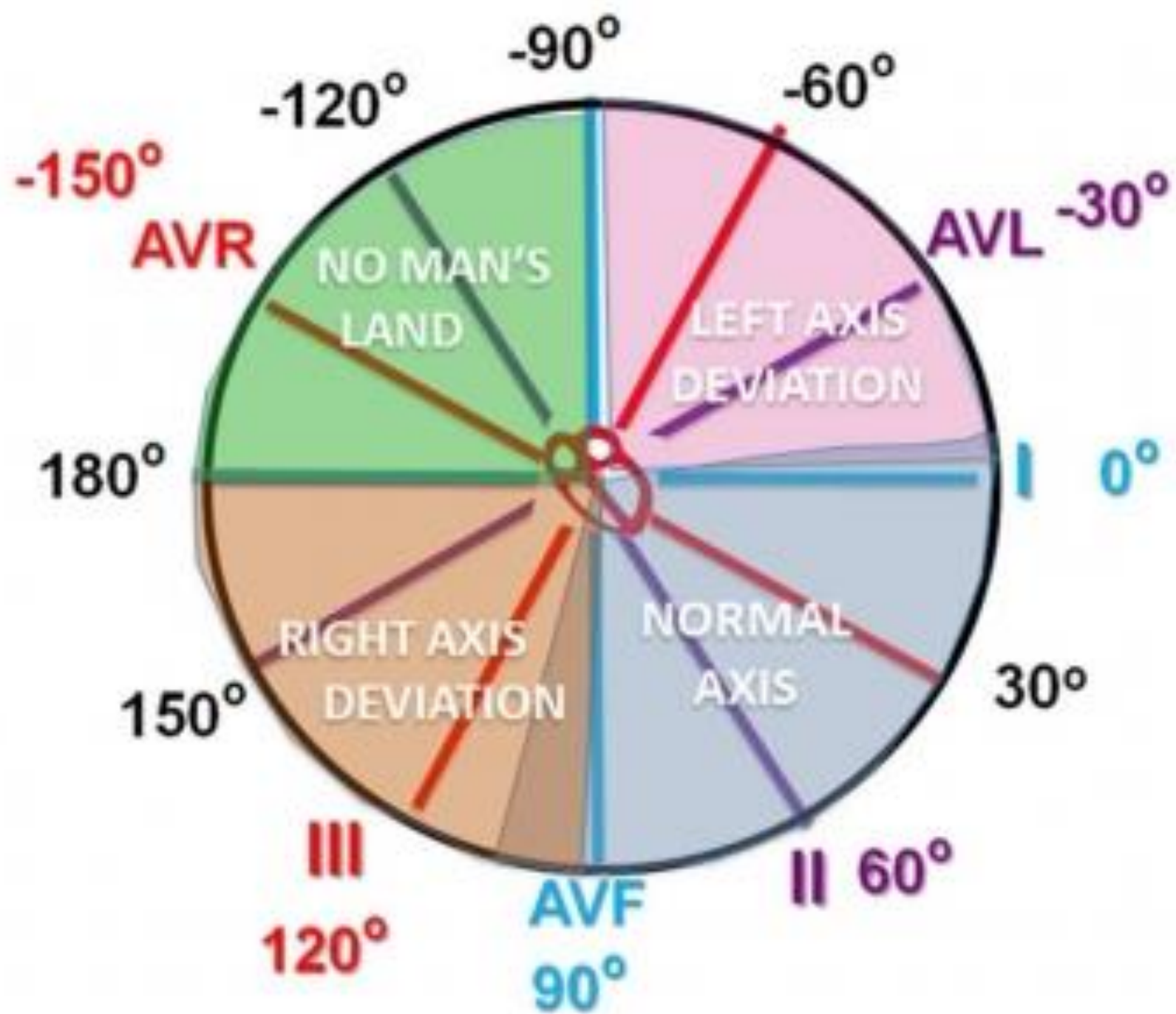
AVR P отп., rSR¹



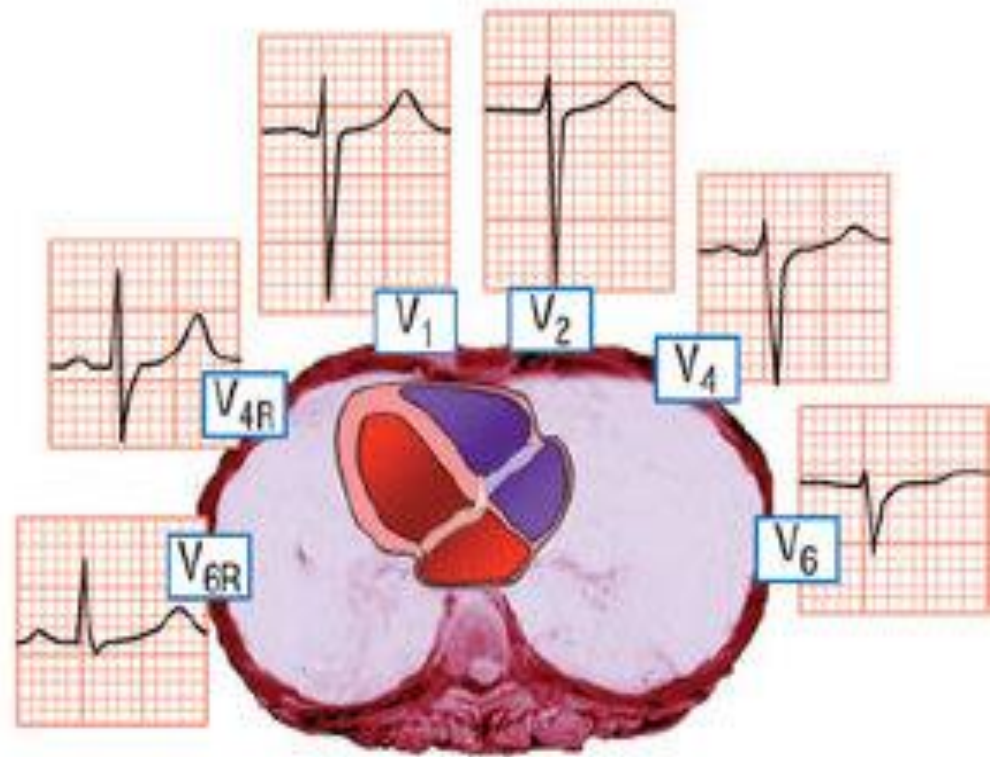
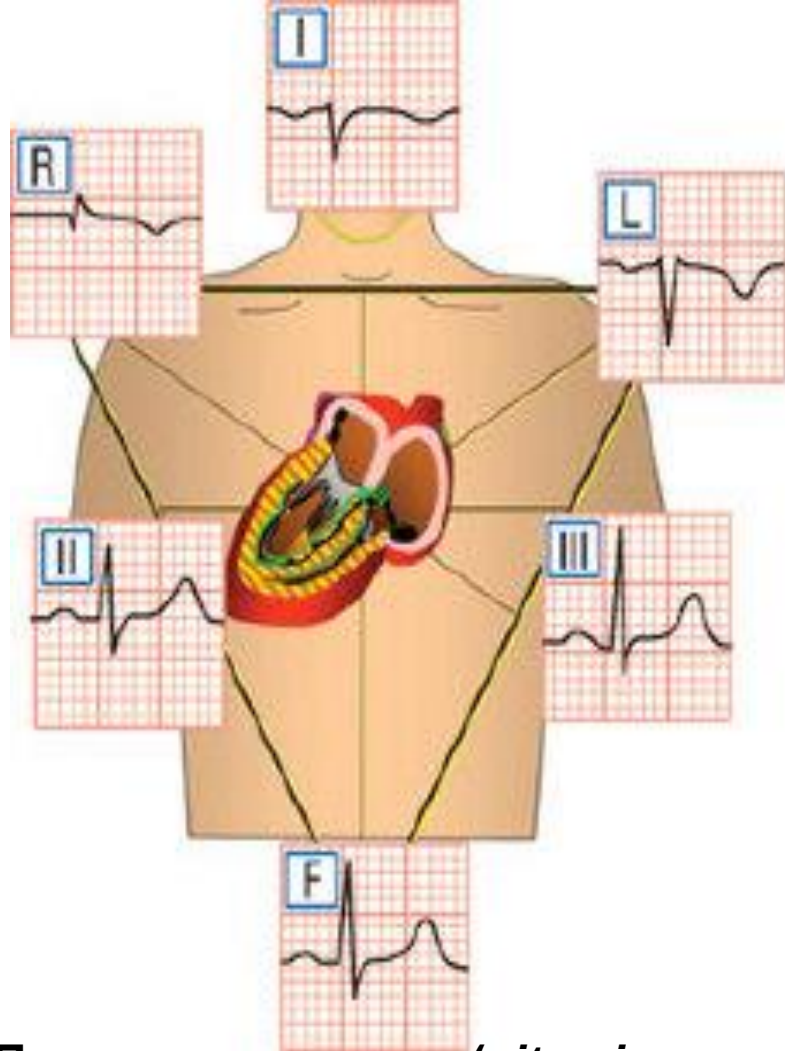




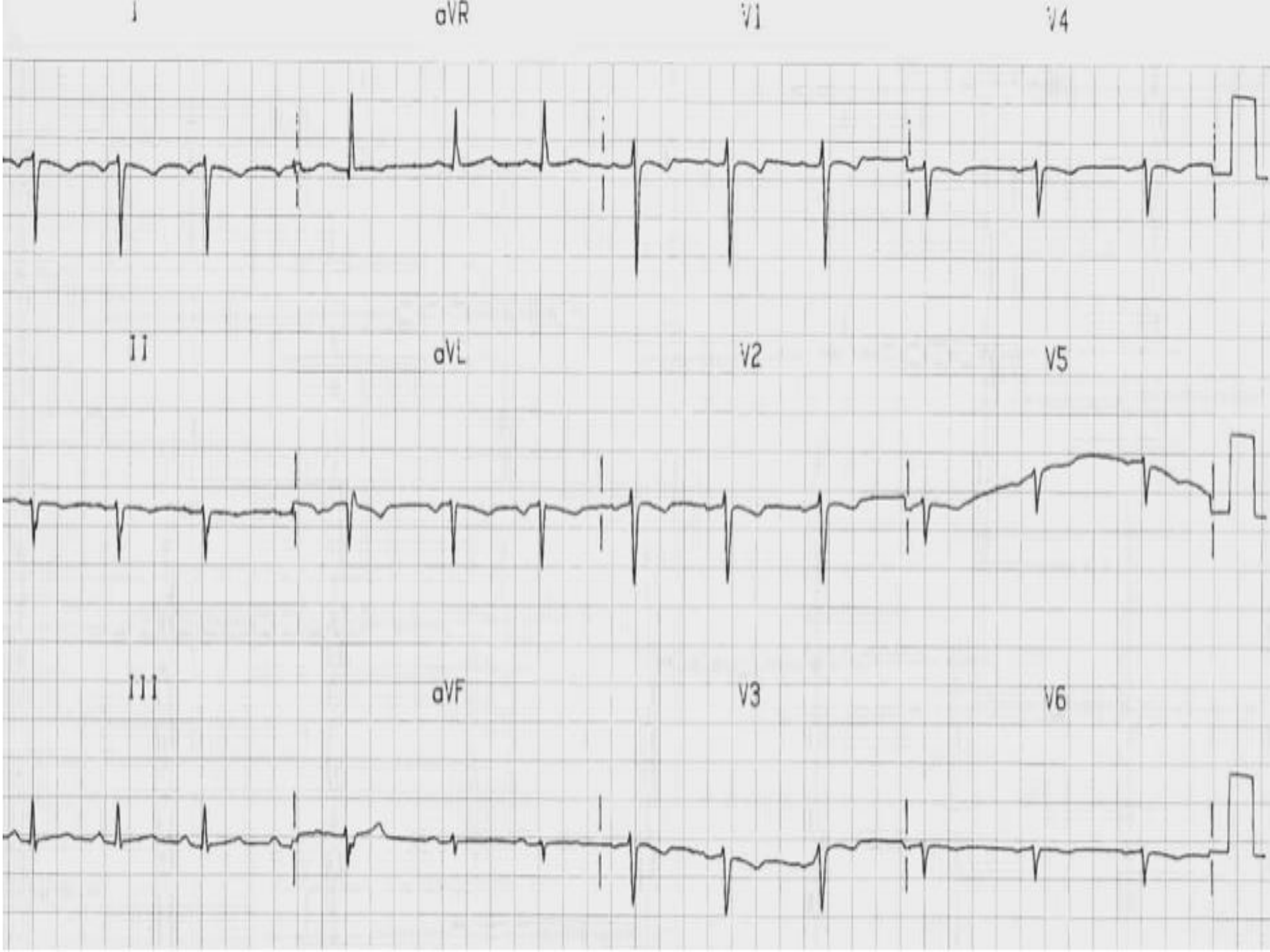




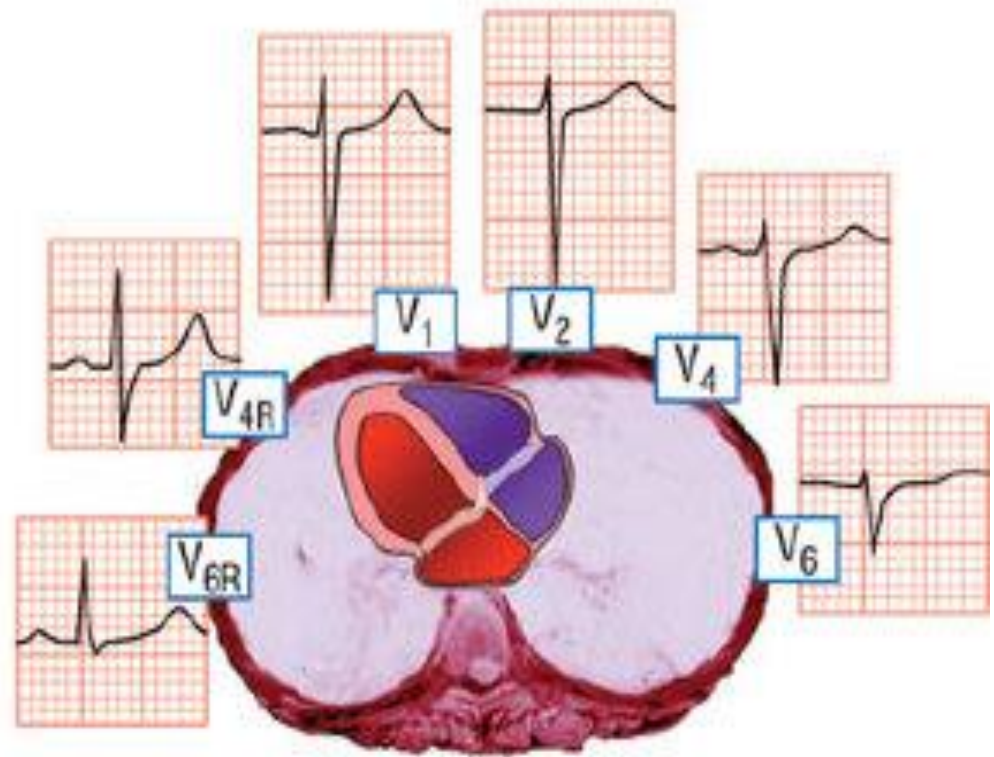
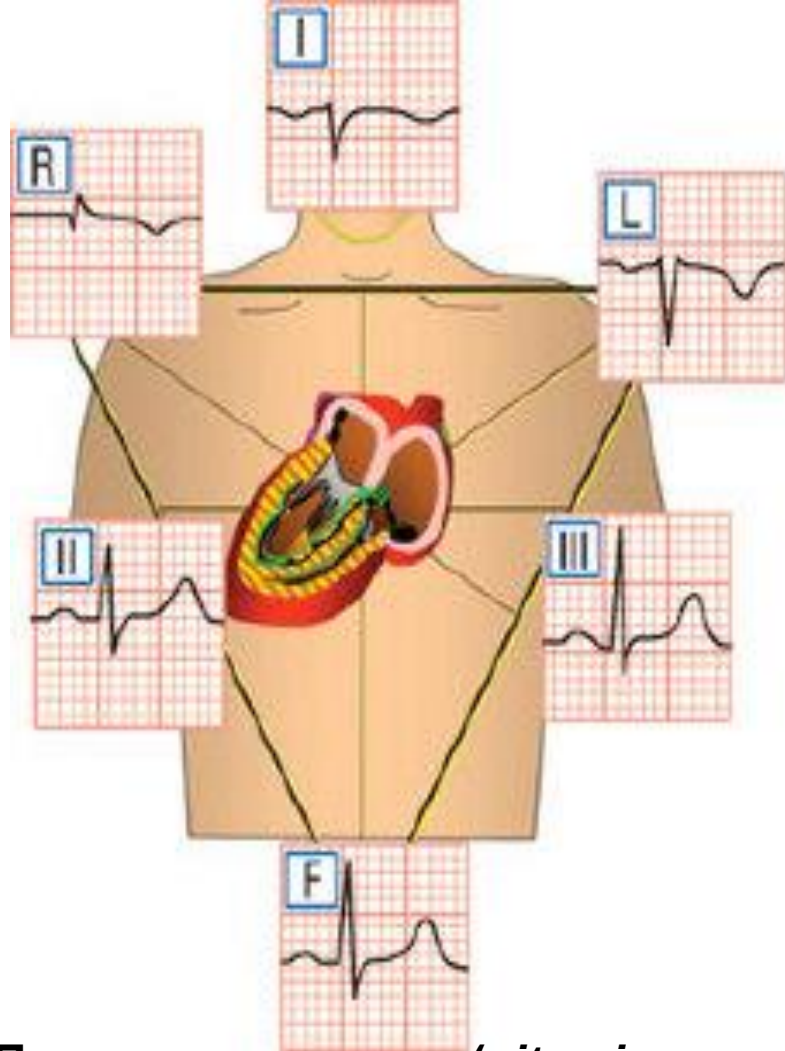
ДЕКСТРОКАРДИЯ



При декстрокардии (*situs inversus*) все параметры электрической позиции сердца зеркально отражаются справа от срединной линии. Зубец *P* будет отрицательным в отведении I, а ось *QRS* будет отклонена в правый нижний квадрант (от $+90^\circ$ до $+180^\circ$). В прекардиальных отведениях не будет происходить нормального развития комплекса от *rS* до *qR* к отведениям *V*₅-*V*₆, но это будет наблюдаться в отведениях, расположенных симметрично на правой половине грудной клетке (*V*_{3R}-*V*_{6R})



ДЕКСТРОКАРДИЯ



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Схематический вид ЭКГ в зависимости от зоны инфаркта

