



SNS COLLEGE OF ALLIED HEALTH SCIENCES- COIMBATORE 35



DEPARTMENT : DEPARTMENT OF CARDIAC TECHNOLOGY

TOPIC : HEXAXIAL REFERENCE

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LECTURER**



▣ **Electrical axis...**

The general direction in the frontal plane or toward which lead the QRS complex is predominately oriented

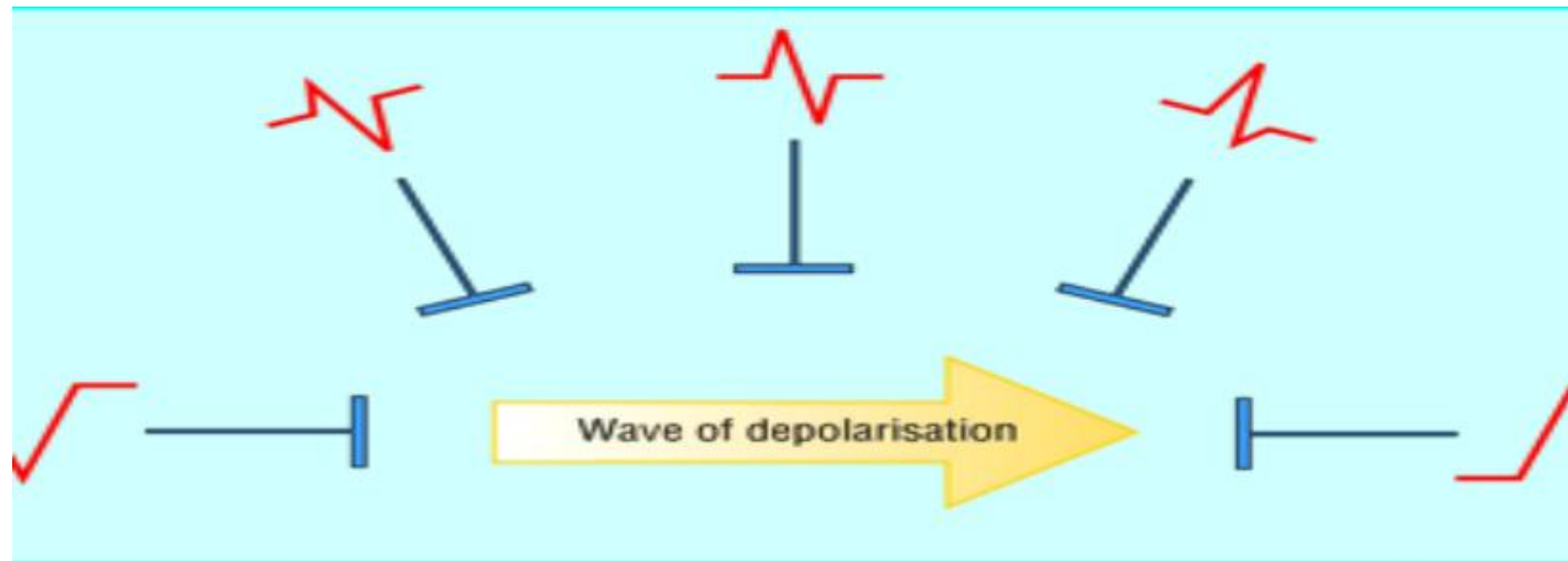
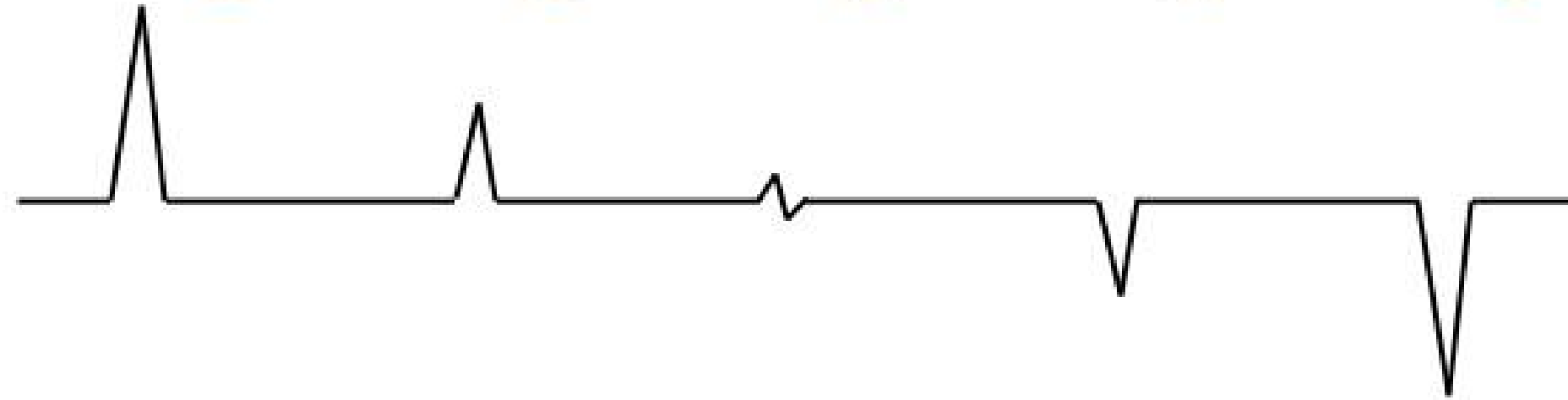
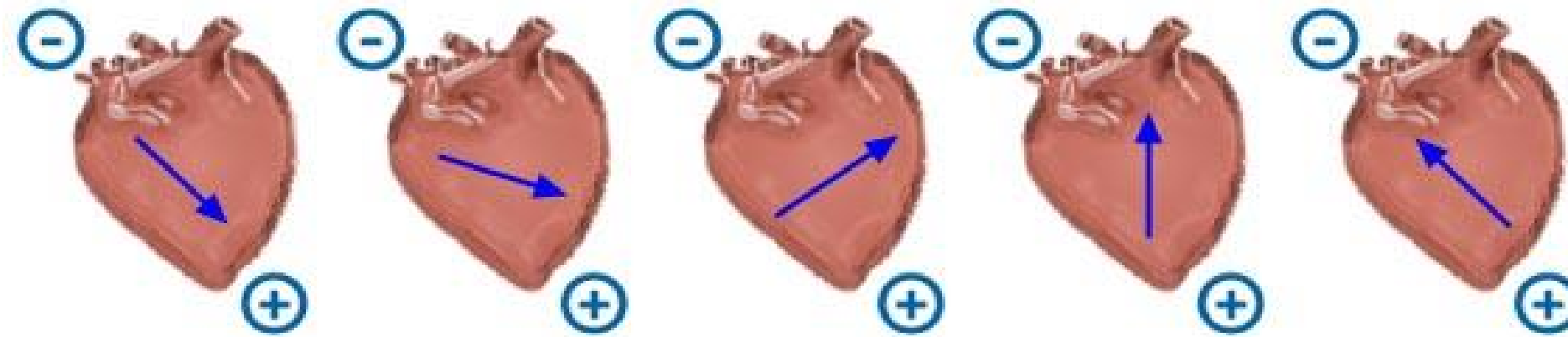
...the mean direction of depolarization through the frontal plane of the heart



General rules

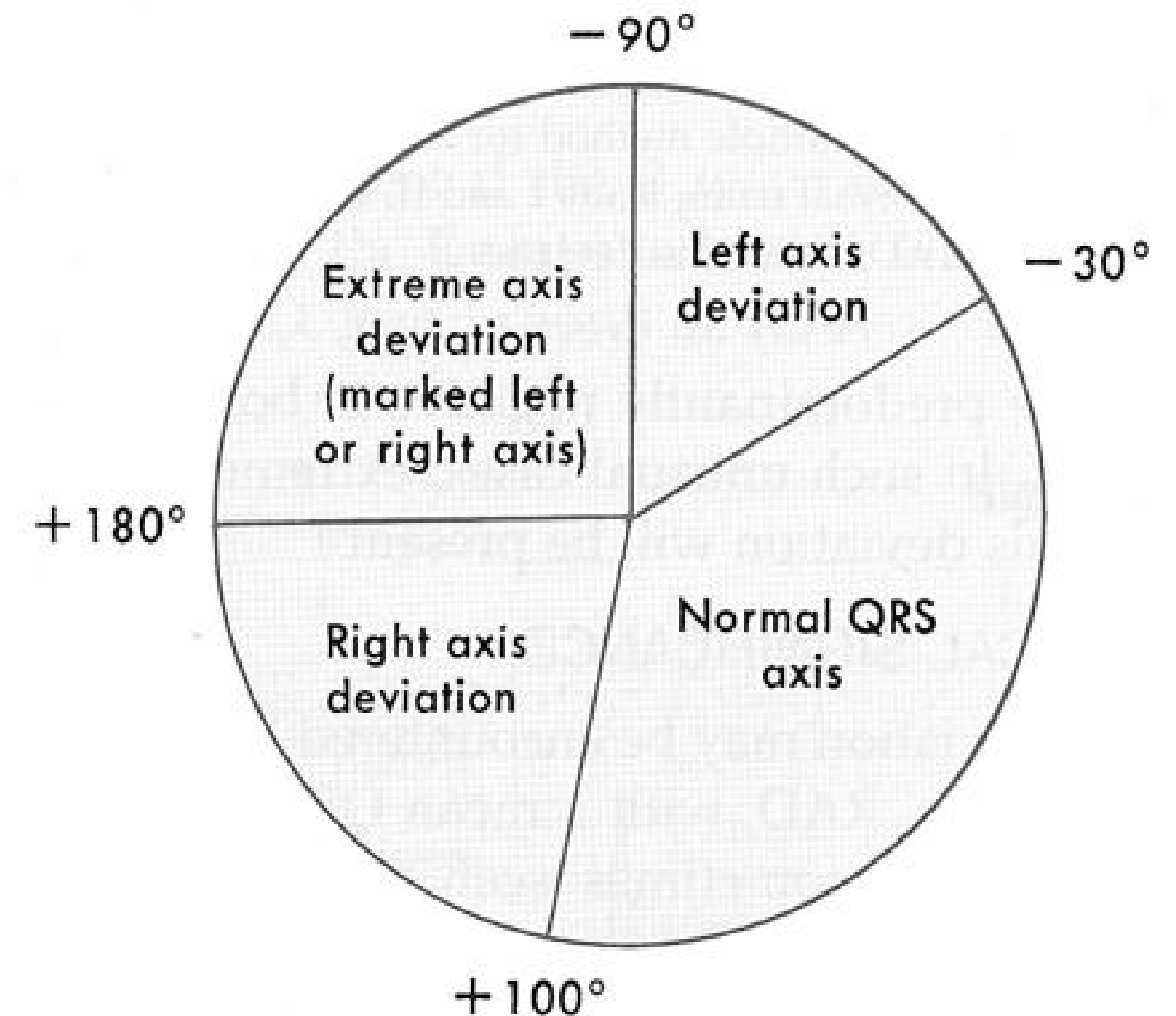
- the mean QRS axis points midway between any two leads that show tall R waves of equal height
- the mean QRS axis is oriented at right angles (90°) to any lead showing a bi-phasic complex
- The axis of the ECG is the major direction of the overall electrical activity of the heart. It can be normal, leftward (left axis deviation, or LAD), rightward (right axis deviation, or RAD) or indeterminate (northwest axis).
- The QRS axis is the most important to determine. However, the P wave or T wave axis can also be measured.

LEAD II



AXIS DEVIATION

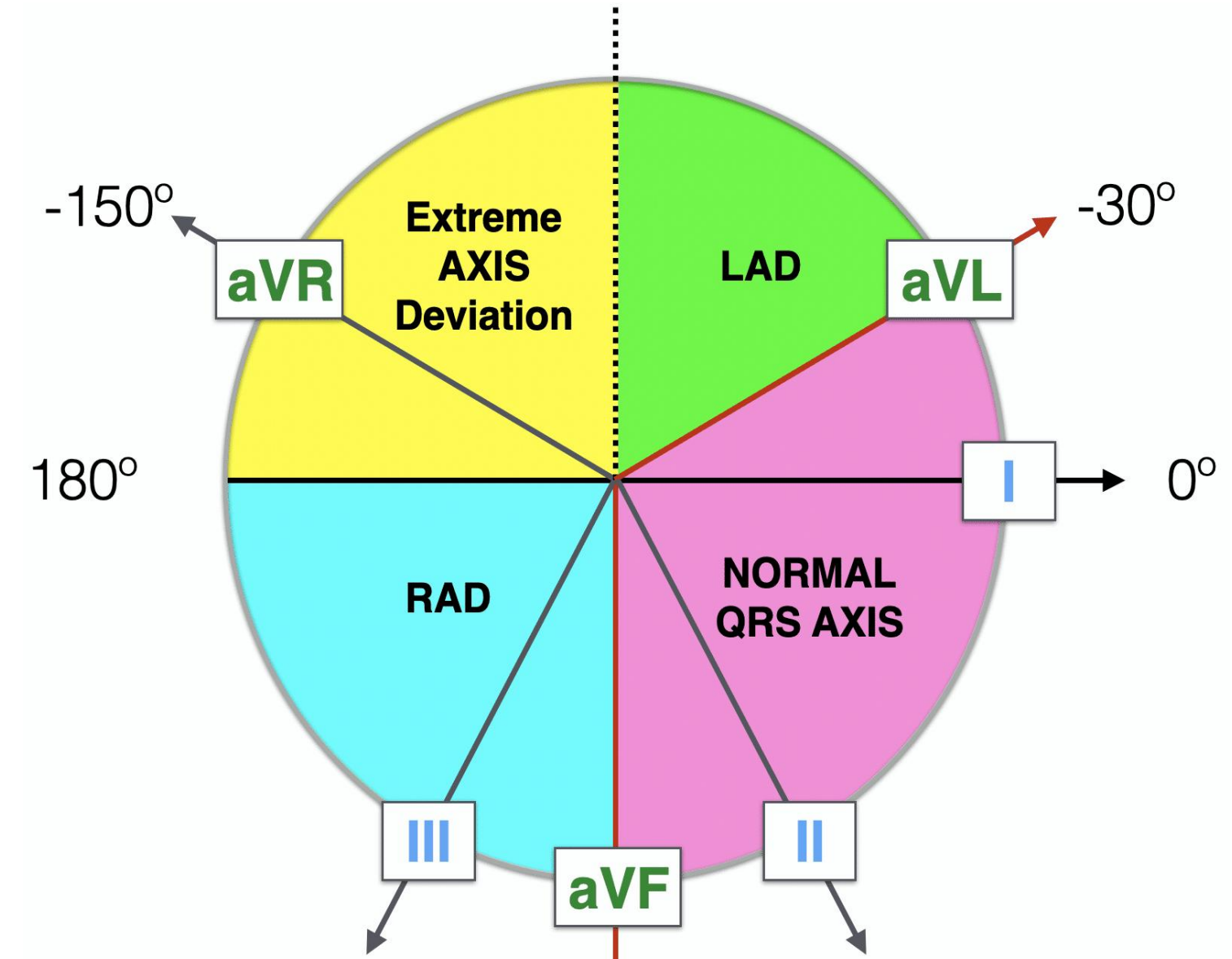
- To determine the QRS axis, the limb leads (not the precordial leads) need to be examined. The depiction of the standard leads and their relationship to the cardiac axis is below.
- Note that lead I is at zero degrees, lead II is at +60 degrees, and lead III is at +120 degrees. Lead aVL (L for left arm) is at -30 degrees and lead aVF (F for foot) is at +90 degrees. The negative of lead aVR (R for right arm) is at +30 degrees; the positive of lead aVR is actually at -150 degrees.





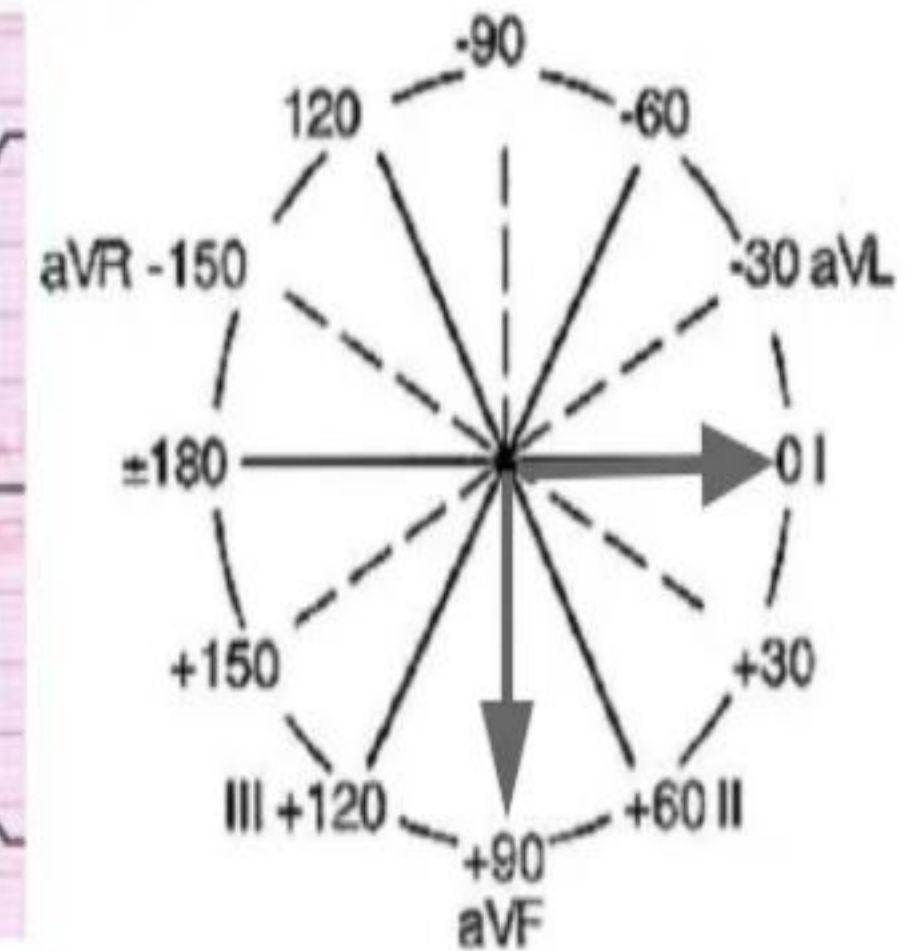
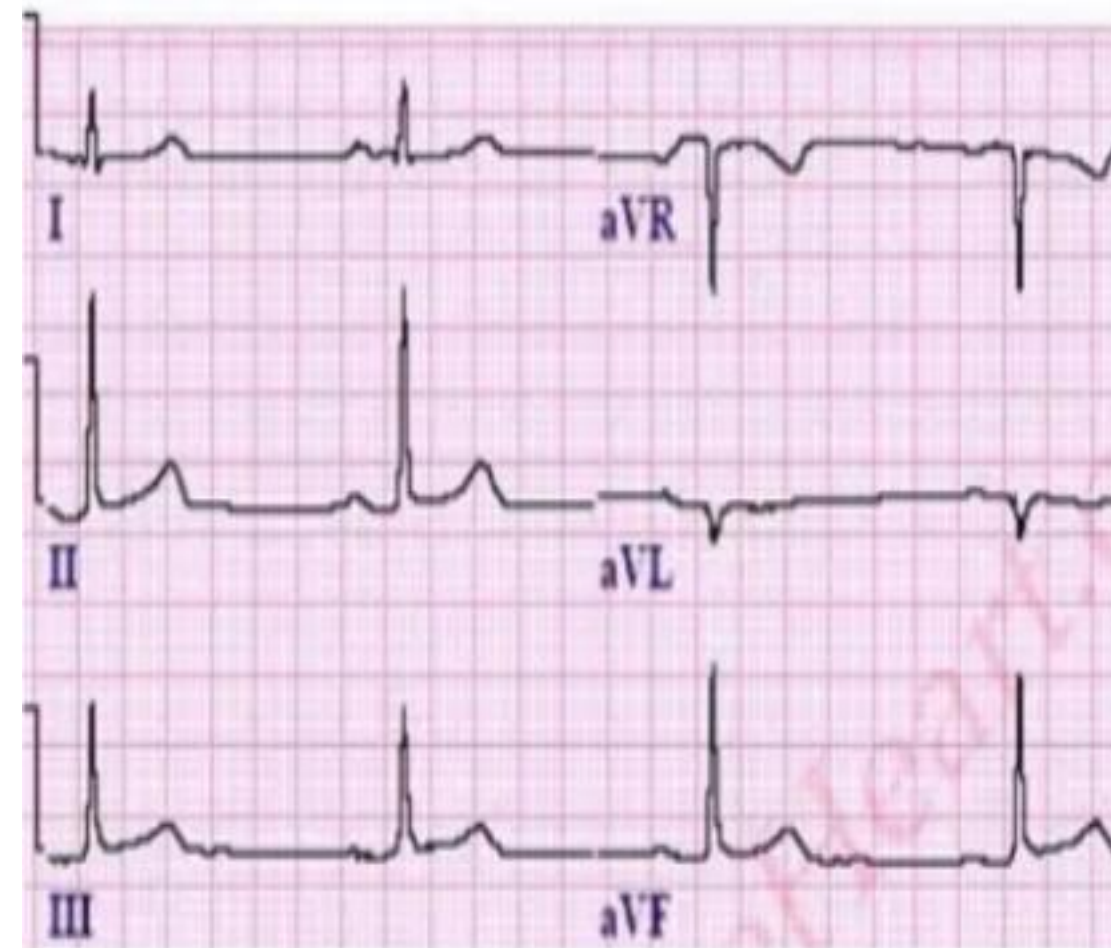
Normal	Positive	Positive
LAD	Positive	Negative
RAD	Negative	Positive
Intermediate axis	Negative	Negative

- The normal QRS axis should be between -30 and $+90$ degrees. Left axis deviation is defined as the major QRS vector, falling between -30 and -90 degrees.
- Right axis deviation occurs with the QRS axis and is between $+90$ and $+180$ degrees. Indeterminate axis is between $+/- 180$ and -90 degrees.
- LAD = Left Axis Deviation
- RAD = Right Axis Deviation
- NW = Northwest axis, or indeterminate axis



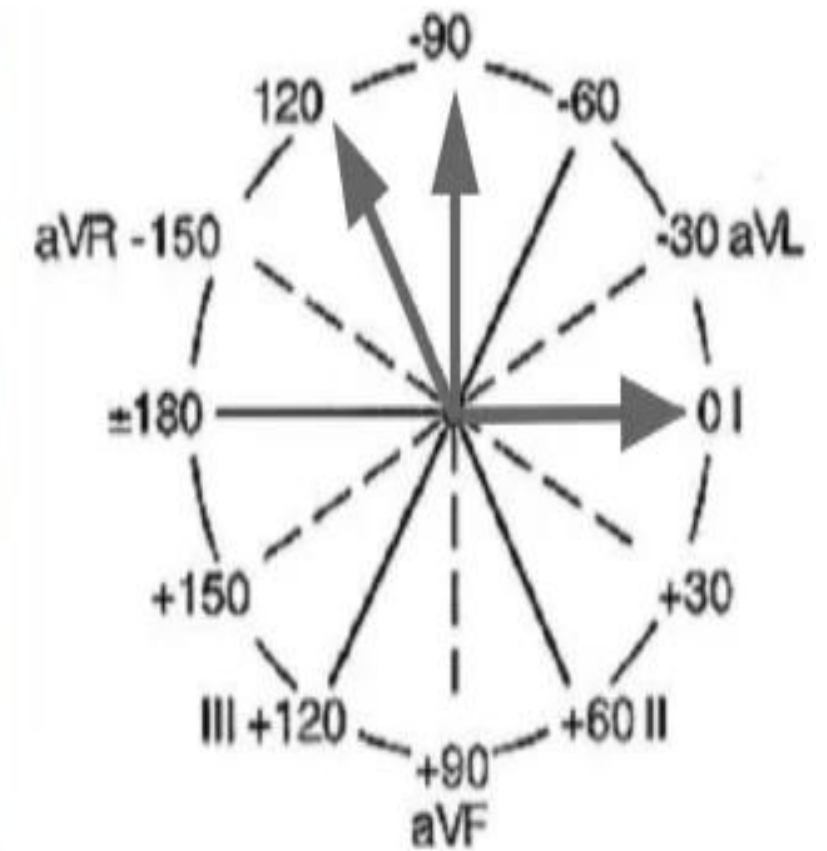
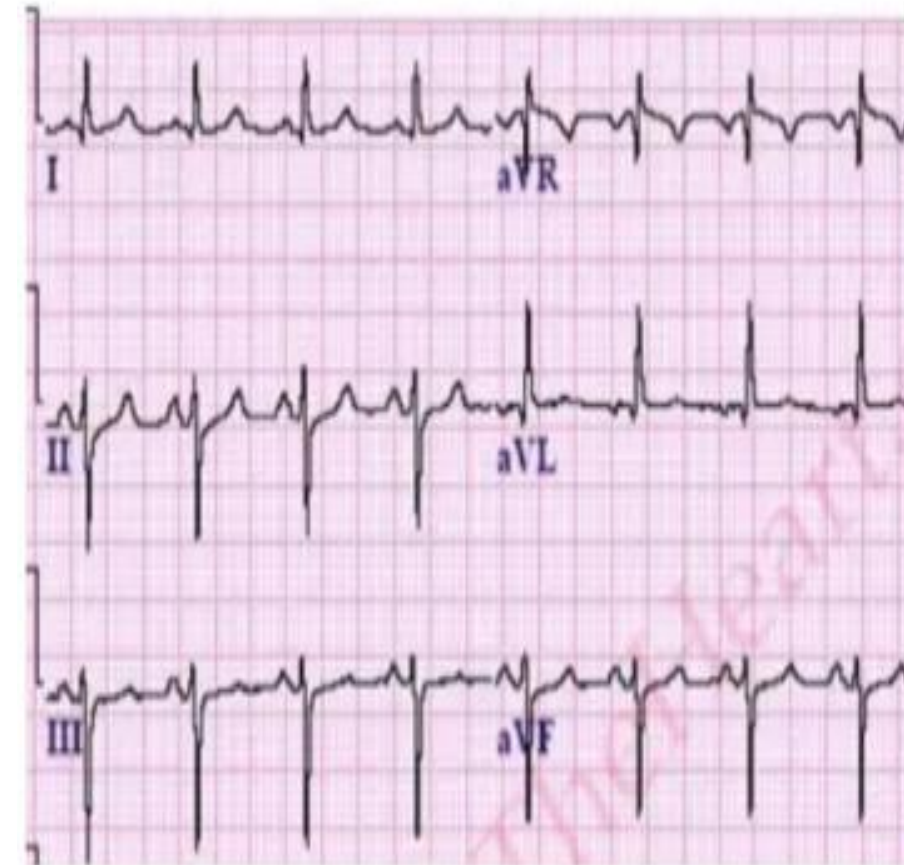
Normal QRS Axis

- If the QRS complex is upright (positive) in both lead I and lead aVF, then the axis is normal. The image below demonstrates this example, with the electrical vector heading towards the positive of lead I and the positive of lead aVF, as indicated by the arrows.
- The QRS axis is thus between these two arrows, which falls within the normal range.



Normal QRS Axis: Positive in Lead I and aVF

- **Left Axis Deviation**
- If the QRS is upright in lead I (positive) and downward in lead aVF (negative), then the axis is between 0 and -90 degrees. However, recalling that left axis deviation is defined as between -30 and -90, this scenario is not always technically left axis deviation. In this scenario, the QRS axis could fall between 0 and -30, which is within normal limits. To further distinguish normal from left axis deviation in this setting, look at lead II. If lead II is downward (negative), then the axis is more towards -120, and left axis deviation is present.
- If the QRS complex in lead II is upright (positive), then the axis is more towards +60 degrees, and the QRS axis is normal.



Left Axis Deviation of the QRS Axis:
Positive in Lead I, negative in lead aVF and lead II



The causes of LAD are listed below. Note that the first three account for almost 90% of ECG tracings with LAD.

- Normal variant
- Left anterior fascicular block
- Left ventricular hypertrophy (rarely with LVH; usually axis is normal)
- Left bundle branch block (rarely with LBBB)
- Mechanical shift of heart in the chest (lung disease, prior chest surgery, etc.)
- Inferior myocardial infarction
- Wolff-Parkinson-White syndrome with “pseudoinfarct” pattern
- Ventricular rhythms (accelerated idioventricular or ventricular tachycardia)
- Ostium primum atrial septal defect
- Below is an example of LAD to help visualize the above explanation.



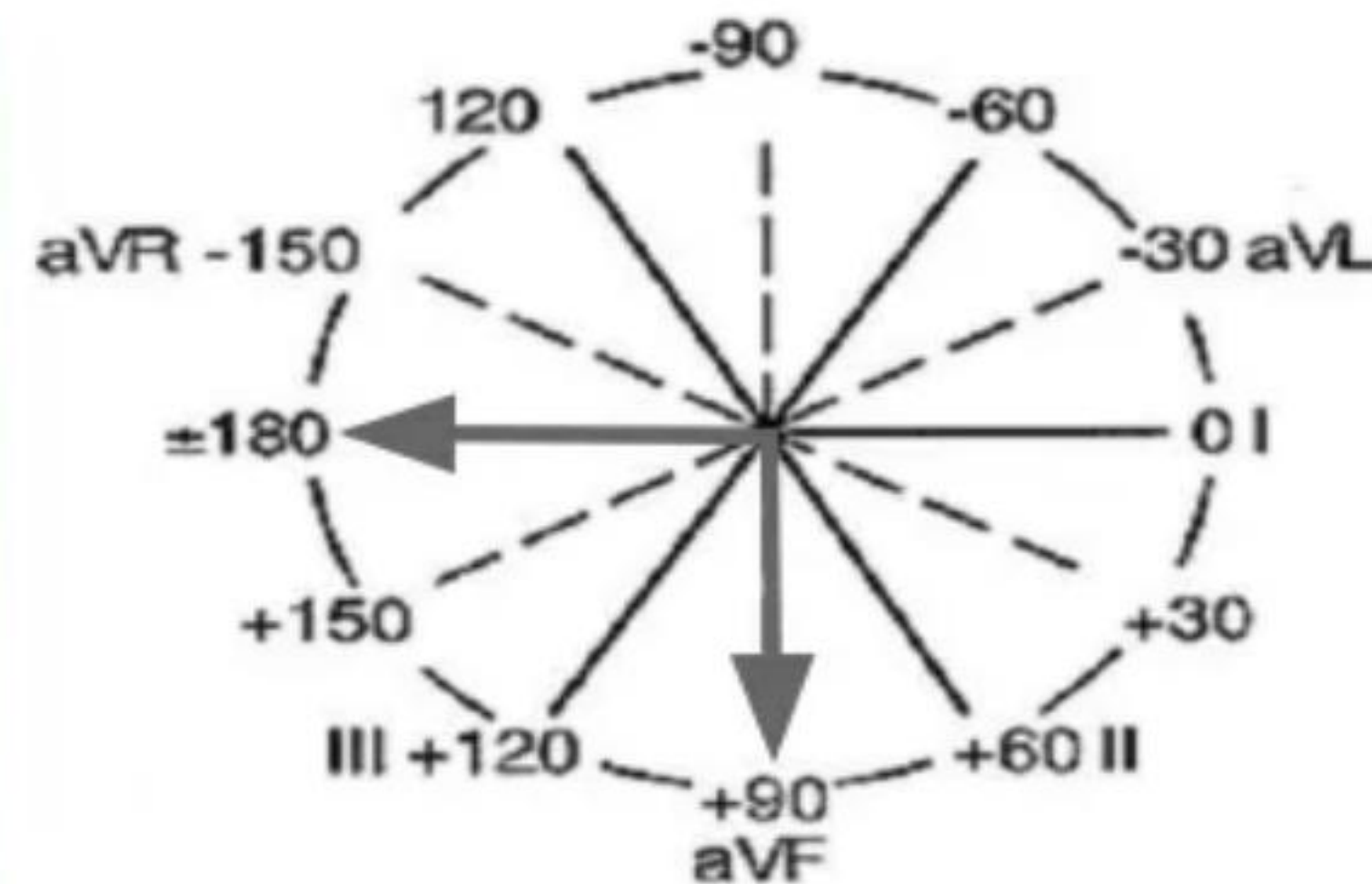
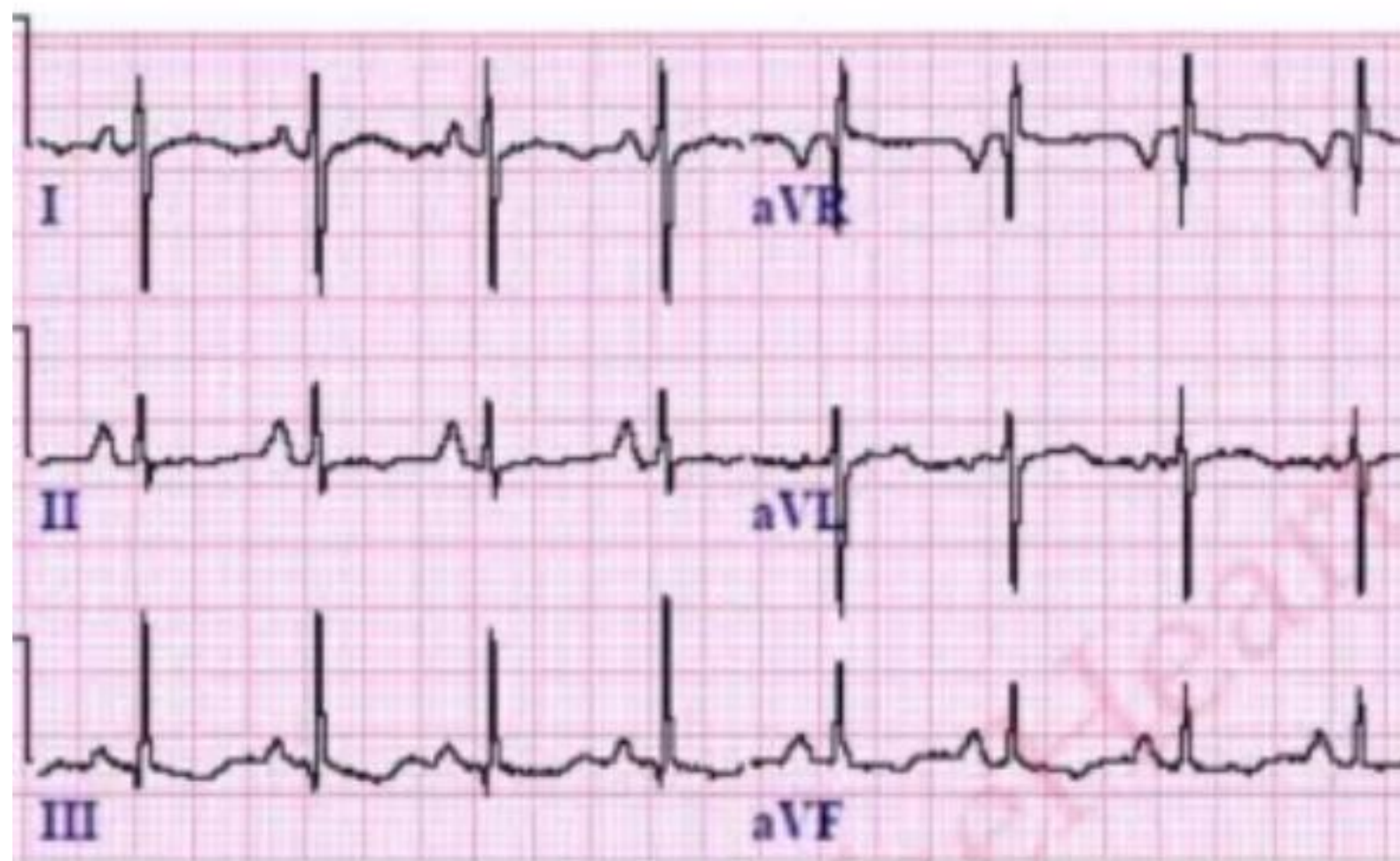
Right Axis Deviation

If the QRS is predominantly negative in lead I and positive in lead aVF, then the axis is rightward (right axis deviation).

The causes of RAD are listed below.

- ❖ Normal variant
- ❖ Right bundle branch block
- ❖ Right ventricular hypertrophy
- ❖ Left posterior fascicular block
- ❖ Dextrocardia
- ❖ Ventricular rhythms (accelerated idioventricular or ventricular tachycardia)
- ❖ Lateral wall myocardial infarction
- ❖ Wolff-Parkinson-White syndrome
- ❖ Acute right heart strain/pressure overload — also known as McGinn-White Sign or S1Q3T3 that occurs in pulmonary embolus

RIGHT AXIS DEVIATION



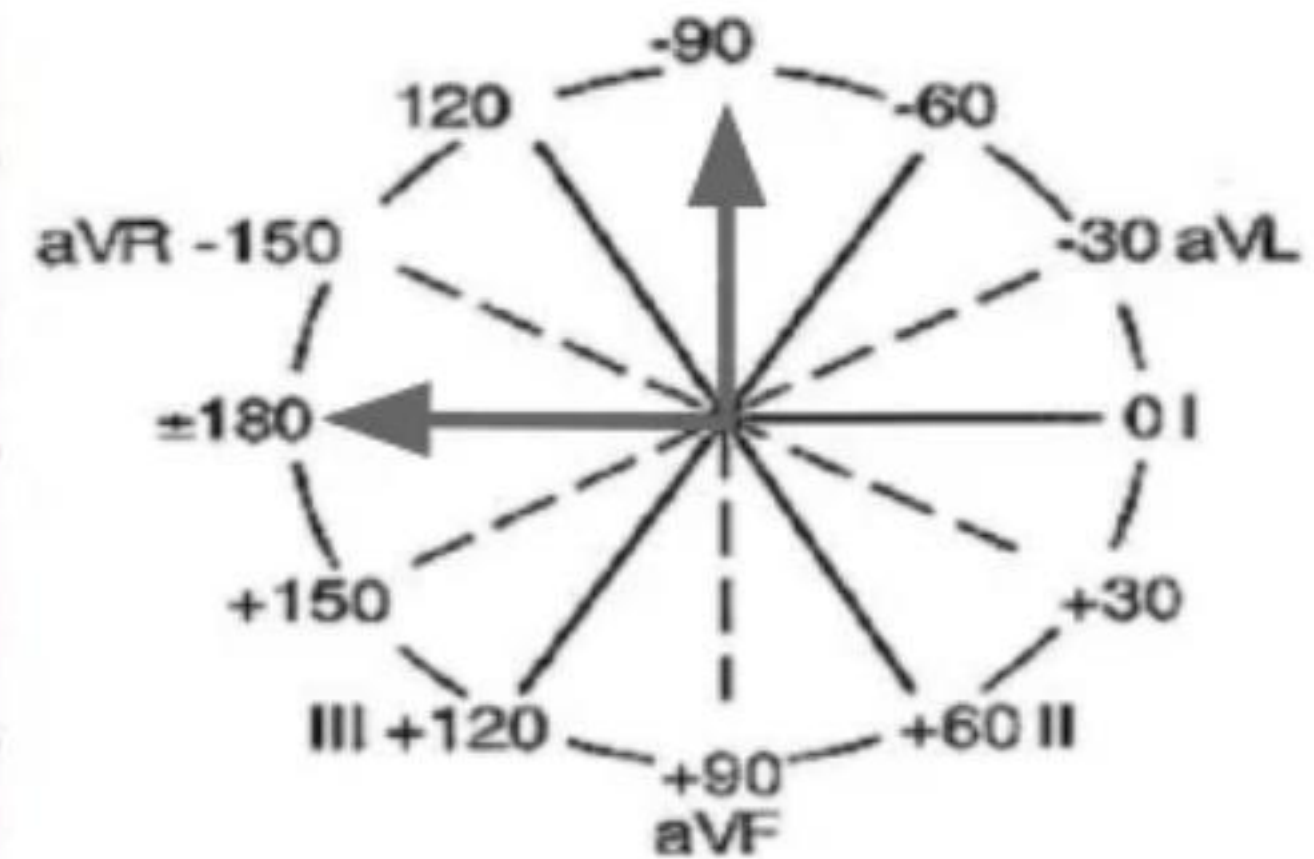
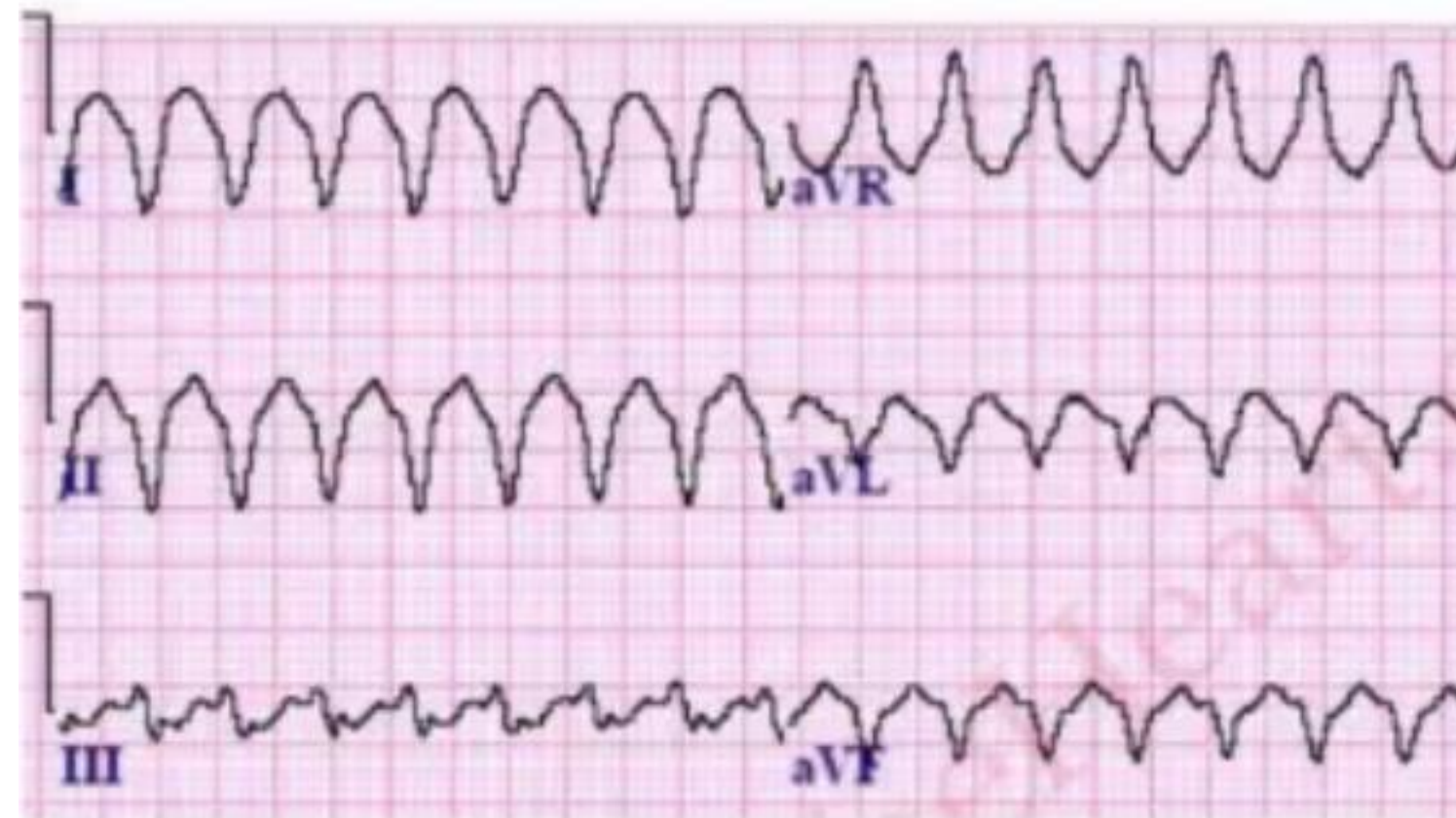
Right Axis Deviation of the QRS Axis:
Negative in Lead I and positive in lead aVF



Indeterminate Axis

If the QRS is downward (negative) in lead I and downward (negative) in lead aVF, then the axis is indeterminate and sometimes referred to as “northwestern axis.” This finding is uncommon and usually from ventricular rhythms; however, it can also be from paced rhythms, lead misplacement and certain congenital heart diseases.

INDETERMINATE AXIS DEVIATION;



Indeterminate Axis of the QRS Complex:
Negative in lead I and negative in lead aVF



THANK YOU