

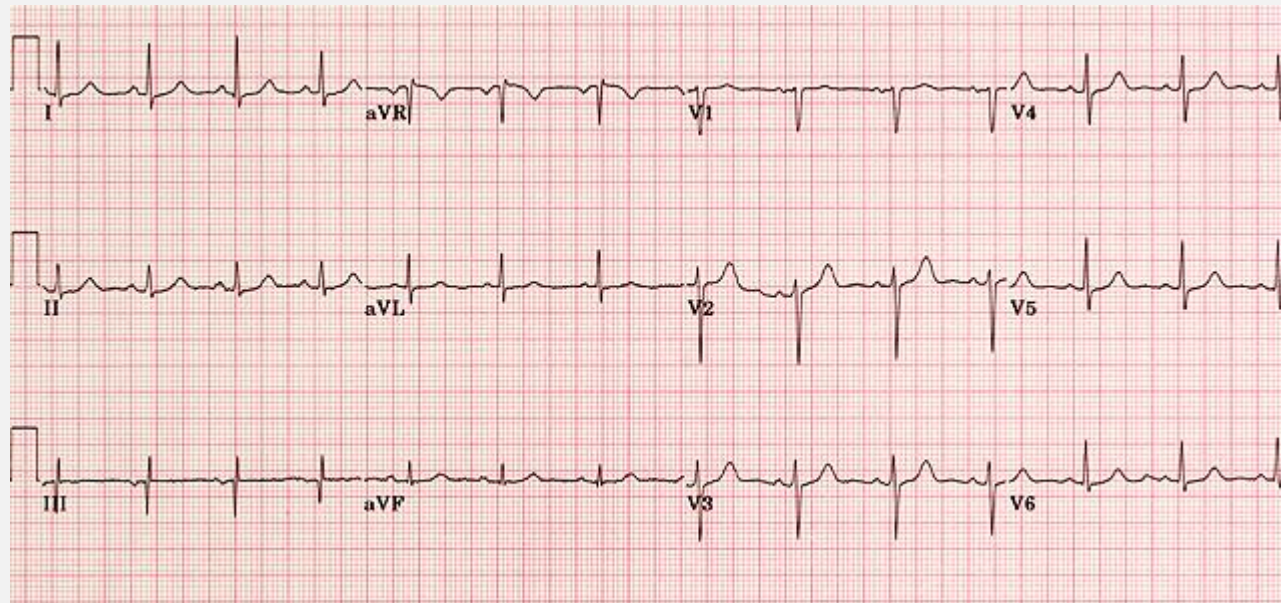


# EKG basal teori og elektrodeplacering

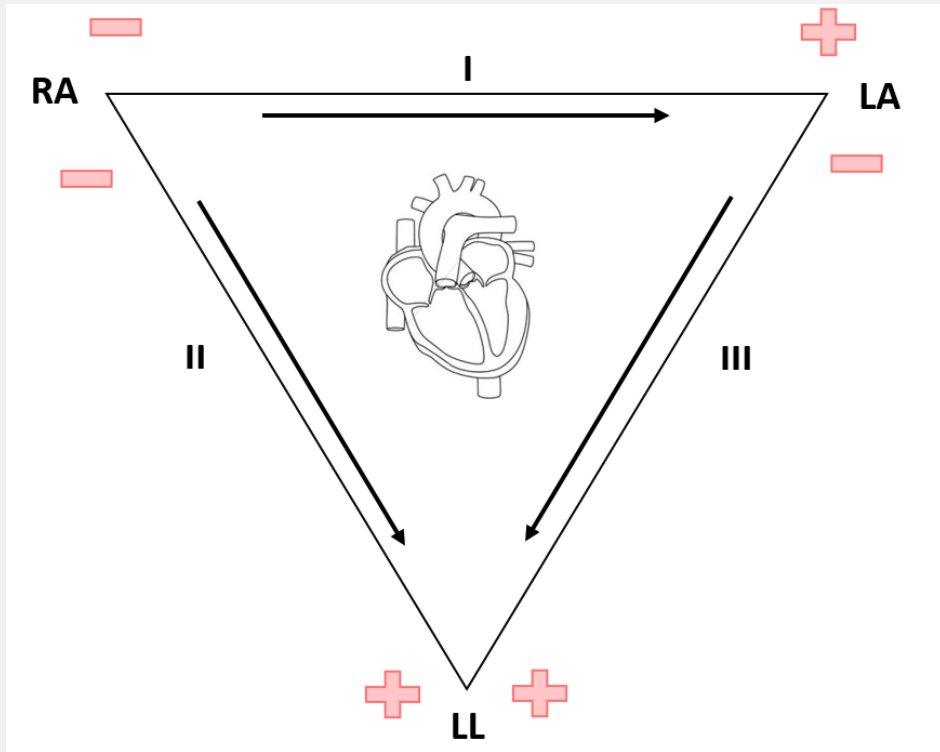
Anne Alnor, læge  
Blodprøver og Biokemi, OUH

Et EKG består af 12 afledninger;

- Bipolære ekstremitetsafledninger (I, II, III)
- Unipolære ekstremitetsafledninger (aVR, aVL, aVF)
- Præcordiale afledninger (V1-V6)



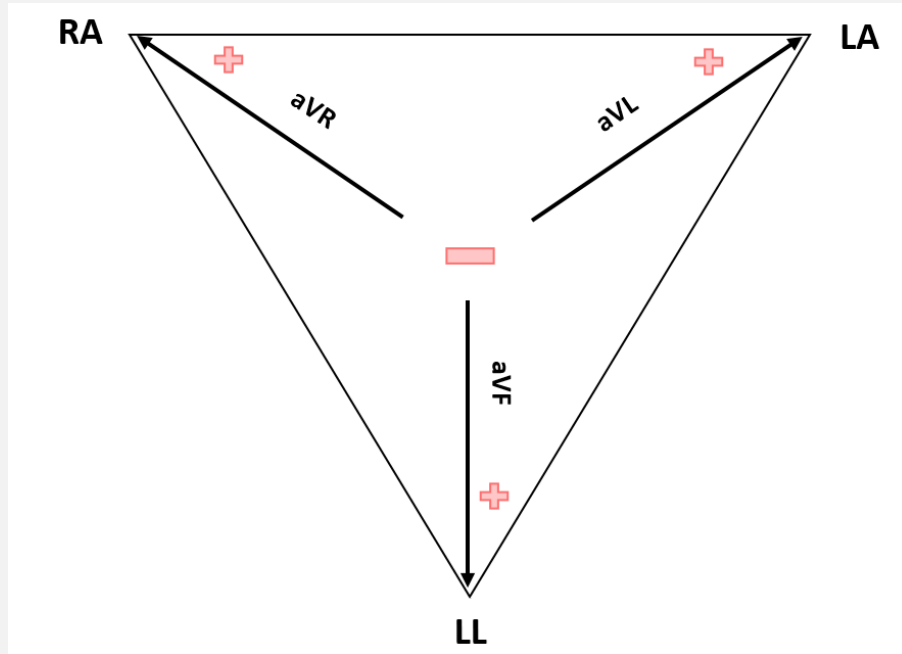
Willem Einthoven 1860-1927  
(Nobelpris 1924)



Einthovens lov danner en ligesidet trekant, hvor hjertet er i midten af trekanten.

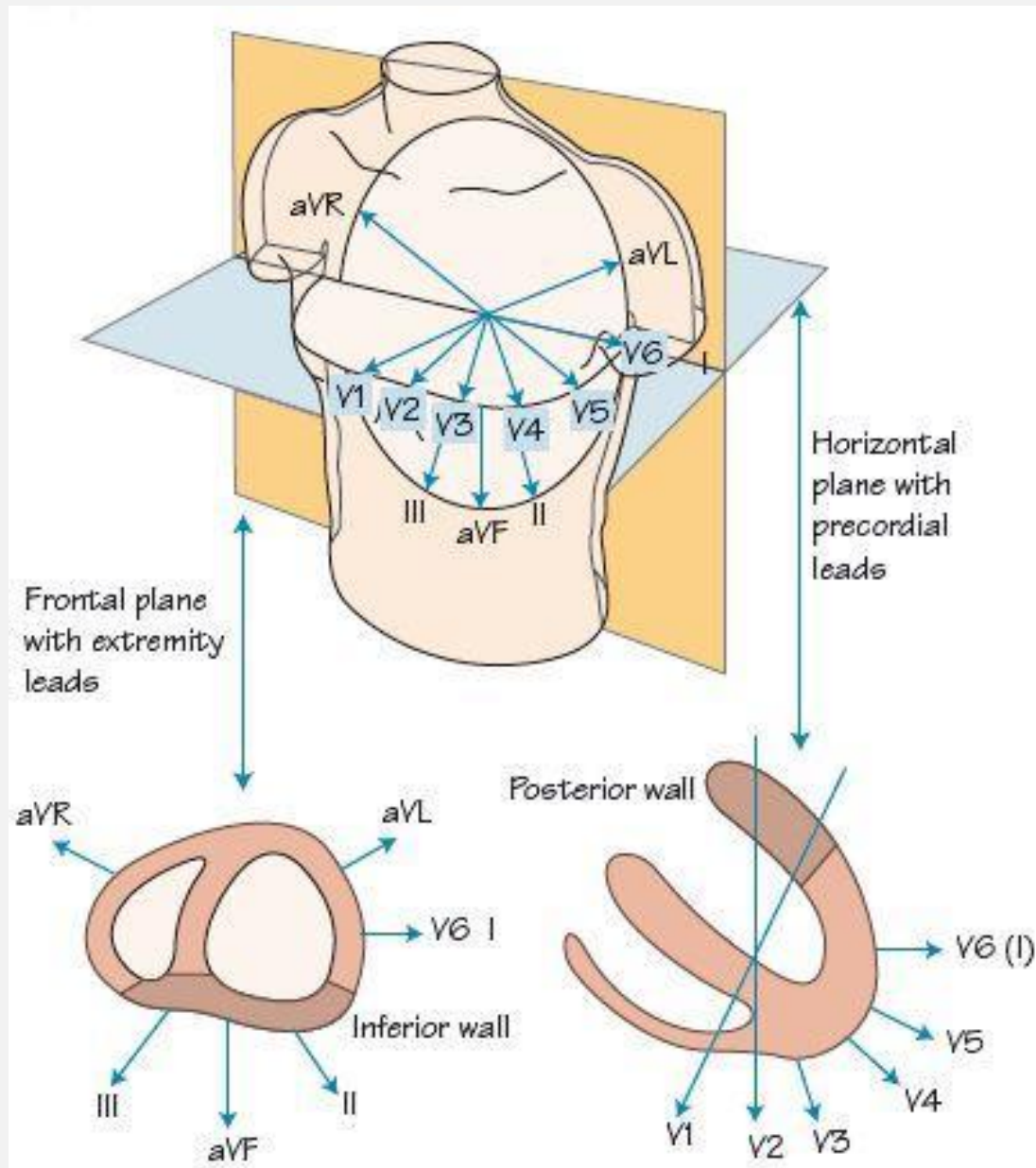
De bipolære ekstremitetafledninger bruges til at danne en graf af spændingsforskellen mellem to ekstremiteter på et givent tidspunkt, dvs. de er bipolære. I ekstremitetsafledningerne er der derfor én positiv elektrode og én negativ elektrode.

<u>LEAD</u>	<u>Positive Electrode</u>	<u>Negative Electrode</u>
I	LA	RA
II	LL	RA
III	LL	LA

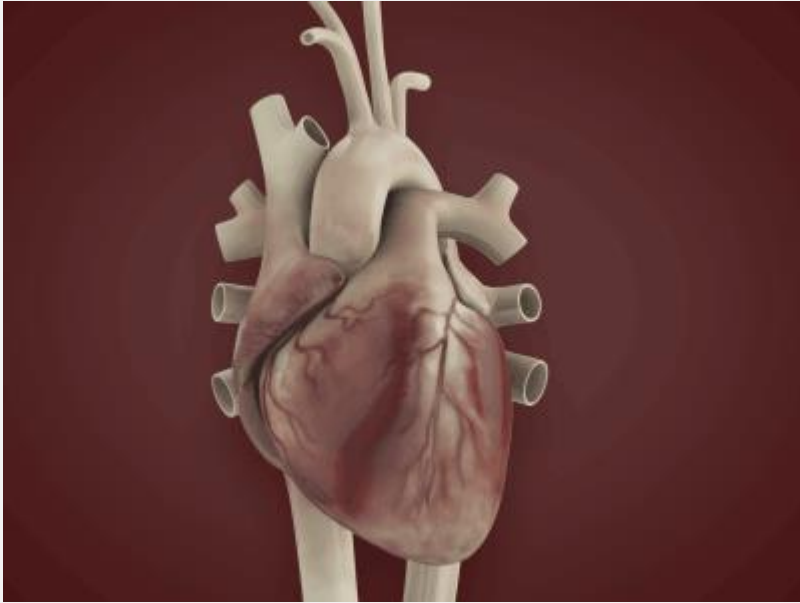


De unipolære ekstremitetsafledninger bruger et nulpunkt med en relativ negativ spænding og viser spændingspotentialt derfra og til hver af ekstremiteterne. Derved får man spændingsforskellen i hjertet fra tre yderligere retninger i frontalplanet.

<u>LEAD</u>	<u>Positive Electrode</u>
aVR	RA
aVL	LA
aVF	LL

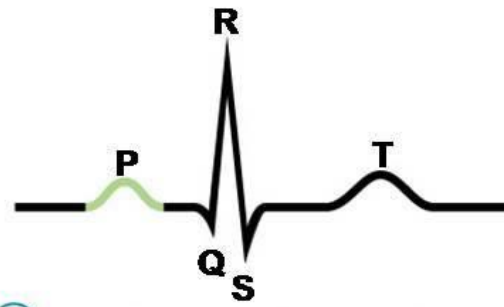
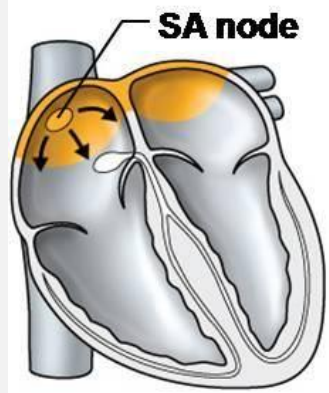


De prækordiale afledninger danner et overblik over hjertets elektriske signal i horisontalplanet.

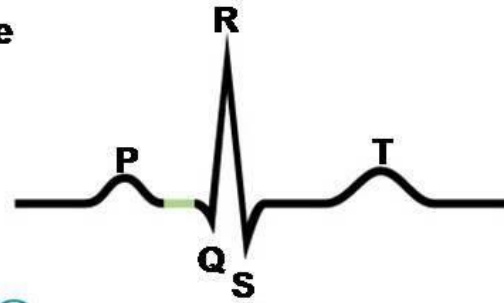
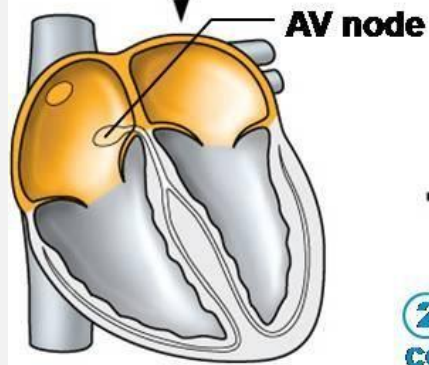


Hjertets kontraktion er resultatet af depolarisering og repolarisering af hjertecellerne. Det kan vi registrere vha. EKG'et

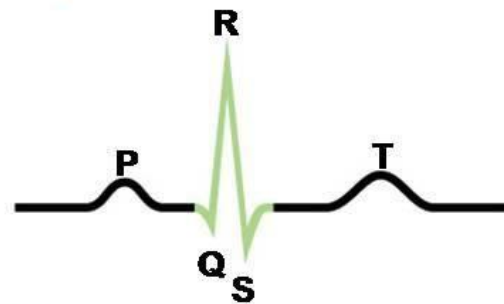
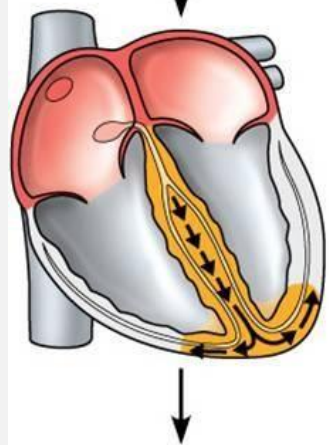
Depolarisering af hjertet imod den positive elektrode giver en positiv top på EKG'et  
Depolarisering af hjertet væk fra den positive elektrode giver en negativ top på EKG'et  
Repolarisering af hjertet imod den positive elektrode giver en negativ top på EKG'et  
Repolarisering af hjertet væk fra den positive elektrode giver en positiv top på EKG'et



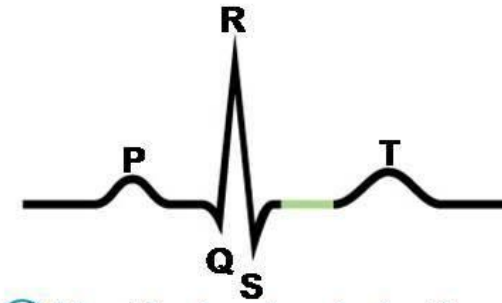
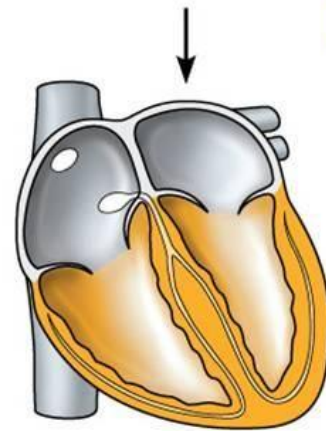
① Atrial depolarization, initiated by the SA node, causes the P wave.



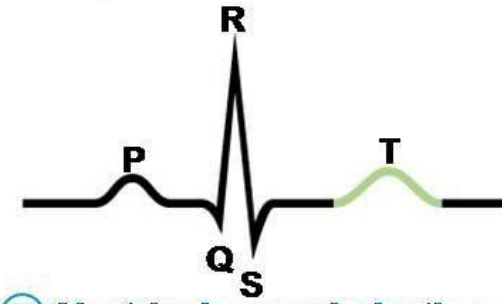
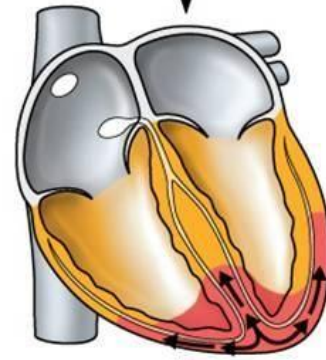
② With atrial depolarization complete, the impulse is delayed at the AV node.



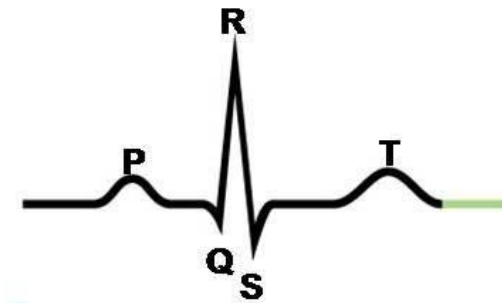
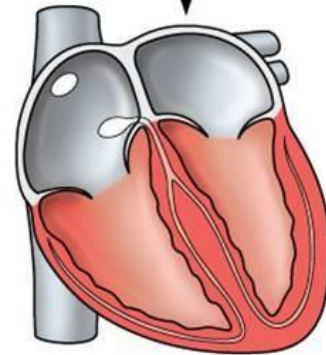
③ Ventricular depolarization begins at apex, causing the QRS complex. Atrial repolarization occurs.



④ Ventricular depolarization is complete.



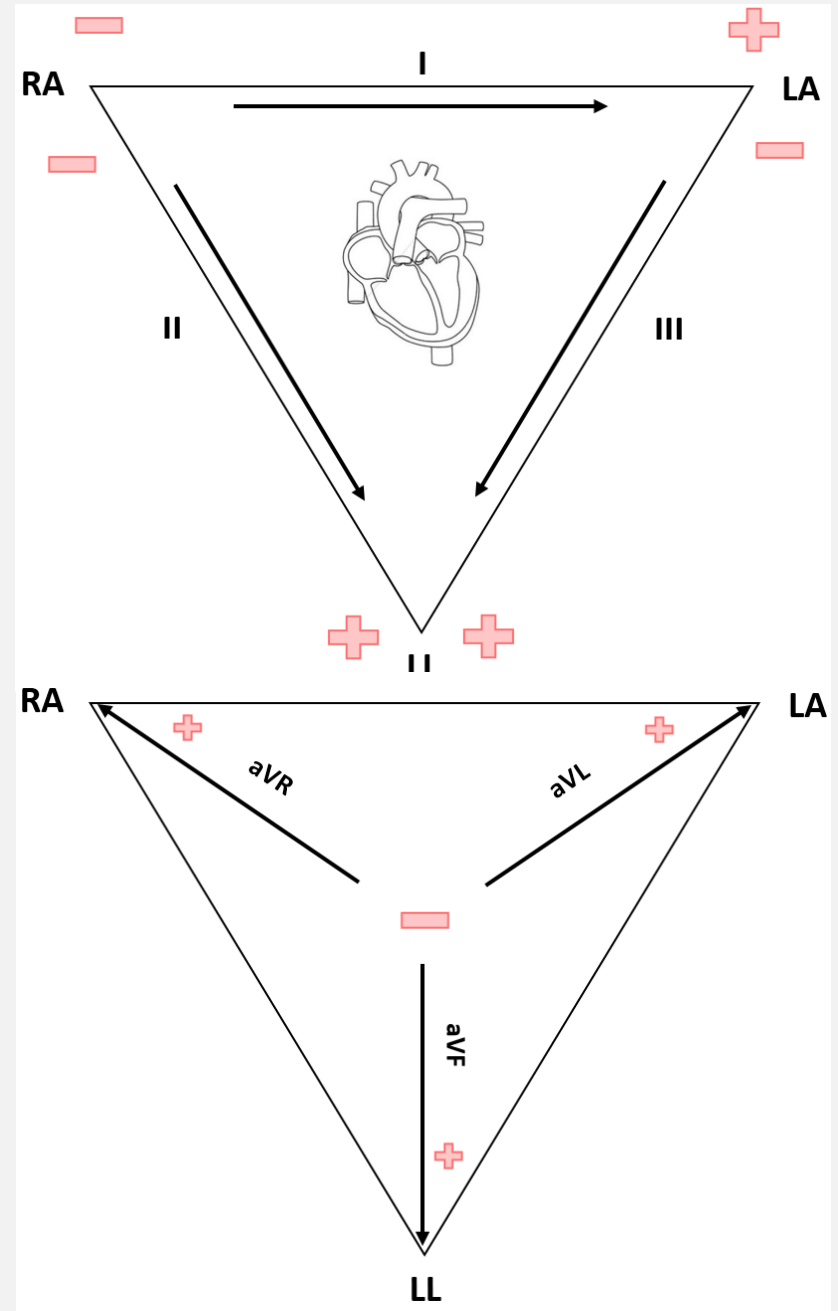
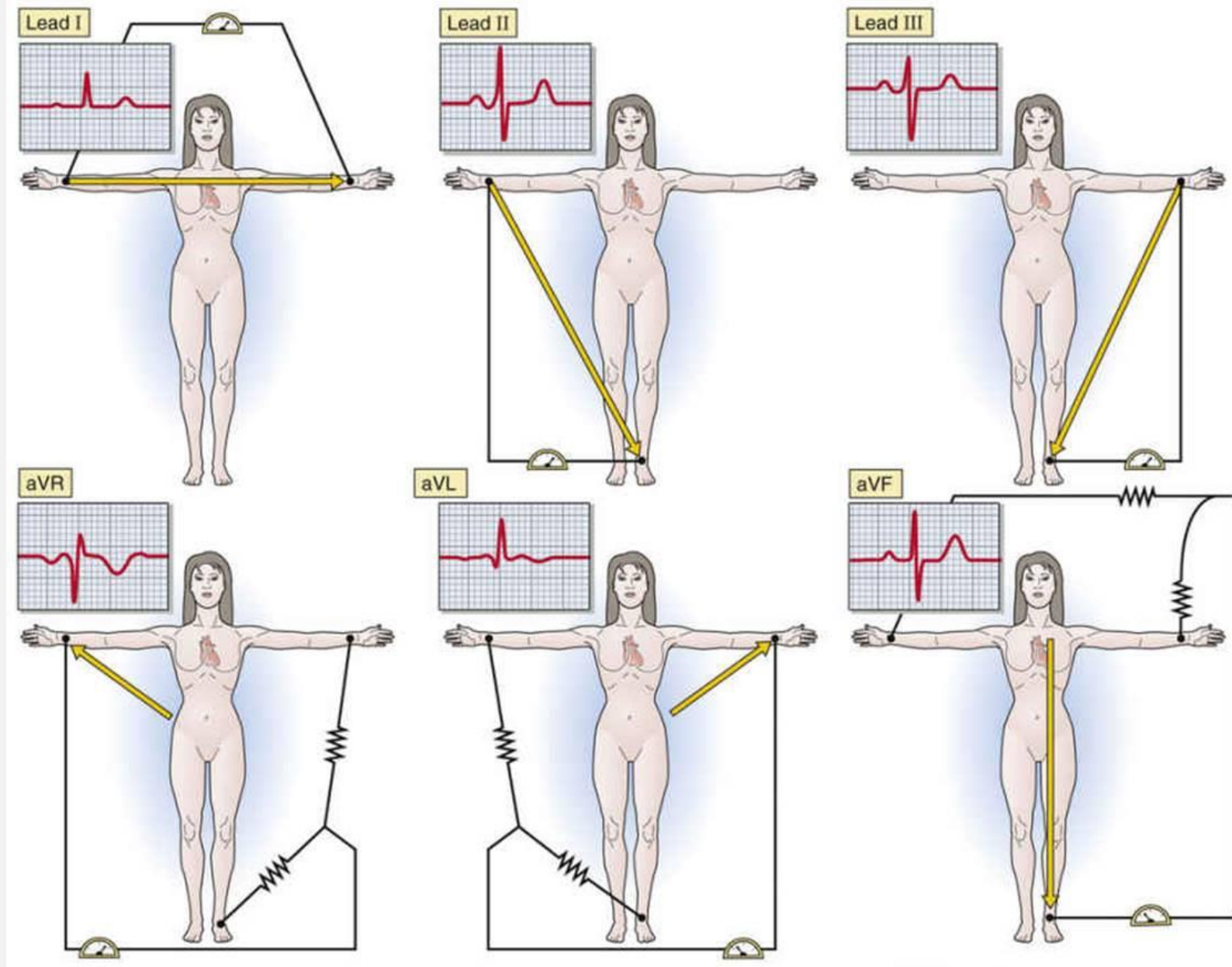
⑤ Ventricular repolarization begins at apex, causing the T wave.



⑥ Ventricular repolarization is complete.

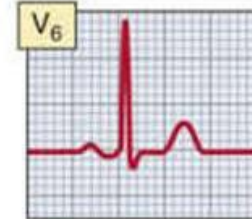
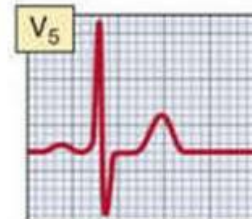
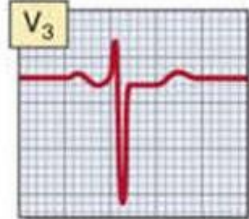
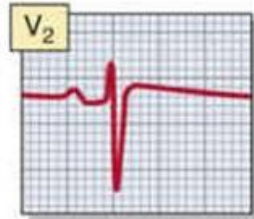
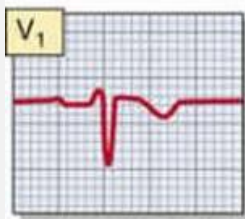
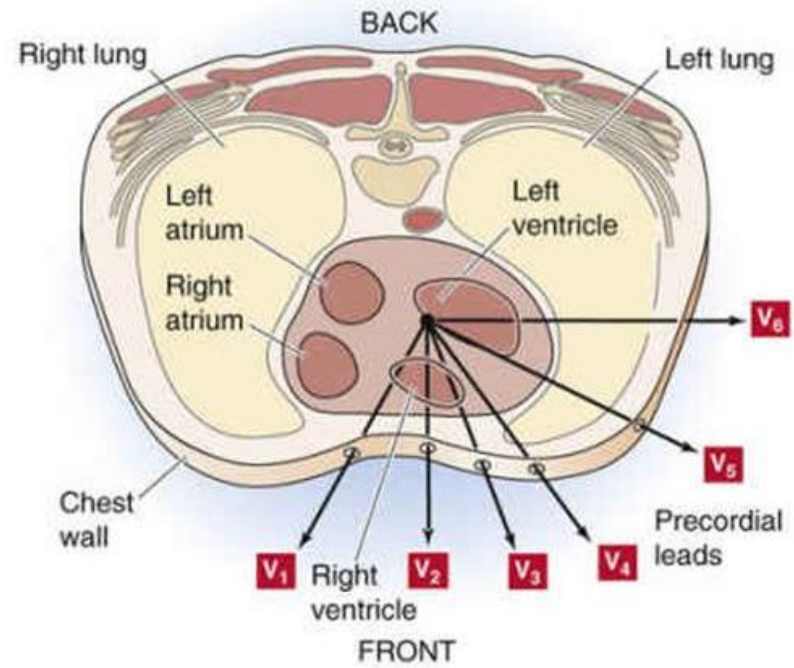
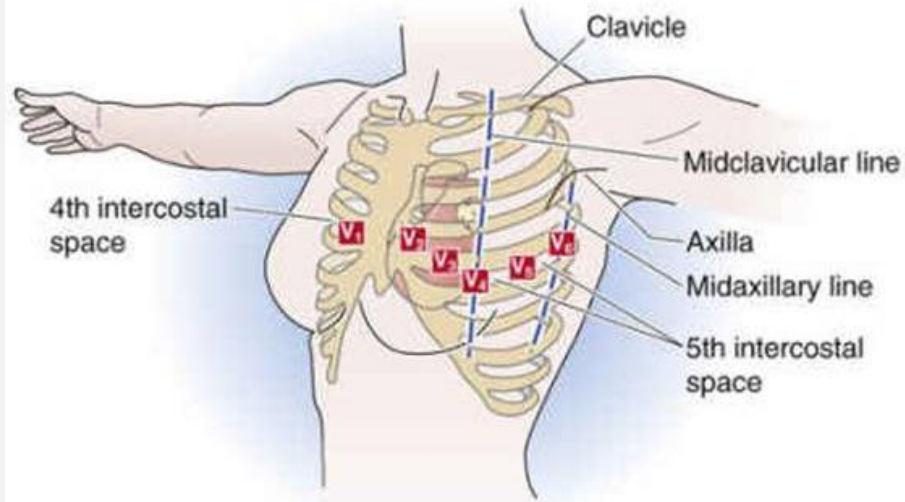
■ Depolarization ■ Repolarization

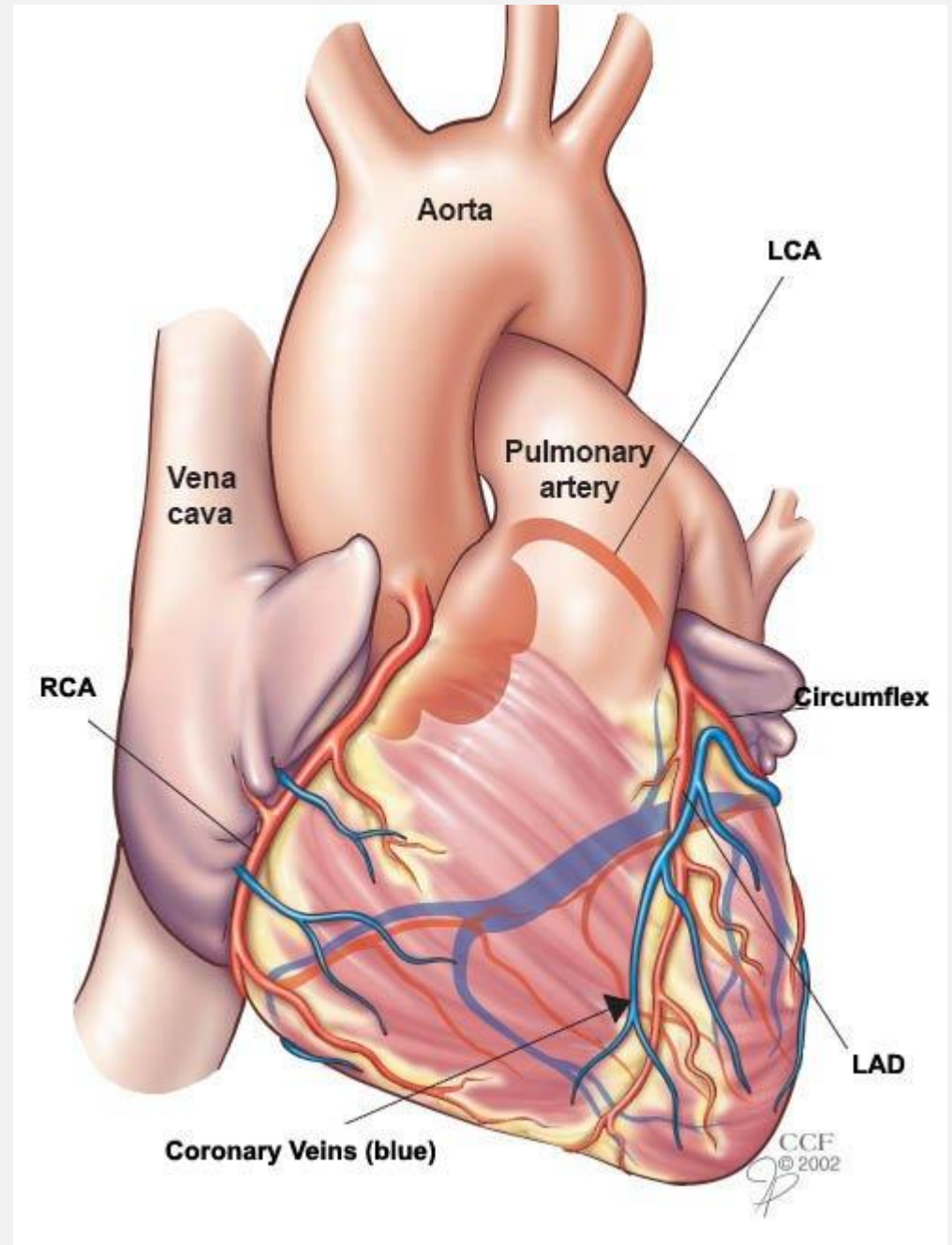
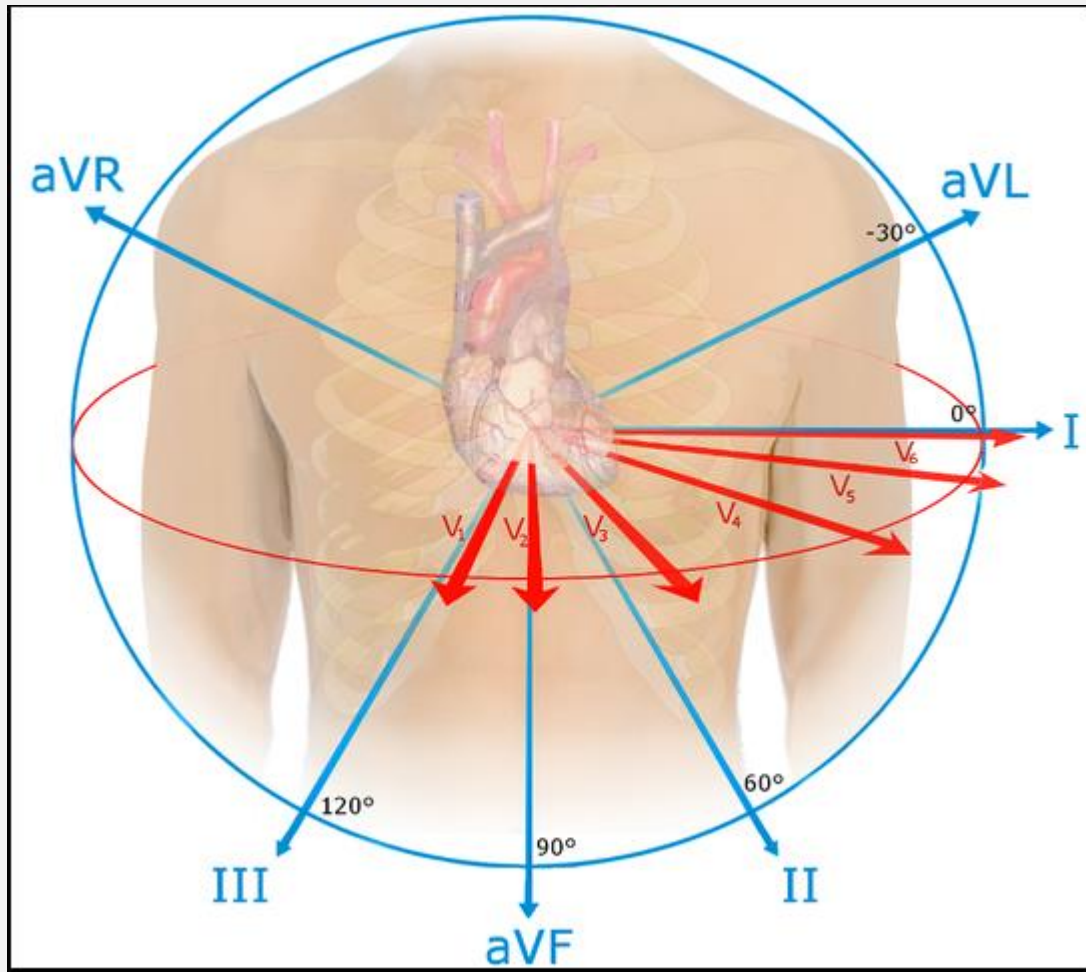
A FRONTAL PLANE LEADS

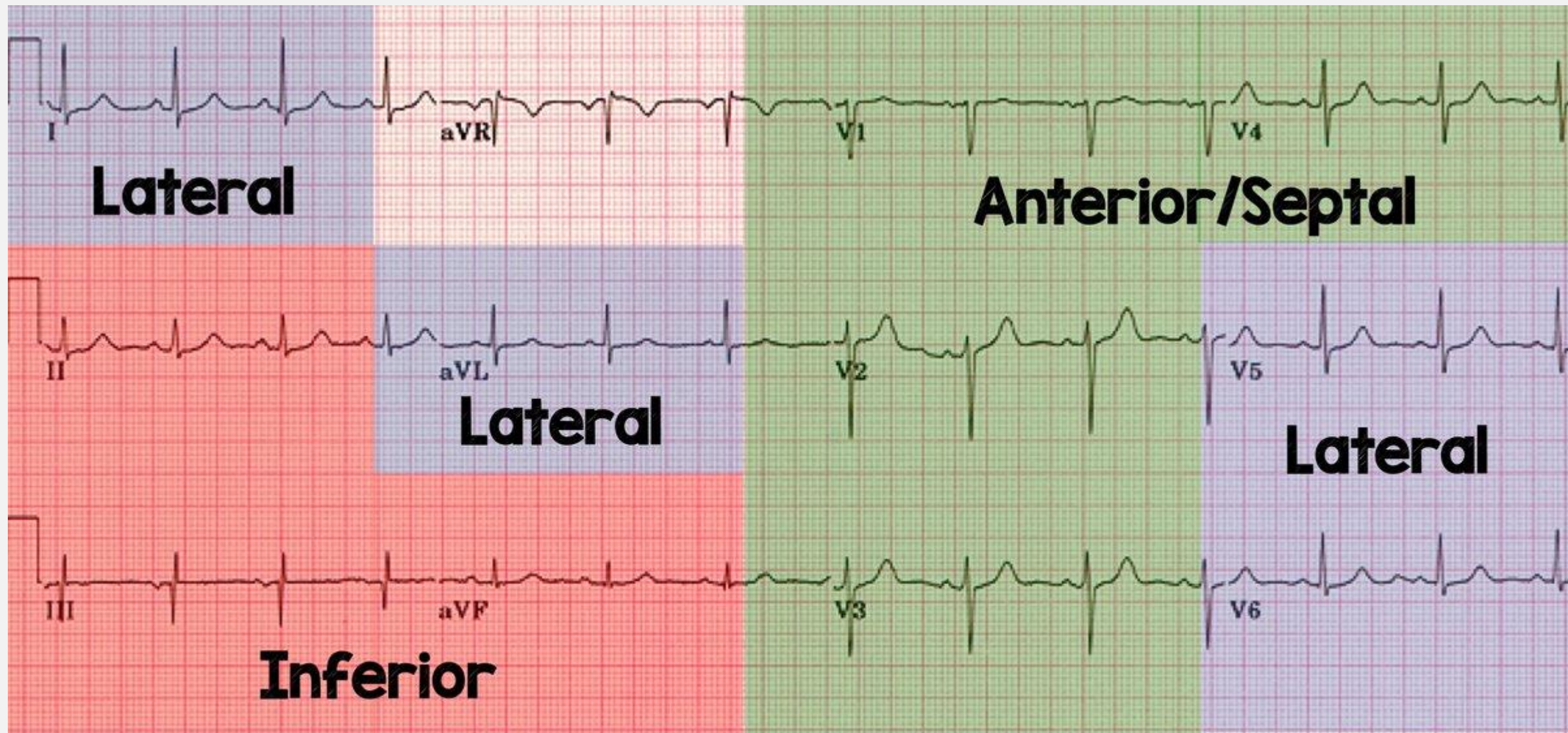




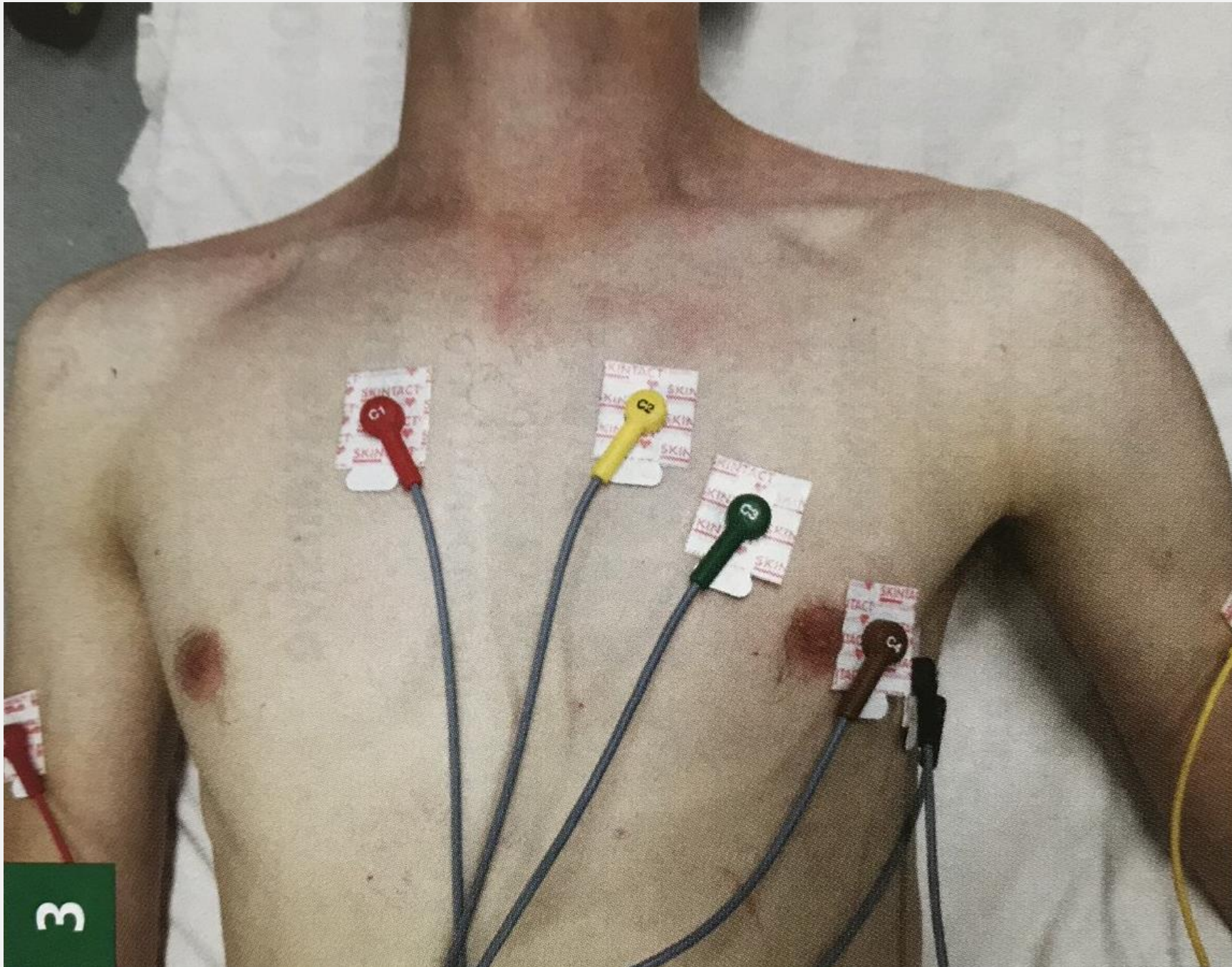
## B TRANSVERSE PLANE-PRECORDIAL LEADS

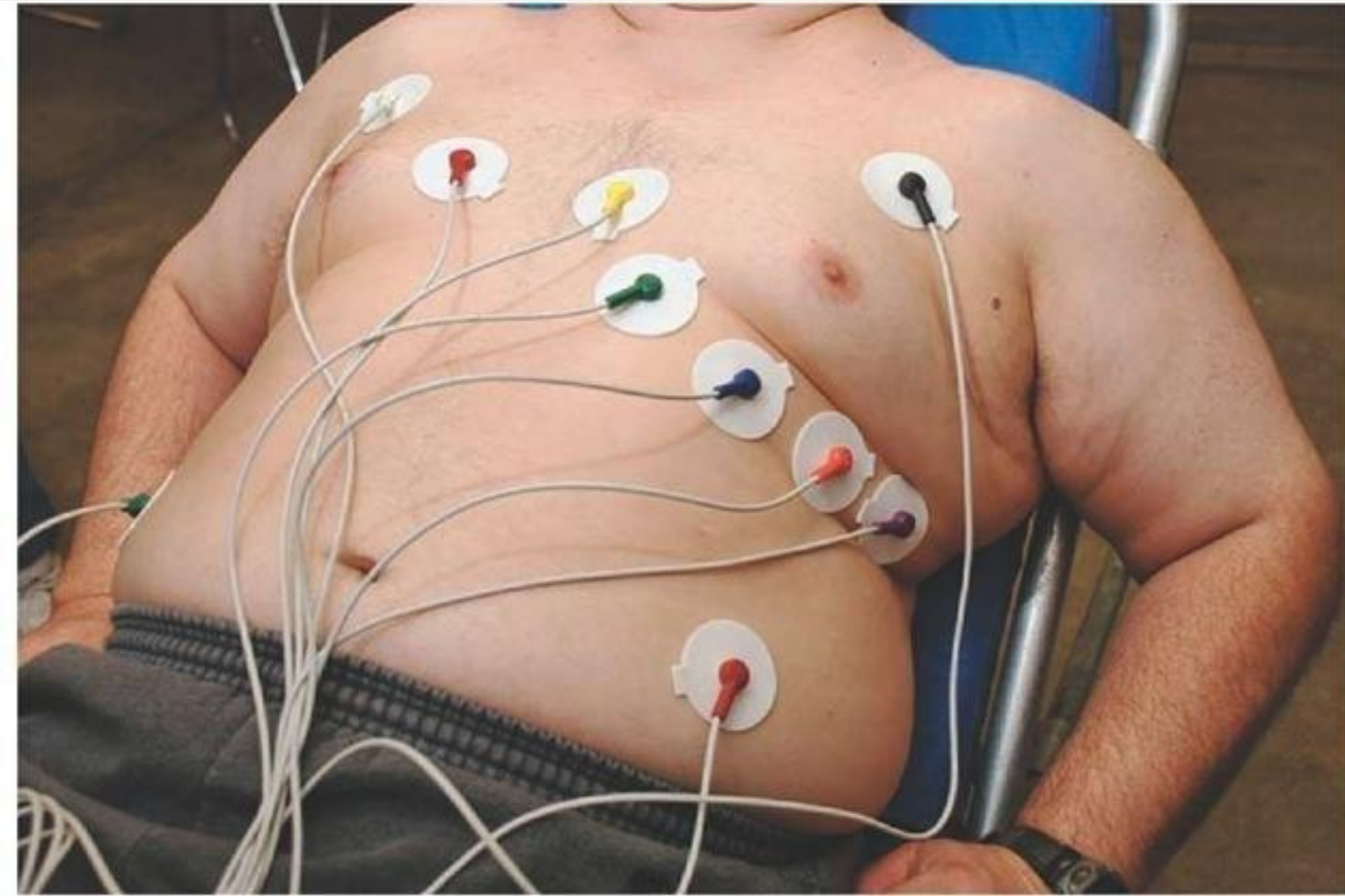


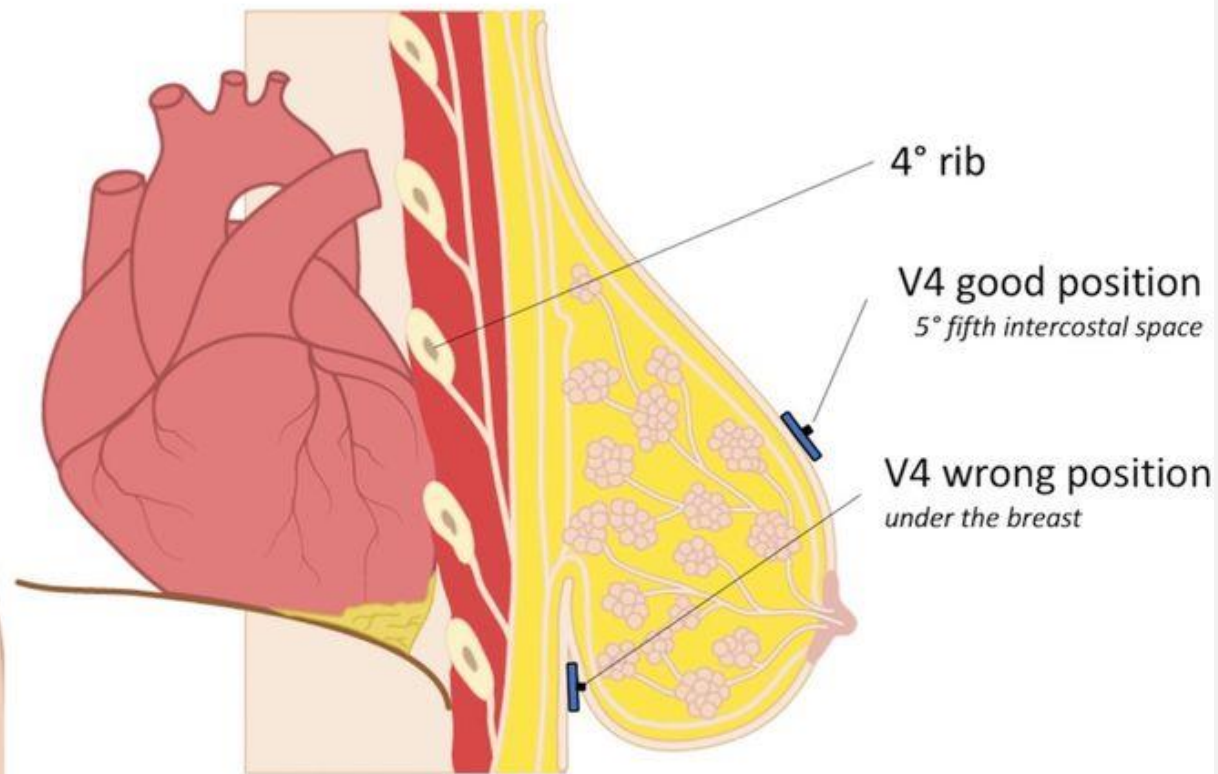
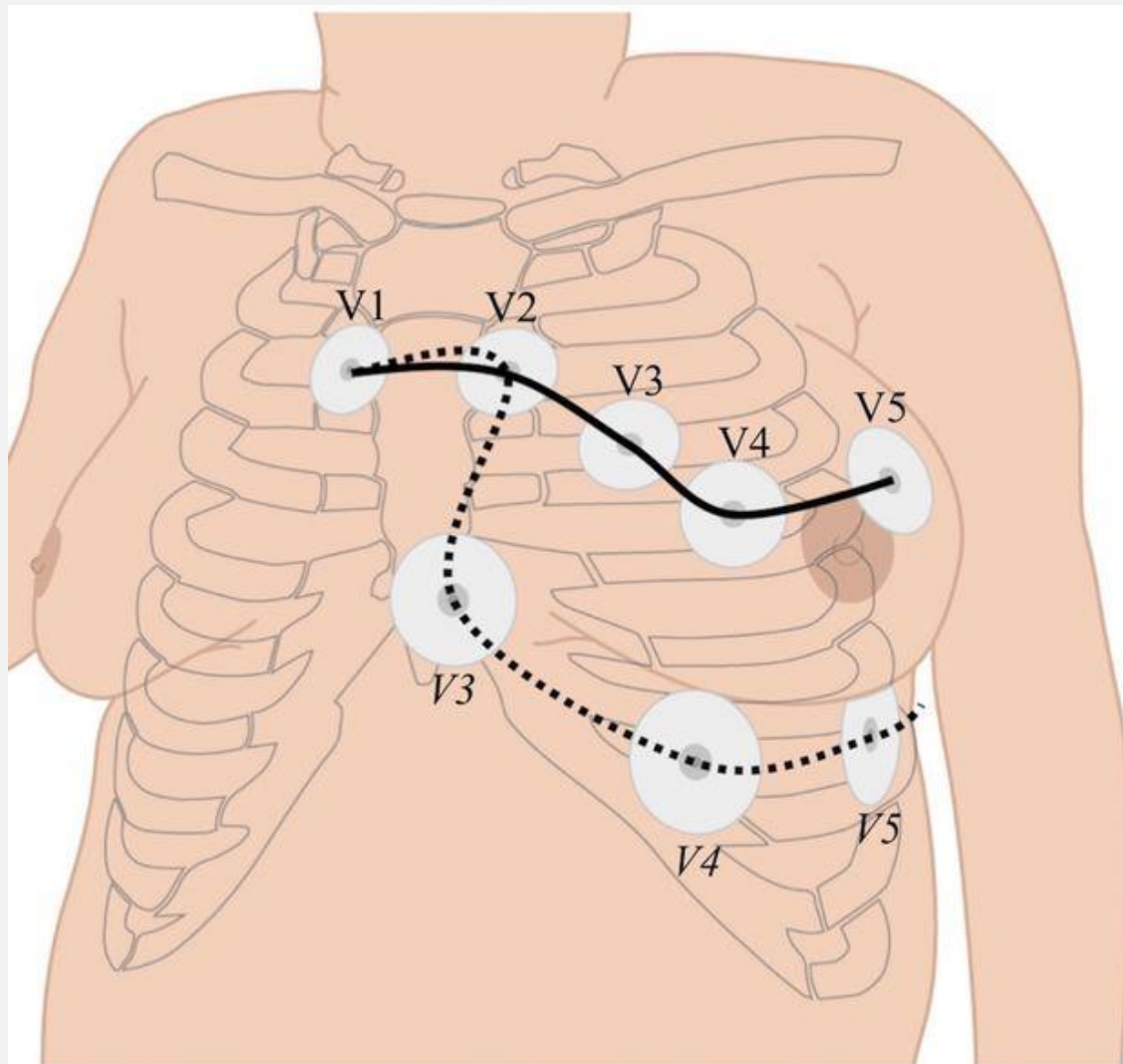




<b>Lateral Leads</b>	<b>I, aVL, V5 - V6</b>	<b>LCx or Diagonal of LAD</b>
<b>Inferior Leads</b>	<b>II, III, aVF</b>	<b>RCA and/or LCx</b>
<b>Anterior/Septal Leads</b>	<b>V1 - V4</b>	<b>LAD</b>







— ECGs #1 and 3  
..... ECG #2

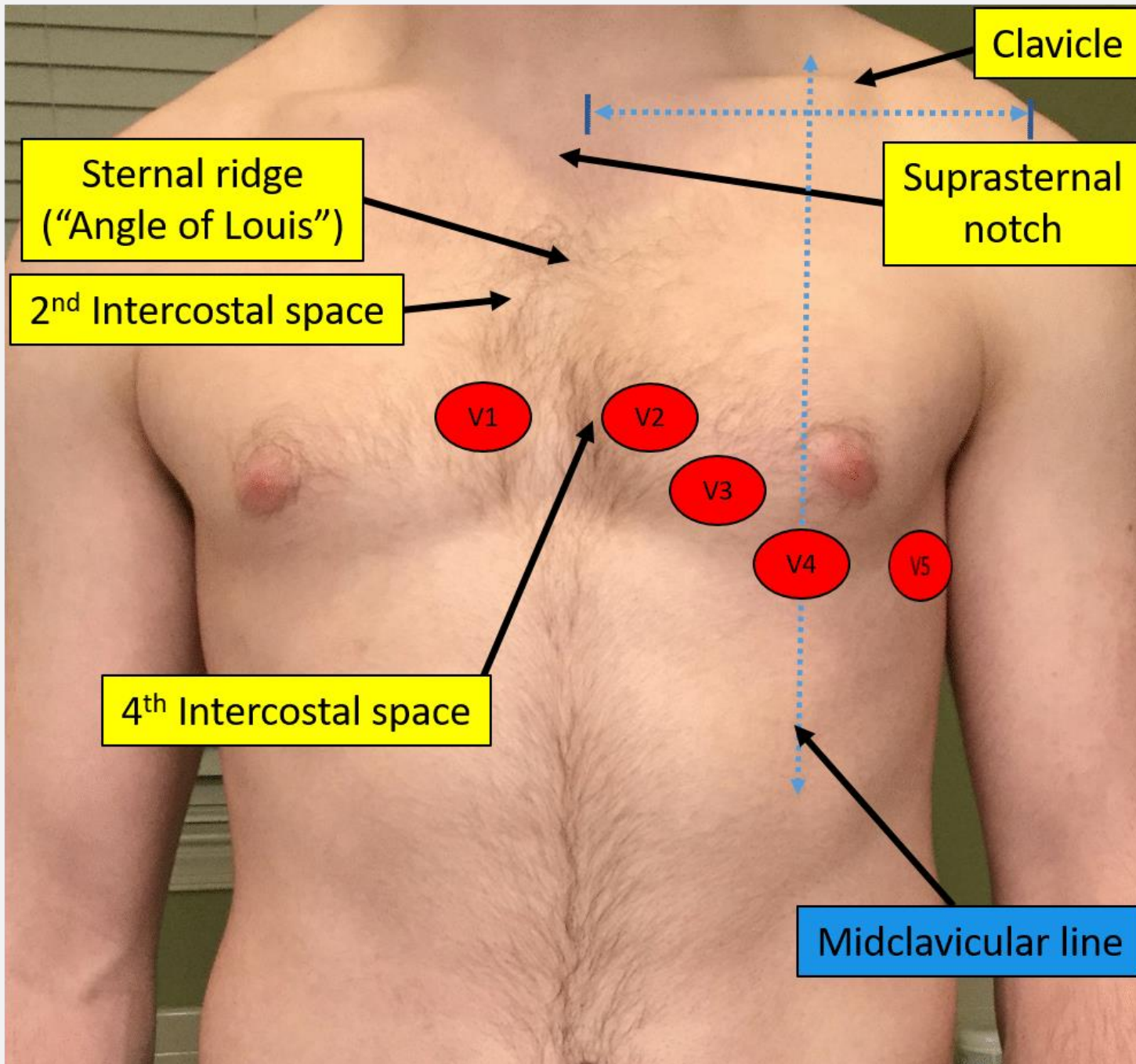
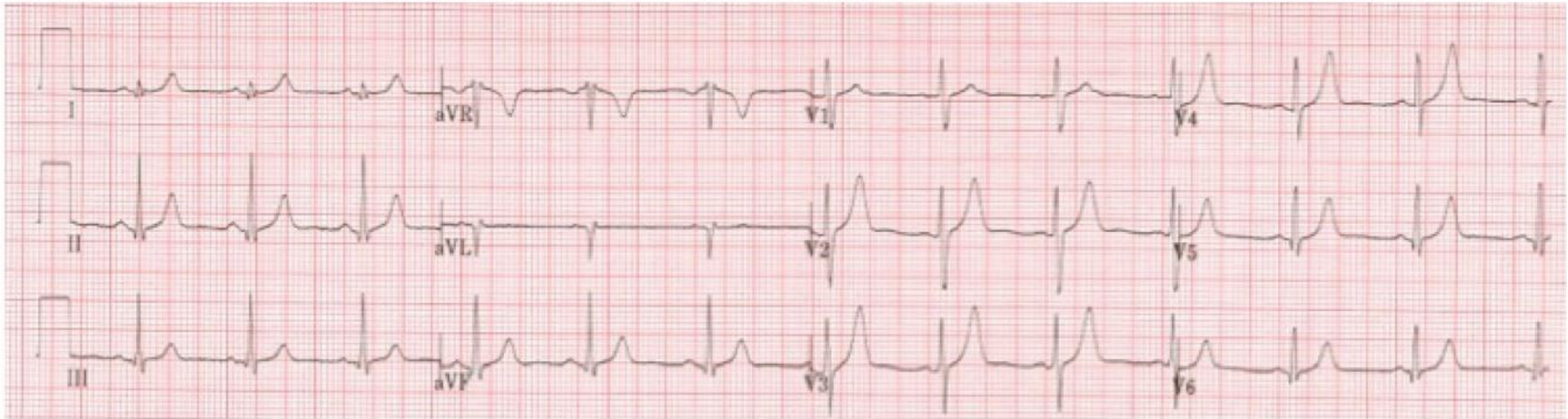


Figure 1.

A



Normalt EKG



Ombytning højre og venstre arm: I inverteres, II og III bytter plads, aVL og aVR bytter plads, aVF er den samme

Figure 2.



Kilde: **Common ECG Lead Placement Errors. Part I: Limb lead Reversals**

Figure 1.

A

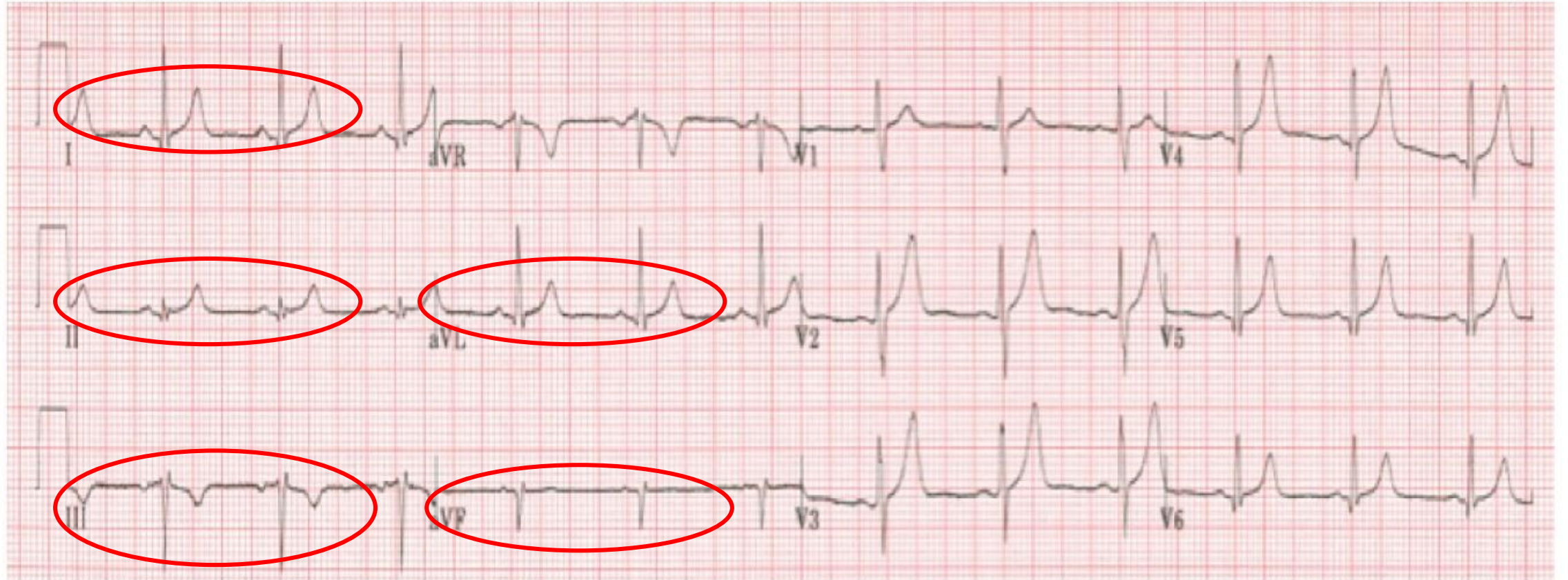


Normalt EKG

Ombytning venstre arm og venstre ben. III inverteres, I og II bytter plads, aVL og aVF bytter plads, aVR er den samme

Figure 4.

A



Kilde: **Common ECG Lead Placement Errors. Part I: Limb lead Reversals**

Figure 1.

A



Normalt EKG

Ombytning højre arm og venstre ben. II inverteres, I og III inverteres og bytter plads, aVR og aVF bytter plads. aVL er uændret.

Figure 7.

A



Kilde: **Common ECG Lead Placement Errors. Part I: Limb lead Reversals**

Figure 1.

A



Normalt EKG

Ombytning af arm og ben elektroderne. I bliver flad. II ligner en inverteret III, III er inverteret, aVR og aVL er ens, aVF ligner en inverteret III

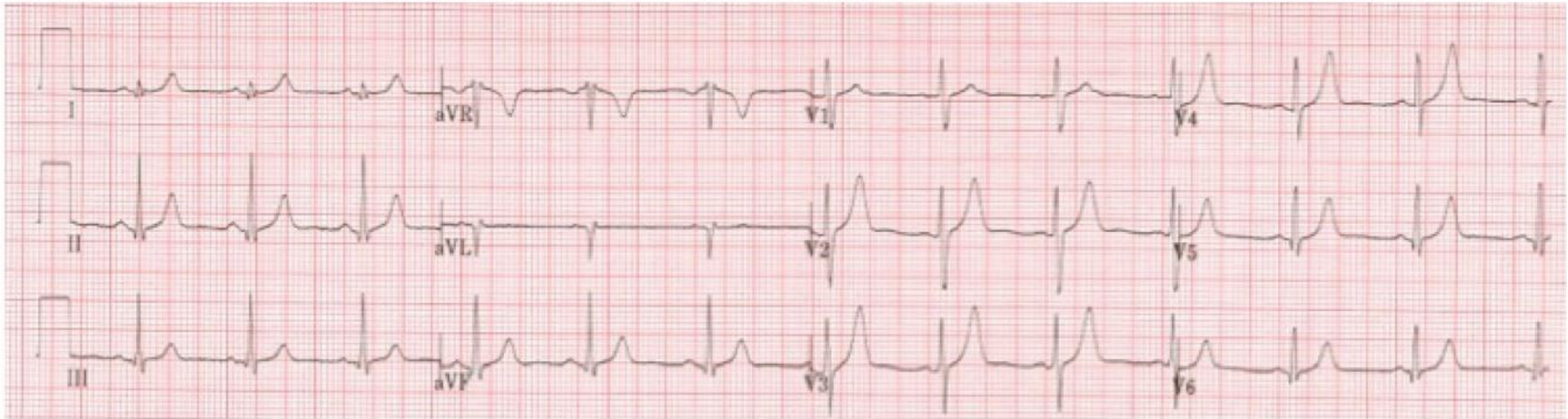
Figure 8.



Kilde: **Common ECG Lead Placement Errors. Part I: Limb lead Reversals**

Figure 1.

A

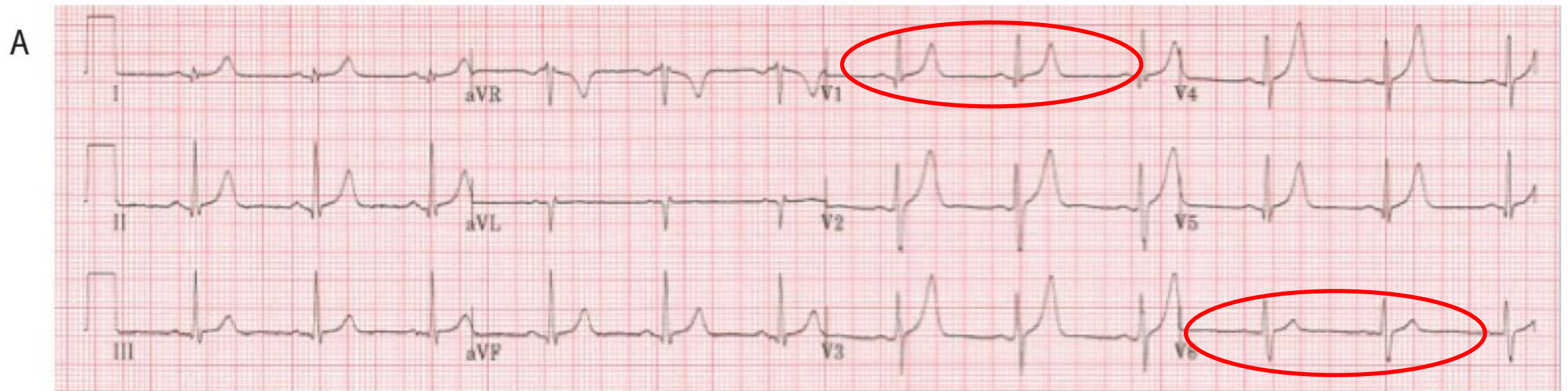


Normalt EKG



# Ombytning af V1 og V6

Figure 4.



Kilde: **Common ECG Lead Placement Errors. Part II: Precordial Misplacements**