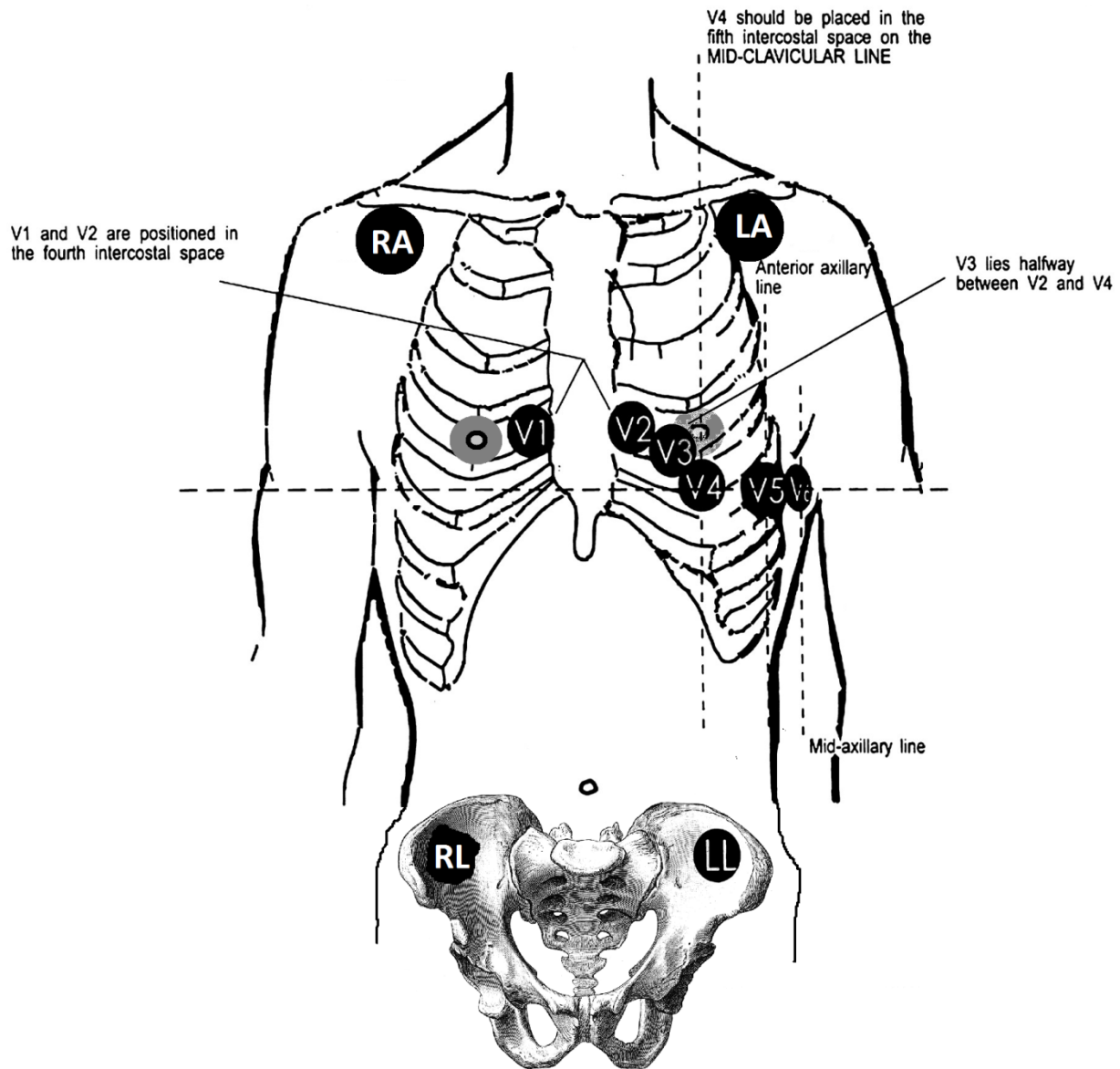


12-lead ECG Electrode Placement



V4, V5 and V6 follow the 5th intercostal space and are NOT horizontal as indicated in the image.

"Is it correct to place the electrodes under the female breasts?"

Placement of electrodes directly on the breast is typically not practiced in the US. Obviously not all breasts are created equal...the standard of care would direct non-standard placement. Any alteration of electrode placement must be documented and serial ECG's should have electrodes placed in the same locations if at all possible. This would make comparison tracings more meaningful clinically.

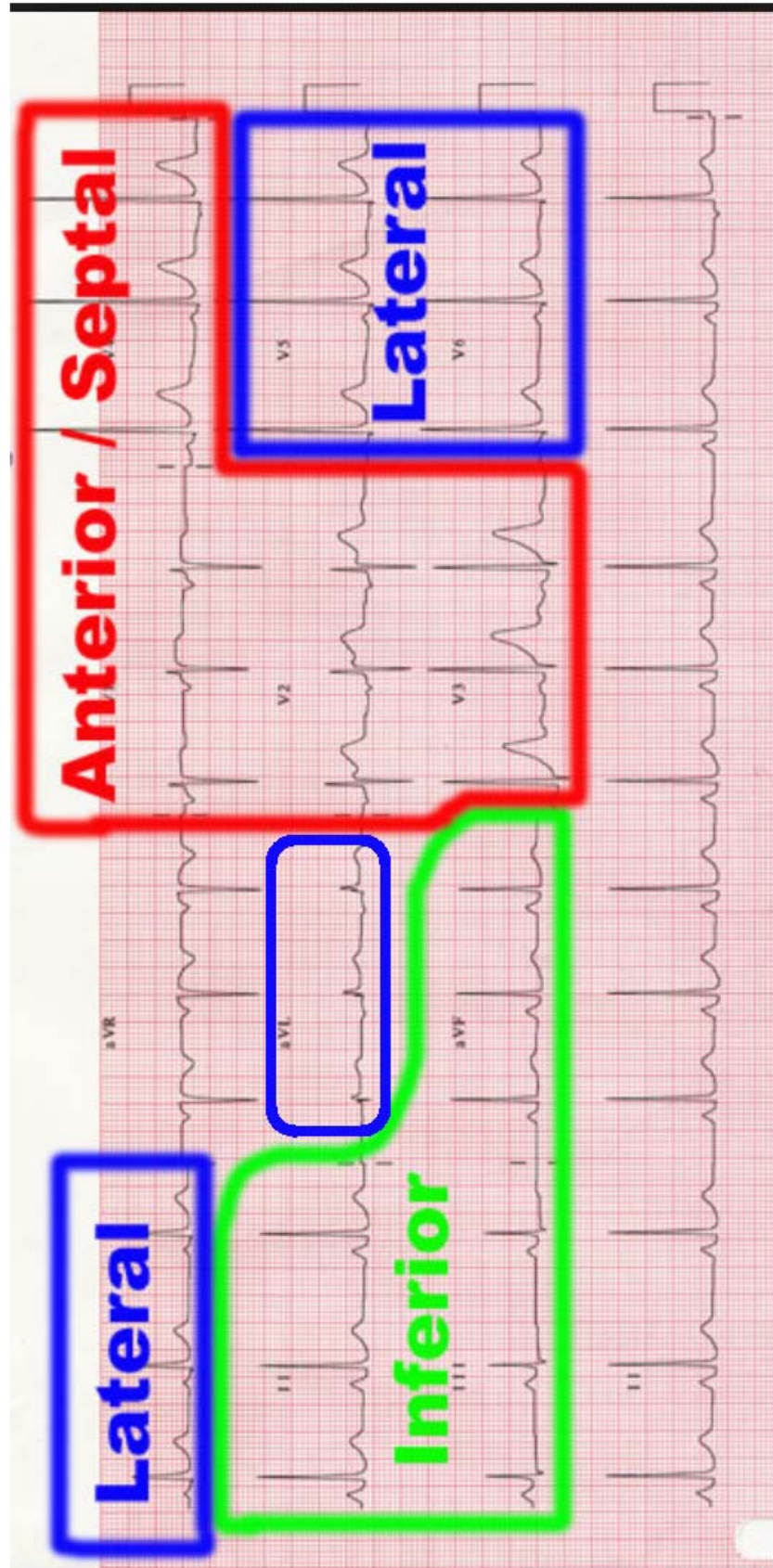
While it is better to have the electrode conduct from the top of the breast, sometimes it is necessary for placement under the breast, e.g., SOP, patient preference ... as a rule, though,

"Breast tissue appears to have a practically negligible effect on ECG amplitudes (no rise in voltage on vertical axis due to higher resistance...more tissue), and in women, the placement of chest electrodes on the breast rather than under the breast is recommended in order to facilitate the precision of electrode placement at the correct horizontal level and at the correct lateral positions."
[Rautaharju PM, Park L, Rautaharju FS, Crow R. **A standardized procedure for locating and documenting ECG chest electrode positions.**]

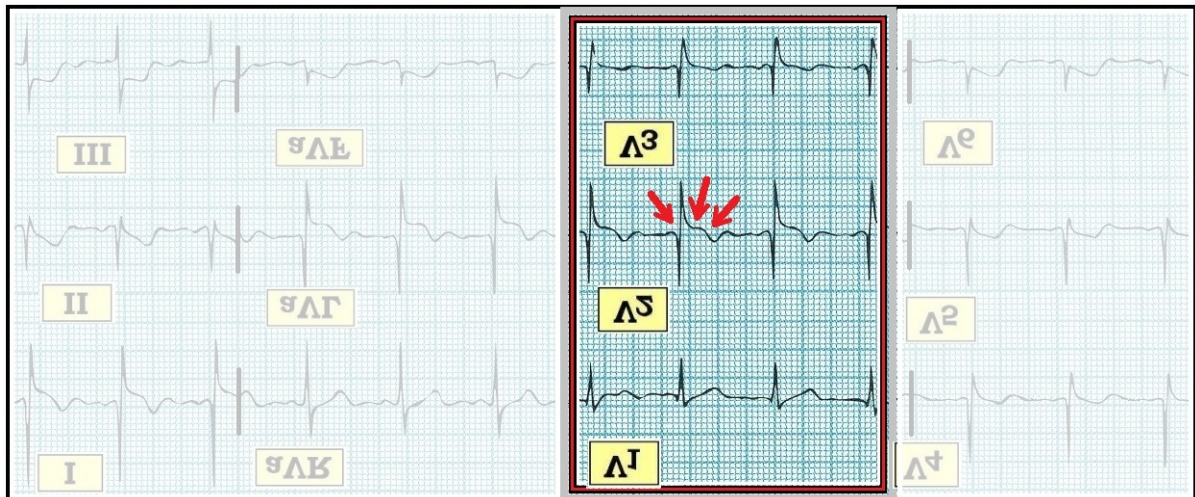
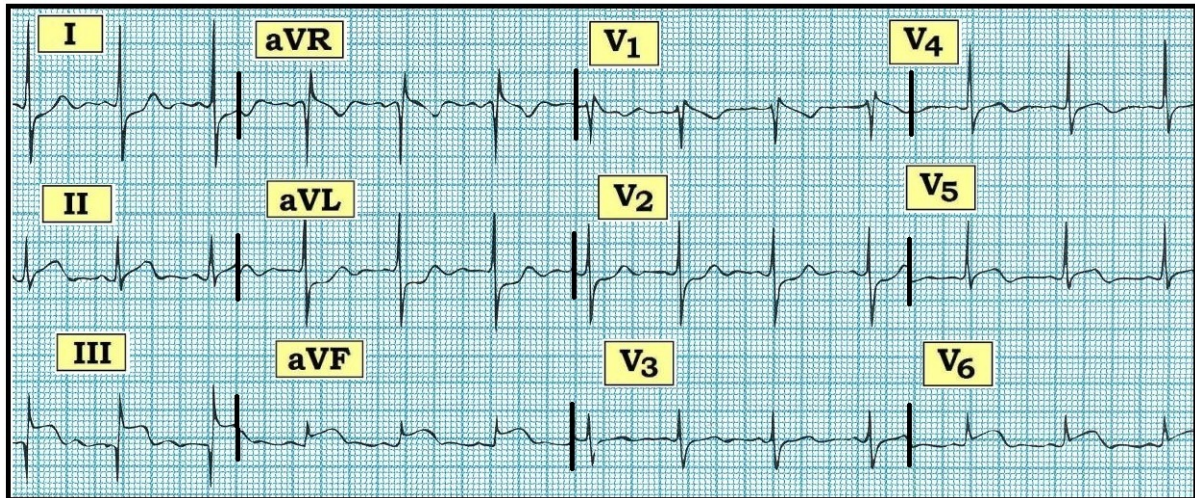
Furthermore, there will always be a debate regarding bone vs muscle. Bone does not conduct nearly as well, but muscle contributes to artifact within the tracing. **Moving the electrodes from the limbs to the torso** helps with this aspect, and "may" affect electrical axis (right-ward shift; important to verify as it ranges from non-existent to minimal to significant). Axis is determined by the frontal plane leads, not the precordial leads, excepting V₂. Limb placement is critical and must be placed consistently within your facility. Again, any electrode placement other than the standard locations (including alternate location due to breast tissue) must be documented.

For further information, go to: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2499893/>

Also, keep in mind that your lab fees for the semester (8 weeks!) have already been spent ... plus. Meaning: not everyone may get an EKG in lab - -we'll go as far as we can with what we have.



I Lateral	aVR	V1 Septal	V4 Anterior
II Inferior	aVL Lateral	V2 Septal	V5 Lateral
III Inferior	aVF Inferior	V3 Anterior	V6 Lateral



Long QT Syndrome

The electrical activity that occurs between the Q and T waves is called the QT interval. This interval shows electrical activity in the heart's lower chambers, the ventricles.

The term "long QT" refers to an abnormal pattern seen on an EKG (electrocardiogram).

The timing of the heart's electrical activity is complex, and the body carefully controls it. Normally the QT interval is about a third of each heartbeat cycle. However, in people who have LQTS, the QT interval lasts longer than normal.

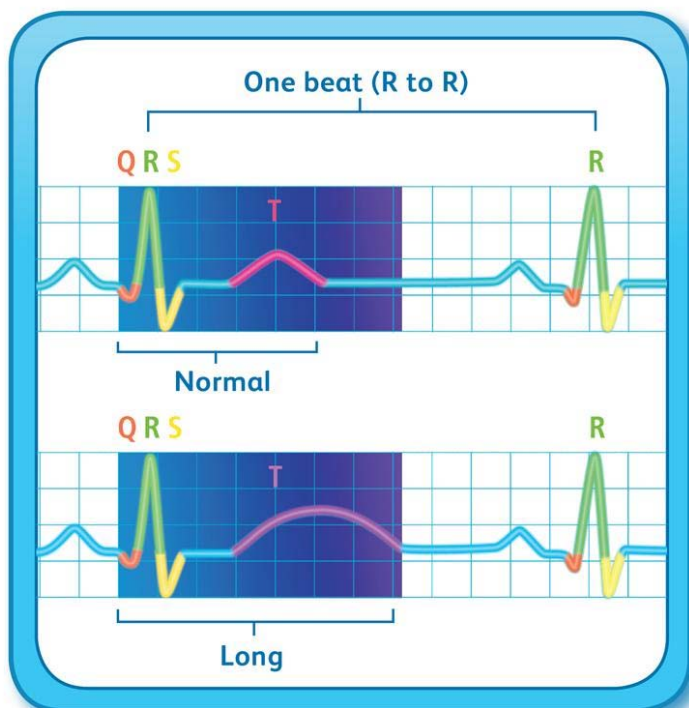


Illustration showing prolonged QT interval on an electrocardiogram (ECG)

<http://www.genedk.com/wp-content/uploads/2010/12/LQT.jpg>

A long QT interval can upset the careful timing of the heartbeat and trigger dangerous heart rhythms.

On the surface of each heart muscle cell are ion channels.

Ion channels open and close to let electrically charged sodium, calcium, and potassium atoms (ions) flow into and out of each cell.

This generates the heart's electrical activity.

In people who have LQTS, the ion channels may not work well, or there may be too few of them. This may disrupt electrical activity in the heart's ventricles and cause dangerous arrhythmias.

- LQTS often is inherited, which means you're born with the condition and have it your whole life. There are seven known types of inherited LQTS. The most common ones are LQTS 1, 2, and 3.
- In LQTS 1, emotional stress or exercise (especially swimming) can trigger arrhythmias.
- In LQTS 2, extreme emotions, such as surprise, can trigger arrhythmias.
- In LQTS 3, a slow heart rate during sleep can trigger arrhythmias.

- You also can acquire LQTS: you develop it during your lifetime. Some medicines and conditions can cause acquired LQTS.
- Lifestyle changes and medicines can help people who have LQTS prevent complications and live longer.
- Some of these lifestyle changes and treatments include:
 - Avoiding strenuous physical activity or startling noises.
 - Adding more potassium to your diet (as your physician advises).
 - Taking heart medicines called beta blockers. These medicines help prevent sudden cardiac arrest.
 - Having an implanted medical device, such as a pacemaker or implantable cardioverter defibrillator. These devices help control abnormal heart rhythms.
- <http://www.nhlbi.nih.gov/health/health-topics/topics/qt/>