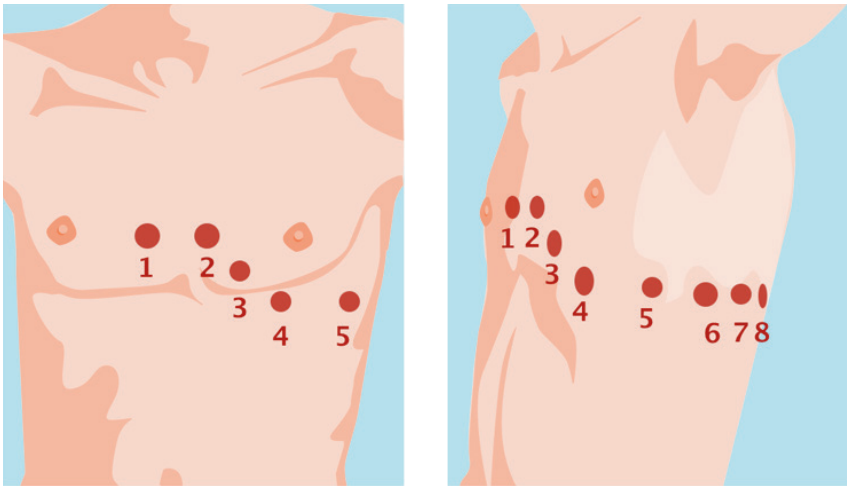
Level 4

The precordial leads—what nobody ever tells you

In this chapter you will learn where to put the precordial leads and what they tell you about the heart.

How to place the precordial leads

The precordial leads show the electrical activity of the heart in the horizontal plane. Most commonly, six precordial leads are recorded. The precordial leads are registered in combination with the limb leads. You will learn more about the limb leads in Level 9 of this training.



Proper placement of the precordial leads V1 through V6.

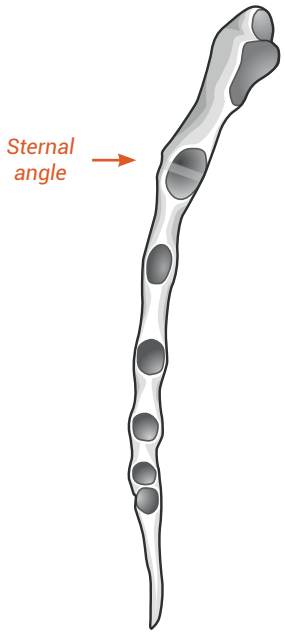
The precordial leads are placed at predefined positions on the chest. Here's how to go about it:

1. First, find the second rib and the second intercostal space. Then count down to the fourth intercostal space. Attach V1 in the fourth intercostal space on the right side of the sternum, and attach V2 in the fourth intercostal space on the left side of the sternum.
2. After you've attached V1 and V2, attach V4 at the intersection of the midclavicular line and the fifth intercostal space.
3. Attach V3 exactly halfway in between V2 and V4. From V4 on, we don't need to worry about the intercostal spaces anymore; the subsequent leads are attached at the same horizontal level as V4.
4. V5 is placed in the anterior axillary line (same level as V4).
5. V6 is placed in the midaxillary line (same level as V4).

Occasionally, two additional leads (V7 and V8) are also attached. V7 is located at the posterior axillary line (same level as V4), and V8 is attached at the scapular line (same level as V4).

How to find and count the intercostal spaces correctly

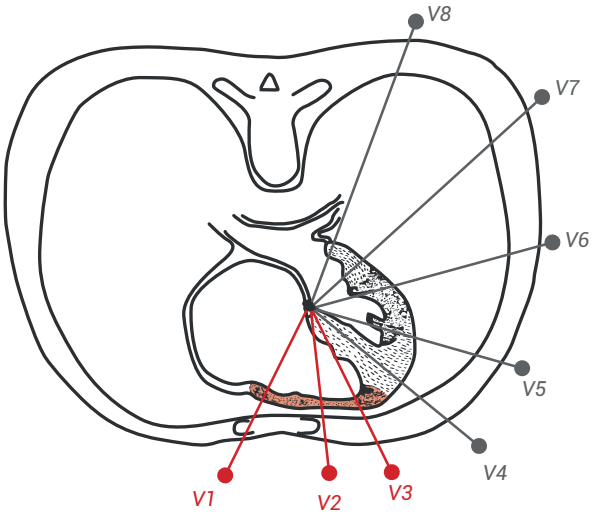
The easiest way to find the fourth intercostal space is to look for the sternal angle. The sternal angle is a little edge in the upper third of the sternum (see image), which can be found in almost any patient. The second rib inserts right next to the sternal angle. Below the second rib is the second intercostal space. Then you just count down to the fourth and fifth intercostal spaces, respectively.



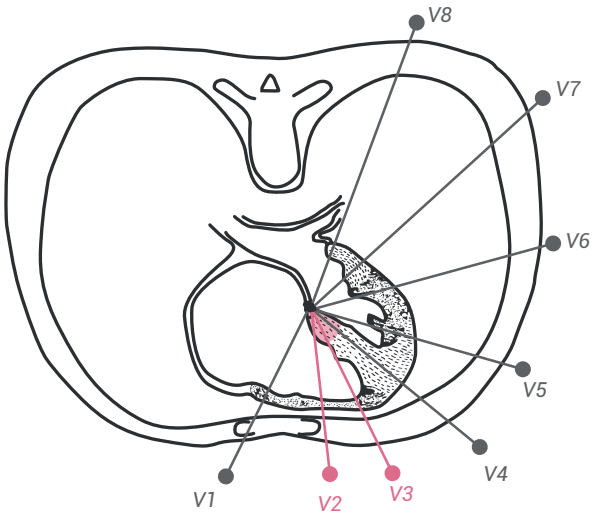
Try to find the second rib on yourself using this approach, and you'll see that it's easy. Then count the intercostal spaces.

What anatomical regions are depicted by what leads?

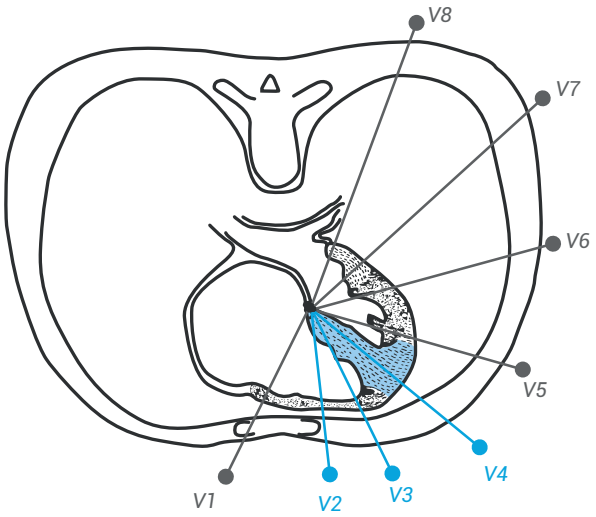
Each precordial lead depicts a certain region of the heart. Some leads even depict more than one region. Let's say you see ST elevations on the ECG—a sign of myocardial infarction. Just by looking at the affected leads, you'll be able to tell where the infarction is located.



The changes in the right ventricular myocardium can be seen in leads V1, V2, and V3.

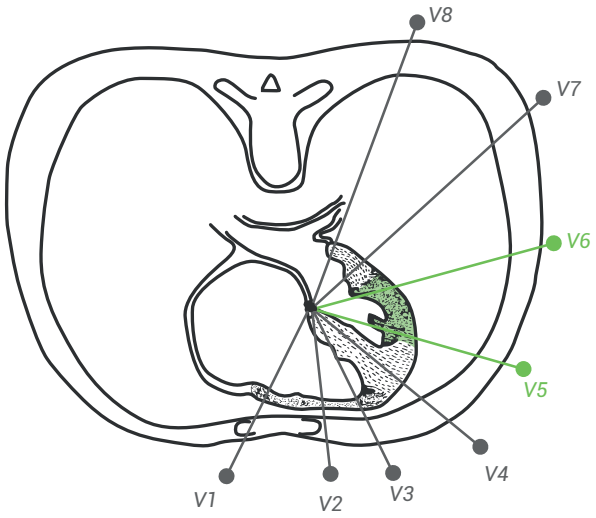


But changes in the basal septum also can be detected in these leads, although usually only in V2 and V3.



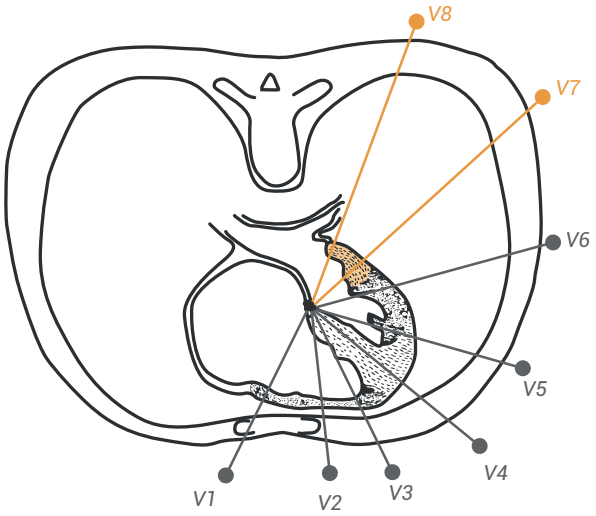
V2, V3, V4: anterior wall of the LV

If changes can be seen in V2, V3, and V4, then the anterior wall of the left ventricle (and the septum) are affected.



V5, V6: lateral wall of the LV

V5 and V6 show the lateral wall of the left ventricle.



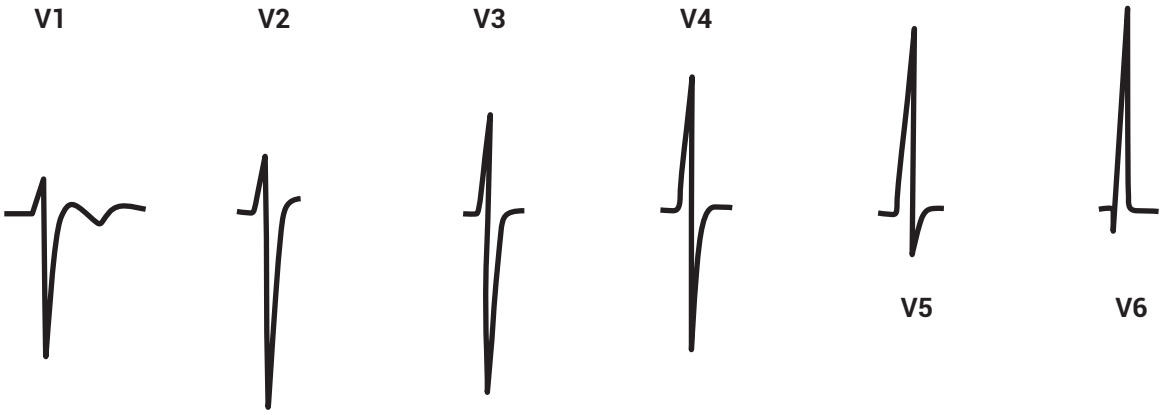
V7, V8: posterior wall

V7 and V8 depict the posterior wall of the left ventricle.

Changes that are seen in the anterior AND the lateral walls are called **anterolateral**. *Changes that are seen in the lateral and posterior walls are called* **posterolateral**. *Changes that are seen in the anterior wall and the septum are called* **anteroseptal**.

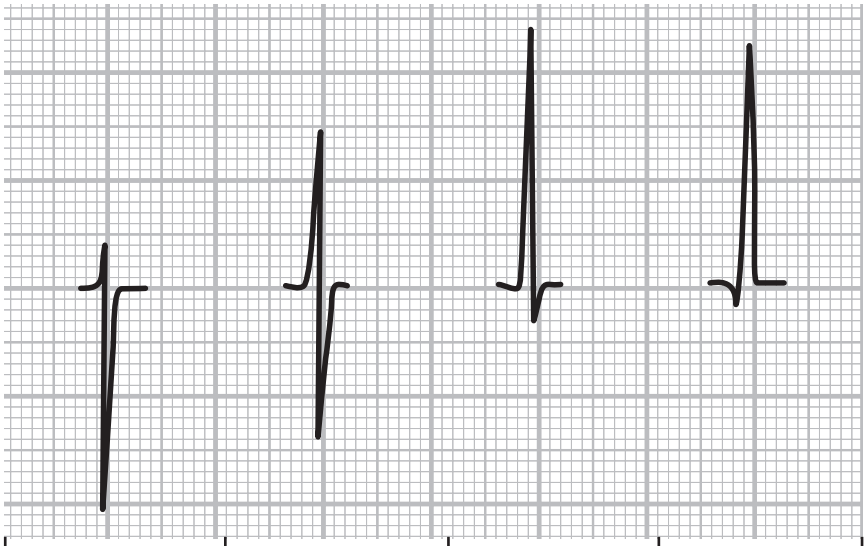
The normal pattern

Each precordial lead has a typical ECG pattern. Try to remember this picture of normal chest leads:



The R/S ratio ("R to S ratio")

As the name implies, the R/S ratio compares the size of the R wave to the size of the S wave in each lead. Let's look at four examples. Please complete the calculations for examples 3 and 4 (answers are at the end of the chapter).



	Example 1	Example 2	Example 3	Example 4
R (mV)	0.4	1.4		
S (mV)	2.0	1.4		
R/S	0.4/2.0 = 1/5 = 0.2	1.4/1.4 = 1		

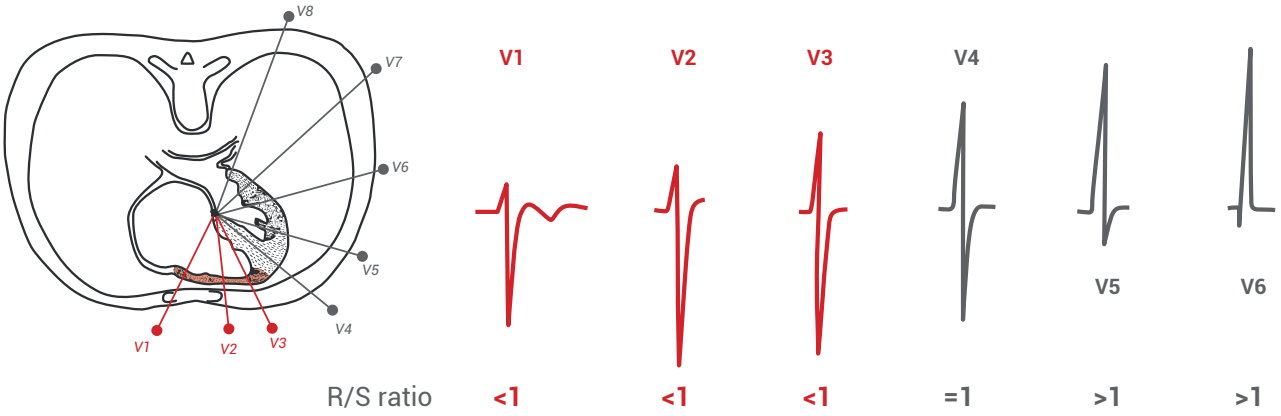
[Solution at end of chapter]

A lot of doctors neglect the R to S ratio. But you shouldn't!

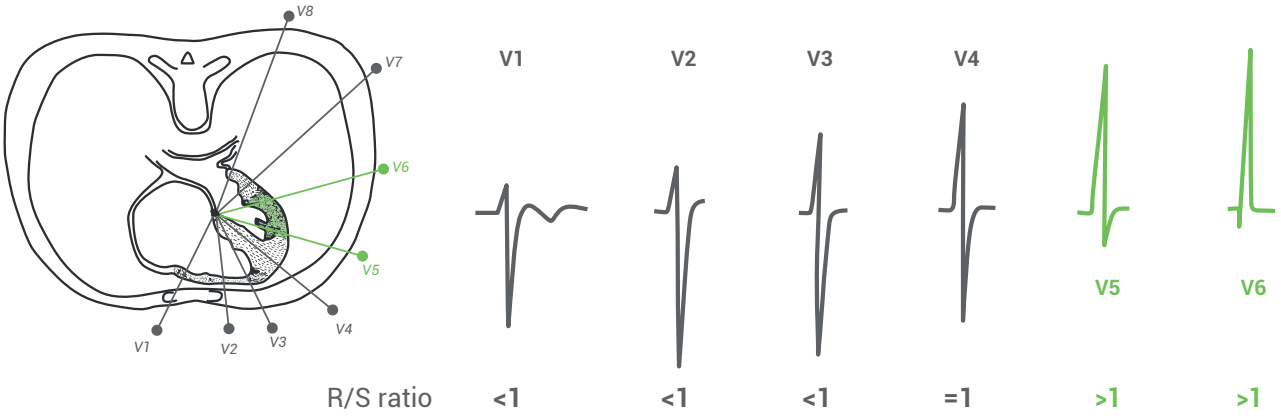
So why is the R/S ratio important?

There are two very important laws that apply under normal circumstances (i.e., when the muscle mass of the left ventricle exceeds that of the right ventricle). Law number 1 says:

Leads with an R/S ratio <1 correspond to the right ventricle

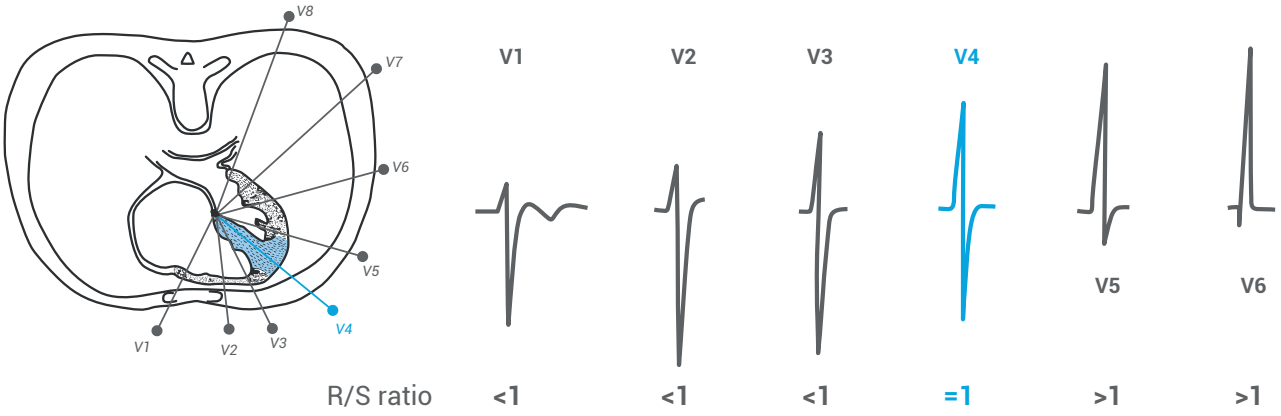


Leads with an R/S ratio >1 correspond to the left ventricle



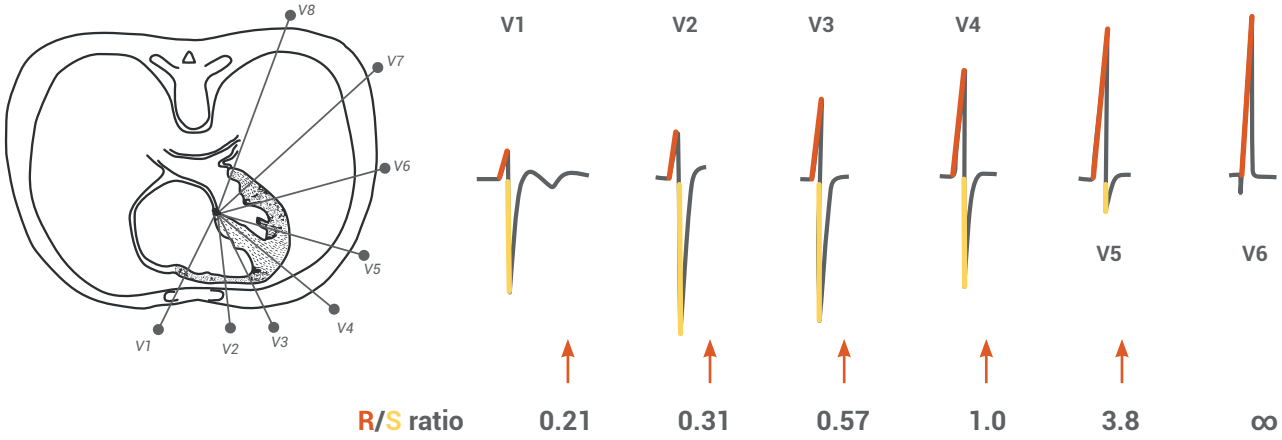
Leads with an R/S ratio of =1 correspond to the transitional zone between right and left ventricle

The transitional zone usually occurs at leads V3 or V4.



And law number 2 says:

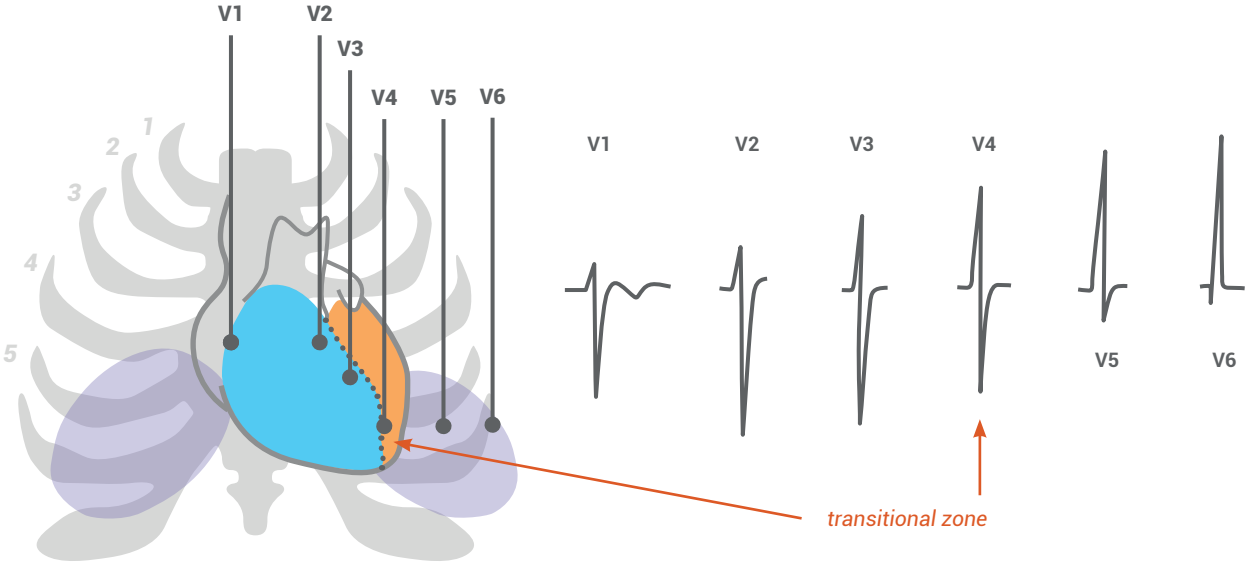
Under normal circumstances, the R/S ratio increases as you go from right to left



It's also important to note that the amplitude of the initial R wave increases as we go from V1 over to the left ventricle.

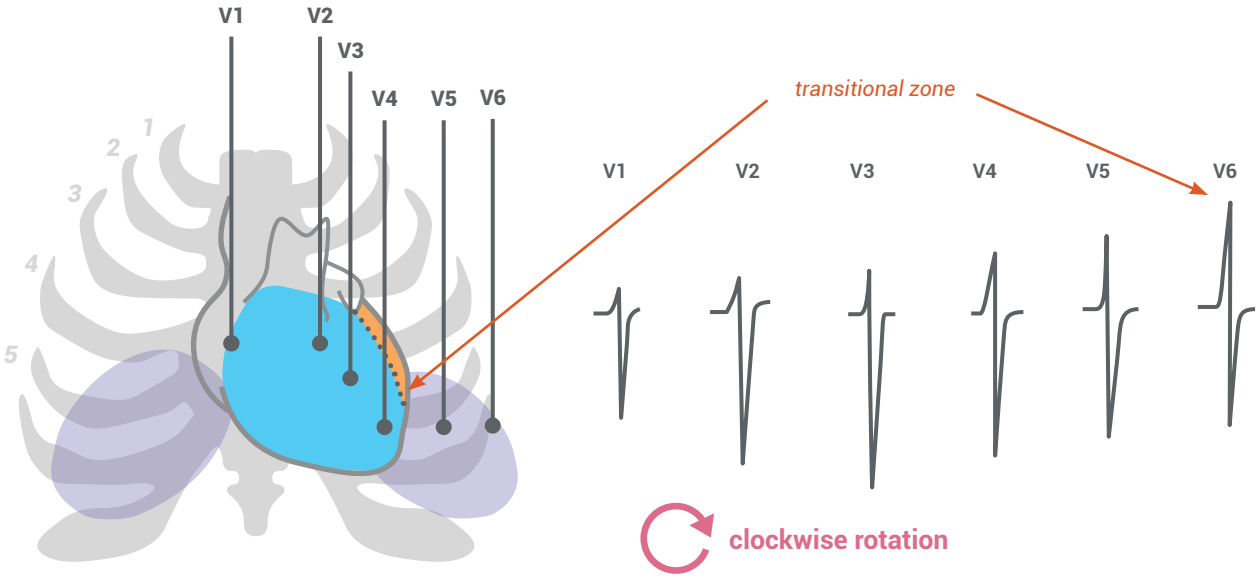
When the transitional zone is off

As you learned above, the transitional zone (the dotted line separating right from left ventricle) usually occurs at V3 or V4, as depicted in this image:

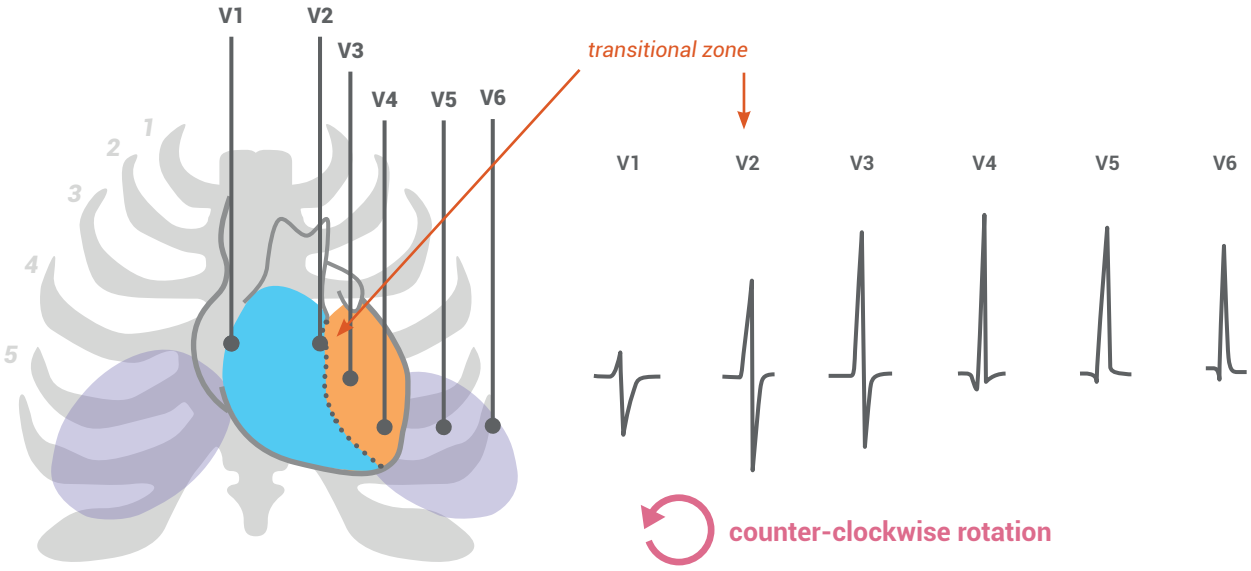


But not every heart is the same. Sometimes, the heart is "rotated" in a clockwise or counterclockwise fashion along its longitudinal axis (going from the apex to the base of the heart).

When the heart is rotated in a clockwise fashion, the transitional zone shifts toward V5 or V6:



And when the heart is rotated in a counterclockwise fashion, the transitional zone occurs at V1 or V2:



You'll need to be able to tell whether a precordial lead depicts the right or the left ventricle. Knowledge about rotation is therefore critical.

Answers to R/S ratio calculations:

	Example 1	Example 2	Example 3	Example 4
R (mV)	0.4	1.4	**2.4**	**2.3**
S (mV)	2.0	1.4	**0.3**	**0**
R/S	0.4/2.0 = 1/5 = 0.2	1.4/1.4 = 1	**8.0**	**∞**