

Caution: Occlusion Myocardial Infarctions Can Be Subtle!

Discussion

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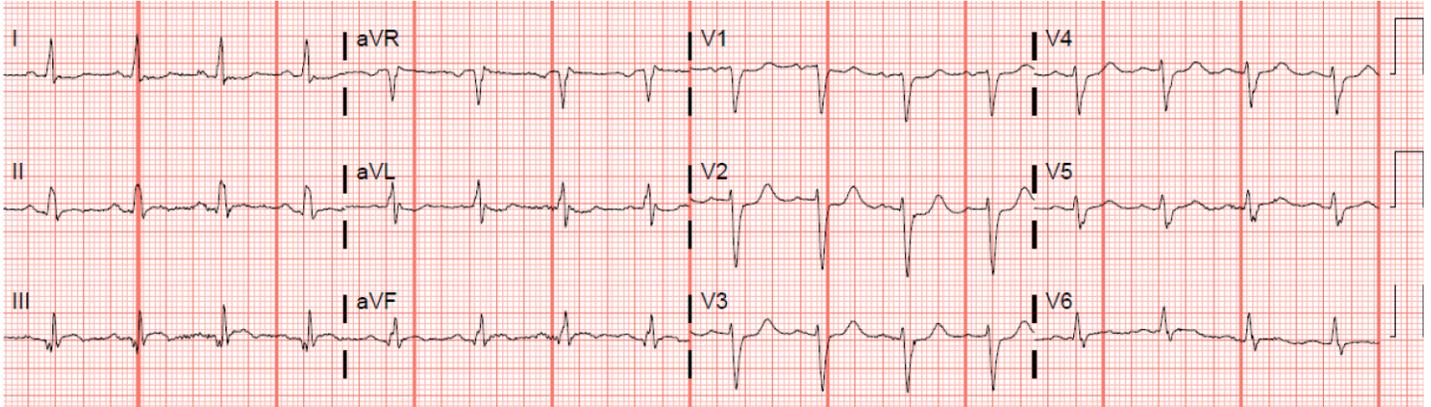


Figure 1

Take a close look at this ECG. What do you see? There are several important teaching points to be made. All the findings are very subtle.

Nothing really seems to jump out at you on this ECG but there is so much there!

Looking at the *frontal plane* (limb) leads first, the most striking thing to me is the ST depression in Lead aVL. Let's look a little closer... is there any T wave inversion? No. The T wave is upright.

PEARL | When the T wave is *biphasic* (down/up, up/down), it is classified by its *terminal portion*. A biphasic down/up T wave, for instance, would be designated an *upright* T wave.

Well, if Lead aVL has ST depression, we'd better check its partner in the basolateral (formerly "high lateral") group: Lead I. Yes! There is ST depression in Lead I. If you don't see it, study it more closely. As I warned you – it's very subtle!

So, we have ST depression in Leads I and aVL. Remember: subendocardial ischemia does not localize but the *reciprocal changes* to an *acute transmural ischemia* (acute "MI") DO localize fairly well! If the frontal plane basolateral leads are acting reciprocally to an acute ischemia, where should we look for that ischemia? In the inferior leads (II, III, aVF)!

There is just the “hint” of ST elevation in the inferior leads – it is certainly NOT obvious! Are we just fooling ourselves into thinking that ST elevation is present in those leads? NO! There are *reciprocal changes* present which validate our impression. It’s during cases like this one that reciprocal changes are most helpful. When the ST elevation is very obvious and localizing (and with the appropriate scenario), they aren’t really needed.

Let’s move on to the precordial (horizontal plane) leads. Notice anything? How about the ST depression in Leads V1 – V4? Did you notice it initially? If not, look more closely.

[FYI: In the Masterclasses we have “Eye Exercises” in which the participants develop skill in recognizing the subtlest changes.]

What are we seeing in precordial leads V1 – V4? Those are *reciprocal changes*! That is NOT an anterior ischemia! That finding indicates acute transmural ischemia located on the other side of the heart from the right precordial leads. We usually see involvement of just V1 – V3, but it is not too unusual for Lead V4 to be involved, also.

PEARL | Are you wondering why I seem so focused on *ischemia* rather than *infarction*? It’s because *that is what we are looking for*; it’s what we must treat! ST elevation is ISCHEMIA. Q waves are INFARCTION. Why on earth would you want to treat an infarction? It’s dead tissue!

[Spoiler Alert: You *aren’t* going to resurrect it – I promise you!]

We used to think that the ST depression in Leads V1 – V3 represented a *posterior wall* ischemia but we now know that it is really an ischemia of the *lateral wall* of the left ventricle. It’s easy to see how the mistake was made – the lateral wall of the left ventricle is located posteriorly in the chest.

There is another subtlety that I would like to point out. Look at the ST segments and T waves in the inferior leads (II, III, aVF) and compare them with the ST segment and T wave in Lead V3, for instance. Can you distinguish the ST segments from the T waves in the inferior leads? Difficult, isn’t it? Now how about the ST segment and T wave in Lead V3? That one is very obvious.

Always be suspicious when the T wave appears to begin at the J-point (the end of the QRS). Two conditions are likely to cause that: *acute ischemia* and *hypercalcemia*. If

the scenario includes a patient with ACS-compatible symptoms, then go with acute ischemia!

The precordial transition occurs late (V6). That is typical of a left axis deviation, but when we look at the frontal plane leads, we see that Leads I and II are both upright indicating a *normal* QRS axis. What's happening? What's happening is that you are visualizing the heart as a two-dimensional structure when it is obviously three-dimensional. Remember that the ventricles are not really "right-left" but "anterior-posterior." The electrical axis of the heart in the horizontal plane has rotated to the LEFT and is pointing posteriorly... toward the LEFT ventricle.

PEARL | We refer to the QRS vector in the frontal plane as *AXIS*, but we refer to it in the horizontal plane (precordial leads) as *ROTATION*.

I hope you learned something from this short discussion.