# Bundle Branch Block With Primary and Secondary Repolarization Abnormalities

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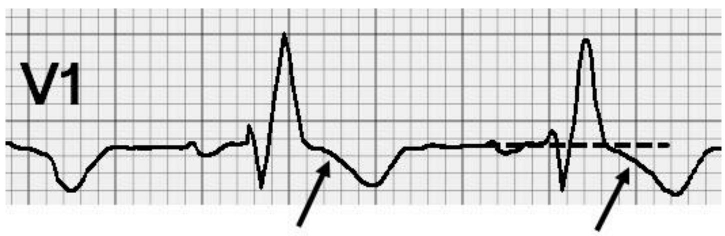


***Figure 1***

There is one area of misinterpretation / misinformation that I see a lot… mostly on the internet. That is the lack of understanding that we must adhere to the proper definitions regarding deflections, intervals and other entities on the electrocardiogram. It is not acceptable to redefine these known facts just to suit your research findings or to justify a questionable diagnosis. The concept of repolarization following complete bundle branch blocks is one of those areas.

There are two kinds of repolarization abnormalities: *primary* and *secondary*. A *primary* repolarization abnormality occurs because of a pathological change *within the myocyte*. It is a problem *at the cellular level*, such as ischemia, hypoxia, acidosis, medication toxicity or poisoning, electrolyte imbalances, etc. A primary repolarization abnormality may follow a normal QRS or an abnormal QRS.

A secondary repolarization abnormality follows an *abnormal* QRS. It's an abnormality – but one that we expect! An abnormality of depolarization will be followed – invariably – by an abnormality of repolarization. While primary repolarization abnormalities may take many different forms, secondary repolarization abnormalities are rather strictly defined. Figure 29-4 presents a very *normal* complete RBBB as recorded in Lead V1 (we always look in Lead V1 to decide which bundle branch block is present). Let's take a close look at that first QRS-T interval. Note:

1. Repolarization begins *at the J point* – not AFTER the J point.
2. The J point is usually *on the baseline* – but it is not required to be on the baseline. It can also be above or below it. Whether the J point is *on* the baseline or *above* it or *below* it, *repolarization still begins at the J point!* The J point should normally be on the baseline. We can forgive up to 1.0 mm of J point depression – but no more! Anything deeper becomes a *primary* repolarization change.
3. From the J point, the baseline immediately begins to *slope downward* into an inverted T wave – NOT a biphasic T wave – an *inverted* T wave.

4. Look closely at the ST segment as it slopes downward. Do you see the subtle upward convexity about midway between the J point and the nadir of the T wave (arrows)? That is an *important characteristic* of a secondary repolarization abnormality. It isn't visible 100% of the time, but I would estimate that it is there about 95% of the time. And it is *subtle* – it's *always subtle*.

That is a ***true secondary repolarization abnormality***. You will see it with RBBB in lead V1 (frequently in Lead aVR and rarely in Lead III). In LBBB it will be present in Leads I, aVL, V5 and V6 – but NOT Lead V1. In LBBB, Lead V1 will manifest a very exaggerated reciprocal of this secondary repolarization abnormality as manifested in Leads V5 and V6.

On occasion, a bundle branch block will be followed by a *primary* repolarization abnormality. This may be obvious – something totally different than the expected secondary repolarization abnormality – or it may be very subtle, requiring a very discerning eye. Let's look at an RBBB with an *obvious* primary repolarization abnormality:

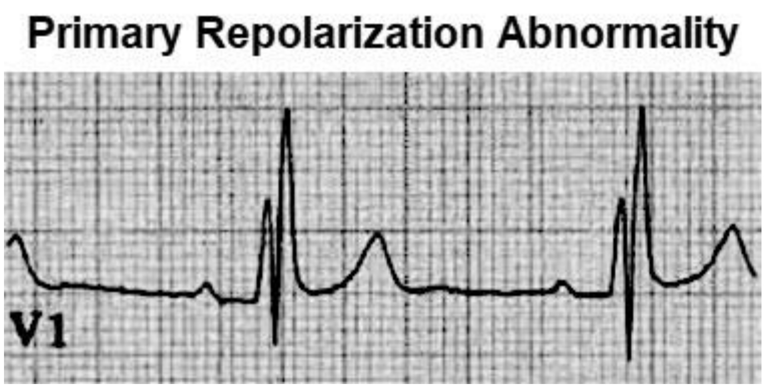


***Figure 2***

Wow! Look at that T wave! It's pointing in the wrong direction! And where is that graceful downsloping ST segment with the subtle convexity? This is indeed a true, complete RBBB – but that isn't the secondary repolarization abnormality that we expected! This is a very *obvious primary repolarization abnormality*. A lot of things can cause this but this is due to ischemia. Now let's look at a very *subtle primary repolarization abnormality* that still looks very much like a secondary repolarization abnormality (like a wolf in sheep's clothing):

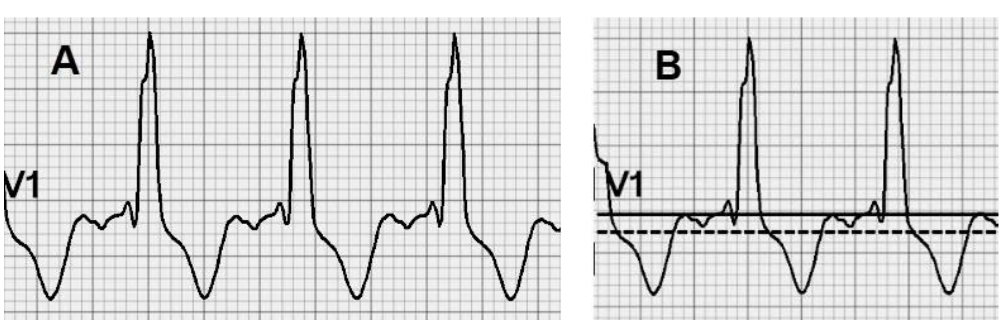


***Figure 3***

This (Figure 3) looks just like a normal secondary repolarization abnormality, doesn't it? The ST segment begins its downward slope at the J point, the subtle upward convexity is there, and it ends in an inverted T wave. Except for just one thing – the J point is more than 1.0 mm below the baseline. Under normal circumstances the J point should be on the baseline. In the case of bundle branch blocks, we can forgive 1.0 mm of depression – *but no more than that!* This is the subtle form of a primary repolarization abnormality. In a situation like this, one should very strongly suspect ischemia (or one of the other causes if the evidence supports it), at least until proved otherwise.

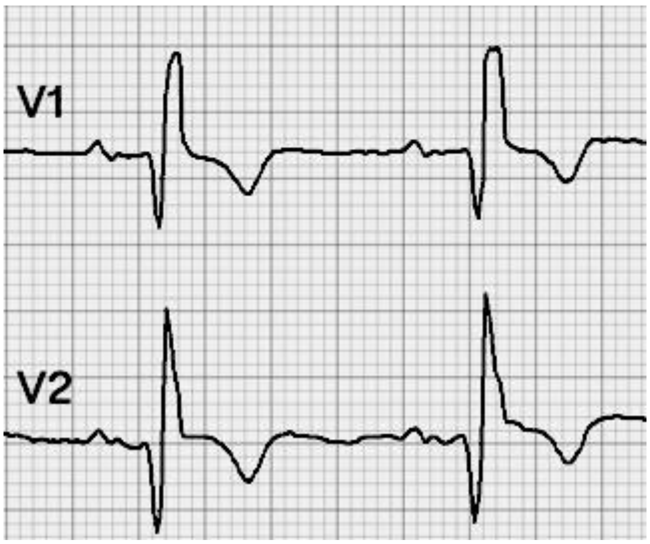


***Figure 4***

One more subtle primary repolarization abnormality change:

This (Figure 4) is another subtle form of primary repolarization abnormality: in Lead V1 it looks like a normal secondary repolarization abnormality, but does something look not quite right? There is a little too much of a plateau between the J point and where the ST segment begins its descent into the inverted T wave. It's very subtle, but look at Lead V2 – it's not subtle at all there. By Lead V3 there was an obvious upwardly convex ST elevation. This was *not* just a secondary repolarization abnormality. Here are a few more subtle primary repolarization abnormalities disguised as secondary repolarization abnormalities (Figure 5):

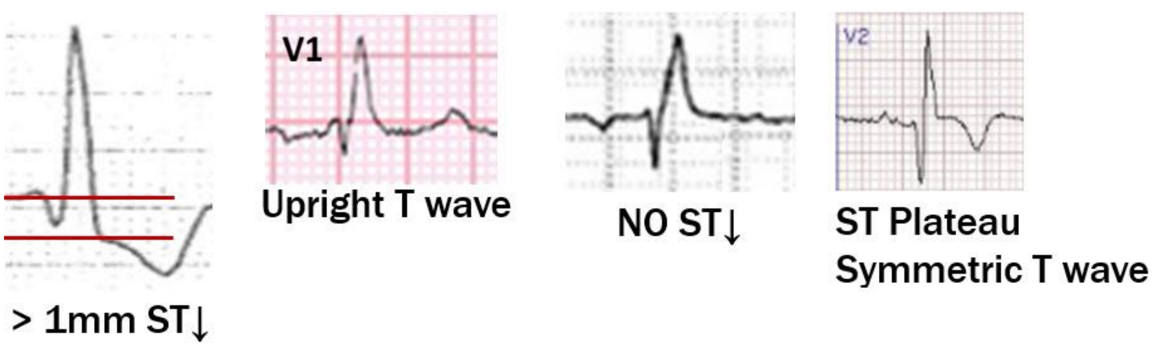


***Figure 5***