Slurring of the Base of the R Wave

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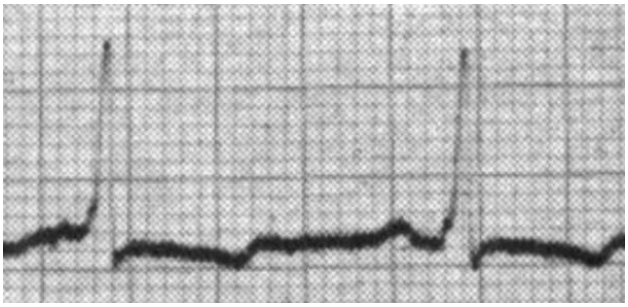
What exactly is *slurring* of an ECG line or deflection?

Today, when we look at a printed ECG, we see a uniform, thin line that maintains the same width and density throughout the ECG. In the "not-so-good old days" years ago, the printed ECG was recorded using a stylus with an almost red-hot tip leaving a burn mark on the ECG paper (which had a thin wax coating on it). The slower the conduction through a particular region of the heart, the slower the stylus would move on the paper. Thus, *slower* conduction left a *wider* burn mark while *faster* conduction left a much *thinner* mark. That thickening of the line was called *slurring*. Here is an example from an old tracing:



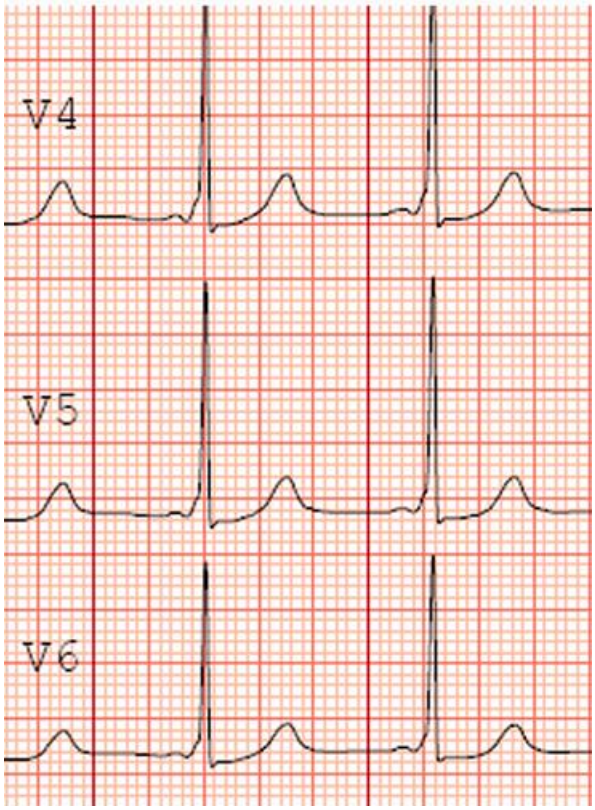
As you can see (left), the stylus moved much more rapidly during depolarization (the QRS complexes) leaving a very thin line. However, it moved comparatively slowly during repolarization and diastole which created a thicker burn line.

FYI, if we wanted to measure the *height of the R wave*, we measured from the TOP of the thick baseline; but if we wanted to measure the *depth of the S wave*, we measured from the BOTTOM of the thick baseline. We'll come back to this tracing in a moment.

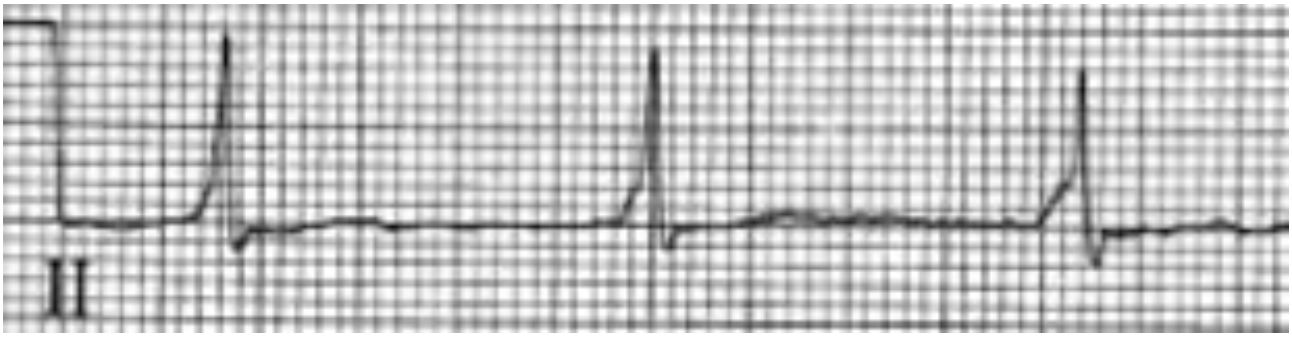
The R wave can be slurred at the base on its initial ascending side and also at the base on its terminal, or descending, side. Let's discuss slurring at the base of the ascending side first.

There are THREE causes of slurring of the base of the R wave on its ascending side…

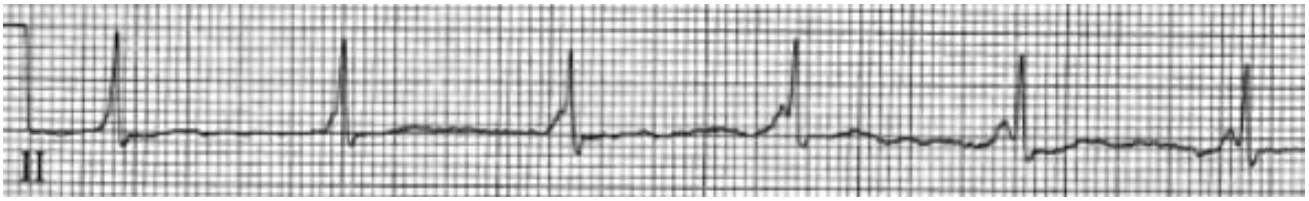
1. ***The delta wave of ventricular pre-excitation (right)***. This one is obvious and should have been the first one that you thought of. Here is an example:



2. ***AV dissociation in which a P wave is encroaching on the R wave***. Here is an example:

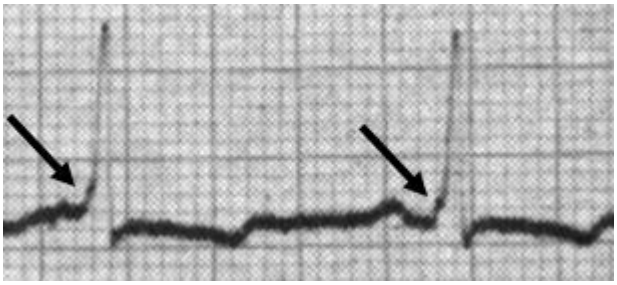


That is NOT a delta wave – it's a P wave that is dissociated from the QRS complexes! Here is a longer rhythm strip:



Here You can see the AV dissociation more clearly.

3. ***Incomplete left bundle branch block (iLBBB)***. I doubt that you were aware of this one! Most people aren't. For years it was debated whether there was even such a thing as iLBBB. There *<u>is</u>* such a thing, but it appears to be mostly associated with early left ventricular hypertrophy. This is what is looks like:

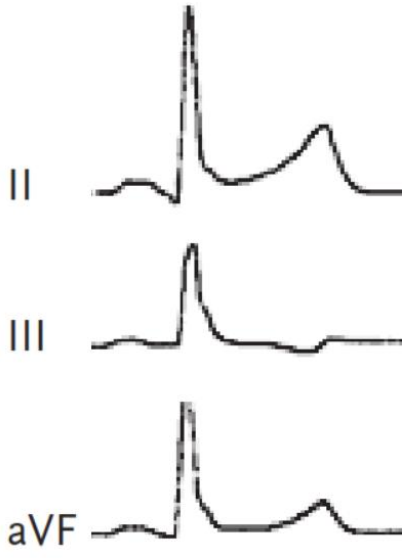


This is the first ECG snippet from the beginning of this article. You can see a subtle slurring (arrows) at the base of the R wave on its ascending side. Incomplete LBBB is rarely seen and the *slurring* – which will only be present in Leads V5 and V6 – are even more rarely seen. However, if you look at enough ECGs, you may eventually encounter it.

Now let's discuss TWO problems that result in slurring of the terminal or descending R wave at the base…

1. ***Early repolarization (EP) and early repolarization syndrome.***
   Most early repolarization is totally benign. And even the "dangerous, potentially lethal" type of early repolarization syndrome has a very, very low probability of causing any problems. But… you need to recognize it when you see it. Now, in this

article I am just going to show you what to look for. I am planning a thorough discussion of early repolarization and early repolarization syndrome for an upcoming article.



This is slurring of the downslope of the R wave due to early repolarization (left). Note that it can look just like a "delta wave" *but on the wrong side of the R wave*. This is NOT an unusual presentation. Since it doesn't have the J-point notch and the ST elevation that is typically associated with early repolarization, it is often not recognized for what it is. This particular instance of EP is the dangerous kind. However, the patient still has a miniscule chance of developing paroxysmal ventricular fibrillation – unless he or she is young and has come to your office because of multiple syncopal episodes and a history of death in the immediate family at a young age or due to unexplained causes.

2. ***AV Dissociation***. AV dissociation can also distort the base of the R wave on the *descending* (or terminal) side. Here is an example:

Here we see a P wave in front of the QRS, within the QRS and exiting the QRS on the descending side.

So there are the most common causes of slurring of the base of the R wave: THREE on the ascending side and TWO on the descending side.