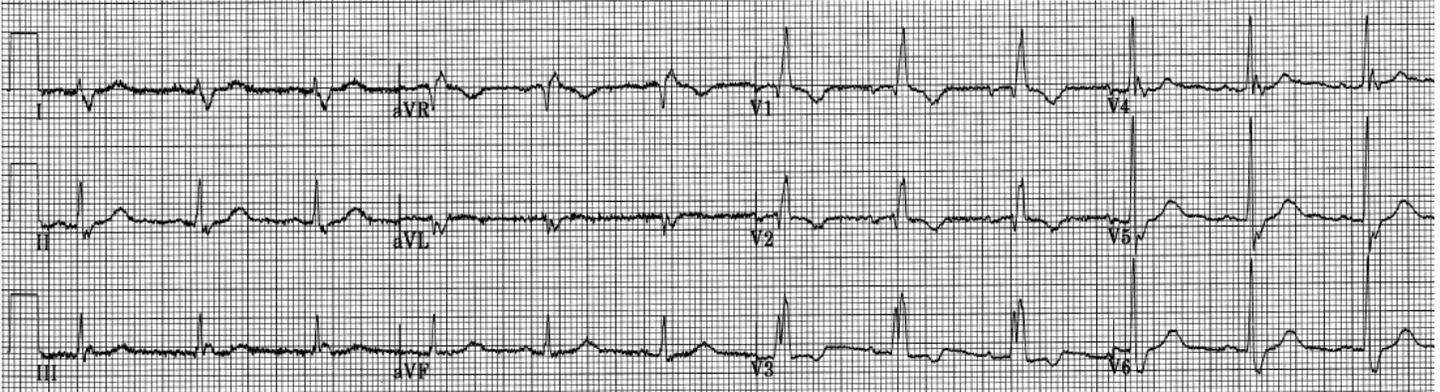


Complete Right Bundle Branch Block (cRBBB): Not Always Classic!

27-Nov-1923	Vent. rate	73 bpm	Normal sinus rhythm
Female Caucasian	PR interval	162 ms	Right bundle branch block
	QRS duration	126 ms	Abnormal ECG
	QT/QTc	418/460 ms	
	P-R-T axes	44 100 68	



One of the most common deficiencies I find among those taking my advanced ECG courses is a very rudimentary knowledge of bundle branch blocks that is often fraught with misconceptions and misinformation.

I am going to discuss complete RIGHT bundle branch block (cRBBB), what it means and how to recognize it.

First, let's get some misleading information out of the way...



Figure 1

The QRS interval in the illustration on the left (Figure 1) is a *classic* complete right bundle branch block (cRBBB). This is the QRS of “rabbit ears” fame. It is typically present in Lead V1 but it can also be seen in two other leads. Do you know which leads I’m referring to?

This rSR' morphology is seen definitively in Lead V1 because V1 is the right-most of the regular precordial leads (V1 – V6). It is the location of the V1 electrode that allows the positive pole of Lead V1 to see this classic morphology of cRBBB. But there is another lead that is even further to the right and that is **Lead aVR**. When the rSR' morphology is present in Lead V1, it will almost always be present in Lead aVR as well.

What is the *third* lead that may – from time to time – exhibit an rSR' morphology during cRBBB? There is one more right-sided lead that no one ever thinks about: **Lead III** (Figure 2). In addition to being an *inferior* lead, it is also a *right-sided* lead. The appearance of the rSR' morphology in Lead III during cRBBB is unpredictable, but you will see it from time to time. Don't depend on it, however.

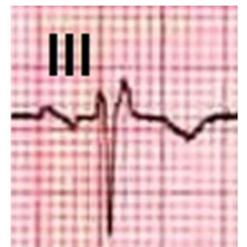


Figure 2

OK... so you can recognize a classic cRBBB morphology in Lead V1. Quick! What does a classic cRBBB morphology look like in Lead V6? Did you have to stop and think? Do you actually know?

27-Nov-1923
Female Caucasian

Vent. rate 73 bpm
PR interval 162 ms
QRS duration 126 ms
QT/QTc 418/460 ms
P-R-T axes 44 100 68

Normal sinus rhythm
Right bundle branch block
Abnormal ECG

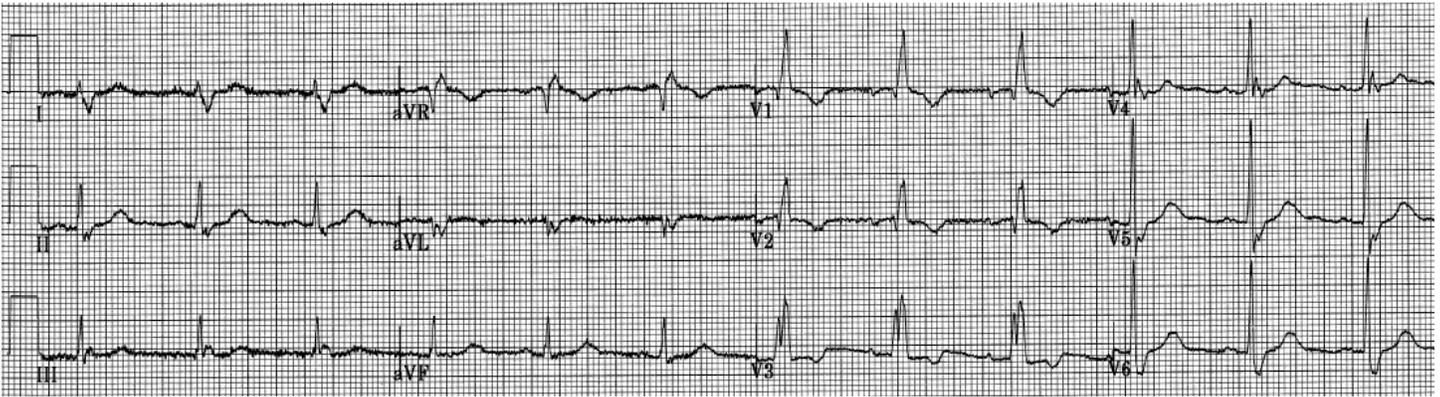


Figure 3

The classic cRBBB morphology in Lead V6 is just the opposite of that in Lead V1: qRs (Figure 3). The q represents the septal q which is usually present (and *normal*), the R represents *left ventricular depolarization*, and the wide, slurred s wave represents *right ventricular depolarization*. During cRBBB, it is very important to see the wide slurred s (or S) wave in left-sided leads (I, aVL, V5, V6) because that represents a rightward terminal QRS vector indicating the late depolarization of the right ventricle *after* the left ventricle.

Here is a general rule that stands no matter how NON-classic the morphology of cRBBB appears: right-sided leads always end with an R or R' wave and left-sided leads always end with a wide s (or S) wave. ALWAYS!

So, the first thing you should think about when you see a cRBBB is this: ***the ventricles are depolarizing and contracting in succession – not together as normal!*** Because the right bundle branch is “blocked,” the left ventricle depolarizes and contracts first – followed by the right ventricle.

If you are wondering about the quotes around the word *blocked*, that is because many – if not most – cRBBB are not actually *real* blocks. In many cases, the right bundle branch is simply conducting more slowly than the left bundle branch, allowing time for the left ventricle to depolarize first. Only in rare cases can we make this distinction with a 12-lead ECG, so it is nothing that you need be concerned about.

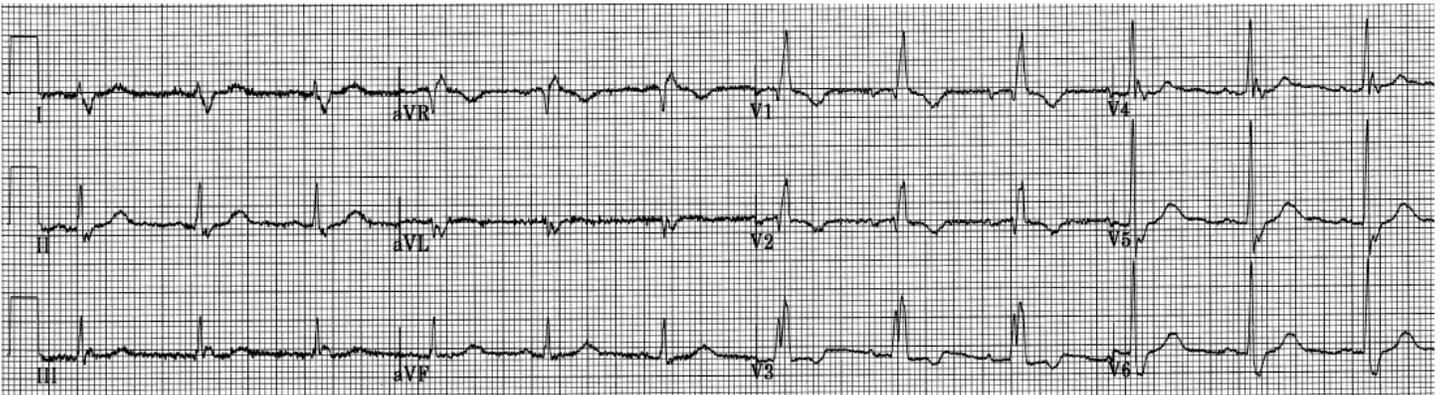
How does the impulse from the left ventricle reach the right ventricle? The impulse crosses over the interventricular septum from left to right – transversely. This is accomplished by slower cell-to-cell conduction. The only conducting pathways in the septum are the bundle branches themselves and they only run longitudinally.

Now, I want to move everyone away from the “rabbit ears” concept of cRBBB because the classic cRBBB morphology does NOT have to be present during cRBBB. Look at the tracing repeated at the top of each page. Lead V1 has a qR morphology. So does Lead aVR since it always mimics Lead V1 during cRBBB. Leads I and V6 end with a wide s wave – as expected. No septal q waves are present. Could this be due to rotation of the heart or an old anterior MI? We can't be sure from one ECG, but given the patient's age (this ECG was recorded in

27-Nov-1923
Female Caucasian

Vent. rate 73 bpm
PR interval 162 ms
QRS duration 126 ms
QT/QTc 418/460 ms
P-R-T axes 44 100 68

Normal sinus rhythm
Right bundle branch block
Abnormal ECG



2011), I suspect either an old MI or fibrosis as the cause. A qR complex in Lead V1 is sometimes associated with severe right heart strain, but I really don't see other evidence of that with normal P waves and T waves in the inferior leads.



Figure 4 Courtesy of ECG Guru

Complete RBBB can also manifest with a monophasic R in Lead V1. This snippet (Figure 4, courtesy of Dawn Altman – ECG Guru) on the left illustrates this clearly. Lead aVR from this tracing appeared as a qR complex.

Another form the QRS in Lead V1 can assume is the notched monophasic R wave as in Figure 5. This is not really an RR'. The downslope of the first R must return to the baseline before the following positive deflection can be called an R'. And there is no "s" wave separating the two peaks; an S wave cannot be present until the line has dropped below the baseline. All S waves must have a negative area within the curve. By the way, there is no physiologic meaning to the "prime" symbol. Both positive deflections are R waves of equal importance – we just use the prime (') symbol to specify which R wave we are talking about.

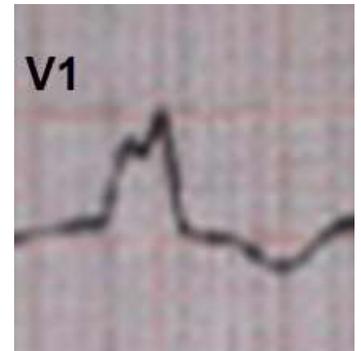


Figure 5

Normally, the QRS interval in Lead V6 during cRBBB has a qRs morphology. For it to be classic, the R wave must have more amplitude than the S wave; in other words, the R/S ratio should be > 1.0. But that is classic and, like Lead V1, not every cRBBB QRS in Lead V6 is classic. The most common reason is the presence of an anterior fascicular block or a posterior fascicular – both of which can result in an R/S ratio < 1.0 (Figure 6).

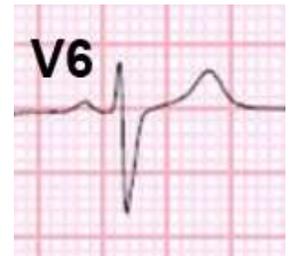


Figure 6

So, if you are just looking for "rabbit ears" to diagnose a classic cRBBB, you are going to miss a significant number of them. Here's one final PEARL: **Lead I is the most reliable lead for diagnosing cRBBB – whether classic or non-classic.** The QRS will be at least 0.12 seconds wide and there will be a wide, slurred S wave present. Even during all the non-classic changes in the precordial leads, **the morphology of Lead I in cRBBB does not change** except in very, very rare instances.