

A Challenge for the Intermediate to Advanced ECG Nerds!

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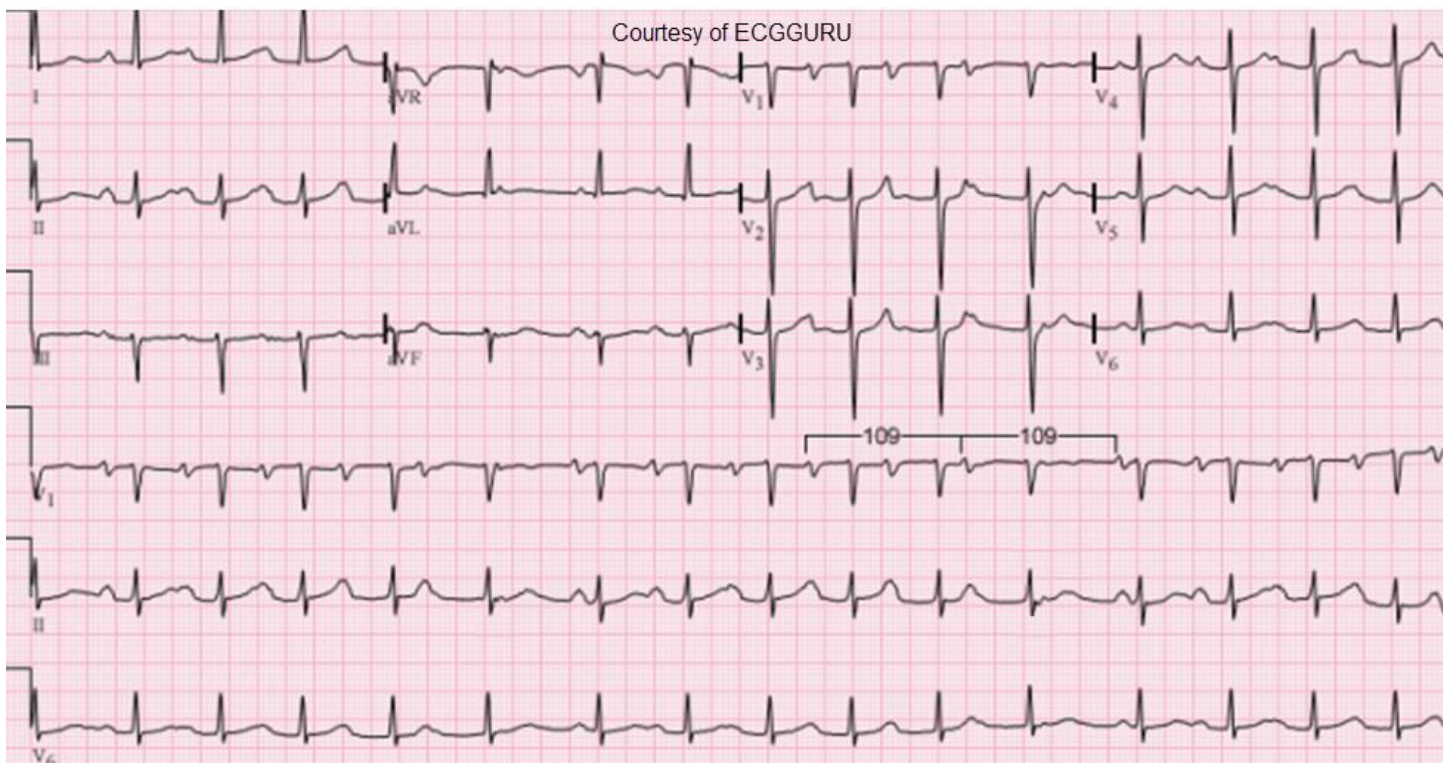


Figure 1

Let's concentrate on the Lead V1 rhythm strip (4th channel) since it has the best P waves. It looks like an obvious Mobitz I AV block with the PR intervals growing longer and longer. But... is there a dropped P wave? Did that 5th P wave actually conduct?

There appears to be a small P wave just after the 5th QRS complex. Let's enlarge it:



Figure 2

You can see that the 5th QRS complex ends differently than all the others: it has a tiny r wave at the end. Or is it not an r wave? Perhaps it's a P wave because it appears right on time for a sinus

P wave. Case solved: instead of ending with a non-conducted P wave, the Mobitz I episode ends with a junctional ectopic QRS followed by a P wave. An infrequent – but not rare – occurrence.

Or did it?

If that little r wave is really a P wave – where did it originate? If it were a sinus P wave, appearing on time like all the other sinus P waves on the tracing – shouldn't it look the same?

But it doesn't look like any of the other P waves (this pattern repeats on the full 12-lead ECG).

So was the 5th P wave the non-conducted P wave... or not?

The sinus P waves have a very distinct and consistent +/-biphasic morphology. But all we see of the P wave following the 5th QRS is a single upright phase. There is no negative portion following it.

Wait a minute... that is NOT a sinus P wave. It is a **P' wave** (a P wave originating outside the sinus node). Then the 5th QRS is not really a junctional ectopic but it is the result of conduction by the 5th sinus P wave.

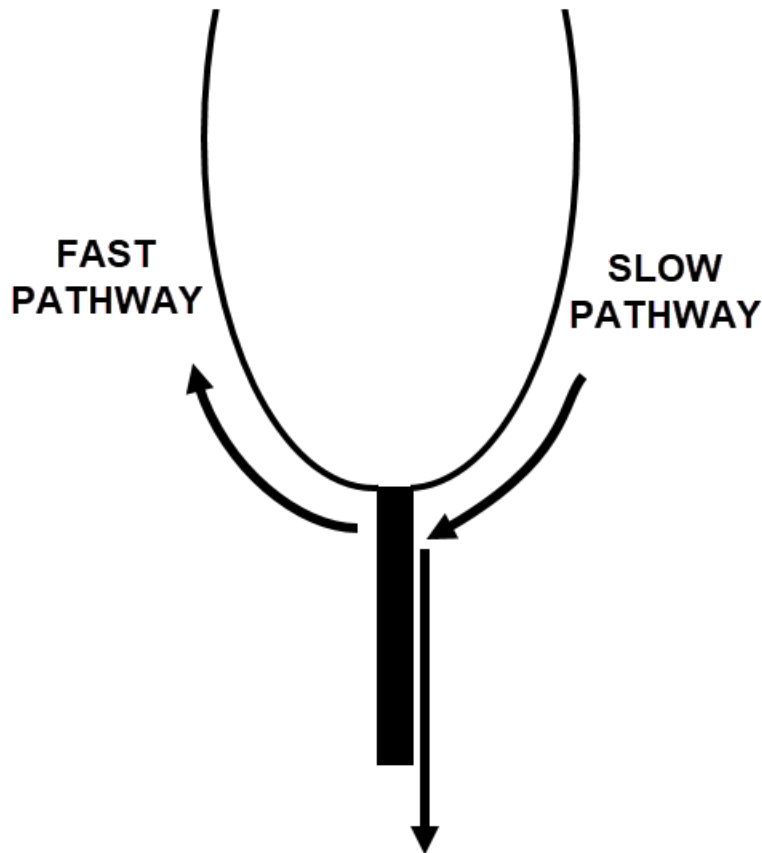
PEARL | *When you see a long PR interval ending with a QRS complex that is followed almost immediately by an abnormal appearing P wave – always consider the possibility (or even probability) of a sinus P wave that traveled down the slow pathway, conducted to the ventricles and then returned to the right atrium via the fast pathway.*

In this particular case, the Mobitz I block was likely occurring in the fast pathway. When it eventually failed to conduct, the impulse traveling down the slow pathway was able to reach the ventricles while sending a retrograde impulse back up the fast pathway which had recovered by this time, resulting in a reciprocal beat – an atrial echo! I think the timing is fortuitous in that the P' appears when one would expect the next sinus P wave.

The Mobitz I (Wenckebach) episode then begins anew.

Remember THREE things:

1. Impulses traveling through the AV node travel down TWO pathways – a *fast* pathway and a *slow* pathway. If the fast pathway begins to slow down, it may eventually conduct at a velocity that is slightly slower than the slow pathway, *which will then take over*.
2. The *slow* pathway really isn't slow – it's just SLOWER than the fast pathway!
3. When an impulse arrives at a division in the pathway, it will take BOTH routes. See the illustration below:



As the impulse travels down the slow pathway, it comes to a division of the pathway. One division leads down the bundle of His to the ventricles and the other division leads retrogradely back up the fast pathway.

As I stated in #3: when an impulse reaches a division of the pathway (the so-called “fork in the road”), it will take BOTH routes.

This is the basis of reciprocal beats (“echo” beats) AND AV nodal reentrant tachycardias (AVNRT).

I warned you there was more to this than the initial impression!

Want to learn more? Come join us March 30 – April 2, 2026 in Houston, Texas for The Masterclass in Advanced Dysrhythmias!