

PVCs and Short Runs of Ventricular Tachycardia

Discussion

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Figure 1

The base rhythm is sinus but there is a 3rd degree AV block. The P waves march on through the short, 5-beat run of ventricular tachycardia in the middle of the tracing and continue to appear right on time following the VT. What does that tell us?

It tells us that not only is there an *antegrade* 3rd degree AV block, there is also a *retrograde* 3rd degree AV block. We know this because none of the ectopic beats were able to enter the right atrium and reset the sinus node. Just because a pathway is blocked in one direction does not necessarily mean that it is blocked in the *other* direction.

Did the P wave, indicated by the vertical arrow, conduct? *It did not* because we've already established that there is a bidirectional 3rd degree AV block present. **A normal PR interval in the presence of AV dissociation does NOT necessarily indicate conduction.** IT IS SIMPLY A COINCIDENCE! Even true capture beats often have prolonged PR intervals.

What is the basis of this ventricular ectopic rhythm? It has all the signs of **triggered activity**. There is evidence of both *early afterdepolarizations* ("R-on-T phenomenon") and *delayed afterdepolarizations* leading to triggered activity. Triggered activity typically results in what are known as *idiopathic ventricular tachycardias* which include lethal tachydysrhythmias such as *torsade de pointes* and benign ventricular tachycardias (yes, you read that correctly: BENIGN!) such as the *ventricular outflow tract tachycardias*.

Do you know what the horizontal, double-headed arrow represents? That is a **single** action potential! Yes, I know there are six QRS complexes there, but that is still a single action potential. During triggered activity, a new depolarization is produced before the initial action potential can return to the resting membrane potential, so the action potential actually continues until there is eventually a failure of an afterdepolarization to reach threshold and the cell can return to its resting membrane potential – thus finally ending the action potential.

How can that be? In actuality, there is *just enough* repolarization after each depolarization to initiate another depolarization – but the action potential does not return to the baseline until the end. In *that* sense, it's all a single, complete action potential.

Triggered activity is generally an unstable rhythm and often self-extinguishes after just a few beats. When you see an “R-on-T phenomenon” you are seeing triggered activity. But triggered activity can also develop during diastole – the T-P segment. Both are evident on this ECG.

You will find little or no mention of triggered activity in introductory courses or books. I do discuss this topic in both Masterclasses (***The Masterclass in Advanced Electrocardiography*** and ***The Masterclass in Advanced Dysrhythmias***) as well as in my book, “Getting Acquainted With Wide Complex Tachycardias – A Workbook for the Electrocardiographically Confused!”