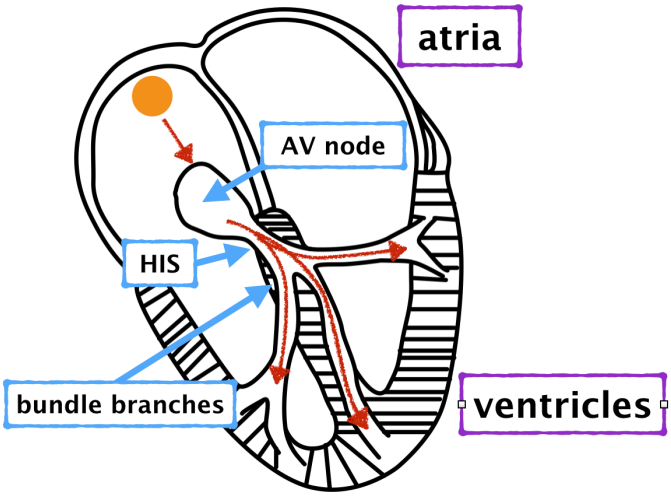
Level 3 : Narrow complex tachycardias = rapid + regular + narrow

In this chapter, you are going to learn about narrow complex tachycardias, what subtypes of tachycardias there are, and how to easily diagnose them. Please note that we are talking about regular tachycardias here (i.e., the R-to-R intervals are constant).

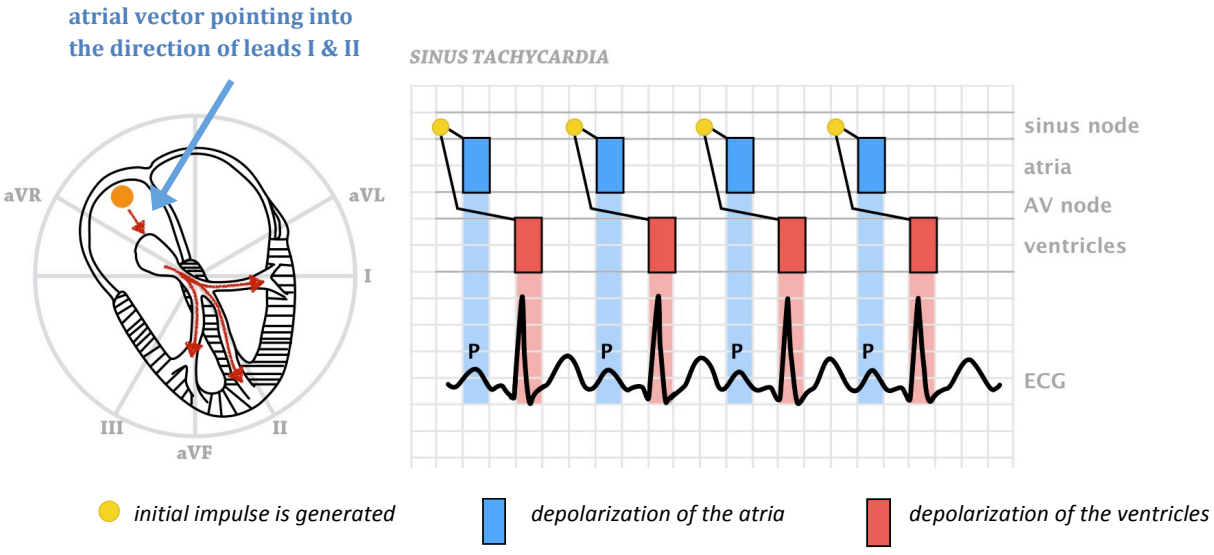
We've already learned that the QRS complex will be narrow if the impulse originates in the atria, takes its course through the AV node, the bundle of HIS, the bundle branches, and the Purkinje fibers. Of course this also applies to tachycardias.



The cardiac conduction system. Under normal circumstances, the impulse is generated in the sinus node, and travels through the AV node and the bundle of HIS and into the bundle branches and the Purkinje fibers (not shown), from where it depolarizes the ventricles.

Sinus tachycardias and atrial tachycardias

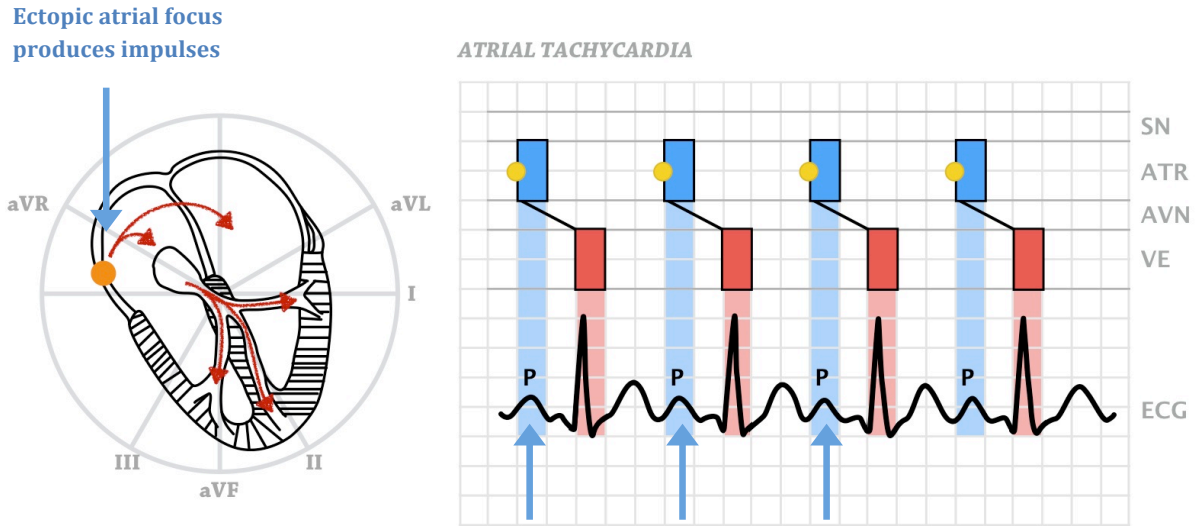
Let's look at an example of **sinus tachycardia** in a patient without bundle branch block:



There are a few things that you should note in the above ladder diagram:

- The QRS complexes are narrow.
- P waves are positive in leads I and II, because the atrial vector points in the direction of these leads.
- P waves precede QRS complexes.

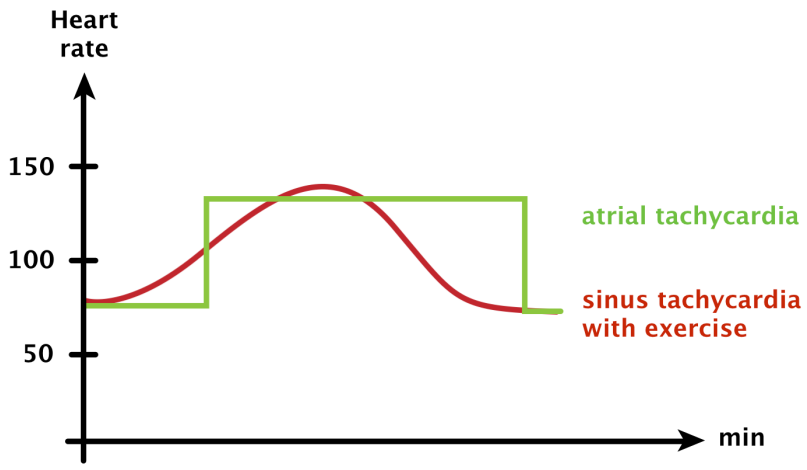
Now let's have a look at **atrial tachycardia** without bundle branch block, another common form of narrow complex tachycardia:



Note that in this case:

- The QRS complexes are narrow.
- P waves are slightly abnormal, but mostly positive in I and II.
- P waves precede QRS complexes.

How can you tell the difference between sinus tachycardia and atrial tachycardia from a clinical perspective? Well, sinus tachycardia is due to an underlying cause such as fever, drugs (e.g. atropin), or exertion. These underlying causes come and go gradually. Therefore, sinus tachycardia also comes and goes gradually. On the other hand, atrial tachycardia is a disorder in and of itself; it comes and goes abruptly, as you can see in the following graph.



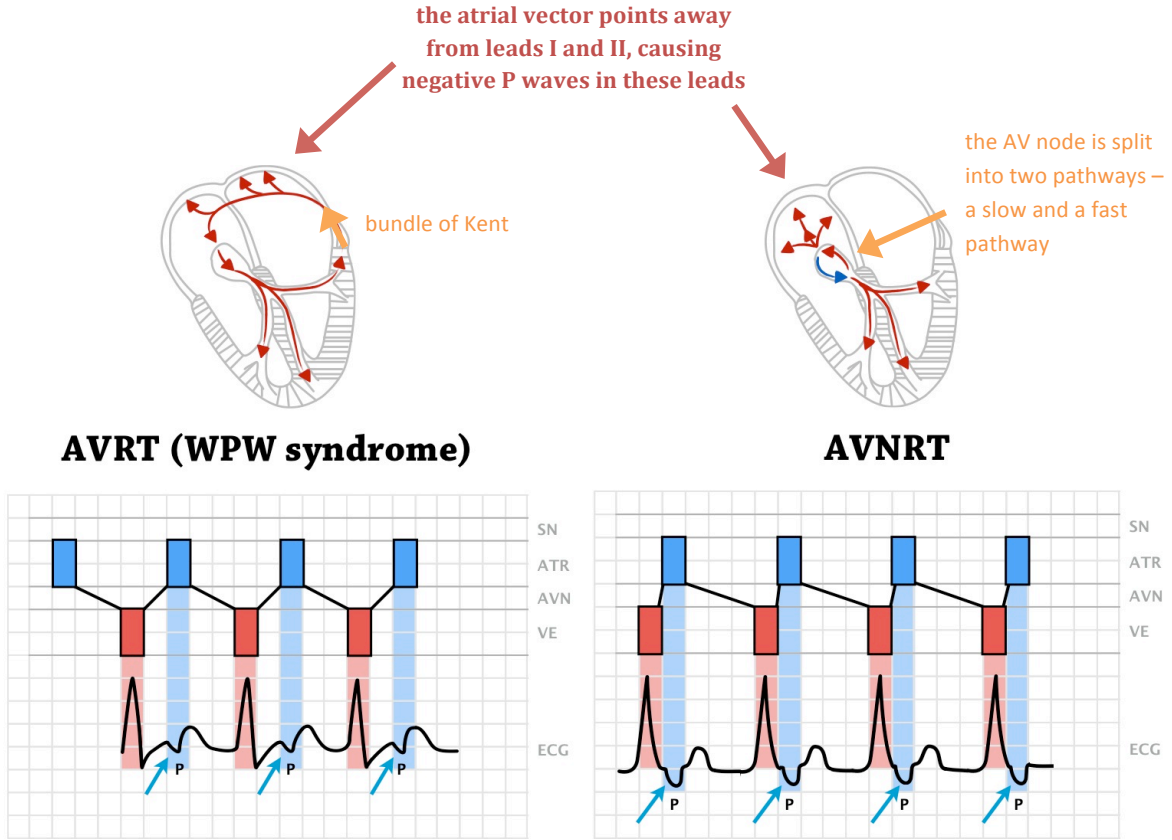
Reentrant tachycardias

In some cases, the atrial impulse not only depolarizes the ventricles but also finds its way back up to the atria again via an additional conduction bundle. Back in the atria it causes another wave of depolarization with a P wave, then travels down through the AV node where it depolarizes the ventricles, again producing yet another QRS complex, and so forth.

Because the atria are depolarized retrogradely, P waves will be negative in leads II, III, and aVF, and positive in lead aVR. This type of tachycardia is called **reentry tachycardia** or **circus movement tachycardia**.

Let's have a look at the two most common types of reentry tachycardias:

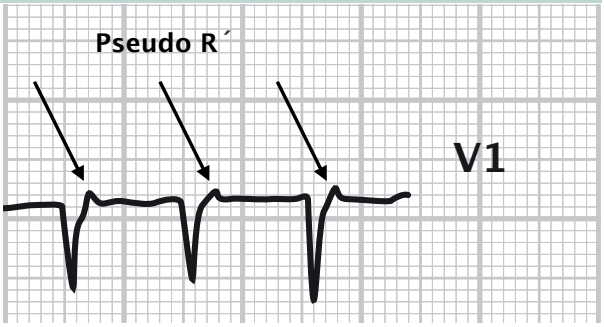
1. **AV reentrant tachycardia (AVRT) in patients with WPW syndrome**: In the case of AVRT, the impulse travels down to the ventricles through the AV node and back to the atria through the so-called bundle of Kent. Compared to AVNRT, the impulse takes longer before it reaches the atria again. Therefore, the retrograde (i.e., negative) P wave will be found further away from the QRS complex than in AVNRT, in close proximity to the T wave.
2. **AV nodal reentrant tachycardia (AVNRT)**: This is a tachycardia using two distinct pathways within the AV node. The impulse travels down the so-called fast pathway and returns to the atria using the slow pathway immediately thereafter. Therefore, the retrograde P wave will be found immediately after the QRS complex or even inside the QRS complex.



In AVRT, the impulse takes longer before it returns back to the atria. The retrograde P wave will thus be located further away from the QRS complex than in AVNRT.

In AVNRT, the impulse returns to the atria earlier than in AVRT. The P wave will be located closer to the QRS complex. Sometimes the negative retrograde P wave is even hidden within the final part of the QRS complex.

Here's a trick for spotting retrograde P waves that are "hidden" within the QRS complex in AVNRT: Look for a notch at the end of QRS in V1. This type of notch is also called "pseudo R prime."



Note that the retrograde P wave is positive in V1, whereas it is negative in I and II.

So in summary, these are the causes for regular narrow complex tachycardias:

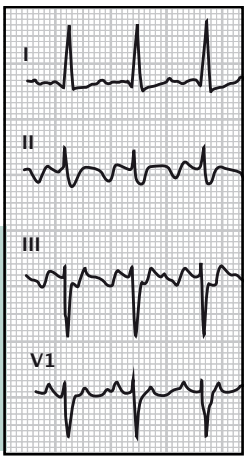
- Sinus tachycardia
- Atrial tachycardia
- AV nodal reentrat tachycardia (AVNRT)
- AV reentrant tachycardia (AVRT) in WPW

And here's a table that will help you differentiate between these types of tachycardias:

	Sinus tachycardia	Atrial tachycardia	AVNRT	AVRT (WPW)
P wave direction (I,II)	*positive*	*positive*	*negative*	*negative*
P wave location	*before QRS*	*before QRS*	*after / inside QRS*	*after QRS*
Distance QRS to P wave	...	...	*short*	*long*

Please note that P waves can also be negative in atrial tachycardia. However, most of the time they are positive with a slightly different morphology than sinus P waves.

There's one more instance when the rhythm will also be rapid, regular, and narrow, and that's atrial flutter with constant 2:1 conduction. However, here we would also expect to see flutter waves in leads II, III, and aVF.



Atrial flutter