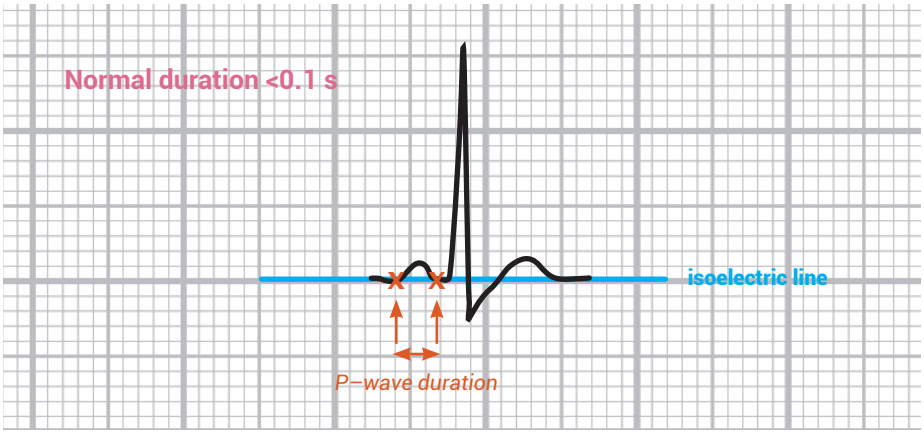
Level 3

When the timing is off—the foundations of interval interpretation

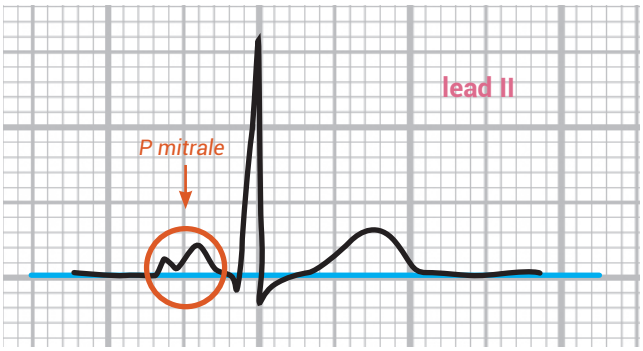
In this chapter, you will learn about the normal values of the different time intervals and what it means if they are longer or shorter than normal.

Duration of the P wave

Depolarization of the atria (i.e., P-wave duration) usually takes **less than 0.10 seconds**. If the left atrium is dilated (enlarged), depolarization takes longer and **P-wave duration will increase to ≥0.12 s**.

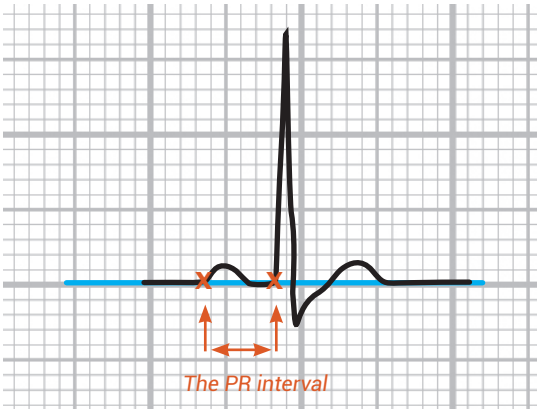


The prolonged P wave seen in atrial enlargement has a "double peak" in lead I and lead II and is called **P mitrale** (see image). You will learn more about this in Level 11.



Duration of the PR interval

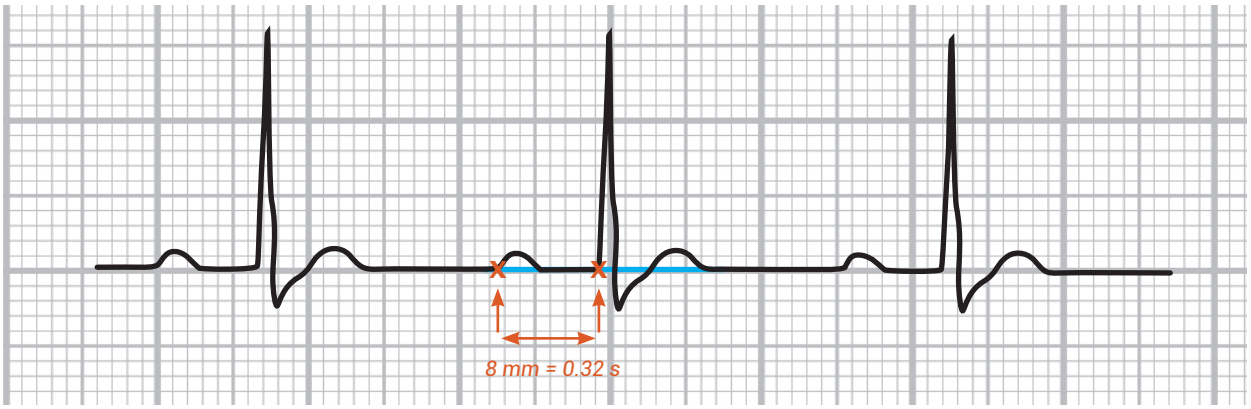
The **PR interval** represents the duration the impulse takes to travel from the atria to the ventricles. It's measured from the beginning of the P wave until the beginning of the QRS complex. **Normal values** are between **0.12 and 0.2 seconds**. Any duration below or above this range is regarded as abnormal.



Paradoxically, it's always called a "PR interval," no matter whether the QRS complex starts with a Q or an R wave.

When the PR interval is >0.2 seconds

When the PR interval is longer than 0.2 seconds AND there is a QRS complex after each P wave, we have what is called a **first degree atrioventricular block** (or AV block I), as seen on the image.



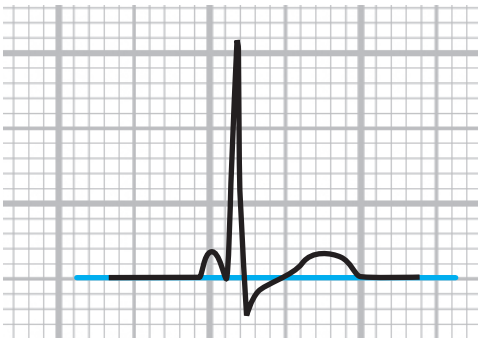
Example of a first degree AV block (AV block I). In this case, the PR interval is 0.32 s and there is a QRS complex after each P wave.

When the PR interval is <0.12 seconds

When the PR interval is shorter than 0.12 seconds, depolarization of the ventricles occurs earlier than normal. This situation is called **preexcitation** (or **preexcitation syndrome**). In these syndromes, an additional bundle conducts the impulse down from the atria to the ventricles. The conduction speed in the additional bundle is faster than in the AV node—so the impulse reaches the ventricles earlier than normal and the PR interval is shortened.

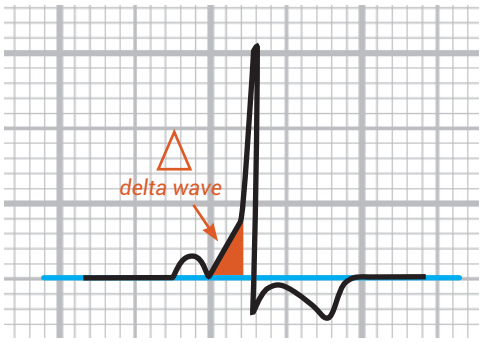
There are two important preexcitation syndromes that you should remember. The **Lown-Ganong-Levine syndrome (LGL syndrome)** is characterized by a QRS complex that immediately follows the P wave. The appearance and duration of the QRS complexes are normal.

The other form of preexcitation is called **Wolff-Parkinson-White syndrome (WPW syndrome)**. A slurred upstroke of the QRS complex immediately follows the P wave; it is also known as a "delta wave," as it resembles the Greek letter delta. The duration of the QRS is usually lengthened to >0.12 s.



Lown-Ganong-Levine syndrome = LGL syndrome

- QRS immediately follows the P wave
- QRS looks normal
- QRS duration is normal

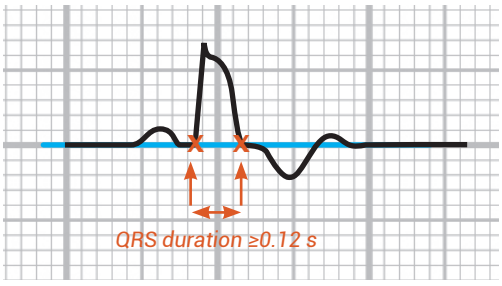


Wolff-Parkinson-White syndrome = WPW syndrome

- QRS immediately follows the P wave
- QRS looks abnormal (delta wave)
- QRS duration >0.12 s

QRS duration

Under normal circumstances, depolarization of the ventricles takes up to 0.10 seconds. Dilatation of the ventricles may cause a slight lengthening of the QRS (>0.1 to <0.12 s). A significantly prolonged **QRS duration of ≥0.12s**, however, indicates that either the right or left bundle branch is blocked. This situation is called a **complete bundle branch block**. You will learn more about it in Level 5.



Complete bundle branch block

There are also other reasons for broad QRS complexes. As we have just learned, one such example is the WPW syndrome, in which a delta wave is added at the beginning of the QRS complex. Other reasons will be introduced in later chapters.