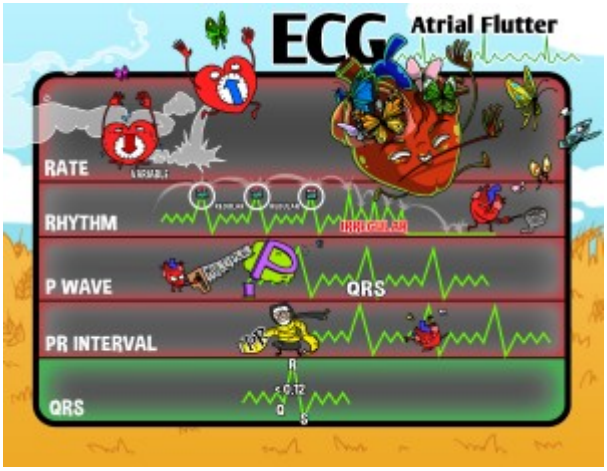
ECG: Atrial Flutter

Atrial flutter is an atrial tachydysrhythmia that originates from a single ectopic point in one of the atria. The rate is variable with the atria ranging between 250 to 350 bpm while the ventricles vary greater or less than 100 bpm. The rhythm may be regular or irregular. The presence of multiple P waves before every QRS creates a saw tooth-shaped pattern. Atrial flutter is associated with certain conditions such as, CAD, mitral valve problems, PE, COPD, cor pulmonale, cardiomyopathy, and hyperthyroidism. Medications to treat atrial flutter include amiodarone, calcium channel blockers, beta adrenergic blockers, digoxin, and ibutilide. Cardioversion and ablation may also be indicated to alleviate symptoms of atrial flutter.



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Rate

Variable

Variable Heart-timer

In atrial flutter, the atrial rate varies between 200-350 bpm. The ventricular rate, based on the conduction rate, is approximately 100 bpm. Often presents with a 2:1 atrioventricular (AV) block, resulting in a ventricular rate of approximately 150 bpm, patients may experience palpitations, shortness of breath, chest discomfort, dizziness, or fatigue. Some may be asymptomatic.

Rhythm

Regular or Irregular

Regular and Irregular Rhythm-drums

While atrial flutter typically presents with a regular atrial rhythm, the ventricular response can be irregular due to variable atrioventricular (AV) conduction. This variability arises from fluctuations in the AV node's ability to conduct impulses, leading to alternating conduction ratios (e.g., 2:1, 3:1, 4:1). Such irregular conduction can result in an inconsistent ventricular rate, sometimes mimicking the irregularly irregular rhythm seen in atrial fibrillation. Factors influencing this variability include intrinsic AV nodal properties, autonomic tone, and the presence of medications affecting conduction.

P Wave

Saw Tooth, Multiple Before Every QRS

Multiple Saw Teeth before QRS

P waves are absent in atrial flutter. Instead, they are replaced by multiple flutter waves, also known as “F waves,” which create a classic sawtooth pattern - most easily seen in leads II, III, and aVF. These flutter waves represent rapid, organized atrial depolarizations occurring at a rate of approximately 250–350 beats per minute. Because the atria are firing so quickly, there's no return to the isoelectric baseline between waves. This repetitive atrial activity results in multiple flutter waves before each QRS complex, commonly in a 2:1 or 4:1 conduction ratio. Recognizing these flutter waves, rather than looking for normal P waves, is key to identifying atrial flutter on ECG.

PR Interval

Non-measurable

Nun-measuring-tape

In atrial flutter, the PR interval is typically non-measurable due to the absence of distinct P waves. Instead, the atrial activity is represented by continuous flutter waves (F waves), which are rapid and regular atrial depolarizations resulting from a macro-reentrant circuit, commonly in the right atrium. These flutter waves create the characteristic "sawtooth" pattern on the ECG, most prominent in leads II, III, and aVF.

QRS Interval

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< 0.12 seconds

Less-than 0.12

In atrial flutter, the QRS complex typically measures less than 0.12 seconds, indicating normal ventricular conduction. This narrow QRS duration suggests that the electrical impulses are traveling through the normal conduction pathways without delay. The rapid atrial rate in atrial flutter does not usually affect the QRS duration unless there is an underlying conduction abnormality. Therefore, the narrow QRS complex in atrial flutter is a key feature that helps distinguish it from other arrhythmias with wide QRS complexes.

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