

Atrial Flutter — Symptoms and Diagnosis

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Atrial flutter is an irregular heart rhythm of the atria. It is classified as supraventricular tachycardia. This rhythm is associated with heart disease and hypertension. Symptoms include palpitations. Complications include increased risk of stroke and congestive heart failure. Diagnosis is made by observing sawtooth 'flutter' P waves on electrocardiogram (ECG) at a rate of 240-400 contractions per minute. Treatment through ablation is usually curative, although medication can also play a role.



Definition of Atrial Flutter

Atrial flutter as supraventricular tachycardia

Atrial flutter is defined as a [supraventricular tachycardia](#) with an atrial origin that meets two requirements:

- Atrial heart rate between 240-400/min
- AV node conduction block

Additionally, it is characterized as a sawtooth pattern on ECG in leads II, III, and aVF. The QRS complexes will be narrow because its ectopic signal originates in the atrium. The ventricular [heart](#) rate will be constant and elevated above 100/min, which is considered a

regularly irregular rhythm.

It is important to note that the atrial heart rate seen in atrial flutter is different from the ventricular heart rate. One of every 2 or 3 depolarization signals may pass through the AV node. A 2:1 or 3:1 ratio of P waves to QRS complexes are commonly seen on ECG. A patient may have an atrial heartbeat of 300/min but a ventricular heart rate of only 150/min. In this situation, the heart rate would be reported as 'atrial flutter with a heart rate of 150/min.'



Image: "A 12 lead ECG showing atrial flutter" by James Heilman, MD. License: [CC BY-SA 3.0](https://creativecommons.org/licenses/by-sa/3.0/)

The most common symptoms are palpitations and those symptoms associated with low cardiac output, including **fatigue, dyspnea, and chest pain**. Syncope and congestive heart failure are also possible symptoms.

There are two types of atrial flutter:

- **Type 1** is the most common or 'typical' atrial flutter. It has a reentrant loop-type arrhythmia around the tricuspid valve and an atrial rate of 240–340/min. Type 1 atrial flutter produces the characteristic sawtooth pattern in leads II, III, and aVF on ECG.
- **Type 2** is an atypical flutter. It has an abnormal reentrant loop-type arrhythmia and a much higher atrial rate, at 340–440/min.

Epidemiology of Atrial Flutter

Spread of atrial flutter

Atrial flutter is less common than [atrial fibrillation](#). It is also 2.5 times **more common in men** than women and more common in the elderly, with an **average age of onset of 64 years**.

Etiology of Atrial Flutter

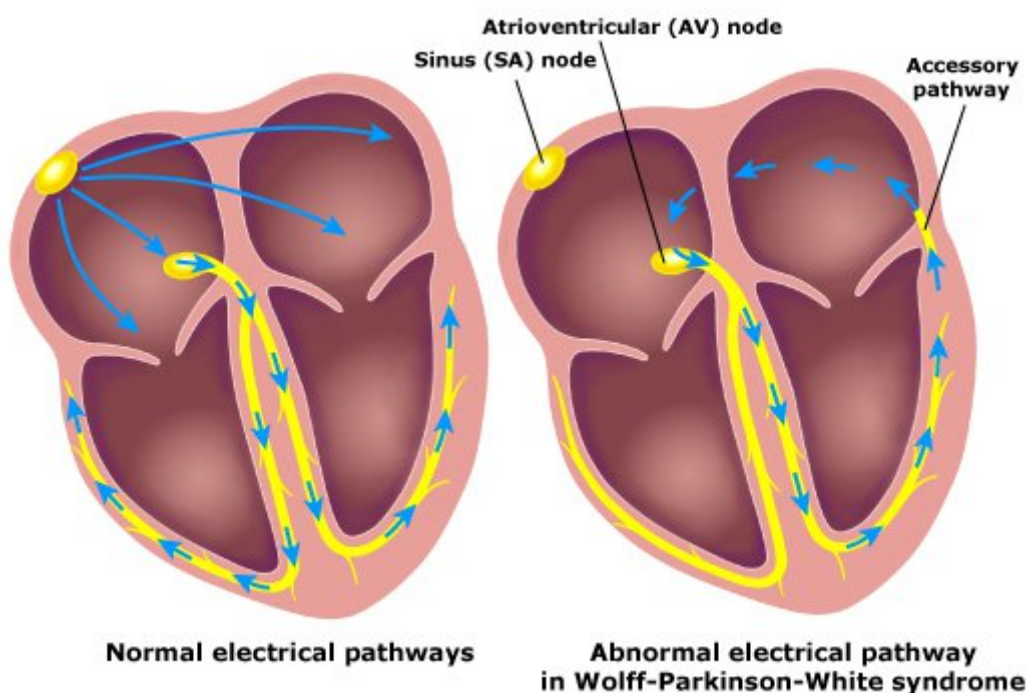
Causes of atrial flutter

A variety of cardiac and pulmonary diseases may result in atrial flutter. Any heart disease that results in inflammation or alteration to the structure of the heart may cause atrial flutter, including **cardiomyopathy, congenital heart defects, rheumatic diseases, and pericarditis**. About 1/3 of patients with atrial flutter may suffer from no other cardiovascular diseases at all; however, about 1/3 suffer from coronary artery disease (angina and [myocardial infarction](#)), and another 1/3 suffer from hypertension. Other conditions include:

- Chronic obstructive pulmonary disease
- [Pulmonary embolism](#)
- Electrolyte imbalance
- Digitalis toxicity
- [Hyperthyroidism](#)

Heart structural defects (scar formation, ablation) and inflammation after surgery may also result in atrial flutter. Pulmonary vein isolation to correct atrial fibrillation is also a risk factor.

Atrial flutter is considered an unstable rhythm that may progress to atrial fibrillation or revert to sinus rhythm. Other etiologies should be considered in cases of chronic atrial flutter, such as [Wolff-Parkinson-White syndrome](#). This syndrome is a disorder of the heart that involves an additional pathway of conducting fibers between the atria and the ventricles. In cases of chronic atrial flutter, there is a possibility that the AV node will begin to conduct every ectopic atrial impulse, resulting in potentially lethal ventricular fibrillation.



Pathology and Pathophysiology of Atrial Flutter

Atrial flutter is a supraventricular tachycardia with an atrial origin. Both type 1 and type 2 atrial flutter require a conduction block. The most common type, type 1, is caused by a reentrant loop-type arrhythmia with an origin in the right atrium that passes around the tricuspid valve. Type 2 atrial flutter may have an origin in the left or right atrium, pulmonary veins (similar to atrial fibrillation), or the mitral valve annulus.

A reentrant loop-type arrhythmia is characterized as a depolarization signal that moves in a tight circle through the conducting fibers of the heart, resulting in rapid uncontrolled contractions. In atrial flutter, this reentry circuit is limited to the atria. Only 1 of every 2 or 3 contraction signals passes through the AV node, resulting in a ventricular contraction.

Symptoms of Atrial Flutter

Signs of atrial flutter

The acute symptoms of atrial flutter are regular palpitations. These are usually well tolerated in a healthy heart in a healthy patient. **However, if the patient is deconditioned or suffers from underlying heart disease, they may develop symptoms including:**

- Shortness of breath
- Chest pain
- Lightheadedness
- Dizziness
- Nausea
- Feelings of impending doom

A prolonged course of atrial flutter may also result in heart failure. Symptoms include:

- Exertional breathlessness
- Edema
- Orthopnea
- Chest pain

Diagnosis of Atrial Flutter

An electrocardiograph is usually sufficient to diagnose atrial flutter.

ECG

An ECG is usually sufficient to diagnose atrial flutter. On [ECG](#), the atrial heart rate of 250–350/min (type 1) or 350–450/min (type 2) is expressed by P waves. The P waves will have a distinct **sawtooth shape** and are sometimes called f-waves or **‘flutter waves.’** Sawtooth flutter waves in ECG leads II, III, and aVF are sufficient to diagnose atrial flutter type 1.

If the flutter waves are upright, the reentry circuit runs clockwise. If the flutter waves are inverted, the reentry circuit loop is counterclockwise (more common). Additionally, the QRS complexes are narrow, as the ectopic beat originates in the atria. Finally, the atrial and ventricular heart rates will be at a constant ratio. A 2:1 or 3:1 ratio of P waves to QRS

complexes is common.

Occasionally, the heart rate is too fast to identify sawtooth flutter waves. An **adenosine infusion** will slow the conduction velocity at the AV node, reducing the ventricular heart rate and increasing the number of observable repeating P waves. This may ease diagnosis. Alternatively, a vagal maneuver may provide the same diagnostic assistance. The most commonly used vagal maneuver in the clinic is the Valsalva maneuver.

Echocardiogram

A transthoracic echocardiogram is part of the standard workup for atrial flutter. This procedure evaluates the left and right atria and helps rule out cardiomyopathy, pericarditis, and valvular heart disease. Additionally, a transesophageal echocardiogram should be performed to detect any thrombus formed in the left atrium. Atrial flutter and atrial fibrillation both allow thrombi formation in the left atria, which may result in a brain embolism.

Differential Diagnoses of Atrial Flutter

- [Atrial fibrillation](#)
- Atrial tachycardia
- [Multifocal atrial tachycardia](#)
- Tachycardia with variable AV block
- [Ventricular tachycardia](#)

Therapy of Atrial Flutter

Treatment of atrial flutter

A complete workup of a patient with atrial flutter includes an ECG and transthoracic echocardiogram. Additionally, before cardioversion, a transesophageal echocardiogram should also be performed to rule out thrombus formation in the left atria. Atrial flutter less than 48 hours in duration does not require anticoagulation therapy. Anticoagulation is recommended for episodes of unknown duration or those lasting greater than 48 hours and should be taken for at least 4 weeks.

Anticoagulation options include:

- Heparin
- Warfarin (maintain an international normalized ratio of 2-3)
- Novel oral anticoagulants (dabigatran, apixaban, and rivaroxaban)

Cardioversion

Atrial flutter may resolve spontaneously or may progress into atrial fibrillation. There are 2 cardioversion methods: electrical and pharmacological. Electrical cardioversion uses a **jolt of electricity to reset the heart** and restore a regular rate and rhythm. Pharmacologic conversion **involves the use of medications** (dofetilide or ibutilide). There is some risk involved with both procedures.

Ablation

First-line treatment for stable patients is **catheter-based radiofrequency ablation**. This procedure is relatively low risk, with a high success rate. A successful procedure may cure the condition and rule out the need for medication in the future.

Medication

Medication is an alternative to ablation. The goal is rhythm or rate control. Ventricular rate control may be achieved using medications that block AV node conduction, such as **beta blockers** (atenolol, metoprolol, and propranolol) or **calcium channel blockers** (verapamil and diltiazem). Additionally, antiarrhythmic medications may be useful to restore a regular rhythm, specifically class IC, III, and IV medications.

Progression and Prognosis of Atrial Flutter

Atrial flutter is considered an unstable rhythm that may progress to atrial fibrillation or revert to sinus rhythm. Tachycardia-induced cardiomyopathy may occur if the ventricular rate remains elevated for a prolonged period of time and should be corrected early in the disease process. Additionally, thrombus formation is a concern with atrial flutter or atrial fibrillation. Treatment with catheter ablation is very well tolerated and rarely results in relapse.

Review Questions

The solutions are located below the references.

1. Classify the following ECG strip:

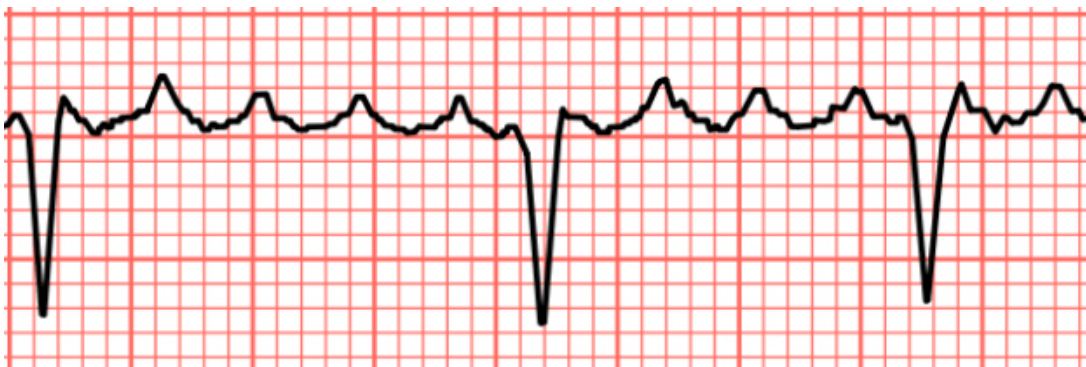


Image: "Atrial flutter with variable block (between 3 and 4 to 1)" by James Heilman, MD. License: [CC BY-SA 3.0](https://creativecommons.org/licenses/by-sa/3.0/)

- A. Atrial fibrillation
- B. Atrial flutter
- C. Ventricular fibrillation
- D. Sinus tachycardia

2. When compare atrial fibrillation and atrial flutter which statement is true?

- A. Atrial fibrillation rhythm is regularly regular, while atrial flutter is regularly regular.
- B. Atrial fibrillation rhythm is irregularly regular, while atrial flutter is regularly irregular.
- C. Atrial fibrillation rhythm is irregularly irregular, while atrial flutter is regularly

irregular.

- D. Atrial fibrillation rhythm is regularly irregular, while atrial flutter is regularly irregular.

3. On ECG, how is atrial fibrillation distinguished from atrial flutter?

- A. Atrial flutter has a faster atrial contraction rate compared to atrial fibrillation.
B. Atrial fibrillation has irregularly irregular rhythm, atrial flutter has no P waves.
C. Atrial flutter has sawtooth P waves, atrial fibrillation appears similar to sinus tachycardia on ECG.
D. Atrial flutter has sawtooth P waves, atrial fibrillation has no P waves.

References

Blomström-Lundqvist C, Scheinman MM, Aliot EM, Alpert JS, Calkins H, Camm AJ, et al. ACC/AHA/ESC guidelines for the management of patients with supraventricular arrhythmias-executive summary: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines and the European Society of Cardiology Committee for Practice Guidelines (Writing Committee to Develop Guidelines for the Management of Patients With Supraventricular Arrhythmias). *Circulation*. 2003 Oct 14. 108(15):1871-909.

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Vidaillet H, Granada JF, Chyou PH, Maassen K, Ortiz M, Pulido JN; et al. (2002)., "A Population-Based Study of Mortality among Patients with Atrial Fibrillation or Flutter". *The American Journal of Medicine* **113** (5): 365-70.

Correct answers: 1B, 2C, 3D

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Notes