



## **ATRIAL FIBRILLATION AND SLEEP APNOEA**

Atrial fibrillation is described as an irregular and often rapid heart rate that commonly causes poor blood flow to the body. During atrial fibrillation, the heart's two upper chambers (the atria) beat chaotically and irregularly — out of coordination with the two lower chambers (the ventricles) of the heart.

A clear and significant association exists between obstructive sleep apnoea (OSA) and atrial fibrillation (AF). Similar to other cardiovascular disorders, there is continuing controversy as to whether OSA is merely a common coexisting condition among patients with AF or whether it is a true causative factor.

Both conditions are very common. Over 2 million adults in the United States have AF, and at least 1 in 15 has moderate to severe OSA. It would therefore be expected that a significant number of people would have both conditions purely by a matter of chance. While we don't have exact figures for Ireland, it is safe to assume that there are probably over 100,000 people suffering from Atrial Fibrillation, many of whom are unaware of it.

Patients with AF and those with OSA share several similar patient-specific features. Hypertension is common in both conditions, both occur more frequently in men, both increase in incidence with older age, and increasing body mass index plays an important role in development of both AF and OSA in both men and women.

Numerous studies have established that patients with OSA, particularly those with severe apnoea (AHI >30), are significantly more likely to develop AF, and patients with AF have a higher prevalence of OSA than would be explained by random chance. After adjustment for multiple variables commonly observed in both conditions, it seems clear that OSA is an independent predictor of, and causative factor in, the development of AF.

The prevalence of OSA is significantly higher among patients with AF than the general public. Among consecutive patients with AF, Gami et al, identified OSA in 17% more patients than controls. Similarly, Bitter et al, established that the prevalence of OSA was 42.7% among consecutive patients with AF. This prevalence was even higher in a study by Braga et al, who found OSA in 81.6% of patients with AF.

There are a number of pathophysiologic mechanisms linking OSA to the development of AF. AF probably occurs as a complex interaction of several hemodynamic and sympathetic consequences of OSA. These include autonomic dysregulation, elevated sympathetic tone, oxidative stresses, endothelial dysfunction, and left atrial stretch.

OSA produces structural changes in the heart that can result in aberrant conduction and, subsequently, AF. Repetitive increases in upper airway resistance that occur with OSA produce alterations in the pressure gradients. The resultant force leads to atrial stretch, enlargement, and remodelling. This increase in left atrial volume is a well-established predisposing factor for AF. This altered pressure gradient also leads to autonomic dysregulation. In a study by Linz et al, the increased negative tracheal pressure that occurs during obstructive events was shown to shorten the right atrial refractory period and increase susceptibility to AF through enhanced vagal activation.

Episodes of atrial fibrillation can come and go, or there may be chronic atrial fibrillation. Although atrial fibrillation itself usually isn't life-threatening, it is a serious medical condition that sometimes requires emergency treatment. It can lead to complications.

Treatments for atrial fibrillation may include medications and other interventions to try to alter the heart's electrical system.

### **Typical Symptoms**

A heart in atrial fibrillation doesn't beat efficiently. It may not be able to pump enough blood out to your body with each heartbeat. Some people with atrial fibrillation have no symptoms and are unaware of their condition until it's discovered during a physical examination. Those who do have atrial fibrillation symptoms may experience:

- Palpitations, which are sensations of a racing, uncomfortable, irregular heartbeat or a flopping in your chest
- Decreased blood pressure
- Weakness
- Light headedness
- Confusion
- Shortness of breath
- Chest pain

If you have any symptoms of atrial fibrillation, make an appointment with your doctor. Your doctor should be able to tell you if your symptoms are caused by atrial fibrillation or another heart arrhythmia.

If you have chest pain, seek emergency medical assistance immediately. Chest pain could signal that you're having a heart attack.

Your heart consists of four chambers — two upper chambers (atria) and two lower chambers (ventricles). Within the upper right chamber of your heart (right atrium) is a group of cells called the sinus node. This is your heart's natural pacemaker. The sinus node produces the impulse that normally starts each heartbeat.

Normally, the impulse travels first through the atria and then through a connecting pathway between the upper and lower chambers of your heart called the atrioventricular (AV) node. As the signal passes through the atria, they contract, pumping blood from your atria into the ventricles below. As the signal passes through the AV node to the ventricles, the ventricles contract, pumping blood out to your body.

In atrial fibrillation, the upper chambers of your heart (atria) experience chaotic electrical signals. As a result, they quiver. The AV node — the electrical connection between the atria and the ventricles — is overloaded with impulses trying to get through to the ventricles. The ventricles also beat rapidly, but not as rapidly as the atria. The reason is that the AV node is like a highway on-ramp — only so many vehicles can get on at one time.

The result is a fast and irregular heart rhythm. The heart rate in atrial fibrillation may range from 100 to 175 beats a minute. The normal range for a heart rate is 60 to 100 beats a minute.

### **Possible Causes**

- High blood pressure
- Heart attacks
- Abnormal heart valves
- Heart defects you're born with (congenital)
- An overactive thyroid gland or other metabolic imbalance
- Exposure to stimulants, such as medications, caffeine or tobacco, or to alcohol
- Sick sinus syndrome — functioning of the heart's natural pacemaker

- Emphysema or other lung diseases
- Previous heart surgery
- Viral infections
- Stress due to pneumonia, surgery or other illnesses
- Sleep apnoea

However, some people who have atrial fibrillation don't have any heart defects or damage, a condition called lone atrial fibrillation. In lone atrial fibrillation, the cause is often unclear, and serious complications are rare.

### **Atrial flutter**

Atrial flutter is similar to atrial fibrillation, but the rhythm in your atria is more organized and less chaotic than the abnormal patterns common with atrial fibrillation. Sometimes you may have atrial flutter that develops into atrial fibrillation and vice versa. The symptoms, causes and risk factors of atrial flutter are similar to those of atrial fibrillation. For example, strokes are also a concern in someone with atrial flutter. As with atrial fibrillation, atrial flutter is usually not life-threatening when it's properly treated

### **Risk factors for atrial fibrillation include:**

**Age:** The older you are, the greater your risk of developing atrial fibrillation.

**Heart disease:** Anyone with heart disease, including valve problems and a history of heart attack and heart surgery, has an increased risk of atrial fibrillation.

**High blood pressure:** Having high blood pressure, especially if it's not well controlled with lifestyle changes or medications can increase your risk of atrial fibrillation.

**Other chronic conditions:** People with thyroid problems, sleep apnoea and other medical problems have an increased risk of atrial fibrillation.

**Drinking alcohol:** For some people, drinking alcohol can trigger an episode of atrial fibrillation. Binge drinking — having five drinks in two hours for men, or four drinks for women — may put you at higher risk.

**Family history:** An increased risk of atrial fibrillation runs in some families.

### **Complications**

Sometimes atrial fibrillation can lead to the following complications:

**Stroke:** In atrial fibrillation, the chaotic rhythm may cause blood to pool in your heart's upper chambers (atria) and form clots. If a blood clot forms, it could dislodge from your heart and travel to your brain. There it might block blood flow, causing a stroke.

The risk of stroke in atrial fibrillation depends on your age (you have a higher risk as you age) and on whether you have high blood pressure, diabetes, or a history of heart failure or previous stroke, and other factors. Certain medications, such as blood thinners, can greatly lower your risk of stroke or damage to other organs caused by blood clots.

**Heart failure:** Atrial fibrillation, especially if not controlled, may weaken the heart and lead to heart failure — a condition in which your heart can't circulate enough blood to meet your body's needs.

### **Conclusions**

Despite any ongoing controversy regarding the role of OSA in the development of cardiovascular disease, it seems that AF is a well-established consequence of sleep-disordered breathing. The physiologic derangements in cardiopulmonary hemodynamics, sympathetic tone, and physical structure of the left atrium that result from OSA seem well suited as causative factors for AF. In addition, numerous studies have found a higher-than-

expected prevalence of AF among patients with OSA and more OSA among patients with AF. The presence of untreated OSA seems to decrease the efficacy of chemical cardioversion, electrical cardioversion, and catheter ablation; similarly, recurrence of AF is significantly more common among patients with untreated OSA, whereas CPAP therapy seems to mitigate this risk.

Given the prevalence of OSA among patients with AF and its impact on outcomes, clinicians should assess individuals with AF for sleep-disordered breathing. If OSA is clinically suspected these patients should be referred for polysomnography.

*DISCLAIMER: While every effort is made to ensure medical accuracy, this paper should not be used to diagnose or treat a sleep disorder. In all cases the advice of a properly qualified medical practitioner should be sought.*

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