

2. Sleep Apnoea and its bidirectional relationship with Cardiovascular and Cerebrovascular disease

This is the 2nd in a series of blogs that explores the concept of personalised sleep medicine

Sleep apnoea or OSA is known to have a bidirectional relationship with various cardiovascular diseases and cerebrovascular disease. This bidirectional relationship highlights the importance of accurate diagnosis and treatment of both OSA and its comorbidities for optimal management (1-3). This means that OSA can increase the risk of developing these conditions, and conversely, certain cardiovascular and cerebrovascular diseases may predispose individuals to OSA.

Cardiovascular diseases



Heart failure

There is known to be a strong bidirectional relationship between OSA and heart failure (HF) and hypertension (1). OSA is an independent risk factor for developing HF, as the intermittent hypoxia, oxidative stress, and sympathetic activation associated with OSA can contribute to myocardial dysfunction and remodelling.

Conversely, HF can predispose individuals to OSA due to fluid retention and redistribution or rostral fluid shift particularly in the neck region, which can narrow the upper airway and promote obstructive events during sleep (4).

Hypertension

OSA is an established risk factor for hypertension, with a dose-response relationship between OSA severity and the risk of developing hypertension and studies report about one-half of patients who have hypertension have OSA. (5-6). The causative mechanisms are intermittent hypoxia, oxidative stress, and sympathetic activation associated with OSA that contribute to the development and exacerbation of hypertension (7).

Coronary artery disease

OSA has been associated with an increased risk of coronary artery disease (CAD) and adverse cardiovascular events, such as myocardial infarction. OSA appears to promote cardiovascular disease via a number of pathobiological triggers, including intermittent hypoxia (IH), sleep fragmentation, and intra-thoracic pressure swings leading to altered cardiac and pulmonary vascular haemodynamics (8-9).

Cardiac arrhythmias



OSA has been strongly associated with various cardiovascular morbidities, including cardiac arrhythmias. The Sleep Heart Health Study found a 4-fold increase in the

prevalence of AF in patients with OSA (10). The mechanisms linking OSA to arrhythmias involve autonomic nervous system activation, oxidative stress, and increased negative intrathoracic pressure, which can lead to myocardial excitability and structural remodelling of the heart. Studies suggest that OSA is linked to a higher prevalence of both atrial and ventricular arrhythmias, and treatment with continuous positive airway pressure (CPAP) may reduce the incidence of these arrhythmias in some cases (11-12).

Cerebrovascular diseases



Stroke

OSA is an independent risk factor for stroke, with a higher risk observed in individuals with severe OSA (13). Up to two-thirds of people who have had a stroke may develop OSA afterward. These people have worse outcomes than those without OSA in terms of short-term morbidity, functional and cognitive recovery, and mortality rates over the long term. Following a stroke, screening for OSA and treating it with CPAP, are important clinical goals (11).

The management of sleep apnoea associated with stroke should be integrated into a multidisciplinary diagnostic, treatment, and follow-up strategy. Personalised connected additional technologies plus CPAP therapy may help to track treatment efficacy in some cases and help to mitigate the associated cardiovascular and cerebrovascular risks. Connected devices that track activity, heart rate variability and weight can be an option

that can be recommended in some people with OSA with co-morbid cardiovascular or cerebrovascular disease.

Citations:

1. [Obstructive Sleep Apnea and Cardiovascular Disease: Where Do We Stand? - PMC \(nih.gov\)](#)
2. [Bidirectional relationships of comorbidity with obstructive sleep apnoea | European Respiratory Society \(ersjournals.com\)](#)
3. [Obstructive sleep apnea and stroke: The mechanisms, the randomized trials, and the road ahead - ScienceDirect](#)
4. [Night-to-night Variability in Obstructive Sleep Apnea Severity: Relationship to Overnight Rostral Fluid Shift | Journal of Clinical Sleep Medicine \(aasm.org\)](#)
5. [Association of obstructive sleep apnoea with long-term cardiovascular events in patients with acute coronary syndrome with or without hypertension: insight from the OSA-ACS project | BMJ Open Respiratory Research](#)
6. [Obstructive Sleep Apnea and Hypertension: A Review of the Relationship and Pathogenic Association - PMC \(nih.gov\)](#)
7. [Obstructive Sleep Apnea and Hypertension: Updates to a Critical Relationship | Current Hypertension Reports \(springer.com\)](#)
8. [Sleep Apnea and Heart Health | American Heart Association](#)
9. [Obstructive sleep apnoea and coronary artery disease - PMC \(nih.gov\)](#)
10. [Sleep Apnea Increases the Risk of New Hospitalized Atrial Fibrillation - CHEST \(chestnet.org\)](#)
11. [Sleep-Disordered Breathing and Cardiac Arrhythmias in Adults: Mechanistic Insights and Clinical Implications: A Scientific Statement From the American Heart Association | Circulation \(ahajournals.org\)](#)
12. [Association Between Sleep Apnea Treatment and Health Care Resource Use in Patients With Atrial Fibrillation \(ahajournals.org\)](#)

13. [Sleep apnoea and ischaemic stroke: current knowledge and future directions -
The Lancet Neurology](#)