Obstructive Sleep Apnea-hypopnea Syndrome and Cardiovascular Diseases

**Key words:** pulse wave velocity, atherosclerosis, blood pressure, nasal continuous positive airway pressure

Obstructive sleep apnea-hypopnea syndrome (OSAHS) can be defined as the coexistence of excessive daytime sleepiness or other symptoms such as impaired cognitive function, heavy snoring and personality changes with irregular breathing (sleep apnea, hypopnea and respiratory effort-related arousal event) at night (1, 2). A conservative estimate of the prevalence of OSAHS in middle-aged men (30–65 years) is in the range 0.3–4%, with most studies citing a prevalence of 1–2%, which is similar to the prevalence of Type 1 diabetes and approximately double that of severe asthma (1). Although obesity is one of the causes of OSAHS, east-Asian people, including Japanese, are apt to have OSAHS because of their congenital craniofacial shape (3). Symptoms of sleepiness and impaired concentration resulting from untreated OSAHS are thought to have serious consequences during activities where reduced alertness is dangerous, such as driving, leading to an increased risk of traffic accidents. There is objective evidence for a 1.3- to 12-fold increase in accident rates among patients with OSAHS (1). Recently, the driver of a Shinkansen super express train in Japan who slept while traveling 26 km was the subject of a sensational report.

Of late, sleep-disordered breathing has been recognized as a potential and treatable risk factor for cardiovascular diseases. Studies have shown that patients with OSAHS have significantly higher blood pressure (BP) than matched controls, although there are many confounding factors such as obesity, age, gender and alcohol consumption. However, epidemiological studies have shown that the presence of OSAHS is an independent predictor of elevated BP even when all known confounding variables have been allowed for (1). Treatment with continuous positive airway pressure (CPAP) therapy reduces BP by up to 3.3 mmHg over 24 hours as determined by measurements of 24-hour ambulatory BP. The decrease was greatest in those with the most marked nocturnal hypoxemia (>20 times 4% desaturation/hour) in whom the mean 24-hour fall in diastolic BP was 5 mmHg (4). Another report showed that effective CPAP treatment in patients with moderate to severe OSAHS leads to a substantial reduction in both day and night arterial BP by 10 mmHg (5) which would be predicted to reduce the risk of a coronary heart event by 37% and the risk of stroke by 56% (6).

Recent reports also have shown the close relationship between OSAHS and atherosclerosis (7). It has been said that the combination of hypoxemia and sleep deprivation in patients with OSAHS may lead to increased levels of inflammatory markers, because hypoxia at high altitudes may evoke the production of inflammatory cytokines and increased levels of C-reactive protein. Indeed, patients with sleep apnea have increased levels of interleukin 6, tumor necrosis factor α, vascular endothelial growth factor and C-reactive protein. C-reactive protein itself may contribute to vascular disease and dysfunction by inhibiting nitric oxide synthase and increasing expression of cell adhesion molecules (7). Adhesion of circulating leukocytes to endothelial cells is considered one of the initial steps in the pathogenesis of atherosclerosis (8). Hypoxic stress induced by OSAHS may directly modulate the expression of adhesion molecules. Adhesion molecules play important roles in the adhesion of circulating leukocytes to endothelial cells. Levels of adhesion molecules in the circulation may be elevated in patients with moderate to severe OSAHS and may be reduced by CPAP therapy (9, 10).

In this issue, Nagahama et al reported that the values of brachial-ankle pulse wave velocity (baPWV), which is an alternative method of expressing PWV, were significantly higher in the OSAHS group than in the control group (11). In conclusion, it is important to assess whether OSAHS predisposes persons to cardiovascular diseases.

PWV is generally assessed by measuring the time that the pulse wave takes to travel a given distance along the blood vessel. The critical factors are the precise measurement of pulse-transit time and path length. The PWV is increased in stiff arteries (12). Blacher et al reported that the value of PWV in subjects with atherosclerotic disease was significantly higher than that in normal subjects (13). Therefore, the data of Nagahama et al showed that OSAHS might induce atherosclerosis. To understand the role of OSAHS for the genesis and development of atherosclerosis, it is important to compare patients with good and poor compliance for therapy such as nasal continuous positive airway pressure (nCPAP) therapy for OSAHS. In doing a follow-up study of whether OSAHS contributes to the development of atherosclerotic changes, measurement of baPWV may be useful because it is noninvasive. In conclusion, it is important to assess whether OSAHS predisposes persons to cardiovascular diseases.

**See also p 184.**

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diseases such as myocardial infarction and stroke in Japan through a long-term prospective study.

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References


