Cardiovascular Consequences of Sleep Apnea

Gerald Edward Kiliyan
Dr. Caryl Fish, Integrated Science

Introduction

Cardiovascular disease is a leading cause of morbidity and mortality throughout the world with 610,000 dying of cardiovascular disease every year in the United States alone. This means that 1 in 4 deaths in the country are related to cardiovascular diseases.

22 million Americans are currently living with Sleep Apnea. This affects not only a person's quality of sleep but also quality of life as well as risk of all cause mortality. Additionally, Sleep apnea diagnosis can also increase the likelihood of developing cardiovascular disease.

The question then arises as to whether treating a patients sleep apnea could treat a patient's cardiovascular disease and decrease the risk of cardiovascular events occurring.

Background

Cardiovascular Disease:

There are several different types of cardiovascular disease. These include:

- Atrial Fibrillation
- Myocardial Infarction
- Atherosclerosis
- Hypertension

Cardiovascular disease is considered a lifestyle related disease as there are many factors which contribute to increasing the risks of developing cardiovascular disease, many which related to everyday choices. These include increased Body Mass Index, high body fat percentage, low activity levels, increased alcohol consumption, increased caffeine intake, and increased stress levels.

Sleep Apnea:

Sleep apnea is marked by the cessation of breathing during sleep.

The most common form is Obstructive sleep apnea which occurs when the muscles of the throat relax and collapse into the airway obstructing breathing.

There are three classifications of OSA. These are defined using the Apnea Hypoxia Index (AHI).

Mild - AHI 5-15
Moderate - AHI 15-30
Severe - AHI > 30

Treatments include:

CPAP, Oral devices, sleep posture therapy, and surgery

The Relationship Between Cardiovascular Disease and Obstructive Sleep Apnea

In order to understand the effects of OSA treatment on cardiovascular outcomes, the relationship between OSA and CVD first have to be established. This was somewhat difficult to claim outright because of the many other variables which the two diseases have in common. It was clearly established that obstructive sleep apnea leads to hypertension. This is due to a few factors mainly the process of hypoxia where oxygen concentration drops rapidly and then overcompensates to return to normal. Additionally, obstructive sleep apnea activates the sympathetic nervous system (SNS), increasing blood pressure as well as endothelial dysfunction (a precursor to atherosclerosis). This SNS activation also increases adrenaline and noradrenaline levels during sleep as well as during the day. SNS overstimulation can also lead to arrhythmias and excess stress on the heart.

The cessation of breathing also causes oxygen desaturation, decreased sleep time, and sleep fragmentation which can all lead to worse cardiovascular outcomes.

Obstructive Sleep Apnea Treatments and Cardiovascular Outcomes

There was mixed research as to whether treating obstructive sleep apnea can actually better cardiovascular outcomes.

- CPAP was associated with decreased cardiovascular mortality
- CPAP has been reported to lower blood pressure in hypertensive patients with OSA
- CPAP has been found to decrease left ventricular hypertrophy as well as ventricular septum thickness, increasing stroke volume and ejection fraction.
- Long term CPAP patients had lower rates of CVD down to that of the general population.

It was however hard to establish a cause and effect relationship due to the many interconnected systems at play.

Many studies struggled to establish the benefits of OSA treatment on CVD independent of these other variables.

Analysis

After considering the conclusions of the reviewed studies it appears to be that although there is a connection between obstructive sleep apnea and cardiovascular disease, it is difficult to establish whether treating the apnea can lower the risks of cardiovascular disease.

Koren et al. Showed that CPAP reduces the risk of cardiovascular events however also stated that the treatment of obstructive sleep apnea may have no effect on cardiovascular disease. Thus even within the same study there are conflicting results.

Thomas and Ren also had a similar problem in that their study found CPAP to lower blood pressure and reverse early atherosclerosis however this study found that sleep apnea treatment did not lower the number of cardiovascular events which occurred.

Several other studies also had the same problem of finding conflicting results.

There may be beneficial effects on cardiovascular disease with CPAP treatment however more research needs to be done. This future research should aim to better control for comorbidities as that seems to be the factor causing the mixed results.

Conclusion

In conclusion, obstructive sleep apnea is a debilitating disease which has also been found to increase the risk of cardiovascular disease. This is due to obstructive sleep apnea attributing to increased sympathetic activity, hypertension, hypoxia, and vascular dysfunction. Because obstructive sleep apnea can lead to cardiovascular disease, it would seem possible that the treatment of sleep apnea would lead to the decrease of cardiovascular risks. While this may seem intuitive, the research shows that this is not exactly the case and that the treatment of obstructive sleep apnea actually has little effect on cardiovascular outcomes.

Bibliography


