

## BroadcastMed | The Relationship Between Sleep Apnea and Cardiovascular Disease

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**JAY WIDMER:** Howdy, I'm Jay Widmer, cardiology fellow here at Mayo Clinic, Rochester. During today's recording, we'll be discussing sleep apnea and its impact on the cardiovascular system, treatment options. And I'm joined by my friend and colleague Dr. Virend Somers, who is an expert, both in cardiovascular diseases and sleep apnea. Welcome, Dr. Summers.

**DR. VEREN  
SUMMERS:** Thanks, Jay. Thanks for inviting me.

**JAY WIDMER:** Absolutely. So we'll get started. So briefly, tell us a little bit about sleep apnea. What is it? And why does this occur?

**DR. VEREN  
SUMMERS:** So when you think of sleep apnea, there's really two essential types, obstructive apnea and central apnea. Obstructive apnea is the kind of apnea that's noisy, socially destructive, associated with snoring. Patients are often obese and generally affects males, but also affects females, maybe a 2 to 1 ratio.

And the apnea occurs because when people fall asleep, they lose the postural muscle tone. And because the upper airway has striated muscle, it loses tone in the upper airway as well. So particularly during REM, or dream, sleep, when you really want to have low muscle tone so you don't act out your dreams, you end up having a very lax upper airway, because of the loss of muscle tone. And so the inspiration, the airway collapses, causes an obstruction.

And the resolution of obstruction occurs when the patient brain wakes up. The patient doesn't know he or she is waking up. But the brain wakes up. Their muscle tone is restored. They start breathing again. So that's obstructive apnea.

Central apnea is the more quiet kind of apnea, the apnea that occurs with heart failure. You'll also see it in your kids or your spouse when you travel to altitude, the low carbon dioxide that's generated by being at altitude causes a central apnea. And we know it also has Cheyne-Stokes breathing.

So it's a nonobstructive apnea. And the apnea occurs because of the lack of the central drive to breathe. So we see that mainly in heart failure. You see it in normal people at altitude. You also see it in premature infants. They often have a high likelihood of central apnea.

So you've got obstructive, which is the noisy kind of apnea. You've got central, which occurs particularly with severe heart failure again. Occurs mainly in males. But the difference is that the central apnea and heart failure tends to be more prominent in people with low body weight, low muscle mass. More cardiac [INAUDIBLE]. They will often have central apnea.

**JAY WIDMER:** Interesting. So you mentioned heart failure and some central sleep apnea.

**DR. VEREN  
SUMMERS:** Yes.

**JAY WIDMER:** With regard to those two types of sleep apnea, are there any that are particularly associated with cardiovascular disease? Or do they cause cardiovascular disease?

**DR. VEREN SUMMERS:** Good question. So let's talk about obstructive first. Obstructive is associated with a breadth of cardiovascular diseases, hypertension, atrial fibrillation, myocardial ischemia, particularly ischemia that occurs at night. If people awake from sleep with chest pain, think about obstructive sleep apnea. Heart attacks, particularly heart attacks occurring at night, if someone has a heart attack, chest pain occurred could at night, look for obstructive apnea. High likelihood that he or she has obstructive apnea.

The other thing that obstructive apnea has been linked to is sudden death. There seems to be an increased risk of sudden death in people with obstructive apnea. And there's also an increased risk of sudden death and defibrillator firing that occurs at night. So if patient has an ICD and it triggers at night, wakes him from sleep, then look for sleep apnea.

**JAY WIDMER:** Both ischemic and nonischemic causes?

**DR. VEREN SUMMERS:** Yes. Absolutely. Absolutely.

But the more important question you asked, or at least the other important question you asked is does sleep apnea cause the heart disease. We don't know for sure. There's this good evidence suggesting it does cause it and suddenly makes it worse. But we haven't got the definitive answer to that yet. I think the best we can do at this point is say sleep apnea probably is a cause of high blood pressure. The rest of it, the jury's still out.

Now, let's talk about central apnea. Central apnea, things are less clear. Patients with central apnea and heart failure, the central apnea seems to be an accompaniment of the heart failure. Whether the central apnea is causing the heart failure to become worse, we don't know. Probably not, based on evidence that emerged recently, which we will talk about.

**JAY WIDMER:** Right. Excellent. So we talked a little bit about ischemic heart disease and heart failure. Are there any other cardiovascular conditions that would be associated with sleep apnea or would we need to think about sleep apnea?

**DR. VEREN SUMMERS:** Well, I think in these cardiovascular conditions that we mentioned, I think if the patient has intractable hypertension or recurrent atrial fibrillation, or heart failure that's not responsive to standard therapy, then you must look for sleep apnea. Because sometimes treating the apnea can make the underlying cardiovascular condition more amenable to being treated with drugs or standard therapy.

Now, things that I haven't mentioned, yeah-- aneurysmal dilatation of the aorta has been linked to obstructive sleep apnea. Patients with pulmonary emboli, they seem to have a higher prevalence of sleep apnea than we'd expect. Certainly, patients with DVT have a high prevalence of sleep apnea.

Now, some work that came from us at Mayo showed that if you have a PFO and you have a left to right shunt, generally, during the obstructive apnea, during the maneuver, you can actually get a reversal of the shunt. So you get a right to left shunt.

So if you have a DVT that's immobilized up to the right atrium and suddenly you get it change, due to the obstructive apnea, from left to right, right to left shunting, you can get a [INAUDIBLE] emboli. So these are the more esoteric things that are linked to sleep apnea.

**JAY WIDMER:** It's certainly something we all need to be thinking about in the clinical realm.

**DR. VEREN  
SUMMERS:** Absolutely.

**JAY WIDMER:** So in terms of treatment options for sleep apnea, what are some of the treatment options? And what are their impact, really, on the cardiovascular disease? You mentioned a little bit earlier about treating hypertension and so forth. But what are some of the ways that we can treat it? And then, how is that gonna help our patients?

**DR. VEREN  
SUMMERS:** Sure. So we'll start with obstructive apnea. And treatment options for obstructive apnea, the patient's overweight, you want them to lose weight. If they have sleep apnea that's worse on their backs-- it's very much a gravitational thing, because there's lots of muscle tone in the upper airway. The tongue can fall backwards into the airway. That's worse when they sleep on the back. And this is why patients with apnea are often improved if they sleep on their sides. So that's something else you can do.

And how do you do that? You can get a t-shirt with a tennis ball sewn in, so when they sleep on their backs, they're uncomfortable, so they sleep over on their sides. That can help relieve apnea to some extent.

There's several other approaches we could talk about. But I think probably the gold standard of sleep apnea therapy is CPAP, or Continuous Positive Airway Pressure. And what that does is splints the airway open during inspirations, so it makes it easier for the subject to breathe.

There are new investigational therapies on the horizon. For example, obstructive sleep apnea. There is a stimulator for the nerves that control the upper airway, so that when you have an apnea, the stimulator activates and maintains airway tone. And again, game that's fairly experimental. And there have been some papers on it suggestive of reasonable results. But we have to wait and see.

Central apnea, probably the optimal way to treat central apnea is what we call Adaptive Servo-Ventilations. It's kind of a CPAP-like device, that in a simplistic way, it kind of learns your breathing, when you're awake and breathing normally, and tries to simulate that kind of breathing pattern when you're asleep to stabilize your breathing.

So if you think CPAP, Continuous Positive Airway Pressure, is a pressure-driven breathing aid, ASV, or Adaptive Servo-Ventilation, seeks to maintain the volume of air flow. And so when you stop breathing-- it's not a question of the airway collapsing, you're just not breathing-- so this thing tries to generate the breathing for you.

Now, you did ask what's the effects of therapy. I'm gonna talk about obstructive apnea first. We do know that treating obstructive apnea in hypertensive patients, particularly those with severe sleep apnea and with severe hypertension who are sleepy, will lower blood pressure.

How does treating sleep apnea do in terms of increasing lifespan? We've had a fairly large study, the SAVE Study, come out in the New England Journal a few months ago. And those results were a little disappointing, because when they treated people with established cardiovascular disease, randomized some to CPAP treatment and the others to usual care without CPAP, the ones getting CPAP didn't really show any striking improvement in outcome.

Now, there are many possible explanations for this. One is they only took nonsleepy patients. And what we've learned over the years is it's the sleepy obstructive apneacs who seem to be at greatest risk. So something about having obstructive apnea and being sleepy that actually confers risk, whether the cause of the sleepiness is also the cause of the cardiovascular problem, we don't know. But it certainly is an interesting thing to think about.

So this study, unfortunately, did not include sleepy patients. What they did find though was that in those people who used their CPAP diligently, who used them for a significant part of the night, there was a strong suggestion towards better outcomes.

So the question is although the randomization of CPAP didn't work on intention to treat basis, perhaps using CPAP more diligently with better adherence may give you a better outcome. We don't know that for sure.

**JAY WIDMER:** Interesting.

**DR. VEREN SUMMERS:** And let's talk about central apnea, because those results are more clear. And this is a study that I was involved in. It was called SERVE-HF, where we had about 1,300 patients with predominant central apnea and low ejection fraction heart failure. So EF's were less than 45%.

We randomized them to either ASV, which is good for treating central apnea, or no ASV. And our expectation was that ASV would improve outcomes. Well, it turned out it actually did not improve outcomes in heart failure patients with low ejection fraction who also have central sleep apnea.

In fact, what we found was an increase in cardiovascular mortality in the treated group. So what does that tell us? It tells us that maybe we shouldn't be treating central sleep apnea in low ejection fraction heart failure with ASV. Whether treating it with other methods makes a difference, we don't know.

But to clarify-- I want to be very clear that this does not apply to patients with normal ejection heart failure. If you have a normal ejection fraction and you have heart failure, we still have to figure out to if ASV is good for you or not.

**JAY WIDMER:** Good to know. Good to know. So a lot of different treatment options.

**DR. VEREN SUMMERS:** Yeah.

**JAY WIDMER:** And certainly, a lot of things to go through in terms of diagnosis, risk stratification, co-morbidities, and then looking at what option is best for patients. Well, great. Well, this has been very instructive. Thank you--

**DR. VEREN SUMMERS:** You're very welcome. Thanks for having me.

**JAY WIDMER:** For giving us these insights. So thank you for joining us today on theheart.org on Medscape.