Case Study: Sleep Apnea Diagnosis in a Man With Type 2 Diabetes Improved Control

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What Is Sleep Apnea?

Diabetes and obstructive sleep apnea (OSA) are common disorders that often coexist. In fact, they are equally prevalent within the U.S. adult population. According to the National Institutes of Health, > 20 million people have OSA and only ~ 10% have been identified. OSA is a disorder characterized by snoring, partial or complete cessation of breathing during sleep, reductions in blood oxygen levels, severe sleep fragmentation, and excessive daytime sleepiness. It is associated with cardiovascular conditions, causing hypertension, heart disease, and stroke. Although the scope of sleep apnea is enormous, sleep apnea continues to be poorly recognized by clinicians.

During sleep apnea, breathing stops (apnea) or gets very shallow (hypopnea). Sometimes the person stops breathing entirely for several seconds, and this can happen hundreds of times a night. A bed partner may hear snoring and then witness gasps followed by a coughing sound, as the person struggles to resume breathing. Both apneas and hypopneas cause sleep arousals; the individual wakes enough to resume breathing but not enough to remember any interruption of sleep. Some arousals simply cause the sleeper to shift into a lighter stage of sleep. In either case, the arousal reduces the quality of sleep.

OSA can affect anyone, including children. However, the population typically associated with the disorder includes overweight adults who snore heavily. Sleep apnea is more common in men, and 50% of type 2 diabetic men also have OSA.

Diagnosis and Treatment

Any practitioner can identify OSA symptoms. Patients are then referred to a sleep specialist, and an overnight polysomnography is conducted in a sleep laboratory or the patient's home. The standard treatment is continuous positive airway pressure (CPAP). The air pressure functions like a splint for the upper airway to prevent apneas from occurring and keep the airway from collapsing. This permits normal breathing to continue during sleep, normal sleep patterns to emerge, sleep to become restorative, and the patient to feel better. The impact is often immediate and dramatic. The success of treatment is measured by the reduction of respiratory disturbance to normal levels, the elimination of symptoms such as fatigue and depression, and improvement in the patient's subjective feeling of well-being. Effective treatment will eliminate snoring and apnea events and has demonstrated decreases in blood pressure and postprandial glucose levels within 30 days.

OSA is often overlooked and misdiagnosed. Complaints of fatigue and sleepiness are attributed to lifestyle, stress, other medical conditions (such as diabetes), or side effects from medications. Sleep apnea should be investigated when patients present classic symptoms (Table 1).

Case Presentation

J.B. is a 61-year-old man who is a busy physician and has had type 2 diabetes for 11 years. He suffers from gastroesophageal reflux disease daily and has moderate depression. For 11 years, he has maintained a weight of 210–220 lb (BMI of 31 kg/m^2), and he does not have hypertension or hypercholesterolemia. J.B. has no other known diabetes complications. He uses a low-carbohydrate meal plan and a bicycle exercise program. However, he snores and reports being excessively sleepy all the time.

J.B. has no family history of diabetes or sleep apnea. During the past year, he has not been able to get his plasma glucose levels to < 200 mg/dl. His hemoglobin A_{1c} (A1C) has been 7.5% (lab norm) on the past two visits. The patient denies polyuria or nocturia. He is in bed for ~ 8 hours per night. His wife does not complain about his nighttime snoring, but she describes herself as a heavy sleeper.

The bed partner is often the first to complain of sleep apnea. In this case,

Table 1. Sleep Apnea Symptoms

Most common symptoms
- Loud snoring
- Choking or gasping during sleep
- Fighting sleepiness during the day

Other symptoms
- Morning headaches
- Memory or learning problems
- Irritability
- Inability to concentrate
- Mood swings or personality changes, perhaps including depression
- Dry throat on awaking
- Frequent urination at night

From National Heart, Lung, and Blood Institute: *Facts about Sleep Apnea.* Bethesda, Md., U.S. Dept. of Health and Human Services, National Institutes of Health (NIH Publ. no. 95-3798), 1995

J.B.'s wife is not bothered. However, fellow physicians who travel with J.B. on medical mission trips joke and complain about his snoring and gasping. J.B. now requests a private room for these trips to avoid the complaints. He did not share this information with his diabetes care team.

J.B. is excessively sleepy, yet he sleeps ~ 8 hours nightly. Colleagues and family who sleep in adjacent rooms have told him that he snores and gasps throughout the night. Published research demonstrates that 50% of men with type 2 diabetes have sleep apnea. These factors are sufficient to suspect sleep apnea and inquire further.

Questions?

1. How do you assess this patient for sleep apnea?
2. Should he be referred for a polysomnography (PSG)?
3. Does CPAP affect glycemic control?

Discussion

Patients with chronic snoring and untreated sleep apnea have a higher risk of both stroke and cardiovascular disease.[1,2] Although most of these patients do have a higher BMI as well as low activity levels and hypertension, it is also possible for patients with normal BMIs and without hypertension to present with snoring and sleep apnea. Sleep apnea can be associated with recent weight gain. Tiredness can cause people to eat for stimulation and skip exercise. Over time, these habits result in obesity, which can worsen sleep apnea, leading to a progression in severity of both conditions.[3]

Sleep deprivation from any cause increases blood glucose, blood pressure, and triglycerides, causes higher evening cortisol levels, reduces serum leptin secretion, and increases inflammatory cytokines. Treating sleep deprivation rapidly reverses these metabolic abnormalities. The reasons for this are complex but seem to include increased sympathetic nervous system activity and adrenal cortisol and catecholamine output.

J.B.'s fatigue and sleepiness finally led him to refer himself to a sleep lab in August 2005. Because he is a physician, he felt certain he had sleep apnea by the time he contacted his friend, the medical director of the sleep lab. The vast majority of patients are referred to a sleep lab or sleep specialist by their physician for further evaluation of symptoms.

It is common for patients to complete a Berlin Questionnaire, a simple validated 10-item questionnaire certified by the American College of Physicians. Questions focus on BMI, snoring, sleepiness, and blood pressure. J.B.'s results for the Berlin Questionnaire indicated a borderline acceptable BMI, severe snoring, severe daytime sleepiness, and an acceptable blood pressure. These results indicate a high risk in two categories of the Berlin Questionnaire, suggesting a strong likelihood of sleep apnea.

J.B. underwent a sleep study and, because of the severity of his sleep apnea, a split night protocol was initiated. This means that the first portion of the sleep study (diagnostic) was so severe that the patient was placed on CPAP therapy for the second portion of the night (titration). An apnea/hypopnea index (AHI) of 51 was reported during the diagnostic portion of the study, indicating severe obstructive sleep apnea (Table 2).

An apnea is defined as no airflow for ≥ 10 seconds, and a hypopnea as a ≥ 30% reduction in airflow for ≥ 10 seconds with a correlating 4% oxygen desaturation. Guidelines for treatment require an AHI ≥ 15 or an AHI ≥ 5 with documented symptoms.

Although some patients are able to reduce their AHI to normal levels with weight loss, few patients are able to maintain this type of weight loss. CPAP therapy is the gold standard sleep apnea treatment. CPAP therapy ranges from 4 to 20 cm H_20 pressure. J.B. required a pressure of 8 cm H_20. The pressure needed to resolve 95% of apneic events throughout the night determines this therapeutic pressure.

J.B. went home with a prescription for CPAP, and a local home care dealer delivered his therapy that day. He has slept with CPAP every night since. He reports feeling great, and his family members have noticed a huge difference in his enthusiasm and energy.

From the research it is known that CPAP treatment can improve insulin responsiveness without a significant change in obesity. This occurred in J.B.'s case. Although his weight and diet have not changed, his glucose levels have improved dramatically and are now consistently < 150 mg/dl. His A1C was 6.5% 9 months after initiating CPAP therapy, and his medications have been reduced (Table 3).

As this case demonstrates, clinicians need to assess sleep profiles among patients with diabetes. This patient estimates that he had sleep apnea for 10 years before getting to a sleep lab for evaluation. Diabetes and sleep apnea frequently coexist because obesity is a risk factor common to both. Yet little is done to assess for diabetes in sleep labs or screen for sleep apnea in diabetes programs. Perhaps the time has come.

Clinical Pearls

- Sleep apnea is very common in diabetic populations but typically goes undiagnosed.
- Sleep apnea can cause hypertension, but hypertension is not required for suspicion of sleep apnea.

Table 2. AHI Scores

Severity	AHI
Mild	5–15
Moderate	15–30
Severe	> 30

Table 3. J.B.'s Medications Before and After CPAP Therapy

At OSA diagnosis	After 9 months of CPAP therapy
Metformin, 1,000 mg twice daily	Metformin, 1,000 mg twice daily
Exenatide, 10 mg twice daily	Exenatide, 10 mg twice daily
Valsartan/hydrochlorothiazide, 160/12.5 mg daily	Valsartan/hydrochlorothiazide, 160/12.5 mg daily
Pioglitazone, 30 mg daily	
Glyburide/metformin, 5/500 mg twice daily	

- Treating sleep apnea with CPAP therapy can improve glycemic control and blood pressure.
- An assessment for sleep apnea can be easily conducted with the Berlin Questionnaire.

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Further Readings

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Note of disclosure: *Ms. Cashman is an employee of and stock shareholder in ResMed, which develops and manufactures devices to screen and treat respiratory and sleep-related medical conditions.*