

Sleep Disorders and Diabetes

CPAP Therapy in Type 2 Diabetes Patients With OSA Improves Glycemic Control During Sleep

Type 2 diabetes and obstructive sleep apnea (OSA) often occur together. Estimates of the prevalence of OSA among individuals with type 2 diabetes range from 18% to 36%.¹⁻³ It has also been estimated that close to 50% of patients with OSA have type 2 diabetes or impaired carbohydrate metabolism.⁴ Other research^{5,6} shows the prevalence of type 2 diabetes in OSA patients to be about 15%. The International Diabetes Federation (IDF) Task Force on Epidemiology and Prevention released a statement saying that research demonstrates that type 2 diabetes and OSA are closely related and that both disorders have significant implications on public health and on individuals⁷ (Tables 1 and 2).

Obesity is a common factor in both conditions, although OSA has been shown to be associated with increased insulin resistance independent of obesity.^{8,9}

Previous studies have shown inconsistent effects of the treatment of OSA using the gold standard of continuous positive airway pressure (CPAP) on glycemic control.^{10,11} Babu et al¹² found, however, an improvement in postprandial blood glucose in type 2 diabetes patients with OSA after treatment with CPAP for 3 months. Arthur Dawson, MD, from the Scripps Clinic Sleep Center, and colleagues, reported in the *Journal of Clinical Sleep Medicine* (2008;4:538–542) that endpoints such as A1C and insulin sensitivity might not reflect short-term

“SHORT-SLEEPERS” MAY DEVELOP IFG

People who sleep less than 6 hours a night appear to have a higher risk of developing impaired fasting glucose (IFG), which can precede the development of overt type 2 diabetes. Researchers reported these findings at the American Heart Association’s (AHA) 49th Annual Conference on Cardiovascular Disease Epidemiology and Prevention.

Participants who slept on average less than 6 hours a night during the work week, when followed over 6 years, were 4.56 times more likely than those getting 6 to 8 hours of sleep to convert from normal blood sugar levels to IFG, researchers said, in a news release from the AHA.

“This study supports growing evidence of the association of inadequate sleep with adverse health issues. Sleep should be assessed in the clinical setting as part of well-care visits throughout the life cycle,” said Lisa Rafalson, PhD, lead author of the study and National Research Service Award fellow and research Assistant Professor at the University at Buffalo in New York. “While previous studies have suggested that there may be many genes that each have a very small effect on the risk of diabetes, there is no known genetic predisposition to sleep disturbances that could explain our study’s results, especially in this limited sample size. It is more likely that pathways involving hormones and the nervous system are involved in the impaired-sleep/fasting glucose association.”

Researchers conducted a matched, nested case-control study to address whether sleep duration at baseline predict-

ed progression from normal to impaired fasting glucose during 6 years of follow-up in the Western New York Health Study. From 1,455 participants, the team identified 91 whose fasting blood glucose levels of <100 mg/dL during baseline exams in 1996 to 2001 had risen to between 100 mg/dL and 125 mg/dL at follow-up exams in 2003 to 2004.

The 91 patients were matched three-to-one with 273 controls whose glucose levels were <100 mg/dL at baseline and follow-up. Researchers also matched the groups according to gender, race/ethnicity, and year of study enrollment. Sleep duration was self-reported using the Stanford 7-day Physical Activity Recall questionnaire, with patients categorized by their daily work week (Sunday through Thursday) sleep duration: short sleepers (<6 hours, 25 participants), long sleepers (>8 hours, 24 participants) and midsleepers (6- to 8-hour sleepers, 314 participants). Sleep data were unavailable on one person.

After adjusting for age, body mass index, glucose, and insulin concentrations, heart rate, hypertension, family history of diabetes, and symptoms of depression, the researchers found a significantly increased risk of developing IFG among short-sleepers compared to the midsleepers. Compared with the midsleepers, long-sleepers showed no association with IFG, the researchers report.

“Our findings will hopefully spur additional research into this very complex area of sleep and illness,” Dr. Rafalson said. ■

TABLE 1. SYMPTOMS OF OSA

<p>Cardinal Features of OSA</p> <ul style="list-style-type: none"> • A history of habitual snoring • A record of witnessed apneas • Excessive daytime sleepiness <p>Associated Symptoms of OSA</p> <ul style="list-style-type: none"> • Fatigue, sleepiness during the day, loss of energy • Irritability • Poor memory • Depression • Mood changes • Morning headaches • Erectile dysfunction in men • Nocturia

changes in glycemic control during sleep.

Dr. Dawson and colleagues used a continuous glucose monitoring system to measure glucose levels during polysomnography recordings of sleep among 20 patients with type 2 diabetes who had moderate-to-severe OSA before treatment and then after 4 to 12 weeks of treatment with CPAP. Included patients were on a stable diabetes regimen and were newly diagnosed with OSA with no previous CPAP treatment.

Results showed that in this group of patients—most of whom were obese—sleeping and nocturnal hyperglycemia were reduced, and the sleeping interstitial glucose level was less variable during CPAP treatment. The average glucose level during sleep decreased by approximately 20 mg/dL after an average of 41 days of CPAP, Dr. Dawson and colleagues found. The sleeping glucose level was also more stable after treatment, with the median standard deviation decreasing from 20.0 to 13.0 and the mean difference between maximum and minimum values decreasing from 88 to 57.

In a news release from the American Academy of Sleep Medicine, Dr. Dawson said, “The low blood oxy-

gen level and the arousals associated with an apneic event activate the sympathetic nervous system and cause the release of stress hormones, both of which tend to raise the blood glucose. If we could prevent these apneic events with CPAP, then we might keep the glucose level lower and more stable through the night.”

Dr. Dawson said he and his colleagues believe that recognizing and treating OSA could improve outcomes in individuals who have type 2 diabetes and OSA. He added that by using a continuous glucose monitoring system they were able to pick up short-term changes in the glucose level that would not be detected by traditional measurements.

For more on OSA and diabetes, see the supplement that mailed with the February 2009 issue of Review of Endocrinology, available at: reviewofendo.com/articles/0209/0209_supp.pdf. ■

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TABLE 2. PREVALENCE, EFFECTS, AND GROUPS AT RISK FOR OSA

<p>Prevalence of OSA</p> <ul style="list-style-type: none"> • OSA can occur in any age group, but prevalence increases between middle and older age. • OSA with resulting daytime sleepiness occurs in at least 4% of men and 2% of women. • About 24% of men and 9% of women have the breathing symptoms of OSA with or without daytime sleepiness. • About 80% to 90% of adults with OSA remain undiagnosed. • OSA occurs in about 2% of children and is most common at preschool ages. <p>Effects of OSA</p> <ul style="list-style-type: none"> • Fluctuating oxygen levels • Increased heart rate • Chronic elevation in daytime blood pressure • Increased risk of stroke • Higher rate of death due to heart disease • Impaired glucose tolerance and insulin resistance 	<ul style="list-style-type: none"> • Impaired concentration • Mood changes • Increased risk of being involved in a deadly motor vehicle accident • Disturbed sleep of the bed partner <p>Risk Groups</p> <ul style="list-style-type: none"> • People who are overweight (body mass index [BMI] 25–29.9 kg/m²) or obese (BMI ≥30 kg/m²) • Men and women with large neck sizes: ≥17 inches for men, ≥16 inches for women • Middle-aged and older men, and postmenopausal women • Ethnic minorities • People with abnormalities of the bony and soft tissue structure of the head and neck • Anyone who has a family member with OSA • People with endocrine disorders <p style="text-align: right;"><i>Source: American Academy of Sleep Medicine</i></p>
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