Low Serum Testosterone is Associated with Obstructive Sleep Apnea in Middle Aged Men

Mary Ann McLaughlin MD, Boback Berookhim MD, Farah Noorani MD, Cynara Maceda MD, Ronald Tamler MD, Rupa Iyengar MD, Simonette Sawit MD, Narayan Escolin MD, Jacqueline O'Boyle MD, Samuel Kurtis MD, Jacqueline Moline MD, Natan Bar-Chama MD

Introduction and Objectives
Obstructive sleep apnea (OSA) is implicated in the initiation and progression of cardiovascular disease (CVD). Recent studies assert male hypogonadism as a strong predictor for cardiovascular events, with small studies pointing to a specific correlation between hypogonadism and OSA in elderly men. Mediators of the association between both OSA and hypogonadism with CVD include endothelial dysfunction, inflammation, and oxidative stress, among others. The Berlin Questionnaire is the most widely used questionnaire for OSA, with published sensitivity up to 86% and specificity of 87%. We aim to characterize the relationship between patients at high risk for OSA and hypogonadism in a large population of middle-aged men.

Methods
We evaluated 2,121 male law enforcement personnel from the World Trade Center Medical Monitoring and Treatment Program. Hypogonadism was defined as total testosterone (TT) level < 300 ng/dL. Patients with a positive score on the Berlin Questionnaire were identified as OSA screen positive (OSA+), indicating high risk for OSA. A chi-squared test and independent t-test were used to assess differences between hypogonadism and OSA+. We performed multivariate binary logistic regression to adjust for body mass index (BMI), and Framingham Risk Score (FRS), a validated measure of 10 year cardiovascular risk.

Results
Mean age was 47 years, with a mean BMI of 30.4 kg/m2 among the patient population. 810 patients (38.2%) had hypogonadism and 911 patients (43.0%) were OSA+. Mean FRS were significantly higher among those patients who were OSA+ as opposed to normal counterparts (7.03 versus 6.14 respectively, p < 0.0001). Men with hypogonadism were more than twice as likely to be OSA+ than eugonadal counterparts (OR 2.04, 95% CI 1.7 – 2.43, p<0.0001). Adjusting for BMI and FRS, hypogonadal men were 49% more likely
to be OSA+ (OR 1.49, 95% CI 1.23-1.80, p <0.0001).

**Conclusions**
We observed a significant association between low serum testosterone and those at high risk for OSA as defined by the Berlin Questionnaire, after controlling for confounding variables. Clinicians should be encouraged to screen for OSA in hypogonadal men as part of overall risk assessment. Further research is necessary to describe the underlying pathophysiology connecting the two conditions.