CLINICAL VIGNETTE

Incidental Finding of PFO After Home Sleep Apnea Test

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Introduction

When a patient is referred for evaluation of a possible sleep disordered breathing disorder, a sleep study is typically ordered. The sleep study can be either a home sleep apnea test (HSAT) or an in-lab polysomnogram (PSG). Usually, the home sleep study is the first step taken in the evaluation given its low cost and convenience which increases patient access to testing.[1] The parameters monitored on a home sleep test, at a minimum, include respiratory effort, airflow, and oxygen saturation. The information reported from this type of study includes respiratory event index (REI), oxygen saturation nadir and baseline, and total evaluation time. The disadvantages of a HSAT include the lack of sleep stage monitoring in most kits, higher rate of technical error, and a higher false negative rate in comparison to PSGs.

Most home sleep studies have been validated against the gold standard, the in-lab polysomnogram which is an attended study with a minimum of the following: electroencephalographic activity, electrooculogram, electromyography, respiratory inductive plethysmography, airflow, snoring, oxygen saturation, body position, and videography.[2] While more specific and sensitive than a HSAT, this testing requires patient access to a sleep laboratory with geography and scheduling availability, and incurs a higher cost.

We present a patient presenting to sleep clinic for evaluation of snoring who completed a HSAT and subsequently found to have an anatomical heart defect, due to an abnormal result found on sleep testing. The purpose of this report is to familiarize providers with home sleep apnea testing and interpretation of findings.

Case Presentation

A 69-year-old male with hypertension was referred by his primary care provider for snoring. His risk factors for sleep disordered breathing included snoring, hypertension, age greater than 50, neck circumference greater than 17 inches, and male gender. STOP BANG, a risk assessment tool for sleep apnea, was 5/8 which puts him at high risk for sleep disordered breathing. Epworth Sleepiness Scale was 0/8.

A HSAT was obtained with the following results:

Respiratory events index (REI): 12.7/hour
O2 nadir 82% from baseline 88%
Time O2 saturation less than 88%: 221 minutes
Total evaluation time: 421 minutes

The patient's REI of 12.7 per hour was diagnostic for mild obstructive sleep apnea. However, what stood out in his study was the extent of his nocturnal hypoxemia. His oxygen saturation was less than 88% for 221 minutes, which was discordant to his mild sleep apnea. The patient elected to not treat his mild sleep apnea given he was asymptomatic. He had no known pulmonary or cardiac conditions which would explain the hypoxemia. His body mass index of 35 placed him at risk for obesity hypoventilation syndrome but a recent bicarbonate of 23 made this less likely. Given the severity of his nocturnal hypoxemia, he was referred for pulmonology for further evaluation and an echocardiogram with bubble study was ordered.

The trans-thoracic echocardiogram with bubble study revealed a possible patent foramen ovale (PFO) during the injection of agitated normal saline. A subsequent trans-esophageal echocardiogram revealed an atrial septal aneurysm with a small PFO, confirmed by a positive bubble study. The patient underwent successful PFO closure by Interventional Cardiology.

Discussion

While a polysomnogram is the gold standard for evaluation of sleep disordered breathing, most insurers prefer HSATs be the first step in evaluation. HSATs are more economical and provided noninferior results when compared to polysomnograms.[3-5] A polysomnogram should be considered in situations where other sleep conditions such as central sleep apnea, nighttime hypoventilation or narcolepsy, is suspected. Patients with increased risk for such conditions generally have GOLD stage 2-4 COPD, NYHA class III-IV heart failure, awake hypoventilation, neuromuscular weakness, opioid use, or history of stroke.[6] These patients should be referred to sleep medicine as the evaluation may require additional specific testing parameters besides a baseline polysomnogram. HSATs have a reported failure rate ranging from 3% to 33%.[7] If a HSAT has been attempted and found to be invalid due to technical error, a polysomnogram should be the next step in evaluation.

The main results obtained from HSATs include REI, oxygen saturation, and total evaluation time. The REI is calculated by the total number of apneas and hypopneas divided by the total evaluation time. Because HSATs cannot detect sleep stages, total sleep time is not used in the calculation as in polysomnograms. As total evaluation time is longer than total sleep time, the number of apneas and hypopneas in a HSAT are divided by a larger denominator leading to an underestimation of the true ratio. Therefore, false negatives are more likely in comparison to polysomnograms. If a patient has a high pretest probability for sleep disordered breathing and a negative HSAT, the next step is to evaluate further with a polysomnogram.

Our patient had a REI of 12 per hour which is diagnostic of mild obstructive sleep apnea. He was not symptomatic from his condition, and elected to not treat at this time. Usually, the oxygen saturation data is used to corroborate with the sleep apnea diagnosis. However, his condition was mild and discordant with the severity of nocturnal hypoxemia. This prompted obtaining a transthoracic echocardiogram, and referral to Pulmonology for evaluation of other etiologies.

This case summarizes the use of HSATs for evaluation of sleep disordered breathing, their advantages and disadvantages, and appropriate interpretation. It demonstrates that additional helpful information can be obtained in a HSAT, alerting to a non-sleep-related diagnosis.

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