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LETTERS TO THE EDITOR

Positive Home Sleep Apnea Test After a Negative Polysomnogram: Role of Potential Confounding Factors

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A recent study[1] in this journal showed that among 141 patients who underwent an in-laboratory polysomnography (PSG) and had an apnea-hypopnea index (AHI) < 5 events/h, 83.7% were found subsequently to have a respiratory event index (REI) of ≥ 5 events/h on a home sleep apnea test (HSAT) of which 64.5% received a diagnosis of mild obstructive sleep apnea (OSA). These patients who had a REI ≥ 5 events/h on the HSAT were noted to spend an average of 232.4 minutes in the supine position during the HSAT as compared to an average of 101.5 minutes in the supine position when they underwent the PSG. However, from the data reported, it remains unclear whether a positional change in the REI was observed during the HSAT or not. Only 2 of the 3 types of HSAT devices used during this study reported body position. It would be helpful to know the accuracy of the body position monitor used on these HSAT devices. It is also unclear whether patient position during the PSG was manually recorded by video monitoring or whether it was recorded using an automatic position sensor, the readout of which can sometimes be discrepant from the patient's actual body position seen on video monitoring. To the authors credit, they have described in detail some of the limitations of this study including the fact that hypopneas during the PSG tests were scored using the 4% desaturation criteria (also known as the alternative criteria) as opposed to the 3% desaturation and arousal criteria (also known as the recommended criteria), the utilization of which would likely have resulted in a higher percentage of patients having an AHI ≥ 5 events/h on the PSG.[2]

On another note, the current scoring criteria for sleep may at times not fully reflect the underlying biology. As is well known, sleep studies are scored in 30-second epochs. An individual epoch is scored as sleep if the electroencephalogram shows sleep for most of the epoch.[3] In other words, if stage N2 sleep is seen for the entire 30 seconds, then the epoch would be scored as stage N2 sleep. Another example would be where stage N2 sleep is seen for 20 seconds and awake is seen for 10 seconds. In this situation also, the epoch would be scored as stage N2 sleep. However, if awake is seen for 20 seconds and stage N2 sleep is seen for 10 seconds, then the epoch would be scored as awake. The problem with this is that disruptive respiratory events can sometimes be seen during these brief fragments of sleep, but these respiratory events cannot be scored as the epochs during which they are occurring, based on the scoring rules as noted above, are scored as awake. Contrary to this, these respiratory events would be scored on a HSAT. This raises a bigger question. Should the sleep scoring rules be revised to reflect the underlying biology? Taking the above example, if in an epoch, awake is seen for 20 seconds and stage N2 sleep is seen for 10 seconds, rather than score the whole epoch as awake, should the 20 seconds of awake be scored as awake and the 10 seconds of stage N2 sleep be scored as stage N2 sleep? This would probably make more sense especially for the circumstances cited above. However, it may also get more tedious to score the studies and what would be the minimum amount of sleep that would be needed to score as such? The above line of thought could be extended to the scoring of sleep on a Multiple Sleep Latency Test though the discussion around this likely extends way beyond the realms of this letter.

The other factor which may affect the results of the sleep study is the pulse oximeter. Correct positioning of the pulse oximeter is very important for it to give accurate readings. It is well known that mispositioned pulse oximeters can give false low readings.[4] However, under similar circumstances, certain pulse oximeters may actually give falsely elevated non-physiologic readings.[5] This can be screened for by looking at the trend window on which the pulse oximeter may be seen to read a steady 100% for extended periods of time. Going though the study, one may see the occurrence of respiratory events despite which the oximeter is noted to continuously read 100% without any desaturations. In our sleep laboratory, we have tended to see such readings generally replaced by a more physiological readout after the pulse oximeter has been repositioned on the patient's finger. It is unclear whether any one pulse oximeter is more prone to such an error or not. However, one could speculate that pulse oximeters of the clip-on variety may be more prone to such errors as they may be more easily mis-positioned during the course of the night. Incidentally, at our sleep center, the few patients in whom I have observed this problem to occur were studied in the sleep laboratory where we use clip-on pulse oximeters. I have generally not seen this problem to occur in the patients who have undergone a HSAT at our sleep center. Interestingly, the HSAT devices that we use, utilize a soft-tipped pulse oximeter probe which maintains a more snug and sturdy hold on the finger. Thus, depending on the kind of pulse oximeter used during a particular study,

one may possibly see some variation in the oximetry readings which may result in an underscoring of hypopneas. In addition to positioning, there are other internal factors which may lead to differences between the readings between different pulse oximeters. In fact, prior studies comparing different pulse oximeters have shown that the AHI and the oxygen desaturation index can differ in a clinical relevant manner depending on the particular kind of pulse oximeter being used.[6,7]

Lastly, in my experience with HSAT devices other than the ones utilized during this study, I have seen that it can at times be difficult to clearly distinguish between central and obstructive apneas when only a single effort belt is being used as opposed to when 2 effort belts are being used. The signal from the single effort belt can at times be difficult to interpret and could potentially result in over classification of central apneas as obstructive apneas and possibly vice versa.

Despite the limitations and confounding factors noted above, this study does raise important awareness surrounding this group of patients who are symptomatic for OSA and have a negative PSG. Keeping the numerous factors in mind that can affect study results is important. For every test, one needs to understand its limitations, drawbacks, and sources of error. Putting this in context with an individual patients history will allow one to reach correct and clinically relevant conclusions. Most importantly, one needs to remember that the REI or AHI is a dynamic factor and can vary from night-to-night. A single night negative test in a symptomatic patient should be viewed with caution and should be grounds for further evaluation.

CITATION

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DISCLOSURE STATEMENT

The authors report no conflicts of interest.