

Using Overnight Pulse Oximetry to Manage Oral Appliance Therapy (OAT) during Treatment for Obstructive Sleep Apnea (OSA)

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INTRODUCTION

It is estimated that obstructive sleep apnea (OSA) affects at least 25 million Americans.¹ OSA occurs when a patient's airway gets blocked during sleep. The benefits of physicians prescribing overnight pulse oximetry testing to pre-screen for OSA are well known.² In addition, studies supporting the use of overnight pulse oximetry by dental sleep practitioners to confirm their patients' response to oral appliance therapy (OAT) during treatment for sleep disordered breathing (SDB) are well documented.³ In fact, the American Academy of Dental Sleep Medicine (AADSM) recently recommended in its treatment protocol the use of pulse oximetry home sleep testing to manage mandibular advancement splint (MAS) appliances.⁴ However, the practice of using a pulse oximeter to manage MAS appliances has only recently entered the mainstream of care.

OVERVIEW

Sleep disordered breathing (SDB) includes OSA and is part of the scope of temporomandibular disorders (TMD). Not to consider SDB would be ignoring an important factor in the pathology of TMD. Successful treatment of SDB can not only add years to a patient's life, it can also greatly improve quality of life.⁵

The most common treatment for OSA is a continuous positive airway pressure (CPAP) machine prescribed by a physician. A CPAP mask is worn over the nose (and sometimes also the mouth) and the mask is connected to a hose that gently pushes air into the throat to keep the airway open during sleep. However, studies have shown that more than half of all patients who use a CPAP machine stop using it within a year due to discomfort.⁶

As an alternative to CPAP treatment for OSA treatment, oral appliance therapy (OAT) is often deployed by dental sleep medicine practitioners, working in partnership with referring sleep physicians. With OAT, the patient wears a mandibular advancement splint, which is a mouth-guard-like appliance that positions the lower jaw forward to open the airway continuously through the night. Studies have shown that patients comply better with OAT than with CPAP.⁷ The American Academy of Sleep Medicine recommends oral sleep appliances as first line treatment options for those with mild and moderate levels of sleep apnea as well as for individuals who are CPAP intolerant.⁸

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Overnight pulse oximetry monitoring is essential in pre-confirming the effectiveness of OAT for OSA treatment. A pulse oximeter monitors a patient's heart rate and blood oxygen saturation in arterial blood. According to the AADSM and the AASM, overnight pulse oximetry has been shown to be an effective sleep screening tool used to evaluate the response to OAT prior to sending patients back for follow-up polysomnography (PSG) testing at a sleep lab.⁹

As a specialist in Orofacial Pain and Dental Sleep Medicine, my patients are referred to me for temporomandibular joint syndrome (TMJ), headaches or sleep apnea. After my patients have been diagnosed by a board-certified sleep physician, I use overnight pulse oximetry screening to manage the MAS that I typically prescribe. Specifically, I use Nonin Medical's WristOx₂[™] wrist-worn pulse oximeter and Nonin's nVISION[®] data management software to verify the appliance's effectiveness before my patients return to their physicians for a final PSG. We have tried other pulse oximeters, and due to its ease of use, durability and reliability, I have found that the WristOx₂ is the best device for this purpose. In addition, patient training issues with the WristOx₂ are very few, if any.

CASE EXAMPLE

Exam and History: A 48 year old woman presented with subjective symptoms of fatigue, frequent arousals and morning headaches. She reported waking up 3-4 times per night and returning back to sleep in less than 10 minutes. She reported mild snoring and waking up gasping for air at times. Her husband did not report any pauses in her breathing. An objective exam showed signs of jaw clenching at night to include scalloped tongue, teeth abfractions, gingival clefting, high vaulted palate and mandibular tori. The cone beam x-ray showed normal tonsils, a small airway, a high vaulted palate and a right septal deviation with turbinate hypertrophy. Her Epworth Sleepiness Scale was 13 (elevated). Her BMI was 29 (overweight/borderline obese). Her temporalis and deep masseter muscles were tender to palpation, in addition to her temporalis tendons on both sides (from excessive clenching).

The treatment plan was to send her for a PSG with esophageal pressure monitoring (PES). She was instructed to return for a consult and review of treatment options to include OAT.

NPSG Results: AHI 9, RDI 33, SpO₂ 88% (time below 90% oxygen saturation was 3.3% of the night), PES -45cm H₂O (note: this indicates significant effort, as a normal reading would be -5cm H₂O). The diagnosis was OSA; ICD-9 327.23.

Treatment: The recommended treatment was a Resmed Narval[™] CC oral appliance. Impressions were taken and the MAS was fabricated and inserted at 50% protrusion. The patient was instructed to wear her morning aligner for 15 minutes or until her posterior teeth touch. She returned for a one week follow-up with no TMJ or tooth pain. Her occlusion was checked with and without the morning aligner. She still had fatigue and arousals with the headaches less intense. She was instructed to advance the MAS until she slept through the night.

Titration: At the six-week point, she was advanced to 75% of maximum protrusion and sleeping through the night, but still reported fatigue. She was sent home with a Nonin Medical WristOx₂ Model 3150 wrist-worn pulse oximeter. The first pulse oximeter reading indicated an SpO₂ of 91 with significant heart rate variability. The maximum heart rate spikes were about every 90 minutes with a corresponding drop in oxygen saturation. At no time was she reading under 90% SpO₂. The AHI, based on a 3% drop in oxygen from baseline, was 6. I interpreted this data to mean that the airway was patent and most apnea was resolved, but that there was still respiratory effort occurring, which would explain the fatigue. The 90 minute cycles of increased heart rate indicated that most of her remaining effort was occurring during the rapid eye movement stage of sleep. She was told to advance the MAS two more units.

Results: After advancing the MAS two more units, the patient reported that her fatigue was resolved. She was again sent home with a Nonin Medical WristOx₂ Model 3150 wrist-worn pulse oximeter. Her SpO₂ was 94% with no heart rate variability; she experienced a normal steady decline of her heart rate throughout the night. She was sent to the sleep physician for a final PSG, which confirmed resolution of her OSA. The patient was put on a yearly recall with instructions to let us know if she experienced any change in her symptoms or bite.

CONCLUSION

The need for diagnosing and treating SDB, including OSA, is critical due to the volume of potential patients affected, the associated health risks (diabetes, high blood pressure, heart disease, stroke, depression) and the potential for reduced quality of life (poor concentration, fatigue, increased risk of accidents).¹⁰

Diagnosis and treatment of OSA should not have to wait until patients' symptoms are bad enough to drive them into their doctor's office. Dentistry has, as part of its treatment structure, a yearly recall of patients. This presents an opportunity for sleep disorder dentists to partner with sleep physicians to improve patient quality of life and lower healthcare costs by working together to diagnose and treat OSA appropriately.

Pulse oximetry sleep tests are useful to dentists for managing MAS appliances but not for diagnosing or confirming resolution of OSA. Only a sleep physician who is board certified in sleep medicine can diagnose or confirm resolution of OSA.¹¹ MAS is reimbursable, and overnight pulse oximetry sleep tests can be included as part of the cost-of-care delivery.

Oximetry sleep tests are easy and inexpensive for dental sleep practitioners to employ using a pulse oximeter such as Nonin Medical's WristOx₂ Model 3150. Training is minimal, and patients appreciate the fact that their oxygen saturation levels are being monitored for verification of MAS effectiveness before they return to their physician for a final PSG. Performing these tests lets the physician know that the dental practitioner is serious about OSA treatment and knowledgeable about how to make treatment effective.



EXAM AND TREATMENT ROUTINES

When patients are referred for OSA:

- I perform an exam, conduct a cone beam scan or Panorex X-ray and take the patient's history. If patients have had a PSG already, then pre-verification of benefits will have been done. I will review the PSG with patients and recommend a MAS or combination therapy. If they have not had a PSG from a physician, I will refer them at this point and have them return to review results.
- I fabricate and insert the MAS in the patient's mouth.
- I manage the MAS forward until symptoms are resolved – i.e., the airway remains open.
- I then send the patient home for a pulse oximetry home sleep test (HST).
- If issues are identified, then I will repeat the process and HST until symptoms are resolved and I can determine that the MAS is effective.
- I send the patient and HST reports to the physician for a final PSG.
- If the issues are unresolved, I fabricate a TAP® PAP nasal pillow CPAP mask for combination therapy and send the patient to a physician for a CPAP titration.

When patients are referred for TMD:

- I perform an initial history and exam for TMD (or headaches) and SDB on every patient. I treat the pain or TMD, and if they have any signs and/or symptoms of SDB other than jaw clenching, I refer them for a PSG. If they have no other signs and symptoms of SDB, I will send them home with an HST just to make sure they are free of any issues. I especially look at the heart rate variability in these cases, as that is an indication of respiratory effort.
- I will have the patient start with CPAP while I treat the TMD.
- When the TM joints are stable, I will transition them into a MAS or combination therapy, depending on the severity of the problem.
- Finally, I manage the MAS therapy with a pulse oximeter as described above and refer the patient to a physician for a final PSG.

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DISCLOSURE

Dr. Prehn has not received any compensation from Nonin Medical, Inc. for authoring this white paper or endorsing Nonin Medical's products.



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