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Indications for treatment of obstructive sleep apnea in adults

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Why treat obstructive sleep apnea (OSA)? OSA is associated with significant daytime sleepiness, reduced quality of life, insulin resistance, motor vehicle crashes, and vascular morbidity and mortality [1–3]. Current evidence supports the belief that all these parameters can be impacted favorably by treatment. Medical therapy with positive pressure eliminates snoring and favorably affects daytime sleepiness, driving risk, vascular function, vascular risk, and quality of life [4–8]. The conundrum for the clinician is that patients are variably affected by OSA of similar severity (Fig. 1). Treatment may be difficult to accept or adhere to, and some treatment options are not uniformly effective. The long-term impact of treatment is uncertain.

The current convention is to grade the severity of OSA by the apnea-hypopnea index (AHI). The American Academy of Sleep Medicine recommends grading sleep apnea as mild (AHI 5–15), moderate (AHI 15–30), and severe (AHI >30) [9]. This metric statistically correlates the presence of sleepiness, neurocognitive impairment, and vascular risk [10–12]. It is relatively easy to treat patients with severe, symptomatic OSA. The difficulty with regard to treatment frequently occurs when patients with severe OSA are not symptomatic or when patients are profoundly symptomatic with a low AHI.

Treatment of the minimally symptomatic patient with severe OSA can be challenging. The medical therapy of choice—positive pressure via a mask—is unique and not discrete [13]. The treatment is administered in one of the most intimate settings, the bedroom.

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In the absence of definitive long-term outcome data, there is uncertainty regarding how hard to push therapy in patients with mild to moderate OSA with minimal symptoms [14]. Patients who are profoundly symptomatic with relatively mild OSA may not accept positive pressure therapy. The long-term effect of alternative treatments to positive pressure is unknown but may be of value in select circumstances.

Patient assessment

Successful treatment cannot be accomplished without proper patient assessment. It is helpful to understand what a patient hopes to gain from the evaluation. This expectation is best handled by seeing the patient before polysomnography. The clinician can understand what is driving the evaluation: the complaint of snoring, the complaint of fatigue or daytime sleepiness, or the concern of vascular risk. It is also helpful to understand up front whether the patient, spouse, or referring physician is most concerned about OSA.

If the patient is most concerned with the possibility of OSA and he or she is subjectively sleepy, there is a good chance that medical therapy with positive pressure will be accepted. These patients are good candidates for split-night polysomnography [15–17]. If the patient does not complain of daytime fatigue or sleepiness or does not regard snoring as a significant problem, acceptance and adherence to positive pressure therapy may be difficult to establish, and split-night polysomnography may not be the best approach [18,19]. In this circumstance, it is generally best to obtain a full night of diagnostic polysomnography data and review the findings before a trial of positive pressure.

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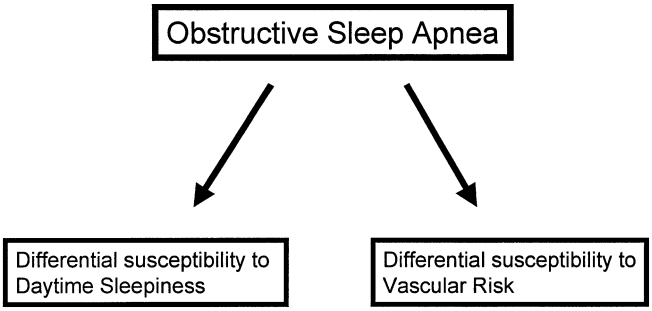

Fig. 1. The variable effect of OSA on physiologic outcomes.

The clinician must know if insufficient sleep or depression contribute to the complaint of daytime sleepiness or fatigue [20]. Does shift work or a possible sleep phase shift contribute to daytime impairment? Could concomitant narcolepsy without cataplexy or idiopathic hypersomnolence be present? Does the patient have difficulty with sleep maintenance unrelated to OSA? If so, adequate therapy may involve treatment of insomnia or restless leg syndrome. Can non–sleep-related pathology, such as chronic pain, contribute to alterations in sleep architecture and continuity?

Before positive pressure therapy is attempted, several issues that are likely to impact on acceptance or adherence of positive pressure should be considered. Is the patient familiar with positive pressure therapy? If not, an educational intervention is necessary before the introduction of therapy [21,22]. Is nasal obstruction present? If so, medical and possibly mechanical treatment of the nose may be necessary for effective treatment [23–25]. Is the patient claustrophobic? If this is the case, an attempt at desensitization may be beneficial before instituting therapy [26].

Tailoring the treatment to a given patient

Once the decision has been made that a patient potentially would benefit from a trial of therapy, the first intervention in conjunction with lifestyle recommendations (ie, avoiding alcohol and sedatives, ensuring proper sleep hygiene, beginning smoking cessation, and maintaining fitness) should be a trial of positive pressure via a mask [13,27]. The trial is best accomplished in the laboratory with a technician in attendance. Attended positive pressure titrations allow for further patient education and reassurance by the technical staff and proper mask fit, optimal modality (ie, continuous positive airway pressure [CPAP] or bi-level pressure) and an accurate pressure prescription [21]. Whether this is accomplished in the context of a split- or full-night study depends on the previously discussed considerations.

In-line heated humidification may be particularly useful in elderly patients and patients with nasal congestion or mouth leaks [28,29]. It should be prescribed for patients who are treated with systemic anticoagulation [30]. Chin straps and oronasal masks may be tried for mouth leaks but are poorly tolerated compared with nasal interfaces with heated humidification.

Second-line therapy: alternatives to positive pressure

Despite adequate preparation and an effective attended titration, several patients with an elevated AHI or daytime symptoms will not accept or adhere to positive pressure therapy. This possibility highlights the need for follow-up with objective measurement of adherence to positive pressure therapy. In these patients, it is important to revisit the primary complaint that drove the evaluation in the context of the severity of OSA and underlying vascular risk (Fig. 2).

Primary concern: snoring

In patients with mild OSA (AHI 5–15), minimal symptoms of fatigue or daytime sleepiness, and the primary complaint of snoring, trial of an oral appliance or a palatal procedure is a reasonable option [27]. Patients may prefer an oral appliance to positive pressure [31]. The response to treatment is not complete, which mandates follow-up [7]. Despite expert adjustment, treatment with oral appliance therapy may be limited by tooth movement and bite discomfort [32,33]. The long-term outcomes with oral appliance therapy are not well characterized.

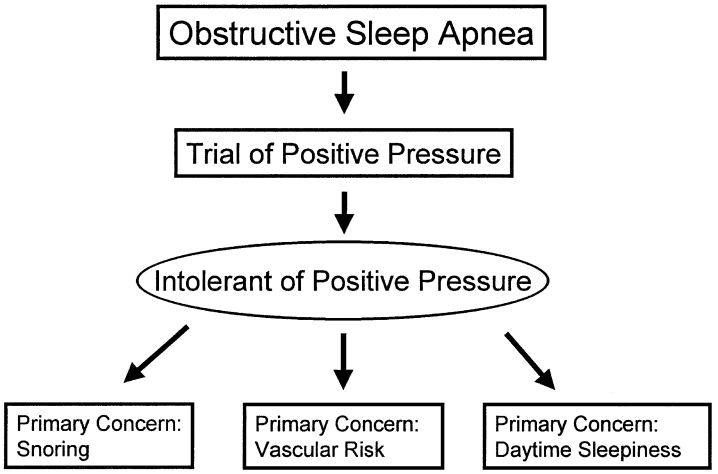

Fig. 2. Focusing the treatment on the primary patient complaint.

Palatal procedures include conventional scalpel technique uvulopalatopharyngoplasty, laser assisted uvulopalatoplasty, and radiofrequency treatment of the palate (somnoplasty) [34,35]. The pros and cons of the palatal procedures are discussed in detail elsewhere in this issue. Overall, palatal procedures alone can be effective treatments of snoring. If a tonsillectomy is included, mild OSA can be impacted favorably, although as in the case of oral appliances, the response to treatment may not be complete and follow-up is mandatory [36].

Optimal treatment of nasal pathology can modify snoring favorably and may be an important contribution to the treatment plan. This treatment may require medical interventions (ie, antihistamines, nasal steroids, or leukotriene antagonists) [23,25]. Mechanical treatment of nasal obstruction may provide additional added value. Radiofrequency treatment of the nasal turbinates can be effective and may avoid an operating room procedure [24].

Primary concern: vascular risk

Patients with OSA are at risk for vascular morbidity or mortality [37]. If vascular comorbidity is present in the absence of significant daytime impairment, treatment with positive pressure may not be accepted [19]. Similar difficulty may be encountered with oral appliance therapy. No definitive data support surgery–other than tracheostomy–as an effective treatment option to impact vascular comorbidities related to OSA [38,39]. Burgeoning evidence supports the concept that intermittent hypoxia may be the primary determinant of vascular risk related to OSA [40]. This may be mediated, in part, by reactive oxygen species that are precipitated by an ischemia-reperfusion insult related to the intermittent cell hypoxia [41]. In animal experiments, intermittent hypoxia has been shown to upregulate sympathetic tone, which results in catecholamine release and elevated blood pressure [42].

Nocturnal oxygen may be accepted in patients who do not tolerate positive pressure therapy [43]. Although definitive evidence is lacking, it is biologically plausible that nocturnal oxygen would affect vascular risk favorably. One current limitation to this treatment option is the inconvenience of transporting oxygen concentrators that are bulky and weigh on average between 20 and 50 lbs [44].

Primary concern: daytime symptoms

It is always helpful to determine the response of impaired daytime function (ie, fatigue and sleepiness) to positive pressure therapy. It is a considerable problem to sort out this effect when patients are unwilling to accept treatment with positive pressure. Chronic sleep deprivation (the most common cause of daytime impairment) and depression as confounders should be excluded [20]. An objective assessment of daytime sleepiness, such as the multiple sleep latency test, can be helpful in determining the degree of daytime impairment and providing insight into the possibility of a concomitant diagnosis of narcolepsy without cataplexy or idiopathic hypersomnolence [45].

A judicious trial of a daytime stimulant may improve quality of life. This trial is best accomplished in conjunction with treatment with positive pressure therapy. Certain patients may have continued daytime sleepiness despite treatment with CPAP or bi-level pressure. Pack et al reported success with modafinil as adjunctive therapy for daytime sleepiness in OSA [46]. In their 4-week double blind treatment trial (n = 157), inclusion criteria required that patients adhere to CPAP (7.1 + 2.9 hours placebo versus 7 + 1.2 modafinil). Modafinil at a dose of 400 mg/day resulted in a significant improvement in subjective daytime sleepiness and objective daytime sleepiness measured by the multiple sleep latency test. There was no difference between the two treatment groups in the percentage who normalized their multiple sleep latency test scores to more than 10 minutes (25% placebo versus 29% modafinil, $P = 0.613$) [46].

Nonamphetamine daytime stimulants seem to be reasonably safe as an adjunct to treatment with positive pressure for daytime sleepiness [47]. Currently, stimulant therapy alone cannot be recommended for patients with sleep apnea (AHI >5) [46,48]. If the patient does not accept positive pressure therapy, second-line therapy for OSA should be pursued, whether medical, surgical, or dental, before contemplating adjunctive stimulant treatment. It is imperative that the potential impact on vascular risk be examined carefully. Follow-up monitoring of blood pressure is necessary.

Special circumstances

Upper airway resistance syndrome

There is uncertainty regarding the use of stimulant therapy alone in patients with the upper airway resistance syndrome [49–51]. Ideally, a trial of treatment with positive pressure is advisable. Unfortunately, a significant percentage of these patients may not accept treatment with positive pressure. This approach is frequently hampered by the fact that third party payers will not reimburse homecare companies for a positive pressure treatment trial of upper airway resistance syndrome, and the patient may be unwilling to bear the cost.

Down syndrome

Patients with Down syndrome have upper airway abnormalities that place them at risk for sleep-disordered breathing [52]. In the adult patient with Down syndrome, the challenge is therapeutic, not diagnostic [53]. Many of these patients have difficulty accepting positive pressure therapy. Oxygen may be easier to tolerate and worth trying if CPAP or bi-level pressure is not an option [43]. It is essential that the caregiver responsible for the patient be trained to help the patient with the prescribed therapy.

Hospitalized patients

Obstructive sleep apnea can be found in medical patients hospitalized with another primary diagnosis. Clinical experience dictates that the prevalence is increased compared with healthy outpatients. This rate undoubtedly reflects the high incidence of obesity, cardiovascular disease, cerebrovascular disease, and diabetes in this patient population. These patients present a challenge to diagnose and treat while acutely hospitalized. The need for monitoring and intravenous medications poses problems for the sleep laboratory in which nursing personnel may not be available to provide additional care. The patient may be reluctant to pursue treatment with positive pressure during the hospitalization. Sleep deprivation, the use of sedatives and narcotics, and suboptimal volume status also may tend to worsen the severity of the underlying OSA. It may be important to identify OSA acutely, but definitive treatment with CPAP or bi-level pressure may be best reserved when the patient is stabilized as an outpatient. Head of bed elevation and supplemental oxygen may be better tolerated acutely [43,54–56].

Elderly patients

Elderly patients (particularly older than 80 years), much like hospitalized patients, are challenging to treat. Major abnormalities of the sleep schedule are frequently present. Concomitant insomnia and advanced phase disorders make it problematic to assess a response to positive pressure if OSA is present [57]. Many of these patients have significant vascular risk, and treatment makes good clinical sense. Second-line therapy with oxygen or head of bed elevation is frequently the best fit in these patients and may provide significant benefit [43,54–56].

Hypoventilation syndromes

Hypercapnia is common in OSA but frequently overlooked. One recent series found that 17% of patients referred for polysomnography had evidence of daytime hypercapnia [58]. There is uncertainty whether CPAP is contraindicated. If a patient complains of frequent morning headaches or has evidence

of persistent right heart failure or hypercapnia—or both—at the time of follow-up, a bi-level pressure titration should be considered [59].

Summary

The primary treatment modality for OSA remains positive pressure therapy. Differential susceptibility to daytime sleepiness and vascular risk exists. In patients who do not accept positive pressure therapy despite careful attempts to optimize the treatment, second-line therapy should be explored.

A careful assessment of the primary treatment concern should guide further intervention(s). Although palatal surgery can treat snoring effectively, the effect on the AHI and daytime sleepiness is less robust. Oral appliances may help some patients [31]. Recent data suggest that the durability of the treatment over time is uncertain and subject to frequent dental complications [32,33].

Treatment with oxygen should be considered in patients who do not accept positive pressure therapy and are believed to be at increased risk for vascular complications [43]. Current generation oxygen concentrators are difficult to transport and limit the use of this treatment option in highly mobile patients [44]. Special populations, including patients with Down syndrome, hospitalized patients, and elderly persons, may be more accepting of treatment with oxygen via nasal cannula alone. Although this approach makes biologic sense, definitive outcome evidence is lacking.

Future expectations

Cumulative epidemiology data provide a convincing argument that patients with OSA are at risk for impaired daytime performance (sleepiness or fatigue), insulin resistance, automobile crashes, and vascular complications. It also has become evident that whereas a dose-response relationship exists with regard to the AHI and risk for the group as a whole, differential susceptibility may exist for a given patient [10–12].

The challenge for the future is to define the risk in a given patient. Physiologic tests that provide added value to the current evaluation are welcome. Quantifying daytime impairment with vigilance testing and better assessing vascular risk with new technology may prove to be useful [60–62]. On the horizon, insights gained from functional genomics, proteomics, and possibly metabonomics undoubtedly will provide powerful data for future clinical decision making in OSA [63].

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