TREATMENT OBSTRUCTIVE SLEEP APNEA/HYPOPNEA SYNDROME -OSAHS–

A comprehensive approach to the management of OSAHS is needed to reduce risk factors and comorbidities. The clinician should seek to identify and address lifestyle and behavioral factors as well as comorbidities that may be exacerbating OSAHS. As appropriate, treatment should aim to reduce weight; optimize sleep duration (7–9 hours); regulate sleep schedules (with similar bedtimes and wake times across the week); encourage the patient to avoid sleeping in the supine position; treat nasal allergies; increase physical activity; eliminate alcohol ingestion within 3 h of bedtime; and minimize use of sedating medications. Patients should be counseled to avoid drowsy driving.

CPAP is the standard medical therapy with the highest level of evidence for efficacy. Delivered through a nasal or nasal-oral mask, CPAP works as a mechanical splint to hold the airway open, thus maintaining airway patency during sleep. An overnight CPAP titration study, performed either in a laboratory or with a home "autotitrating" device, is required to determine the optimal pressure setting that reduces the number of apneas/hypopneas during sleep, improves gas exchange, and reduces arousals. Rates of adherence to CPAP treatment are highly variable (average, 50–80%) and may be improved with support by a skilled health care team who can address side effects **(Table 319-3)**. Despite the limitations of CPAP, controlled studies have demonstrated its beneficial effect on blood pressure, alertness, mood, and insulin sensitivity. Uncontrolled studies also indicate a favorable effect on cardiovascular outcomes, cardiac ejection fraction, atrial fibrillation recurrence, and mortality risk.

Oral appliances for OSAHS work by advancing the mandible, thus opening the airway by repositioning the lower jaw and pulling the tongue forward. These devices generally work better when customized for patient use; maximal adaptation can take several weeks. Efficacy studies show that these devices can reduce the AHI by γ50% in two-thirds of individuals, although these data are based largely on patients with mild OSAHS. Side effects of oral appliances include temporomandibular joint pain and tooth movement. Oral appliances are most often used for treating patients with mild OSAHS or patients who do not tolerate CPAP. However, since adherence to the use of oral appliances sometimes exceeds CPAP adherence, these devices are under investigation for treatment of more severe disease.

Upper airway surgery for OSAHS is less effective than CPAP and is mostly reserved for the treatment of patients who snore, have mild OSAHS, and cannot tolerate CPAP. Uvulopalatopharyngoplasty (removal of the uvula and the margin of the soft palate) is the most common surgery and, although results vary greatly, has a success rate similar to or slightly lower than treatment with oral appliances. Upper airway surgery is less effective in severe OSAHS and in obese patients. Success rates may be higher for multilevel surgery (involving more than one site/structure) performed by an experienced surgeon, but the selection of patients is an important factor and relies on careful targeting of culprit areas for surgical resection. Bariatric surgery is an option for obese patients with OSAHS and can improve not only OSAHS but also other obesity-associated health conditions. Other procedures that can decrease snoring but have minimal effects on OSAHS include injection of the soft palate (resulting in stiffening), radiofrequency ablation, laser-assisted uvulopalatoplasty, and palatal implants.

Supplemental oxygen can improve oxygen saturation, but there is little evidence that it improves OSAHS symptoms or the AHI.

TABLE 319-3 SIDE EFFECTS OF CONTINUOUS POSITIVE AIRWAY PRESSURE CPAP AND THEIR TREATMENTS

Side Effect	Treatment
Nasal congestion	Provide heated humidification, administer saline/steroid nasal sprays
Claustrophobia	Change mask interface (e.g., to nasal prongs), promote habituation (i.e., practice breathing on CPAP while awake)
Difficulty exhaling	Temporarily reduce pressure, provide bilevel positive airway pressure
Bruised nasal ridge	Change mask interface, provide protective padding
Aerophagia	Administer antacids

CENTRAL SLEEP APNEA

CSA, which is less common than OSAHS, may occur in isolation or, more often, in combination with obstructive events in the form of "mixed" apneas. CSA is often caused by an increased sensitivity to pCO_2, which leads to an unstable breathing pattern that manifests as hyperventilation alternating with apnea. A prolonged circulation delay between the pulmonary capillaries and carotid chemoreceptors is also a contributing cause; thus individuals with congestive heart failure are at risk for CSA. With prolonged circulation delay, there is a crescendo-decrescendo breathing pattern known as *Cheyne-Stokes respiration* **(Fig. 319–2*B*)**. Other risk factors for CSA include opioid medications (which appear to have a dose-dependent effect on CSA) and hypoxia (e.g., breathing at high altitude). In some individuals, CPAP—particularly at high pressures—seems to induce central apnea; this condition is referred to as *complex sleep apnea*. Rarely, CSA may be caused by blunted chemosensitivity due to congenital disorders (congenital central hypoventilation syndrome) or acquired factors. Treatment of CSA is difficult and depends on the underlying cause. Limited data suggest that supplemental oxygen can reduce the frequency of central apneas, particularly in patients with hypoxemia. Cheyne-Stokes respiration is treated by optimizing therapy for heart failure and, in some cases, using CPAP with or without supplemental oxygen. *Adaptive servoventilation*, a form of ventilatory support that dynamically changes inspiratory support levels across periods of apnea and hypopnea, can minimize large fluctuations in PCO_2 that produce central apnea and can be effective for the treatment of CSA.