

Nasal Surgery for Obstructive Sleep Apnea Syndrome

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KEYWORDS

- Nasal obstruction • Nasal surgery • Septoplasty • Turbinate reduction
- Obstructive sleep apnea syndrome • Sleep disordered breathing
- CPAP compliance

KEY POINTS

- Mechanical and inflammatory factors leading to nasal obstruction contribute to sleep disordered breathing by increasing nasal airway resistance, causing sleep fragmentation, and causing mouth breathing.
- Treatment of obstructive sleep apnea with continuous positive airway pressure (CPAP) is considered the first line of therapy, but long-term compliance is only about 40%, often because of nasal obstruction.
- Medical treatment with topical nasal steroid sprays and nasal dilators have been shown to improve sleep disordered breathing.
- Surgical treatment of nasal obstruction, including septoplasty, turbinate reduction, and nasal valve reconstruction, has been shown to improve sleep disordered breathing.
- Surgical treatment of nasal obstruction has been shown to reduce CPAP requirement and improve compliance with CPAP.

OVERVIEW OF OBSTRUCTIVE SLEEP APNEA

Obstructive sleep apnea (OSA) is a major health problem in the United States. With a prevalence in middle-aged adults of 2% to 4%¹ of the population, untreated OSA has been implicated in increased risk for cardiovascular disease, including hypertension and heart failure.²⁻⁷

The standard test for diagnosis of OSA is polysomnography, which produces outputs on several physiologic variables. The apnea-hypopnea index (AHI), expressed as the number of apneas and hypopneas per hour of sleep, and respiratory

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disturbance index (RDI), expressed as the number of apneas, hypopneas, and respiratory effort-related arousals per hour of sleep are the most important reported measures of disease severity. In general, an AHI or RDI of 5 or greater connotes a diagnosis of sleep apnea, 5 to 14 is defined as mild disease, 15 to 29 as moderate disease, and 30 or greater as severe disease. The goal of treatment of OSA is improvement in quality of life and longevity. Secondary outcome measures include a reduction of AHI and RDI and other key variables, such as lowest oxygen saturation, (LSAT) or oxygen desaturation index (ODI) as measured on polysomnography.

The first-line and most common treatment of OSA is positive airway pressure (PAP) treatment. PAP is effective in reducing the AHI and RDI if used properly. However, the mask interface, air pressure required, and need to use a machine at the bedside all night lead to poor acceptance and compliance rates. Compliance with PAP was defined by Kribbs and colleagues⁸ as using PAP for at least 4 hours a night for at least 5 nights a week (or a total of 20 hours a week) and this definition has been accepted by the American Academy of Sleep Medicine, Centers for Medicare & Medicaid Services, and almost all third-party payers in the United States. Because normal sleep time is about 49 hours a week, the current definition of compliant therapy represents the use of PAP for 41% of normal sleep hours ($20/49 = 41\%$). Published studies on PAP have shown that only 58% to 80% of patients accept PAP therapy,⁹⁻¹¹ and that 49% of patients are compliant in the first month of therapy.⁸ The largest study to date, the Apnea Positive Pressure Long-term Efficacy Study (APPLES) was a 6-month, randomized, double-blind, 2-arm, sham-controlled, multicenter trial on a total of 1516 enrolled subjects. In this study, Kushida and colleagues¹² found when analyzing CPAP use over the prior month that the compliance rate at 6 months was only 39% in the active CPAP group. In addition, there are many patients who prefer other therapy besides PAP because of the social issues related to PAP use. PAP therapy options include continuous PAP (CPAP), bilevel positive airway pressure, and autoadjusting positive airway pressure. Adherence to therapy is similar with the various PAP modalities.

Patients cite several issues with PAP, including discomfort and inability to sleep while connected to an air pressure device. Heated and humidified air and adequate education improve patient compliance, but compliance rates remain low. Nasal obstruction is a common limitation to effective PAP use. Medical treatments for nasal obstruction are typically tried first but, when not effective, nasal surgery may be indicated.

In the medical literature, a surgical cure is generally defined as a greater than 50% reduction in AHI and a final AHI of less than 20/h, but any reduction in AHI represents a reduction of disease burden and, in theory, should result in an overall improvement in morbidity and mortality.

THE ROLE OF THE NOSE AND NASAL OBSTRUCTION IN OBSTRUCTIVE SLEEP APNEA

Nasal obstruction is a common complaint in patients with sleep disordered breathing, occurring in up to 45% of patients.^{13,14} Nasal airway resistance is responsible for approximately two-thirds of total airway resistance. Increasing nasal resistance and nasal obstruction may be caused by a deviated septum, turbinate hypertrophy, internal or external nasal valve collapse, nasal mucosal inflammation, or space-occupying lesions in the nose (**Table 1**). Airway resistance is proportional to the length of the airway and inversely proportional to the fourth power of the radius.¹⁵ As a result, a very small change in the size of the nasal airway caused by a septal spur, turbinate enlargement, internal or external nasal valve collapse, nasal polyp, or diffuse

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