

# Sleep Apnea / Hypopnea Syndrome – A Review

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**Abstract**

The sleep apnoea/ hyperpnoea syndrome is characterized by repeated upper airway narrowing or collapse during sleep. These episodes are accompanied by hypoxemia, surges in blood pressure, brief arousal from sleep and pronounced snoring. The signs and symptoms of OSAS may be recognizable in the practice of Dental and Oral Maxillofacial surgery. Common findings in the medical history include day time sleepiness, snoring, hypertension, and type 2 diabetes mellitus. Common clinical findings include male gender, obesity, increased neck circumference, excessive fat deposition in the palate, tongue (macroglossia) and pharynx, a long soft palate, a small recessive maxilla and mandible, and calcified carotid artery atheroma on panoramic and lateral cephalometric radiograph. After confirmation of the diagnosis by a physician, Dental surgeons and Oral maxillofacial surgeons can participate in the management of the disorder by fabricating mandibular advancement appliances that enlarge the retroglossal space by anterior displacement of tongue, and performing corrective upper airway surgery that prevents recurrent airway obstruction respectively.

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## Incidence

The incidence of OSAS in the middle aged population (30-60 years) is 4 % in men and 2% in women (1). However, incidence rises dramatically with age, to an estimated 28% to 67% for elderly men and 20% to 54% for elderly women (2).

## Clinical Manifestations

OSAS is characterized by repetitive episodes of upper airway obstruction that occur during sleep usually in association with a reduction in blood oxygen saturation. Patients may report that they frequently fall asleep during the day while driving, working, reading and watching television (3). This leads to reduced productivity and poor work output. Also performing activities related to transportation or the use of

machinery and heavy equipment can put both the patient and others at significant risk of injury (4, 5). Snoring ranging in severity from mild to extremely loud is invariably present. OSAS patients may witness gasping, choking or periods of apnea, with repeated arousals through the night. When questioned in the morning the patient is usually unaware of the frequency of the arousals. Other complaints include a feeling of not being rested despite a full night of sleep, dry mouth, morning headache, absence of dreams, fatigue, decreased libido, and symptoms of depression. In many cases these symptoms are so severe that the partner sleeps in another room.

The respiratory consequences of OSAS are related to the extent of hypoxemia and hypercapnia that develop as a result of the disordered breathing. Advanced cases of OSAS are associated with pulmonary hypertension, cor pulmonale, chronic carbon dioxide retention and polycythemia (6). The cardiovascular consequences of OSAS may include systemic hypertension, cardiac arrhythmias, myocardial infarction, and cerebral vascular accidents, all of which lead to a higher mortality rate than in the general population (7, 8).

Thus OSAS can be a debilitating and potentially life

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threatening condition. Both proper diagnosis and appropriate treatment as soon as possible are important.

### Diagnostic Aids

If the history supports the diagnosis of OSAS, the patient should be referred to a sleep disorders laboratory for the over night polysomnography, the objective method of establishing the diagnosis and assessing the potential success of treatment. The most important variables used in determining the presence and severity of OSA are the apnea index, the hypopnea index, the respiratory disturbance index (RDI) and the lowest oxyhemoglobin saturation (9). Apnea is defined as cessation in air flow for 10 seconds or more, and the apnea index is the number of apneic episodes occurring in a 1 hour period (10). Hypopnea has been defined as a 50% reduction in tidal volume for more than 10 seconds, and the hypopnea index is the number of hypopneic episodes in a 1 hour period (10). The RDI is defined as the number of apneic and hypopneic episodes per hour of sleep (10). The lowest oxyhemoglobin saturation is simply the lowest oxygen saturation measured by pulse oximetry during the study. OSAS is diagnosed if the RDI reaches a certain threshold level, typically 5 or 10 (2, 10). OSAS becomes clinically significant when the RDI is greater than 20 and oxygen desaturation events fall to a level below 80% to 85% (11).

### Pathophysiology

OSAS is mainly caused by an anatomic abnormality that narrows or obstructs the airway. Obstruction more commonly occurs at multiple levels of the upper airway during episodes of hypopnea and apnea (12). In any patient, upper airway patency is maintained through many interrelated anatomic and physiologic factors (13). The pharynx consists of 3 segments: the nasopharynx, the oropharynx, and the hypopharynx. The muscles become hypotonic during sleep, and airway stability becomes dependent on pharyngeal size and pharyngeal tissue compliance in these 3 segments (13, 14). Airway obstruction occurs if the compliance of the soft tissues in the narrowed segments of the passive airway is inadequate to offset the negative intraluminal pressure created during inspiration. Thus, the central nervous system adjusts to a lighter level of sleep by increasing muscle tone to allow opening of the airway and resumption of the breathing cycle.

Many a times, clinical examination will not reveal a gross

oro-facial deformity, but upper airway imaging eg cephalometric radiography can help in determining the anatomic factors contributing to OSAS. This can help in the treatment planning, particularly Orthognathic surgery, and thus lead to more predictable treatment outcomes. Cephalometric studies in patients with OSAS have demonstrated that these patients have smaller retro positioned mandibles, narrower posterior airway space, and larger tongues and soft palates than control patients, as well as inferiorly positioned hyoid bones and retro positioned maxillae (15).

### Management

OSAS patients can be treated non-surgically (conservative method) or surgically.

The severity of the patients' condition is considered in developing a treatment plan. The treatment plan should take into account the potential contributing factors identified by the history, clinical examination and cephalometric studies.

#### Conservative management

As obesity is a risk factor for OSAS, body weight reduction can help reduce sleep apnea (16, 17). However, the patient may have difficulty in losing weight, mainly in more severe cases. Also many patients with OSAS are not obese.

The most successful conservative method is using CPAP (continuous positive airway pressure). Sullivan et al in 1981 first described the use of CPAP in the treatment of OSAS (18). Since then it has become the gold standard in the treatment of this condition (9). However, the compliance of using the equipment may be as low as 46% (19). It is mainly because of physical discomfort associated with wearing the unit, drying of the nasal and oral mucosal membranes, dislodgement during sleep, noise and the social consequences of using the unit.

Medicines such as protriptyline and medroxyprogesterone are used. Protriptyline, a tricyclic antidepressant, has shown reasonable symptomatic improvement of OSAS and may reduce the degree of oxygen desaturation, but anticholinergic side effects and incomplete efficacy limit its use (6). Medroxyprogesterone has limited value in the treatment of OSAS but it may be effective in cases of obesity hypoventilation syndrome with chronic hypercapnia (6).

Myofunctional oral appliances can also be used in the treatment of OSAS (20). Schmidt-Nowara et al 1995 (21), reviewed 20 studies, involving a total of 304 patients, and showed that oral appliances were effective in 51% of cases, as defined by an achievement of RDI of less than 10. In 2 studies that compared oral appliances for mandibular advancement with CPAP, the oral appliances were effective in mild to moderate cases but were less effective than nasal CPAP in more severe cases (22, 23). In both these studies patients strongly preferred the myofunctional oral appliances over nasal CPAP for reasons of comfort. However, long term effects of oral appliances are temporomandibular joint problems and movement of teeth (24). Teeth movement may result in posterior open bite and decreased anterior overjet (20).

### **Surgical Management**

Fee WE et al in 1970 introduced tracheostomy as the first successful surgical treatment of OSAS (25). This procedure, which bypasses the upper airway, is successful in virtually 100% of the cases (26). The medical complications and social problems associated with tracheostomy have stimulated the search for alternatives (6).

Fujita et al in 1981 first described the use of uvulopalatopharyngoplasty (UPPP) for the treatment of OSAS (27). This procedure involves resecting tissues from the free border of the soft palate (including the uvula), posterior tonsillar pillars, the palatine tonsils (if still present) and excessive mucosa from the anterior pillars and posterior pharyngeal walls using a scalpel and general anesthesia in a hospital operating room (28-29). This procedure is associated with significant post operative discomfort and may result in palatal incompetence with nasal regurgitation on swallowing and nasal speech.

In the 1970s, orthognathic surgery (mandibular advancement) was first used for the treatment of OSAS (30). Orthognathic surgery for the treatment of OSAS may involve advancement of maxilla, mandible or chin. Cephalometric analysis allows precise planning of the surgical advancement to maximize the increase in pharyngeal dimensions while maintaining normal facial balance.

If the patient is retrognathic and the respiratory obstruction is occurring at the base of the tongue, an oral and maxillofacial surgeon will advance the entire mandibular alveolus forward and reposition it into a physiologic Class I position. The anterior movement of the alveolus is accompanied by anterior movement of the tongue (away

from the posterior pharyngeal wall) because the tongue is attached to the lower jaw at the genial tubercles. The tongue can be drawn even further anteriorly by performing a genioplasty which encompasses the genial tubercles (31).

If the patient is not retrognathic, and the respiratory obstruction is documented as occurring at the base of tongue and/or soft palate, simultaneous advancement of the maxilla and mandible is indicated. The results of this surgery while not always an esthetic do appear to obviate OSAS in most instances (32).

Orthognathic surgery is more socially accepted in comparison to tracheostomy and CPAP. Also compliance is not a factor in the success of orthognathic surgery as it is for CPAP and oral appliances. It is also more successful in treating severe OSAS than UPPP and oral appliances.

### **Conclusion**

OSAS is a common condition associated with significant morbidity and mortality. It is therefore important that Dental and Oral maxillofacial professionals be aware of the signs and symptoms of OSAS, so that the diagnosis can be confirmed and treatment initiated as soon as possible in association with the physicians. Orthognathic surgery by oral and maxillofacial surgeons and myo-functional appliances by dental surgeons appears to be an excellent treatment option, in patients with identifiable anatomic abnormalities of the jaw bones, resulting in a narrow pharyngeal airway.

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