

## Obstructive Sleep Apnea - A Review

Review Article

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## Abstract

Obstructive sleep apnea (OSA) is a common sleeping disorder. As the name suggests, it is associated with apneic and hypopneic breathing due to some kind of obstruction in the respiratory passage and thereby interferes with sleep. This review aims to give a concise overview on the disease, its pathophysiology, clinical presentation, diagnosis and various methods of management.

**Keywords:** Obstructive Sleep Apnea; Airway; Polysomnography; Medical; Surgical; Management.

## Introduction

Obstructive sleep apnea (OSA) is an increasingly common, chronic sleep-related breathing disorder which is characterized by periodic narrowing and obstruction of the pharyngeal airway during sleep [1, 2]. Untreated OSA can be associated with metabolic disorders, cardiovascular disease, cognitive impairment, depression, loss of productivity in workplace and motor vehicle accidents [3]. The causes and consequences of OSA vary between patients. Most patients with OSA are undiagnosed and untreated which might be related to lack of awareness about the disorder [4, 5]. Early detection of OSA can result in greatly improved quality of life along with reduction of systemic morbidities.

## Pathophysiology

OSA is characterized by recurrent collapse of pharyngeal airway during sleep, resulting in substantially reduced or complete cessation of airflow despite ongoing breathing efforts. These disturbances lead to intermittent hypercapnia and hypoxia and surges in sympathetic activation. The culmination of a respiratory event leads to brief awakening from sleep. These events result in a cyclical breathing pattern and fragmented sleep as the patient oscillates between wakefulness and sleep. Each respiratory event can last 20

to 40 seconds [6].

During wakefulness, OSA patients compensate for compromised airway through protective reflexes to increase upper airway dilator muscle activity to maintain patency of airway [7]. Obstructive sleep apnea occurs due to anatomic factors that cause pharyngeal narrowing which include large neck circumference, cervical soft tissue, vessels and bony structures. Many of these factors cause pharyngeal collapse by decreasing the caliber of the upper airway or by increasing the upper airway surrounding pressure which happens during Rapid Eye Movement (REM) sleep when protective reflexes to maintain upper airway is lost, leading to a period of hyponea or apnea [8].

## Clinical Manifestation

Symptoms of OSA include, snoring, excessive daytime sleepiness, choking or gasping at night, night sweats, neurocognitive impairment, heartburn, morning headaches, maintenance insomnia, erectile dysfunction and nocturia [9]. Snoring due to redundant pharyngeal muscles can be an early symptom of OSA. This proceeds to episodes of apnea leading to excessive daytime sleepiness which is usually the first complaint given by the patient. These patients become somnolent in passive situations or during monotonous activities such as watching television, reading books, or

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during a long drive. If the aforementioned problem occurs despite getting adequate amount of sleep during the preceding night the patient may have a problem with quality of his/her sleep [10]. The symptoms of OSA are the result of sleep disturbance which will in most cases be unnoticed by the patient.

Clinical findings in OSA patients will be obesity, enlarged neck circumference, crowded upper airway, hypertension, accentuated P2 heart sounds, retrognathia, nalsa obstruction, decreased oxygen saturation, S3 heart sound, lower extremity edema (heart failure) [9].

### Diagnosis of OSA

The clinician should search for clinical features that are listed in Epworth Sleepiness Scale Questionnaire. Having  $\geq 2$  of those symptoms indicate the need for further assessment or a sleep study.

The patient should choose one of the 0-3 numbers as described below in the recent two weeks. Scores greater than 10 out of 24 are regarded as presence of daytime sleepiness.

### Polysomnography

Overnight polysomnography is the gold-standard diagnostic test for OSA. Patients who are diagnosed with OSA and choose continuous positive airway pressure (CPAP) therapy are then brought back for follow up study, during which the pressure of CPAP device is titrated. Alternatively those two studies can be done in selected patients over one night, followed by a “split-night protocol”. The two parts of the split night study complement each other; diagnosis of OSA is made during the first part, followed by

titration of CPAP during the second half of the study. If there are more than 20 respiratory events per hour in the first half of the study in a patient with a high pre-test probability (having two or more clinical features), or  $\geq 40$  respiratory events in a patient with a pretest low-probability, splitting the study is recommended. Starting CPAP titration during the same night sleep study is time- and cost effective while expediting delivery of treatment to the patients. It should be noted that the first half of the split night sleep study has to have at least 2 hours of recorded sleep data.

A negative polysomnogram does not exclude diagnosis of OSA particularly in high-risk patients. In such patients repeating the polysomnogram should be considered.

### Portable monitoring

There are a variety of devices that are used for in-home, portable monitoring of cardiorespiratory parameters. An effective portable monitor requires at least three channels to assess airflow, thoraco-abdominal movements, and blood oxygenation [12]. In general the sensitivity and specificity of these devices seem to be high in populations at high risk for OSA assuming there are no other comorbid medical or sleep disorders. Clinical practice guidelines from the American Academy of Sleep Medicine (AASM) indicate that portable monitoring may be used as an alternative to polysomnography to diagnose OSA in patients with a high pre-test probability of moderate to severe OSA [13]. Portable monitoring should not be used if another sleep disorder is suspected or the patient has comorbid medical conditions that predispose to non-OSA sleep related breathing disorders. These comorbid conditions include, but are not limited to, moderate to severe pulmonary diseases, neuromuscular diseases, congestive heart failure, movement disorders, parasomnias, sleep seizures, etc.

**Table. Shows the Epworth Sleepiness Scale Questionnaire.**

0	would <i>never</i> doze or sleep.
1	<i>slight</i> chance of dozing or sleeping
2	<i>moderate</i> chance of dozing or sleeping
3	<i>high</i> chance of dozing or sleeping
	Sitting and reading
	Watching TV
	Sitting inactive in a public place
	Being a passenger in a motor vehicle for an hour or more
	Lying down in the afternoon
	Sitting and talking to someone
	Sitting quietly after lunch (no alcohol)
	Stopped for a few minutes in traffic

Evaluations used in sleep test [11]

Level 1	In-laboratory, technologist attended polysomnography
Level 2	Full (unattended) polysomnography
Level 3	Portable monitoring with three or more channels, including pulse oximetry and heart rate
Level 4	Portable monitoring with only one or two channels including pulse oximet

## Treatment

### Continuous positive airway pressure

Continuous PAP (CPAP), generally administered through the nose (nCPAP), is undoubtedly considered the gold standard treatment for OSA. Since its invention in 1983 by Dr Sullivan, the clinical application of this device has deeply modified the course of the disease over the last three decades, offering to thousands of patients the first noninvasive method to control their disorder [14]. Worldwide, nCPAP is constantly recommended as the first-choice treatment for patients with moderate to severe OSA.

### Positional Therapy

The supine position, mainly due to the effect of the gravity on tongue and soft palate position, is generally associated with an increased number of apnoeas/hypopnoeas.

If postural OSA is diagnosed, patients can benefit from a positional therapy (PT), which should prevent them from sleeping in the supine posture. Many PT strategies are available. These include the simple 'tennis ball technique', consisting of a tennis ball strapped to the back to discourage supine position, supine alarm devices and a number of positional pillows [15].

### Oral Appliances

The most commonly used oral appliances are mandibular advanced splints (MAS). These devices attach to both the upper and lower dental arches in order to advance and retain the mandible in a forward position. This will relocate laterally the pharyngeal fat pads from the airway and the tongue base will move forward. Consequently, the upper airway will be widened, particularly in its lateral dimension, and the function of upper airway dilator muscles, particularly the genioglossus, will improve.

### Surgical management

Patients with OSA generally have excessive tissue in the oropharyngeal tract. Uvulo-palatopharyngoplasty (UPPP), either conventional or laser assisted (LAPP), is a widely established surgical procedure for the treatment of OSA in selected patients. This technique consists of the resection of uvula, part of the soft palate and tissue excess in the oropharynx, and is usually performed with simultaneous tonsillectomy.

Maxillomandibular advancement (MMA) is obtained by osteotomy of the maxilla and mandibular. The advancement of the skeleton structures passively induces an anterior displacement of the soft palate and the tongue with a simultaneous widening of the pharyngeal space.

### Weight control

Obesity is an important risk factor for OSA and over 70% of patients with OSA have obesity; a strict correlation has been docu-

mented between body mass index (BMI) and AHI. Weight loss is therefore a main goal in the management OSA and all patients should be encouraged to control their weight. Bariatric surgery offers a good option of weight loss if conventional methods fail.

### Educational and behavioural intervention

Educational and behavioural interventions represent the first step in approaching patients with OSA, independently from the treatment chosen. Patients should be instructed to avoid risk factors such as smoking, drinking alcohol (particularly in the evening), using sedatives and hypnotics.

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