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# PROSTHODONTIC MANAGEMENT IN OBSTRUCTIVE SLEEP APNEA

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**ABSTRACT**

As evolution continues, our contemporary culture is suffering from shorter sleep durations and lower-quality sleep, which has had numerous detrimental effects on overall welfare. When someone has obstructive sleep apnea, their breathing becomes erratic while they are asleep.Short apneic episodes, which cause sleep interruption and subsequently poor sleep quality, are the hallmark of obstructive sleep apnea. If left untreated, this illness can be lethal.During sleep, a person's breathing frequently stops many times.

In the Apnea-Hypopnea index (AHI), the number of breathing episodes that are disrupted each hour is recorded.An OSA score of five or above is considered suggestive. A score of 5 may be associated with symptoms such as fatigue, drowsiness, and poor perception during the waking hours; however, a score of 15 or above is indicative of OSA independent of concomitant conditions.

This article discusses the management of a patient suffering from obstructive sleep apnea by prosthodontic intervention with oral appliances

*Key Words: Obstructive Sleep Apnea, Apnea, Hypopnea, Prosthodontic management, Appliances*.

## INTRODUCTION

Sleep is a major buffer for hormonal release, glucose regulation and cardiovascular function.[1]

Sleep-disordered breathing (SDB) disrupts sleep pattern and quality. Short sleep duration and poor quality of sleep, increasingly common in our modern society, have many adverse effects on general health. Obstructive sleep apnoea (OSA) is the most common sleep disorder being diagnosed.[2]

A person experiences a partially inhibitory response to sensory activation associated with altered muscle activity during sleep, which is a physiologic phenomenon of the brain and body.[3]

Recurrent occurrences of the REM and NON-REM stages of sleep progress. The acronym for "rapid eye movement" (REM) refers to a period of dreaming in which the body is almost paralyzed.The body's systems enter an anabolic condition as sleep advances, aiding in the restoration of the body's numerous systems. such as the neurological, skeletal, muscular, and immunological systems.[4]

They play a crucial role in controlling the function and upholding the circadian rhythm of the immunological and endocrine systems, as well as helping the body regulate temperament, memory, and perception-related functions.[5]

Melatonin is a hormone that keeps the circadian rhythm and controls the sleep-wake cycle. People might experience a variety of sleep disorders, the most common respiratory condition linked to airway blockage being sleep obstructive.[6]

## OBSTRUCTIVE SLEEP APNEA(OSA)

The condition known as obstructive sleep apnea, or OSA, is characterized by breathing pauses during sleep. Breathing stops due to a blockage in part or entirely in the upper airway, which changes how sleep progresses physiologically. Apneas happen when the upper respiratory tract's muscles contract. During sleep, the tonicity of breathing decreases, leading to the collapse of the upper airway and a total cessation of oxygen intake.[7] Three types of apnea exist: complex sleep apnea, obstructive sleep apnea, and central sleep apnea. Significant reductions in blood oxygen saturation led to periodic pauses in sleep and gasps for breath when the person awakens from deep sleep and starts breathing again. Over time, the number of these incidents rises by one every hour.

Although Fatigue in the morning is a common symptom, sleep apnea is often identified by performing sleep studies at night in a sleep lab because the periods of alertness during sleep are brief and the individual does not recollect experiencing them at night.More recently, it has been demonstrated that there is a higher risk of sudden cardiac death while sleeping and a higher total mortality rate among untreated persons Exacerbations of asthma, hypertension, and epilepsy have been reported in people with untreated or undiagnosed OSA.[8]

INDEX-APNEA-HYPOPNEA(AHI)

The definition of an apnea is when breathing stops for ten or more seconds. Typically, it signifies total blockage of the upper respiratory tract. A hypopnea is generally characterized as a drop in airflow of at least 30% for a duration of 10 seconds. accompanied by a 4% reduction in oxygen saturation. It means that there is a brief decrease in inspiratory airflow as a result of higher upper airway resistance. If breathing persists even after the airflow stops, the apnea is deemed obstructive. If there is no contemporaneous breathing effort, an apnea is deemed to have a central cause.[9]

## ETIOLOGY:

One of the main factors causing OSA development is corpulence. Obesity and OSA co-occurence ranges from 55% to 100%, particularly those with elevated BMI. When pulse oximetry is done at night, corpulent individuals score higher on the AHI and somewhat lower onthebase.[10]

People who are abnormalities of the craniofacial The development of OSA is influenced by factors such as a small jaw, dilated palatine tonsils, enlarged uvula, high arch palate, deviation in nasal septum position, elongated facial height in the anterior region, steeper and smaller cranial base anteriorly, inferior displacement of the hyoid bone associated with longer H-MP distance, macroglossia, elongated soft palate, and narrow air channel space posteriorly.[11]

**CLASSIFICATION:**

Sleep obstruction is divided into two divisions under the International Classification of Sleep Disorders (ICSD-3)

-Adult OSA

-Pediatric OSA.[12]

Sleep apnea is measured by the Apnea-Hypopnea Index (AHI). The index is computed by adding up the number of apnea events and hypopnea episodes that occur in a given hour.Each lasts for duration of 10 seconds.

| AHI | Severity of OSAS |
|---|---|
| 5< | Normal |
| 5-15 | Slight |
| 16-30 | Moderate |
| >30 | Severe |

The following three observations, such as

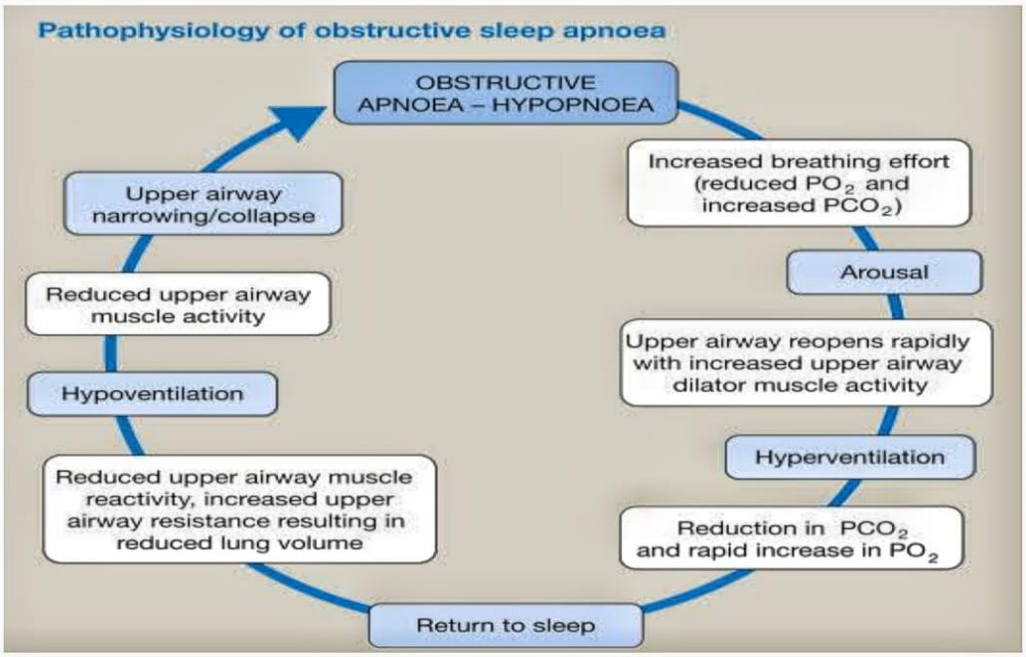
(1) Snorting

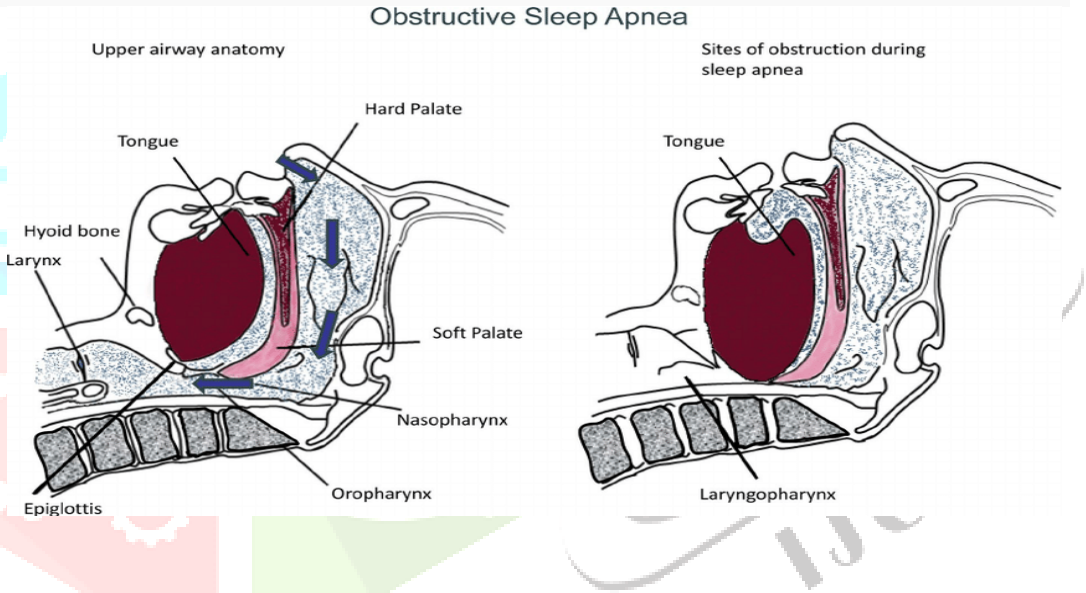
(2) Reduced oropharyngeal and nasopharyngeal flow, and

(3) Thoraco-abdominal paradoxical breathing throughout the episode, are required for the diagnosis of obstructive sleep apnea .[13]

**PATHOPHYSIOLOGY**:

During the REM sleep phase, the tonicity of the muscles that surround the upper respiratory tract gradually decreases. This allows the tongue and soft palate to retract back into the oropharynx, decreasing air channel patency to a partial or total degree. This pauses the airflow into the lungs during inhalation, resulting in a cessation of respiratory tract ventilation. A substantial decline in blood oxygen saturation causes the brain stem's respiratory centers to instantly awaken a sleeping person. An apnea episode causes breathing difficulties and a partial awakening from sleep. These recurrent arousals have a gradually declining effect on the anabolic phenomena that takes place during sleep. The primary cause of OSA is obstruction of the upper air channel during sleep, which mostly affects the epiglottis and back of the tongue.[14]




## DIAGNOSIS

The diagnosis of obstructive sleep apnea (OSA) involves a comprehensive evaluation that includes a combination of history taking, physical examination, and specific investigations. The diagnostic process for OSA typically includes the following components:

- History: Healthcare providers will inquire about symptoms such as frequent awakenings, difficulty falling asleep, unrefreshing sleep, daytime sleepiness, attention and memory impairment, mood disturbances, morning headaches, and excessive nocturia
- Physical Examination: A physical examination may reveal signs such as obesity, large neck circumference, retrognathia, crowded airway, enlarged tonsils, high-arched palate, nasal deformities, and other craniofacial abnormalities
- Comorbid Conditions: Assessment for comorbid conditions associated with OSA, such as resistant hypertension, recurrent atrial fibrillation, stroke, myocardial infarction, pulmonary hypertension, and chronic heart failure, is essential.[15]

**INVESTIGATIONS**:

- Polysomnography: Considered the gold standard for diagnosing OSA, polysomnography involves overnight monitoring of sleep, breathing patterns, and oxygenation.
- Pulse Oximetry: Used for screening purposes, pulse oximetry measures oxygen saturation levels during sleep .[16]
- Lateral Cephalograms: These imaging studies analyze skeletal and soft tissue characteristics related to OSA .
- Computed Tomography (CT) Scanning and Magnetic Resonance Imaging (MRI): These imaging modalities provide detailed information about airway anatomy and can aid in the assessment of OSA pathophysiology .[17]
- Acoustic Reflection Test: This test evaluates airway obstruction and the effects of mandibular advancement on the upper airway by analyzing sound wave reflections .[18]
- Facial Scanner with Intraoral scanner: In a recent study, a mathematical method for OSA clinical assessment was developed by analyzing 3D facial scans (3dMDface; 3dMD, Atlanta, GA, USA) to predict the presence and severity of OSA. The smallest distance between two locations on a curved surface and linear measurements—the shortest distance between two points -were both used in this mathematical technique. When linear and geodesic measures from the 3D pictures were combined into a single algorithm, they were able to predict OSA with 91% accuracy . Compared to 2D photographic analysis, this work offered an inventive push toward more simplified and precise diagnostic techniques for OSA employing facial scanners.[19]

**TREATMENT**:

Can be broadly categorized into four groups. These incorporate:

(1) Modification in Lifestyle.

(2) Mandibular Advancement Appliance.

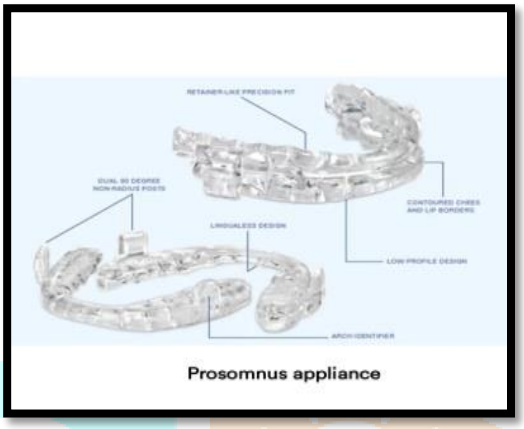
(3) Administration of Continuous Positive Airway Pressure.

(4) Management of Upper Airway Patency through Surgery

- Lifestyle :Modifying one's lifestyle includes controlling one's weight, giving up bad habits like drinking alcohol, and sleeping in the proper position.[21]
- Mandibular Advancement Device: A plastic device having a tooth indentation The jaw can be positioned forward and the airway can remain open as you sleep due to the movement of the mandibular teeth. The progress made is reversible [20]. Precision attachments made of titanium are included to create the device. The attachment, which is inserted at the level of the incisor, allows for progressive movement from 2 to 8 mm, lateral motion up to 6 mm, and the replacement of the vertical pin height due to a silencer system. Because of the titanium hinge metal, this device has the benefit of being able to be adjusted in both "antero-posterior" and "open and closed" positions.[21]

Mandibular Advancement Device


Mandibular Repositioning Device



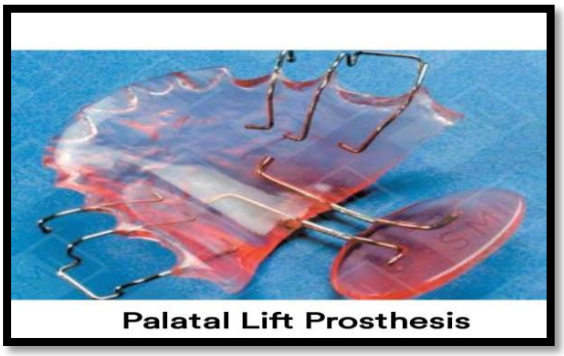
Prosomnus appliance

Elastic Mandibular Advancement Appliance

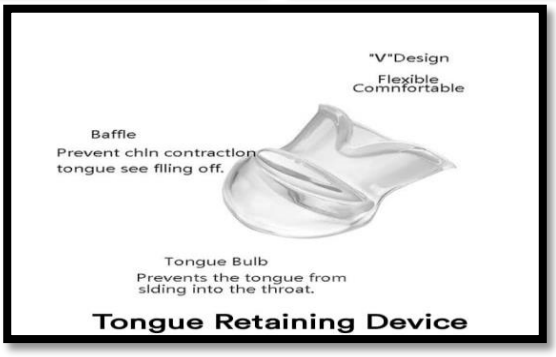

Moses appliance

Klearway Oral Appliance

Thornton Adjustable Positioner

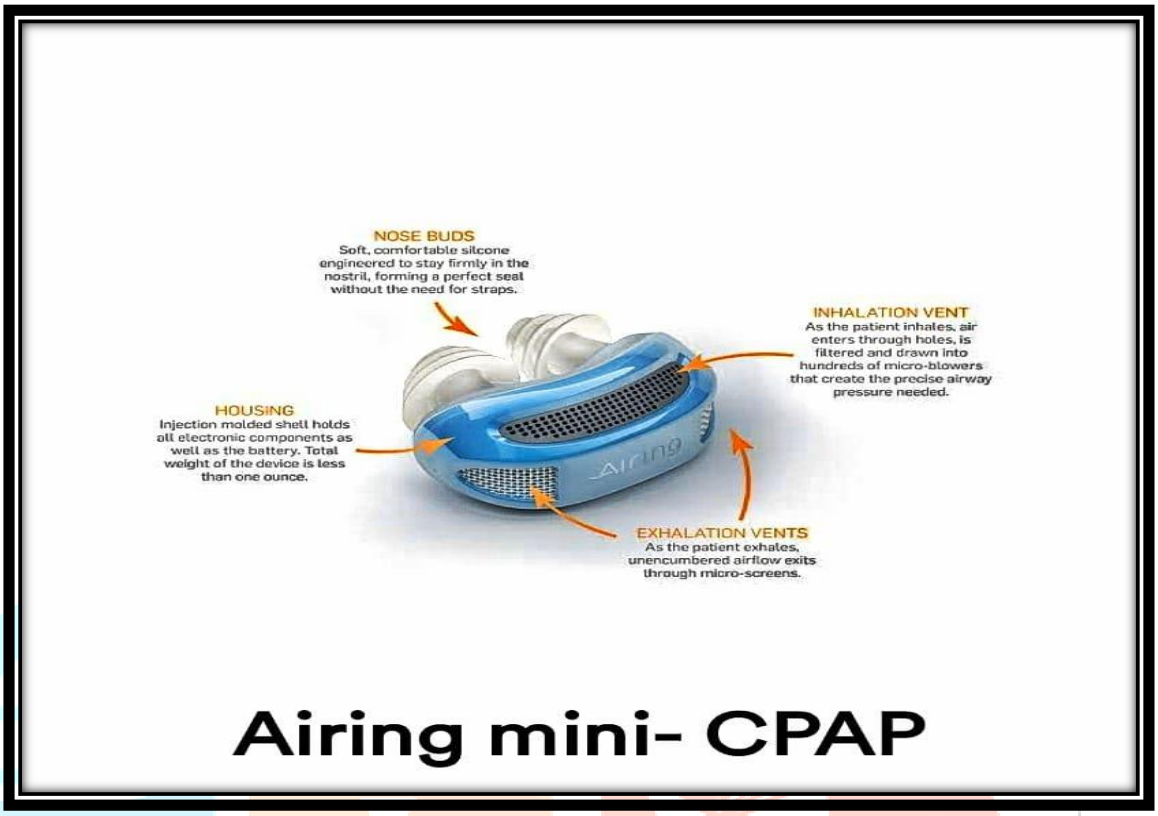


Palatal Lift Prosthesis




Tongue Retaining Device

- Continuous Positive Airway Pressure is a [CPAP].
  An extremely effective method of treating obstructive sleep apnea. However, because the equipment is bulky and expensive, acceptance of nasal CPAP varies from patient to patient with apnea.[22]




- Surgical Management:
  For patients with severe apnea, maxillary mandibular advancement and Uvulopalatopharyngoplasty may be appropriate. Tracheostomy is the last option treatment that can be performed.

  **MANAGEMENT IN EDENTULOUS PATIENT.**Influence of Tooth Loss on Obstructive Sleep Apnea: Edentulous individuals exhibit higher incidence of OSA. The changes observed in the oral cavity are as follows

-Vertical dimension of occlusion is Decreased

-Mandible is positioned Posteriorly

-Hyoid bone is positioned posteriorly and inferiorly

-Impaired function of oropharyngeal musculature due to reduced tone in soft palate and pharynx,

-Macroglossia results in impaired function of oropharynx .[22]

Edentulism is linked to physical abnormalities as well as a greater prevalence of OSA.Patients with insufficient dentition may consider using tongue retaining/reposition devices (TRDs), which are an alternative that does not rely on dentition for support. TRDs have been claimed to function similarly to MADs, using suction pressures to push the tongue forward without requiring mandibular displacement.Nelogi et al. have documented the use of MAD therapy in a patient who was fully edentate and had mild

OSA. The current removable lower and upper dentures had an adjustable MAD fastened to them, which improved the AHI levels.[23]

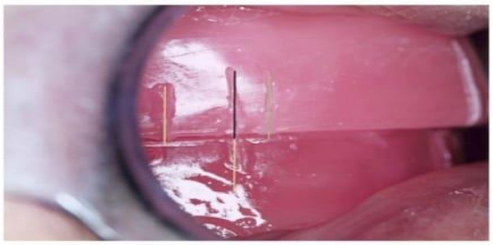


**Fig. 3.** Maxillomandibular relation at 75% maximum protrusion. Mandibular centric relation mark *(yellow line)* and 75% protrusion line *(black line)* coincide.

**Fig. 4.** Frontal view of mandibular advancement splint.

**Fig. 5.** Lateral view of mandibular advancement splint.

**Fig. 6.** Mandibular advancement splint intraorally.

Since poor device retention continues to be a key barrier to oral appliance treatment for edentulous patients in obstructive sleep apnea the use of dental implants has been suggested as a way to improve retention.[23]

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