**Obstructive sleep apnea syndrome**

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**INTRODUCTION**

Obstructive sleep apnea syndrome is a serious disorder that affects a large number of people. The usual sleep architecture is disrupted by a whole or partial restriction of respiratory airflow. Airflow restriction leads to hypoxemia, which is a lower blood oxygen saturation. It induces arousal in an attempt to reopen the airway. These frequent arousals reduce the level of sleep by disrupting the architecture of sleep. Excessive daytime somnolence, a result of this cycle, is one of the defining features of this medical condition. If left untreated, obstructive sleep apnea syndrome severely lowers expected life expectancy due to a number of related comorbidities, including an increased risk of cardiovascular and pulmonary disease and diabetes mellitus linked to obesity. Breathing problems brought on by interrupted sleep are a rather common medical problem. It includes a spectrum of breathing disorders from apnea to hypopnea. Obstructive apnea is defined as a momentary cessation of airflow during sleep lasting 10 seconds or longer despite continued ventilatory effort. Hypopnea is a transitory decline in airflow of 30% to 50% for at least 10 seconds. Obstructive sleep apnea (OSA), the most well-known condition in the category, affects 2% to 4% of people in their middle years.

**Pathogenesis**- OSA is characterized by an obstruction of the upper airway, often at the oropharynx level. Up until a brief recovery from sleep, when airway patency is restored and airflow restarts, the suffocation caused by the apnea progresses. The patient then returns to sleep, and the same sequence of occurrences is typically repeated 400–500 times throughout the course of a single night, resulting in substantial sleep fragmentation.

The primary mechanism underlying the collapse of the upper airway in OSA is the generation of a critical sub atmospheric pressure during inspiration that is larger than the capability of the airway dilator and abductor muscles to maintain airway stability. Sleep plays a permissive yet crucial role by reducing muscle activity to the sub atmospheric airway.

Alcohol is often a substantial cofactor due to its selective depressing effect on the muscles of the upper airways and the alertness response that ends each apnea. The majority of patients also have physically compromised airway patency, which increases the likelihood of tooth occlusion. By increasing the quantity of fat deposited in the pharynx's soft tissues or by compressing it with superficial fat masses in the neck, obesity often results in smaller upper airways. By producing edema in the soft tissues, the high frequency vibration of the palatal and pharyngeal soft tissues that produces snoring may exacerbate the airway narrowing. The upper airway lumen shrinkage is what causes snoring. The upper airway lumen shrinkage is what causes snoring. A high airway compliance causes the airway to be "floppy" and prone to collapsing, according to more recent findings. A high upstream (i.e. nasal) resistance predisposes some patients to the collapse of the upper airway by increasing the sub atmospheric pressure formed in the pharynx during inspiration when the power of the diaphragmatic contraction is elevated to overcome airflow resistance in the nose.5

**ETIOLOGY**

The respiratory disturbances associated with sleep vary by degree

**Apnea** : the cessation of airflow at the nose and mouth for 10 seconds or longer.

**Hypopnea** :

(a) reduction in airflow at the nose and mouth.2.In addition, apneas or hypopneas may vary by mechanism.

1. Obstructive: The upper airway becomes more resistant.

2. Central: Respiratory effort is reduced or ceases.

3. Mixed: a period of central apnea followed by several obstructed breaths. These have the same clinical implications as purely obstructive events.

According to recognized terminology, sleep apnea (central or obstructive) is classified as an asymptomatic disorder; sleep apnea syndrome (central or obstructive) is diagnosed when symptoms appear.

Also newly identified and thought to be a subtype of obstructive sleep apnea syndrome is the upper airway resistance syndrome. In this illness, the capacity of the upper airways decreases while you sleep, requiring more effort to breathe normally. Similar to obstructive sleep apnea syndrome, the increased effort causes daytime sleepiness and leads to recurrent awakenings from sleep (referred to as respiratory effort-related arousal).

4. Congestive heart failure or conditions of the central nervous system are the conditions that central sleep apnea syndrome most usually is connected with.

Reduced upper airway caliber, which can be brought on by any of the following:

i. Obesity (adipose tissue aggregates have been seen close to the airway)

ii. Adenotonsillar hypertrophy, which usually affects children

iii. Mandibular deficit, such as retrognathia or micrognathia, Macroglossia (often related to hypothyroidism)

v. Tumors of the upper airways (rare)

(b) Excessive pressure across the collapsible portion, typically caused by a blocked nose. The muscles that support the upper airway do not contract enough to keep it open. Reduced electrical activity of these muscles during apneas was seen in electromyographic investigations, which is consistent with a problem with respiratory regulation. Unknown is the precise makeup of this respiratory regulating stability.

**PROSTHETIC MANAGEMENTINTRAORAL APPLIANCES**

As early as 1902, an oral appliance was proposed as a possible treatment for upper airway congestion and mandibular insufficiency.

Oral appliances of many different designs have been proposed and investigated in light of the growing interest in sleep apnea, and they are being used more frequently to treat snoring and sleep apnea. This review's objective is to assess the data supporting these devices' efficacy. A device placed in the mouth to change the posture of the mandible, the tongue, and the tissues in the upper airway in order to treat snoring or sleep apnea is referred to as a "oral appliance" in general. Although many of these gadgets employ traditional dental technology and attach to the teeth, we use the more broad phrase to refer to gadgets that are used intraorally but may not always be kept by the teeth. Obstructive sleep apnea has been treated using a variety of technologies. Both those that advance the tongue and those that advance the mandible can be categorized into the two main categories.

One of the earliest appliances created was the tongue retention device (TRD). It is a specially constructed device with a front bulb. Both the top and lower dental arches can fit over it. The anterior compartment's suction holds the tongue in a forward posture. The appliance is held in place by a flange that fits between the lips and the teeth.

The device and the tongue are held forward in the oral cavity by a flange that fits between the lips and the teeth. There have been studies on a number of mandibular positioning devices. There are currently devices with a thermal labile material available, despite the fact that the majority still need dental impressions, bite registration, and manufacturing by a dental laboratory.

**RATIONALE FOR THE USE OF MANDIBULAR ADVANCEMENTSPLINTS (MAS)**

As early as 1902, the use of dental devices to treat upper airway congestion was recognized. Numerous cephalometric investigations using MASs have revealed that awake persons have larger upper airways. It is important to recognize the limits of a 2-dimensional image that only shows antero-posterior shifts when assessing airway responses to MAS. On the other hand, there is a dearth of information on the effects of MAS in the transverse plane. Computerized tomography has been utilized to show that using an oral appliance causes a change in the morphology of the airway as well as an increase in airway space. Recently, Ryan et al. described a rise in the cross-sectional area of the upper airway, particularly in the velopharynx when a MAS was worn, utilizing video fluoroscopy.

In order to see the 3-dimensional changes in the airway after the placement of an anterior mandibular positioning appliance (AMPA), Gale et al. discussed the use of low dose computerized tomography. Because of the extensive but unpredictable alterations seen, the authors were able to show that the use of an AMPA increased the minimum pharyngeal cross-sectional area, but they were unable to connect this to patient response to symptom alleviation. The clinical outcomes appear fairly constant, as OSA improves in the majority of individuals, despite the substantial diversity in MAS design. The mean apnoea hypopnoea index (AHI) appeared to decrease from 47 to 19 according to the results of the American Sleep Disorders Association's analysis of twenty-one papers. Even yet, the review has a number of limitations despite the authors' thorough examination of all published data on the use of intra-oral equipment for the treatment of OSA. It had a tiny sample size and was entirely made up of case series. There were few randomized controlled studies. The patient descriptions, the study methodologies, and the selection criteria were all inconsistent and lacking. More recently, the literature has detailed a small number of excellently planned prospective randomised experiments.

Two of these studies examined the effectiveness of nasal CPAP with the use of a mandibular advancement splint (MAS) 118, 119, and found that the MAS had a significant impact (45% reduction in AHI score), but was less efficient than n-CPAP (70% reduction in AHI score).

Despite the identical compliance rate, the MAS was vastly favored to n-CPAP. The AHI was reported to have decreased from 22.6 (no treatment intervention) to 8.7 (two-piece appliance) and 7.9 (single-piece appliance) in Bloch et al 120's comparison of the effects of two alternative MAS designs. In a prospective randomised research, Tegelberg et al. 121 evaluated the outcomes of MAS treatment and oropharynx surgery. 95% of the patients who finished the study did so by lowering their AHI by 50% or more, according to the investigators. This compared favorably with the outcomes of their study's surgical aspect.

**MECHANISM OF ACTION HOW DO ORAL APPLIANCES WORK?**

The goal of any oral appliance for the treatment of snoring or OSA is to enlarge the airway or at least reduce the collapsibility between the soft palate and the posterior pharyngeal wall. The 3 general types of devices are discussed below.

**Types of Devices Mandibular positioning (advancing)** **devices:** The goal of attaching to one or both dental arches is to advance or rotate the jaw downward. The majority of devices need to be specially tailored to each user in order to fit them perfectly. An expert dental laboratory creates the custom-made gadget using the impressions. These are the most well-liked and practical gadgets. A thermal malleable device made by one manufacturer is intended to be molded and installed in an office. Devices for holding the tongue: The purpose of this design is to hold the tongue anteriorly as you sleep by applying negative pressure to a soft plastic bulb. Although this is an appealing concept, few patients actually choose these devices for obvious reasons of comfort and compliance.

**Palatal lifting devices:** These devices have not demonstrated efficacy in reducing either snoring or OSA and are not recommended by the Sleep Disorders Dental Society.

Snore Guard: It is a boil and bite device that fits comfortably directly on the patient, can be adjusted easily, and seems to be well accepted. The mandible has a 7 mm aperture and is 3 mm behind the maximal projection. Only the anterior teeth are covered by the device, which has a soft polyvinyl lining for the patient's comfort. Only for the purpose of treating snoring, the FDA has approved the Snore Guard for sale. Schmidt-Nowara discovered that 75% of the 68 patients still used the appliance frequently after 7 months of use. In all but one individual, snoring was reduced, and it was gone in 29. Polysomnography showed a mean RDI decline from 47.4 to 19.7 in 20 OSA participants. Oxygenation and sleep disruption were also improved. In a randomized, prospective, crossover research involving patients with mild-to-moderate OSA, Ferguson et al. examined the effectiveness, side effects, patient compliance, and preference of Snore Guard and nCPAP therapy over the course of 4 months. With nCPAP, the RDI was lower than with oral appliances. A total of 48% of the patients who utilized the Snore Guard had successful treatments (reduction of RDI to 10 per hour and alleviation of symptoms), 24% had compliance issues, and 28% had treatment issues. Following use of the Snore Guard, four users declined to use nCPAP.

38% of nCPAP users had compliance issues, while 62% of patients had overall treatment successes and no patients had treatment failures. Patients were less satisfied with nCPAP and experienced more side effects. Seven patients experienced success with both therapies; six of these patients selected Snore Guard as a long-term treatment, while one favored nCPAP. Some individuals with mild-to-moderate OSA respond well to the Snore Guard, which has fewer side effects and higher patient satisfaction than nCPAP. The Snore Guard has the benefits of being reasonably inexpensive and requiring less clinical time from the dentist, but it is not adjustable, it may put too much pressure on certain patients' lower anterior teeth, and it may cause retention issues.

 **TheraSnore:** Therasnore is an adjustable boil and bite device that is available on the market and has only been given FDA market approval for the treatment of snoring. Upper and lower trays in the appliance click together using four locking mechanisms. A stronger polycarbonate frame surrounds two thermoplastic trays that are constructed from the same material.

In 1.5-mm steps, the TheraSnore can be moved forward or backward. The lower tray keeps the tongue and jaw from dropping backward while you sleep, while the upper tray is made to fit over the maxilla. The appliance is adjusted to the patient's central occlusion, and the position indicators on the appliance can be used to advance the mandible.

Schmidt-Nowara et al. used MRI to show that using a Snore Guard or TheraSnore increased the retropalatal and retroglossal spaces in 13 OSA patients. The same patient sample was used by Schwab et al147, who found that the decrease in lateral pharyngeal wall thickness was associated with the rise in cross-sectional area. As per Miyazaki et al.'s148 evaluation of the TheraSnore in 11 OSA patients, 40% of patients experienced an increase in their lowest oxygen saturation level of more than 10%, and 70% showed an increase of more than 5%. The average RDI declined from 49.5 to 32.0, and 60% of patients reported their subjective symptoms improved. (TRD) Tongue Retaining Device. The TRD is a specially constructed appliance with an anterior bulb that holds the tongue forward as you sleep through the use of negative pressure. A modified TRD with lateral airway tubes is also available for individuals with blocked nasal passages, enabling mouth breathing. The TRD has been given FDA marketing authorization for the treatment of snoring. Patients with big tongues benefited from the TRD appliance in particular. In individuals with a deficient dentition or who are edentulous, it is a successful substitute for a mandibular repositioner.33The only device that has been examined in a variety of body postures and in conjunction with other types of therapy is the TRD. After inserting the TRD, the mean AI decreased from 54.4 to 22.7 in a study by Cartwright and Samelson 149 evaluating 14 individuals. Also, shorter and much fewer apneic fits along with improved quality of sleep were observed. As soon as the treatment started, the sleep architecture shifted toward a more normal pattern, with less light sleep and more 6-wave and REM sleep. The results seen were comparable to the rate reported by patients who had either undergone uvulopalatopharyngoplasty (UPPP) or a tracheotomy for therapy. In a group of 16 male patients, those who experienced a significant worsening of the AI when dozing supine were more responsive to the TRD than those who experienced the same degree of impairment in both the lateral and supine positions.

On their backs as opposed to their sides, the AI in untreated subjects was twice as high. In a discriminant function analysis, obesity, age, and position ratio all effectively predicted TRD success (defined as an Al 6 or a 50% drop in AI) for 81% of the patients. 30 male patients made up the sample. At one year, 65% of people who had been using the TRD either on its own or in conjunction with other therapies had improved. As reported by Samelson, the TRD had an impact on 80% of patients after using it for three years or more. In another TRD report, a group of 12 subjects were treated with the TRD alone or in conjunction with some A set of 12 participants were given the TRD either alone or in conjunction with behavioral therapy, such as sleep position training [60] or weight loss, in a different TRD report. In this first group, a mean RDI decline from 37.0 to 17.3 was seen. The TRD was combined with a submucous septal excision or a UPPP in another set of patients with more severe apnea. Provided that the apnea is more severe in the supine position and the patient's weight is not more than 50% above the ideal, the TRD is beneficial either alone or in conjunction with other therapies to improve patients with a wide range of apnea severity. In a different study150, 60 adult males with RDI values greater than 12.5 and two or more times the supine sleep apnea rate compared to their lateral sleep rate were divided into four treatment groups: TRD only, posture alarm, TRD plus posture alarm, and health habit instruction. Some 80% of the TRD plus posture alarm group and 73% of the TRD group showed improvement. The mean RDI for the 15 individuals who received only the TRD was reduced from 27.4 to 11.4. The two factors firmly associated with effective OSA control with the TRD were the patency of the nasal airway and an initially low side index. Lower starting obesity and more weight reduction following treatment were the parameters linked with the highest success for the 15 patients in the TRD plus posture alarm group. For the latter group, a mean RDI decrease from 30.7 to 7.9 was observed. Studies have been done on how the TRD affects the normal activity of the tongue muscles. Ono et al. 151 discovered that the awake genioglossus muscle activity is affected differently by the TRD in control subjects and OSA patients. The TRD decreases genioglossus muscle activity in OSA patients who are awake and corrects the delayed timing of the muscle before to an apneic episode. The TRD may be able to offset genioglossus muscle variations and exhaustion in the muscles of the tongue. A pneumatic splint similar to one used with nCPAP may also be provided by the TRD to expand the upper airway.

OVERVIEW- Patients who cannot tolerate nCPAP or who pose a high risk for surgery may benefit from oral appliance therapy for snoring, OSA, or both since it is easy to use, reversible, quiet, and affordable. Variable airway space, a constant anterior position of the jaw, advancement of the tongue or soft palate, and perhaps a shift in genioglossus muscle activity are what appear to make oral appliances useful.

In order to prevent long-term vertical alterations to the dentition, they should have full occlusal covering. The attending physician must always decide which patients are appropriate for oral appliance therapy. The proper mouth appliance is then chosen by the dentist. If such an evaluation is available, it is useful to document the obstruction site. Traditional cephalometry can estimate the volume of the tongue, soft palate, and nasopharynx with some degree of accuracy, but it is not a reliable predictor of the oropharynx or hypopharynx size. Any gadget that may expand the airway by moving the tongue alone or the mandible and the tongue together could be helpful if a narrow oropharynx is confirmed by CT or MRI assessments. A TRD might be useful if the tongue appears to be abnormally big, if the patient has no teeth or suffers from poor oral health. When combined with behavioral changes, the TRD is considerably more potent.

**Mandibular Repositioners-** All of them work to alter the airway tube's three-dimensional size. By moving the mandible forward, holding the tongue forward, or altering the vertical dimension, oral appliances can influence the baseline activity of the tongue muscle. There have been a number of potential contraindications for using oral appliances, however not all of them apply to every gadget. They should, of course, only be used to treat obstructive sleep apnea, which is measured by nocturnal polysomnograms. If oral appliances just move the jaw downward and backward when a predisposing hypopharyngeal constriction is present, OSA may become worse. Patients who have arthritis, crepitus, or other severe temporomandibular joint concerns do not tolerate oral appliances well; nevertheless, the forward-biting position may help with moderate joint issues. For the majority of appliances, there have to be enough healthy teeth to anchor the oral appliance. In some people, allergies and nasal blockages may also be contraindications. Finally, only cooperative patients who are motivated to wear the appliance during sleep on a regular basis can be treated using oral appliances. Further research is needed on a number of issues. How can the obstruction site be quickly and affordably located? Who is a good candidate for an oral appliance? Which device will be the most useful for every given patient? How well do these appliances function over the long term? Are the temporomandibular joint or teeth affected negatively over the long term? There is unquestionably a need for a lengthy prospective research of the frequency and magnitude of occlusal alterations. Minor tooth position changes can be corrected using a variety of straightforward techniques, but these patients must be closely monitored over time. The effectiveness of oral appliances for the treatment of snoring or OSA is already established, and patients now want alternatives to surgery and nCPAP.

Three comparisons between oral appliances and nCPAP have been done, and it has been shown that oral appliances have significant patient preference and good efficacy. Additionally, it has been discovered that oral appliances are useful for patients whose uvulopalatopharyngoplasty treatments have failed. Several patients with snoring or mild-to-moderate OSA can be successfully treated with oral appliances provided the initial evaluation is coordinated by the attending physician and adequate communication is established with the dentist involved.

 To sufficiently cure the material before it separates from the articulator, direct the light source to both the buccal and lingual surfaces.10.  Remove the prosthesis from the molds, complete it, and put it in the Triad unit for final curing.11. To reveal potential sources as needed, use the pressure-indicating paste clinically. Give the patient instructions on how to correctly insert and remove the prosthesis. Give advice on how to maintain the prosthesis at home. To avoid or reduce the negative consequences of continuous wear, complete dentures should be taken out for a particular time during the day.12 During the subsequent evaluation, rate the patient's sleep quality and look for the emergence of hypersomnolence and other related symptoms. The patient should not experience any myofascial or temporomandibular joint complaints, and the prosthesis should be stable and retained throughout the night. The prosthesis might be divided if discomfort arises, and the vertical dimension could be shrunk.

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