

## **Prosthodontic Management of Obstructive Sleep Apnea - A Silent Pandemic - An Original Study**

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### **ABSTRACT**

In recent years, there has been an increase in awareness regarding obstructive sleep apnea (OSA). Those who suffer from this disease are at a risk for other diseases, road traffic accidents and higher mortality. Sleep disordered breathing patients suffer from hyper somnolence, morning headaches, nausea and restless sleep at night with frequent arousals. However, often their signs and symptoms are overlooked and neglected due to nescience on part of the dentists. Hence, most often it goes undiagnosed despite its high prevalence. A normally appearing snoring can lead to progressive form of obstructive sleep apnea which can result in medical conditions like polycythemia and right sided heart failure. This article illustrates the prosthodontic management of patient with obstructive sleep apnea using mandibular advancement device (MAD)

**Key words:** obstructive sleep apnea, mandibular advancement device (MAD).

### **INTRODUCTION**

Sleep apnea is a relatively common and conceivably life threatening disorder but with the advent of sophisticated diagnostic instruments and increased public awareness, has certainly led to an increase in the number of diagnosed patients. Sleep apnea can be defined as complete cessation of airflow for at least 10 seconds <sup>(1)</sup>. Muscle tone loss in an individual during sleep can result in narrowing of the airway and obstruction as the tongue and soft palate are sucked onto the posterior pharyngeal wall. Uncoordinated abdominal and chest movements are noticeable; this results in arousal and activation of upper airway muscles. In normal individuals, during inspiration and other gravitational forces the muscle tone resists the suction forces by genioglossus muscle and elasticity of upper airway musculature. <sup>(2)</sup>

Snoring is a common annoyance affecting upto 25 % of adult men <sup>(3)</sup>, and results from soft tissues in the upper airway vibrating during inspiration because of increased velocity of air caused by

decrease in the size of airway space. Most snoring and sleep apnea patients have an initially compromised airway space that is often caused by obesity and any condition that impinges on the space like decreased activity of the upper airway musculature. All sleep apnea patients suffer from snoring but all snoring patients do not suffer from sleep apnea. Sleep apnea can be classified as central, obstructive and mixed apnea. Obstructive sleep apnea is also known as occlusive apnea. It is the most common form of sleep apnea and is characterized by cessation of airflow because of upper airway obstruction with the presence of simultaneous respiratory effort.<sup>(1)</sup> Obstructive sleep apnea affects approximately 4% of the middle age male and 2 % of middle age female population.<sup>(4)</sup> Central apnea is characterized by simultaneous cessation of both airflow and respiratory effort while in mixed apnea, episodes are accompanied by no respiratory effort initially, followed by respiratory muscle movement, and finally, by airflow. Numerous treatment options have been proposed in literature for the treatment of OSA. The surgical treatment options include tracheostomy, uvulopalatopharyngoplasty, maxillomandibular advancement osteotomy, geniglossus advancement with hyoid myotomy and suspension, UV somnoplasty and gastric bypass surgery.<sup>(4)</sup> In pharmacological treatment modality, drugs like Protriptyline or Theophylline and Progesterone are administered.<sup>(2, 5)</sup> The non surgical conservative management involves weight loss; Nasal continuous positive air pressure (CPAP), avoiding supine position and alteration in sleep position. The alteration and avoiding supine position is achieved by stitching tennis balls in the back of the tennis T shirt in vertical row.<sup>(6)</sup> Prosthetic management involves fabrication of oral appliances which result in the tongue being in a more forward position than normal and the mouth being held open beyond its normal rest position. Oral appliance presumably keeps the airway open by preventing collapse of the tongue on the soft palate and throat. A variety of oral appliances are available like soft palate lifters, tongue posture trainers, tongue retainers, mandibular advancement devices.<sup>(7)</sup> The present article illustrates Prosthodontic management of a patient suffering from obstructive sleep apnea using mandibular advancement device.

## CASE REPORT

A 25 years old male patient reported to the department of Prosthodontics and Crown & Bridge, Kothiwal Dental College and Research Centre, Moradabad, Uttar Pradesh, India, with the chief complaint of snoring, lack of concentration and tiredness during daytime. (Figure 1) Patient reported to have snored for more than 5 years and in the last few years snoring had become loud and strenuous. The patient was hypertensive since past two years and was under medication for the same. The patient's body mass index was 31.5 kg/m<sup>2</sup> and neck circumference was 17 inches. The lateral cephalometric analysis revealed that McNamara values of upper airway were 12 mm (normal being 15-20 mm). It was inferred that patient has restricted upper airway. Further, Epworth sleepiness scale <sup>(8)</sup> (table 1) was used for analysis and a set of questions were asked from the patient. The ESS score was found to be 13 (normal value being < 10), which revealed that patient; fell in the category of mild to moderate sleep apnea. The STOP BANG questionnaire <sup>(8)</sup> (table 2) included a set of eight questions, each represented by an acronym STOP BANG. A total of four questions were found to be positive and the case was inferred to be a mild to moderate case of sleep apnea.

**TABLE 1. EPWORTH SLEEPINESS SCALE**

SITUATION	CHANCE OF DOZING				
Sitting and reading	0	1	2	3	4

<b>Watching television</b>	<b>0 1 2 3 4</b>
<b>Sitting inactive in a public place</b>	<b>0 1 2 3 4</b>
<b>As a passenger in a car for an hour without break</b>	<b>0 1 2 3 4</b>
<b>Lying down to rest in the afternoon</b>	<b>0 1 2 3 4</b>
<b>Sitting and talking to someone</b>	<b>0 1 2 3 4</b>
<b>In a car while stopped in a traffic</b>	<b>0 1 2 3 4</b>

**0 = would never doze****1 = slight chance of dozing****2 = moderate chance of dozing****3 = high chance of dozing****TOTAL SCORE = 13****TABLE 2. STOP-BANG QUESTIONNAIRE**

<b>THE STOP-BANG QUESTIONNAIRE</b>		<b>IN PATIENT</b>
<b>First four questions</b>	<b>Yes</b>	<b>Four additional questions</b>
<b>S: snore loudly</b>	<b>Yes</b>	<b>B: body mass index &gt; 28</b>
<b>T: feel tired during the day</b>	<b>No</b>	<b>A: age &gt; 50 years</b>
<b>O: observed / witnessed to have stopped breathing</b>	<b>Yes</b>	<b>N: neck size: male, <math>\geq 17</math> inches; female <math>\geq 16</math> inches</b>
<b>P: high blood pressure</b>	<b>Yes</b>	<b>G: gender, are you a male</b>
<b>Yes to two or more above questions: at risk for sleep apnea</b>		<b>Add one or more from above: increased risk for moderate to severe sleep apnea</b>

It was decided that an oral appliance would be appropriate treatment and the necessary records were obtained for the fabrication of oral appliance. According to literature,<sup>(9)</sup> mandibular advancement should be 75 % of the maximum protrusion and vertical opening should be around 4-5 mm between incisor edges based on bite registration wax impression.

Initially, the patient's bite record was taken at 2 mm protrusion (Figure 2) of the mandible and the casts were articulated on a whip mix articulator. This was followed by fabrication of a mandibular advancement device with a vertical opening of 5 mm. Arrow head clasps were fabricated on the casts and clear acrylic was used (Figure 3). The appliance was tried in the patient's mouth and checked for any discomfort (Figure 4a-c).

The patient was advised to lose weight, he was also advised to avoid supine position and wear the appliance during night. The patient was recalled after two weeks, one month, six months and thereafter, at yearly intervals for evaluation.<sup>(10)</sup> At the first follow up after 2 weeks of using the oral appliance, the patient reported that snoring had significantly improved and he felt less sleepy during the day and more prolific at work. Also his Epworth sleepiness scale score had improved from 12 to 9.



FIGURE 1: Frontal view of the patient



FIGURE 2: Bite record being made

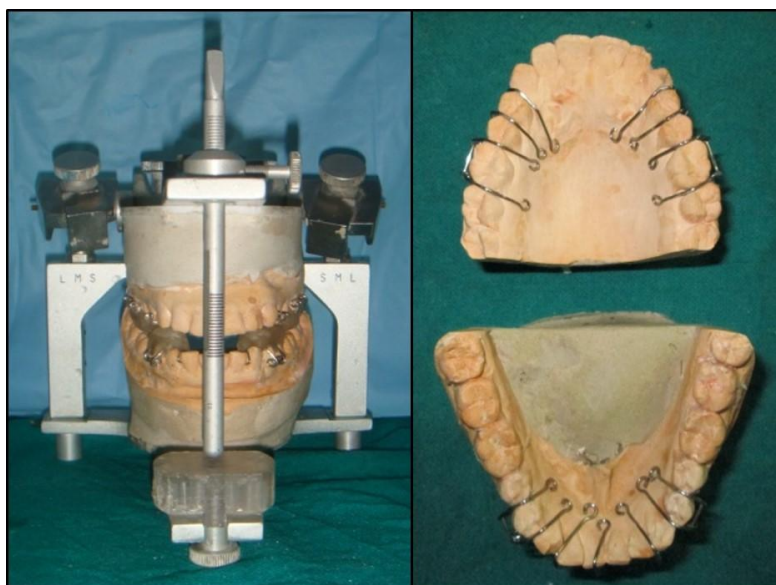


FIGURE 3: Mandibular advancement device fabricated



FIGURE 4a



FIGURE 4b



FIGURE 4c

FIGURE 4a-c: Appliance in patient's mouth

## DISCUSSION

Obstructive sleep apnea can be diagnosed using various diagnostic modalities like Epworth sleepiness scale (ESS), STOP BANG questionnaire and Polysomnography.<sup>(7)</sup>

In polysomnography, number and length of apneic episodes, oxygen saturation, sleep stages and number of arousals are determined. For the diagnosis of sleep apnea there must be upto 30 apneic episodes, each lasting more than 10 seconds.<sup>(2)</sup> Though, polysomnography is the gold standard test for determining sleep apnea, various studies<sup>(12)</sup> have shown that it is a little difficult and not easily tolerable by the patients. Moreover, the economic limitation in the use of polysomnography was also a factor in the present case. Hence, ESS score and STOP BANG questionnaire were considered as viable diagnostic tools for evaluating obstructive sleep apnea.

In the present case mandibular advancement device was used as it has certain advantages over other devices like edentulous patients can also wear MAD and joint pain and occlusal changes are relatively uncommon with MAD use.<sup>(7)</sup> Ferguson et al,<sup>(11)</sup> Jauhar et al, Kaur et al, Mulligan

and Teixeira et al reported that Oral appliance is an effective treatment in some patients with mild-moderate OSA and is associated with fewer side effects and greater patient satisfaction than N-CPAP. Gauthier <sup>(12)</sup> and collaborators compared two different titratable mandibular advancement devices for the treatment of mild and moderate OSA and found that both led to a significant reduction in respiratory events, with a minimal difference between designs. The American Academy of Sleep Medicine does not endorse UPPP as a sole procedure for treating OSA. The AASM recommends that patients considering this surgery first try CPAP or dental devices.

Studies suggest that success rates for sleep apnea surgery are rarely higher than 65% and often deteriorate with time, averaging about 50% or less over the long term. Some studies suggest that surgery is best suited for patients with abnormalities in the soft palate. Results are poor if the problems involve other areas or the full palate. In such cases, CPAP is superior and should always be tried first. Many or most patients with moderate or severe sleep apnea will likely still require CPAP treatment after surgery.

However, certain problems can be associated with the use of oral appliance like muscle pain, joint tenderness, bite changes and clicking sound. The patient can be advocated a soft diet, patient is advised not to chew hard food, applying moist heat on jaw 2 -3 times / day, anti-inflammatory drugs, hyaluronic acid or steroid injection to the joint. In case of acutely painful joint, quickly opening and closing the jaw about a finger width without tapping teeth in close position  $\times$  10 times/ day can be advised. Similarly, for muscle pain Stretch jaw by placing the tongue on the palate for 6 seconds  $\times$  6 times and 6 times /day, If muscle are severely tender use of moist heat for 5 minutes before exercise is advised, Muscle relaxants like tizanidine 2-4 mg 3 times / day, and baclofen 5-10 mg 3 times / day can also be administered.<sup>(13)</sup>

## CONCLUSION

Excessive sleep interruptions may interfere with the lifestyle and health of persons causing them to be less productive at work and may also be associated with road accidents apart from this sleep apnea may also lead to life threatening medical conditions. This article analyzes the effectiveness of mandibular advancement device over other treatment options available. The design advocated in the present case is simple, easy to use and economical.

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