ORIGINAL RESEARCH PAPER

Prosthodontics

KEY WORDS:

PROSTHODONTIC MANAGEMENT OF OBSTRUCTIVE SLEEP APNEA: A CASE REPORT

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ABSTRACT

Obstructive sleep apnea (OSA) is characterized by repetitive episodes of partial or complete upper airway closure leading to diminished (hypopenia) or absent airflow (apnea) into the lungs despite persistent inspiratory effort. The treatment of the OSA varies from conservative therapy to invasive surgical measures. Placement of intraoral prosthesis is a conservative, non invasive means of treatment modality with the goal of positioning the tongue and mandible at an increased vertical and protrusive position to minimize the possibility of oropharyngeal obstruction. This article describes clinical and laboratory technique for the fabrication of mandibular advancement prosthesis for the management of obstructive sleep apnea.

INTRODUCTION

Obstructive sleep apnea (OSA) syndrome is characterized by repetitive episodes of upper airway obstruction that occur during sleep, usually associated with a reduction in blood oxygen saturation.1 People with sleep apnea literally stop breathing repeatedly during their sleep, often for a minute or longer and as many as hundreds of times during a single night.[2]

Apnea is defined as cessation of airflow that lasts for at least 10 seconds. Apnea index is the average number of apneas per hour.3 Hypopnea is defined as a significant reduction in airflow lasting at least 10 seconds. Hypopnea is a 30% or greater reduction in flow associated with a four per cent drop in oxygen saturation. Hypopnea index is the average number of hypopneas per hour.[3]

The severity of the OSA can be assessed using apnea- hypopnea index and respiratory distress index which measures the frequency of disordered breathing events but does not quantify other processes that may be operative in the pathophysiology of OSA such as the degree of oxygen desaturation.[4,5]

The American Academy of Sleep Medicine (AASM) rates the average number of obstructive sleep apnea events per hour as respiratory distress index (RDI).6,7 An RDI of 0 to 5 is normal; 5 to 20 is mild; 20 to 40 is moderate and over 40 is considered severe.

When the tone of the pharyngeal dilating muscles is reduced or when a patient falls asleep in the supine position, the muscle relaxation or force of gravity causes the base of the tongue to approach the posterior wall of the pharynx causing reduction in the diameter of the upper airway. With the consequent reduced air flow, the patient increases the speed of the airflow to maintain the required oxygen supply to the lungs. This increase in airflow velocity causes vibration of soft tissues, which produces snoring. At the severe end of the spectrum, the pharyngeal airway of the sleeping patient repeatedly collapses and obstructs completely causing the patient to arouse from sleep. Arousals increase the tone of the pharyngeal dilating muscles, allowing unobstructed breathing and rapid return of arterial oxygen saturation to normal. Depending on the severity of the disorder, various treatment methods have been advocated. In case of mild to moderate OSA, less invasive options like behaviour modification or insertion of oral appliance are used. Continuous positive airway pressure and surgical options are chosen for patients with moderate to severe OSA. This case report describes the management of OSA syndrome by fabrication of mandibular advancement sleep apnea prosthesis.

Types of Sleep Apnea

a. Obstructive: Most common, occurs when soft tissue in the back of throat relaxes during sleep and blocks the airway, causing to snore loudly.[8]

b. Central: Less common, involves CNS. Occurs when brain fails to signal the muscle that controls breathing. Snore is seldom observed.[8]

c. Complex: Combination of obstructive and central sleep apnea.8

Predisposing factors of obstructive sleep apnea13

- Obesity.
- Age - with increasing age, muscle mass in the airway is replaced with fat leaving the airway narrow and soft.
- Sex: Males more affected than females.
- Retropositioned maxilla and mandible.
- Habitual snoring.
- Enlarged tonsils and adenoids, the main cause of OSA in children.
- Drugs, alcohol, sedatives, anesthetics, sleeping pills and narcotics increase the degree of relaxation of the airway and interfere with brain arousability.
- Smoking, which can cause inflammation, swelling and

narrowing of the upper airway.
- Hypothyroidism, acromegaly, amyloidosis, vocal cord paralysis, Marfan's syndrome, Down's syndrome and neuro muscular disorders.
- Nasal congestion.

Clinical symptoms observed in obstructive sleep apnea[13]
- Excessive daytime sleepiness - cardinal symptom
- Loud snoring
- Morning headaches
- Unrefreshing sleep
- A dry mouth upon awakening
- Chest retraction during sleep in young children
- High blood pressure
- Overweight
- Irritability
- Change in personality
- Depression
- Difficulty in concentrating
- Excessive perspiration during sleep
- Heartburn
- Reduced libido
- Frequent nocturnal urination (nocturia)
- Nocturnal snorting, gasping, choking
- Rapid weight gain
- Confusion upon awakening
- Restless sleep

CASE PRESENTATION
A 32 year old male patient was referred to the Department of Prosthodontics, Osmania Dental College and Hospital, Hyderabad,for the management of obstructive sleep apnea syndrome. (Fig-1) As the patient was diagnosed to have mild to moderate sleep apnea the mandibular advancement oral prosthesis was planned as the treatment preference. The treatment plan was well discussed with the patient and an informed consent was signed.

TECHNIQUE
1. Maxillary and mandibular impressions were made using irreversible hydrocolloid impression material (Algitex, DPI, MUMBAI) and was poured in type III dental stone (Lab stone, KALABHAI KARSON PVT LTD) to get master casts.(Fig-2)

3. The wax interocclusal record was made at an increased vertical and protrusive jaw relation. Mandible was protruded till incisal edge to edge relation was achieved with the vertical opening of 12 mm. (Fig-3)

4. Mounting of the master was done on the semi-adjustable articulator (Hanau Widevue. Made in USA.) using the wax interocclusal record. (Fig-4)

5. A layer of separating media (Cold mould seal, Dental Products of India, Mumbai) was applied on the mounted casts and modelling wax was adapted on the surfaces of maxillary and mandibular casts such that the wax should overlap the incisal edges and the buccal surfaces by 3mm and extend onto the soft tissue palatolingually. The occluding surfaces were made smooth and flat and at the level approximately half the intermaxillary space. 1mm separation was maintained between the maxillary and mandibular surfaces to facilitate the joining of two surfaces after processing.

6. The wax patterns were removed from the casts and invested in type III dental stone (Gold stone, Asian chemicals, Rajkot) in the flask.

7. After dewaxing, clear heat cured acrylic resin (Dental Products of India, Mumbai) was packed in the mold and polymerization was done according to manufacturer's instructions.

8. After deflasking, the external surfaces were finished and polished and were fitted on casts and intraorally before joining the portions.

9. The joining of the maxillary and mandibular portions on the prosthesis was done on articulator by using clear self cure resin (Dental Products of India, Mumbai). An anterior orifice was created for oral ventilation. (Fig-5)

10. The sleep apnea prosthesis was disinfected and inserted in patient's mouth and patient was instructed about its use and maintenance. (Fig-6)

FOLLOW UP
The patient was asked to return on day 1 and 7 for prosthesis evaluation for stability, retention and comfort. The patient had no complaints and was satisfied with the fit and comfort of the prosthesis. After 2 months, during follow up appointment it was revealed that there was remarkable decrease in the snoring and apenic episodes.

DISCUSSION
The use of dental sleep appliances is recommended to treat primary snoring and mild to moderate obstructive sleep apnea. Moreover, these appliances offer an alternative that may be attractive for OSA patients dissatisfied with other therapies or unwilling to accept more complex interventions. Numerous appliances are available and they may be mandibular repositioning or advancement devices, tongue repositioning or retaining devices, soft-palate lifters, tongue trainers and combination of oral appliance and continuous positive airway[9].

Mandibular advancement devices were first described by Robin in 1934. Mandibular advancement devices consists of form fitting trays that fit over the maxillary and mandibular teeth and they may be fixed position, with no allowance for adjustment for advancement or retrusion of mandible or may be adjustable[10].

The goal of therapy with an oral appliance is to modify the position of upper airway structures so as to enlarge the airway or otherwise reduce its collapsibility. In addition to airway size, it can also increase muscle tone specifically, in pharyngeal and genioglossus muscles11. Kazuya Yoshida12 stated that the apnea appliance activated masticatory and tongue muscles during sleep and prevented the upper airway from collapsing. The main advantages of using oral appliances are that, they improve blood oxygen saturation levels, are worn only during sleep and there is good patient compliance. Moreover, the appliances are non-invasive, relatively inexpensive and they can also be easily carried anywhere by the patient.

CONCLUSION
Mandibular advancement prosthesis is one of the noninvasive, inexpensive and one of the conservative treatment modality for mild to moderate forms of OSA. It minimises or prevents the airway collapse by maintaining the mandible and tongue in protrusive position during sleep. It also improves blood oxygen saturation, increases the muscle tone and reduces its collapsibility.

Fig:1

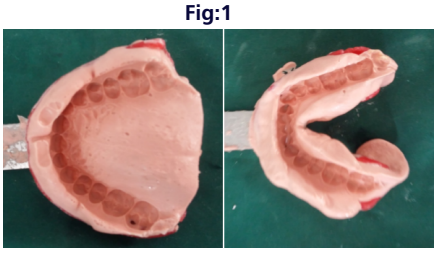

Fig:2

FIG:2

FIG:3

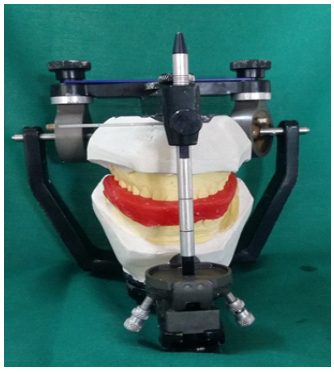

FIG:4

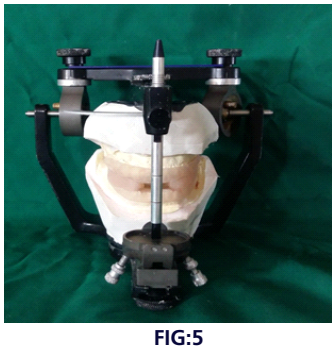

FIG:5

FIG:6

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