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Case Report

MANDIBULAR ADVANCEMENT PROSTHESIS FOR MANAGEMENT OF OBSTRUCTIVE SLEEP APNEA SYNDROME: A CASE REPORT

Navlani Neha D¹, Jagdale Neha D¹, Kamble Vikas B^{2*}, Desai Raviraj G³, Arabbi Kashinath C⁴

¹Post Graduate Student, Department Of Prosthodontics, Crown and Bridge, P.M.N.M Dental College & Hospital, Bagalkot – 587101, Karnataka, India

²Professor and Head, Department Of Prosthodontics, Crown and Bridge, P.M.N.M Dental College & Hospital, Bagalkot – 587101, Karnataka, India

³Professor, Department Of Prosthodontics, Crown and Bridge, P.M.N.M Dental College & Hospital, Bagalkot – 587101, Karnataka, India

⁴Reader, Department Of Prosthodontics, Crown and Bridge, P.M.N.M Dental College & Hospital, Bagalkot – 587101, Karnataka, India

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*Corresponding Author: **Dr. Vikas B. Kamble,**

Professor & Head, Department Of Prosthodontics, Crown and Bridge, P.M.N.M Dental College & Hospital, Bagalkot – 587101, Karnataka, India
Phone number - +919970155404

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.

Keywords: Obstructive Sleep Apnea Syndrome, Sleep Apnea Prosthesis, Oral Appliances

INTRODUCTION

Apnea is defined as the cessation of airflow with a complete obstruction for at least 10 seconds with a concomitant 2 to 4% drop in arterial oxygen saturation¹. The sleep apnea syndrome was first described by Gastaut² and the disorder is associated with daytime sleepiness, hypoventilation and upper airway obstructions associated with sleep disorders and apnea periods. Sleep apnea is classified as obstructive, central and mixed and it may be mild (5-20 apneic episodes per hour), moderate (20-40 apneic episodes per hour) or severe (40 or more apneic episodes per hour). Amongst these patterns the most common is obstructive sleep apnea (OSA), which is characterized by cessation of airflow because of upper airway obstruction with the presence of simultaneous respiratory effort. 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.

CASE PRESENTATION

A 23 year old female patient was referred to the Department of Prosthodontics, P.M.N.M Dental College and Hospital, Bagalkot, Karnataka, from S.N Medical College and Hospital, Bagalkot 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 option. The treatment plan was discussed with the patient and an informed consent was signed.

TECHNIQUE

1. Maxillary and mandibular impressions were made using light body polyvinyl siloxane impression material (Aquasil LV, DENTSPLY India.) and was poured in type III dental stone (Gold stone, Asian chemicals, Rajkot) to get master casts.(Fig-2)
2. The maxillary and mandibular master cast were blocked out using block out wax and were duplicated using irreversible hydrocolloid impression material (Imprint Dust Free, Dental products of India, Mumbai). (Fig-3)
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-4)
4. Mounting of the master casts and cross mounting of the duplicate casts was done on the semi-adjustable articulator (Hanau Widevue. Made in USA.) using the wax interocclusal record. (Fig-5)
5. A layer of separating media (Cold mould seal, Dental Products of India, Mumbai) was applied on the duplicate 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. (Fig-6)
6. The wax patterns were removed from the duplicate 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 master 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-7)
10. The sleep apnea prosthesis was disinfected and inserted in patient's mouth and patient was instructed about its use and maintenance. (Fig-8)

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 airway¹.

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 adjustable³.

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 muscles⁴. Kazuya Yoshida⁵ 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 non-invasive, 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.

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Figure 1: Patient with obstructive sleep apnea syndrome



Figure 2: Upper and lower polyvinylsiloxane impressions



Figure 3: Undercut block out of master cast.



Figure 4: Increased vertical and protrusive intra occlusal bite recorded.

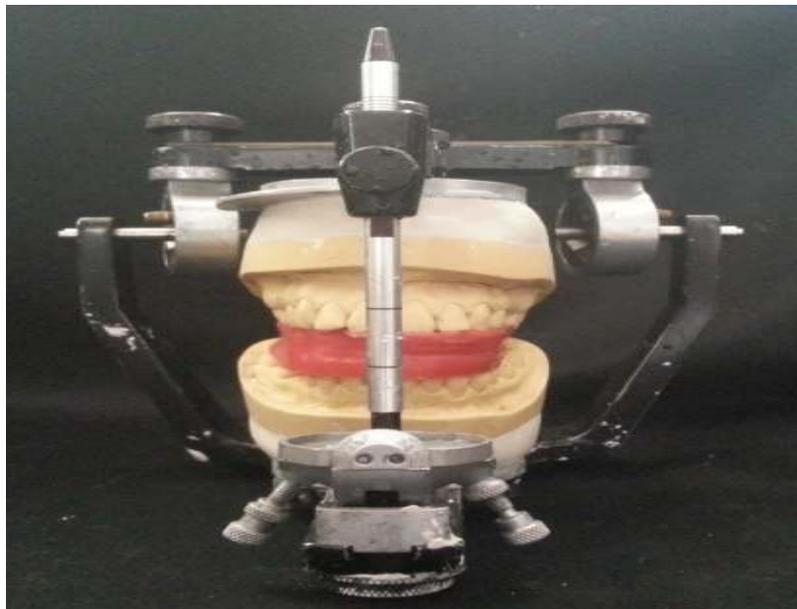


Figure 5: Mounting of the casts on semi adjustable articulator using the bite

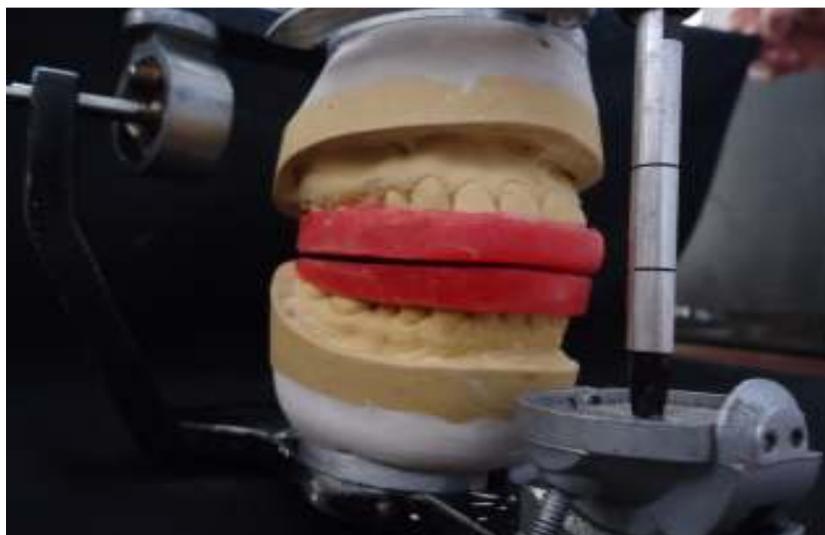


Figure 6: Smooth and flat occluding surfaces of upper and lower wax rims



Figure 7: Sleep apnea prosthesis on the articulator



Figure 8: Sleep apnea prosthesis in the patient's mouth

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