CASE REPORT

A Simple Removable Custom Made Mandibular Advancement Device Fabricated for an Elderly Lady Suffering from Obstructive Sleep Apnea – A Case Report

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Abstract

Nearly every practitioner in dentistry, no matter what his or her specialty or special interest, may have a potential role in the management of patients with a sleep disorder, particularly snoring and sleep apnoea. Every dentist as a practitioner in the healthcare field should be able to assist the patient identified with a potential sleep disorder by making recommendations, referrals or participating in overall management. Many dentists are not familiar with sleep medicine, its magnitude, and prevalence of sleep disorders. This case report reflects how a low cost custom made mandibular repositioning appliance has helped an obese severe obstructive sleep apnea patient, non-affordable for continuous positive pressure device in getting relieved of her symptoms and improved her quality of life by a better night's rest.

Keywords: Obstructive sleep apnea, oral appliance, polysomnography.

Introduction

Obstructive sleep apnea/hypopnea syndrome (OSAHS) is caused by the periodic reduction or cessation of airflow due to narrowing or occlusion of the upper airway during sleep. In several studies[1,2] oral appliances (OAs) have been shown to improve OSAHS symptoms and objectively measured breathing parameters in selected obstructive sleep apnea patients and are considered to be an additional treatment approach. Here we want to present a case of an obese female having severe obstructive sleep apnoea and as she could not non-afford to purchase continuous positive airway pressure(C-PAP) device for home, she was treated with combined approach of C-PAP therapy at hospital and discharged with a simple, low cost custom made mandibular repositioning oral appliance (MRA) to be worn in night at home. Patient was symptomatically well during follow up after one month and was advised to follow up every three monthly for a period of atleast two years.

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Case Report

A 65-year old obese, female with a short neck presented in medical casualty in a state of Type- II respiratory failure. She was having difficulty in breathing and her oxygen- saturation was 85%, pulse rate 130/min, regular and blood pressure 160/100 mm mercury in right arm supine position. Past medical records revealed that she was on antihypertensive medication for 3 years and was a regular snorer for 30 years; severity of snoring was constantly increasing for last 5 years. Chest X-ray (Figure

1) was taken which showed no active parenchymal lesion. Her electrocardiogram showed sinus tachycardia and 2 D-Echo was normal. As her vitals were stable, she was kept on Auto-CPAP with minimum pressure of 4 cm water and oxygen at rate of 2-3 litres/minute was connected to the device. She responded dramatically with the treatment, maximum pressure needed was 12 cm water and serial arterial blood gas analysis report showed reduction in partial pressure of carbondioxide from 70 mm mercury to 45 mm mercury and improvement in partial pressure of oxygen from 55 mm mercury to 80 mm mercury within 24 hours. She was given Auto C-PAP (Auto Set®, ResMed) support continuously for 48 hours initially and later it was changed to 2 hours during day time nap and continuously throughout night. On further exploration of her symptoms, she gave history of morning headaches, impaired concentration, and daytime excessive sleepiness. Diagnosis of obstructive sleep apnea was made and polysomnography (Embletta® PDS, ResMed) was done to judge for severity of disease. Total sleep time was 420 minutes; AHI index was 35, AI index 10, Maximum oxygen saturation was 94%, Minimum oxygen saturation 82%, De-saturation events were 40/hour. Patient was advised C-PAP therapy at home but as patient was non-affordable for C-PAP device, she was referred to us for fabrication of oral appliance. Maxillary and mandibular arch impressions were made in irreversible hydrocolloid (Figure 2). Cast was poured in die stone. Modified labial bow was fabricated for the maxillary arch from right to left canine. The hook was given in the anterior part of 'U' loop of the bow and Adam's clasps were given for right and left first molars.

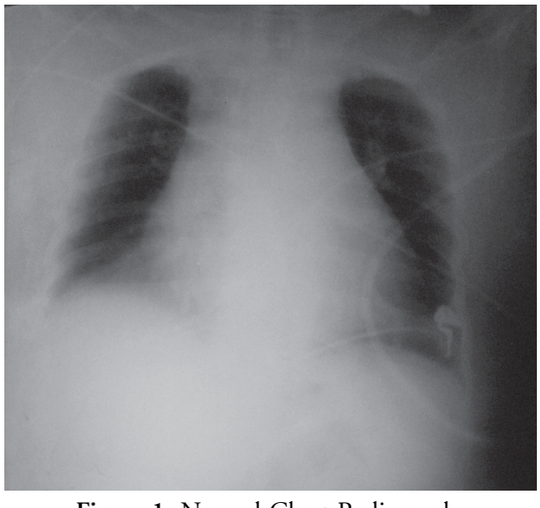

Figure 1: Normal Chest Radiograph

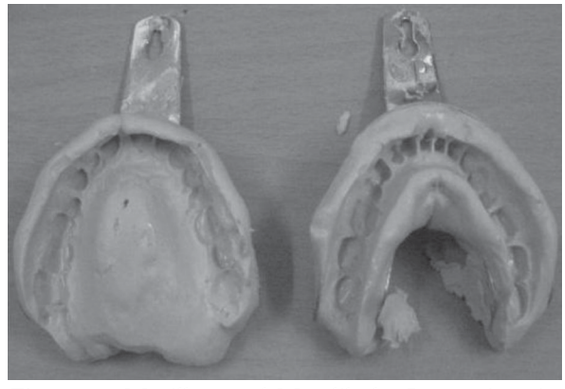

Figure 2 : Maxillary and Mandibular Impressions in Irreversible Hydrocolloid

This appliance was fabricated in acrylic resin for the maxillary arch. In the mandibular arch, labial bow was fabricated from right to left canine. Modified Adam's clasps were given on the right and left first molars. A hook was given in the anterior arm of the Adam's clasp. This appliance was fabricated in the acrylic resin for the mandibular arch. The red elastics used in orthodontics were engaged in the hook on the upper labial bow and hook in the lower Adam's clasp on both the sides. This red elastic pulled the mandible forward (Figure 3, 4).

The patient was advised to wear this appliance only in the night while sleeping and she was advised to change the elastics every night. Advantage of this appliance was that it was simple and easy to fabricate in the laboratory, low cost (Rs 500/- approx) with minimal stress on temporomandibular joint and convenient for patient to wear it at night. Repeat polysomnography done with oral appliance in situ showed reduction in AHI index to 16,

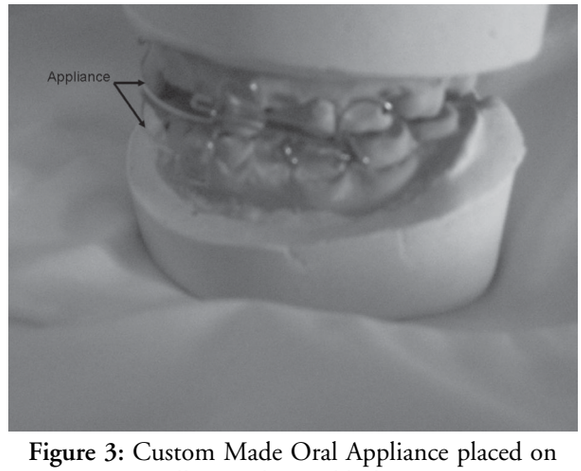

Figure 3: Custom Made Oral Appliance placed on Maxillary and Mandibular Casts

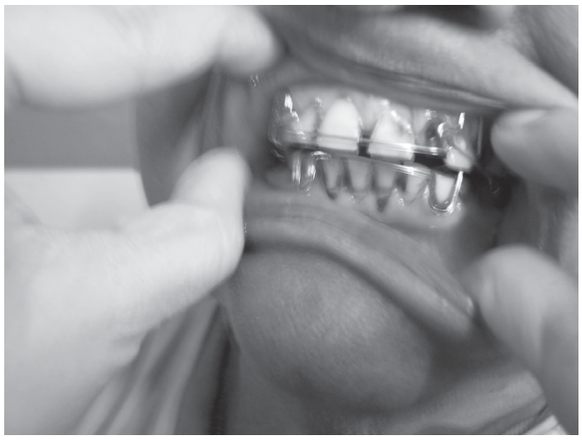

Figure 4: Custom Made Oral Appliance after inserting in Patient's mouth

no apnea and minimum oxygen saturation was 92%. Patient slept comfortably in night with this appliance. CT neck also showed increase in oro-pharyngeal space after wearing the appliance (Figure 5).

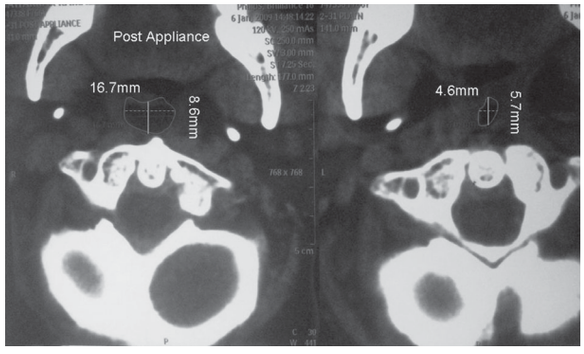

Figure 5: C.T neck showing increase in Oro-pharyngeal airway after applying oral appliance

Patient was advised to follow up every three monthly for a period of at least two years.

Discussion

Obstructive sleep apnea (OSA) is a disturbance in normal sleep patterns; when combined with daytime symptoms, this condition is termed obstructive sleep apnea syndrome. Evidence continues to accumulate in regard to the risk and possible development of comorbid disease in connection with untreated OSA such as systemic hypertension, depression, stroke, angina and cardiac dysrhythmias. Untreated OSA also is associated with motor vehicle accidents, poor work performance, occupational accidents and reduced quality of life.[3,4] The etiology of OSA is a complex interplay between neural, hormonal, muscular and structural anatomical factors.[5] In addition to lifestyle changes, including good sleep hygiene, exercise and weight loss, there are three primary ways to treat sleep apnea. The most common method is nocturnal continuous positive airway pressure (CPAP) therapy. CPAP is applied through a tube which connects a bed-side device to a mask that covers the patient's nose. The air pressure that is generated by the CPAP device splints the back of the throat and holds the airway open during sleep. Other treatment modalities include the use of an oral appliance, a non-invasive therapy, which provides similar benefits to those available through CPAP, or, one of a number of surgeries to the soft palate, uvula, and tongue to eliminate the excess tissue that collapses during sleep. For the most part, the design of OAs is derived from functional orthodontic devices. To maintain the patency of the pharyngeal airway and to prevent the lumen from collapsing during sleep, the appliances hold the mandible in a forward and vertically opened position. OAs are anchored mainly on the dentition rather than the mucosa to ensure retention, thus, the teeth are loaded with permanent forces when the device is worn at night.[6] Patients with OSAHS treated by OAs need to use the device on a long-term basis to prevent the recurrence of symptoms. It is thus important to clarify the potential adverse effects of OA treatment on the dentition, occlusion, and skeletal changes in adults after long-term nocturnal use of the OAs over a period of at least 24 months. The many FDA-approved oral appliances to choose from can generally be classified into one of the following categories: Tongue retaining appliances, Mandibular repositioning appliances. Oral appliances are fitted and supported by dentists trained in this mode of therapy. The Academy of Dental Sleep Medicine has suggested the following criteria for use of oral appliance, in the management of obstructive sleep apnea[7]: patients with primary snoring or mild OSA who do not respond to, or are not appropriate candidates for treatment with behavioral measures such as weight loss or sleep position change; patients with moderate to severe OSA who are intolerant of or refuse treatment with nasal CPAP; patients who refuse treatment, or are not candidates for tonsillectomy and adenoidectomy, cranofacial operations or tracheostomy. In the present case, as patient could not non-afford C-PAP, she was given a custom-made oral appliance. Oral appliance therapy has several advantages: treatment with oral appliances is non-invasive, adjustable and reversible; many patients failing or refusing CPAP therapy find oral appliances to be comfortable and easy

to wear after a couple of weeks of acclamatization to wearing the appliance; oral appliances can be easily carried when traveling, allowing uninterrupted therapy. The dentist chooses whether an MRA or TD is appropriate based on the number of healthy teeth, status of the TMJ and patient preference. MRAs may be pre-fabricated (e.g., "boil and bite") or custom, and may be single position devices, or partly to fully adjustable. Some fixed position appliances can be remade with additional advancement but this is generally time consuming and needs to be done by the dentist or dental laboratory. Diagnostic plaster models are obtained as appropriate for the specific oral appliance. Non-custom appliances are fit to the patient in the dental office. Custom appliances are fabricated by the dentist in coordination with a dental laboratory and are delivered to the patient when manufacture is complete. In the present case, custom made MRA was chosen as it is simple and easy to fabricate, created less force on temporo-mandibular joint and was comfortable to the patient. Red elastics were used in this custom made appliance as they exerted less force on temporomandibular joint as compared to fixed appliances. TDs are used in patients with large tongues, or when there are contraindications to use of an MRA. Some TDs are custom made for the patient (e.g., tongue retaining device (TRD)) but some devices are prefabricated. To use the TRD the patient advances the tongue into the bulb while squeezing the bulb to create negative suction. The patient experiments with the amount of forward positioning of the tongue that is required to decrease snoring and symptoms. Once the patient is using the appliance routinely, overnight testing is required to assess the clinical response objectively. Therefore, oral appliance can play an important role in a selected group of patients in whom an alternative to CPAP is desired. OA therapy represents a unique opportunity for dentists and doctors to provide care for patients with OSA. With collaboration and good communication between the dentist and the sleep clinician, many patients with snoring or OSA can be treated effectively[8].

References

1. **Clark GT,** Blumenfeld I, Yoffe N, et al. A crossover study comparing the efficacy of continuous positive airway pressure with anterior mandibular positioning devices on patients with obstructive sleep apnea. *Chest* 1996; 109:1477–1483.
2. **Ferguson KA,** Ono T, Lowe AA, et al. A randomized crossover study of an oral appliance vs nasal-continuous positive airway pressure in the treatment of mild-moderate obstructive sleep apnea. *Chest* 1996; 109:1269–1275.
3. **Goncalves MA,** Paiva T, Ramos E, Guilleminault C. Obstructive sleep apnea syndrome, sleepiness, and quality of life. *Chest* 2004;125:2091-6.
4. **Lacasse Y,** Bureau MP, Series F. A new standardised and self administered quality of life questionnaire specific to obstructive sleep apnoea. *Thorax* 2004; 59:494-9.
5. **Shamsuzzaman AS,** Gersh BJ, Somers VK. Obstructive sleep apnea: implications for cardiac and vascular disease. *JAMA* 2003;290:1906-14.
6. **Lowe A.** Oral appliance for sleep breathing disorders. In: Kryger M, Roth T, Dement W, eds. Principles and practice of sleep medicine. 3rd ed. Philadelphia, PA: WB Saunders, 2000; 929–939.
7. Practice Parameters for the Treatment of Snoring and OSA with Oral Appliances: An Update for 2005. American Academy of Sleep Medicine Report, 2005, *Sleep,* Vol. 29(2), 240–243.
8. **Ferguson KA,** Cartwright R, Rogers R, Nowara W S. Oral Appliances for Snoring and Obstructive Sleep Apnea: A Review. *Sleep* 2006, Vol. 29(2), 244-262.