

Management of a case of severe obstructive sleep apnea with acrylic herbst splint appliance: A case report

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ABSTRACT

A middle aged serving soldier with severe obstructive sleep apnea and non compliance to CPAP was managed with acrylic Herbst splint oral appliance. The oral appliance enabled the patient to protrude the mandible and tongue forward, thus increasing the posterior airway space when in supine position. There was gross improvement on Apnea index and Epworth sleepiness scale.

Keywords : Obstructive sleep apnea, Oral appliance

Indian J Sleep Med 2006; 1.3, 157-160

Introduction

Sleep disorders of the upper airway result from any condition or disease that cause partial or complete obstruction of the airway when the patient assumes a supine position and goes to sleep. Sleep disruption caused by breathing disorders are potentially life threatening. Oral appliances have been used successfully in mild to moderate OSA and severe OSA who are not amenable to treatment with CPAP (continuous positive air pressure). Oral appliances work by placing the mandible forward and thus increasing the space between post pharyngeal wall and tongue. This communication highlights the efficacy of Acrylic Herbst splint in the management of severe case of OSA.

head aches, fragmented nocturnal sleep and severe snoring. Case evaluation revealed that he was normotensive and had no cardiovascular or endocrinal disorders. Detailed examination revealed increased BMI (27.2 kg/m²), increased neck size(17 inches), normal tongue size, air space between soft palate and tongue was grade 3, Periodontal compromised 46,47 36, 26, TMJ functions was with in normal limits, Mandibular protrusion of 9mm, inter incisal distance on maximum opening 45 mm. Subjective assessment on Epworth sleepiness scale indicated a score of 13. His polysomnography (PSG) report revealed Apnea-Hypopnea index (AHI: 75.2), Apnea index (AI:51), Hypopnea index (HI:24) and confirmed the diagnosis of severe obstructive sleep apnea.

Case report

47 year old serving soldier presented with complaints of excessive day time sleepiness, morning

Lateral cephalogram were recorded at end expiration and the cephalometric analysis was suggestive of retro positioned mandible, decreased posterior airway space, increases soft palate length, and increased hyoid distance from mandibular plane (Fig 1).

He was given a trail of CPAP but the compliance was poor and he requested for any alternate therapy. So it was decided to treat him with acrylic Herbst appliance with 70% of maximum protrusion of mandible and 8mm of vertical opening.

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Fig 1: Diagnostic Lateral cephalogram

Steps followed for appliance fabrication included impression making with sodium alginate impression material, preparation of working models, bite recording with modeling wax, articulation of models with recorded bite and appliance fabrication with acrylic and herbst stainless steel pin and tube components. The appliance was made in the Dental laboratory of the centre.

The appliance was checked on the patient before the final adjustments and the patient was instructed to wear at night during sleep, He was reviewed on the following day and reported cessation of snoring, freshness but discomfort in the temporomandibular region which improved subsequently. Three months after, when the patient got habituated with appliance wear during sleep and had improved on Epworth sleepiness scale (score: 9) he was subjected to polysomnography (PSG) with oral appliance. AHI decreased to 48.3, AI: 8 and HI: 40 (Fig 2, 3). He reported complete cessation of snoring, morning head aches and reduced day time sleepiness.

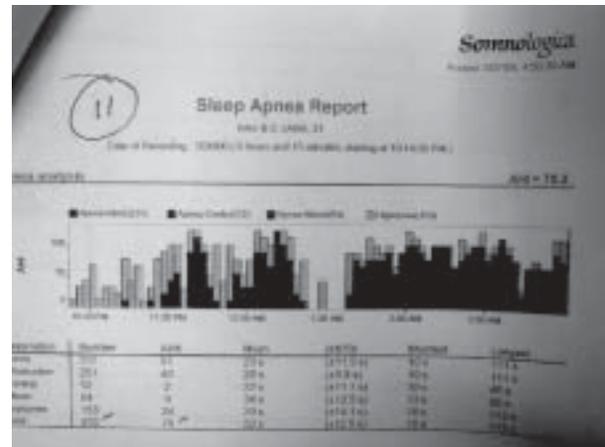


Fig 2: Pre treatment Polysomnograph report

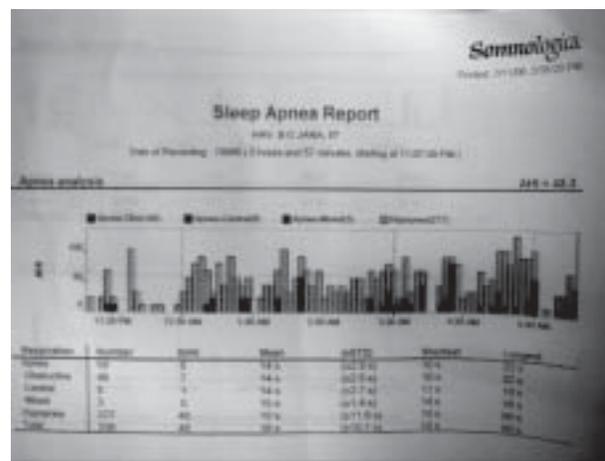


Fig 3: Polysomnograph report with oral appliance.

Discussion

Obstructive sleep apnea syndrome occurs as the base of the tongue periodically contacts the posterior pharyngeal wall or partially occludes the upper airway during sleep. Relaxation of genioglossus muscles and reduction of tone of the surrounding musculature are contributing factors. It is a common disorder that is potentially fatal. Estimated prevalence of sleep disordered breathing and obstructive sleep apnea-hypopnea syndrome in urban Indian males is 19.5% and 7.5% respectively [1].

Oral appliance (OA) therapy for OSA is an emerging treatment alternative because it is less costly, easy to transport, silent, less obtrusive, and do not require a power supply. These removable oral appliances are believed to act by maintaining the mandible in protruded position during sleep and are a viable alternative to CPAP

treatment in a significant number of patients with mild or moderate disease and severe cases not willing to be treated with CPAP or surgery [2]. Behavioral measures such as weight loss or sleep position change should also be recommended with OA therapy. All OSA cases should be given an initial trial of CPAP as greater effectiveness has been shown with this intervention than with use of oral appliances. In our case the patient was given a trial of CPAP but his compliance was poor and preferred oral appliance. Therefore the patient was prescribed Acrylic Herbst splint (OA) and was recommended weight control regimen.

Successful Oral appliance treatment is considered if the AI and HI index decreases by 50% at least from the base line. We observed a 35.7% decrease in AHI and 74.4% in AI along with significant subjective improvement which was evident on Epworth sleepiness scale. The patient also reported complete cessation of snoring and morning head aches.

An influential review of oral appliance therapy in 1995 for OSA accompanied by a practice parameter of the American sleep disorders association, signaled the entry of dentistry into mainstream sleep medicine[3]. Adjustable mandible advancing oral appliances became the predominant form of dental therapy for sleep disordered breathing in 1990s. Controlled studies during late 1990s indicate effectiveness and greater patient preference for oral appliances compared with CPAP in mild and moderate OSA [4,5,6]. In a recent study Rose EC and Coworkers have proven the initial efficacy of Karwetsky activator in the management of mild to moderate OSA. However it is unclear whether Oral appliance treatment can be recommended as a life long option [7].

Mandibular advancement device (MAD) was first described by Robin in 1934 [8] for a case of Pierre robin syndrome to hold the lower jaw forward and hence prevent the swallowing of the tongue and death due to asphyxia in infants. All the oral appliances work by placing the mandible forward and thus increasing the space between post pharyngeal wall and tongue [9]. MAD are of two types, they are fixed and Titratable. Fixed MAD can be a simple Splint, Bionator, Karwetsky activator, removable Herbst appliance etc. All these appliances are made with mandible in requisite protrusive position. Of the fixed MAD, Karwetsky, and Herbst appliance is the most widely used. Although various appliance types are being used, it is not yet possible to predict the most

advantageous appliance type for a particular patient. The authors have also been using this appliance for OSA and found both patient compliance and efficacy is good. Herbst appliance was developed in early 1900s and reintroduced in 1970s by Pancherz to treat mandibular deficiency in children and young adolescents [10]. Removable Herbst appliance is a tooth and tissue borne appliance. The form fitting maxillary and mandibular acrylic plates is divided along the occlusal plane and joined by herbst stainless steel pin and tube components (Fig 4,5).

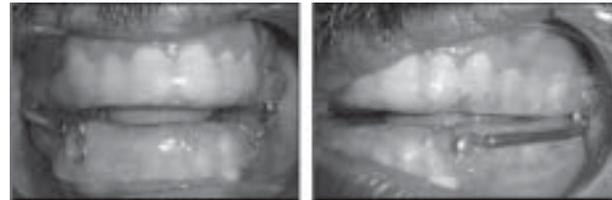


Fig4: Frontal view of acrylic Herbst splint appliance in situ.

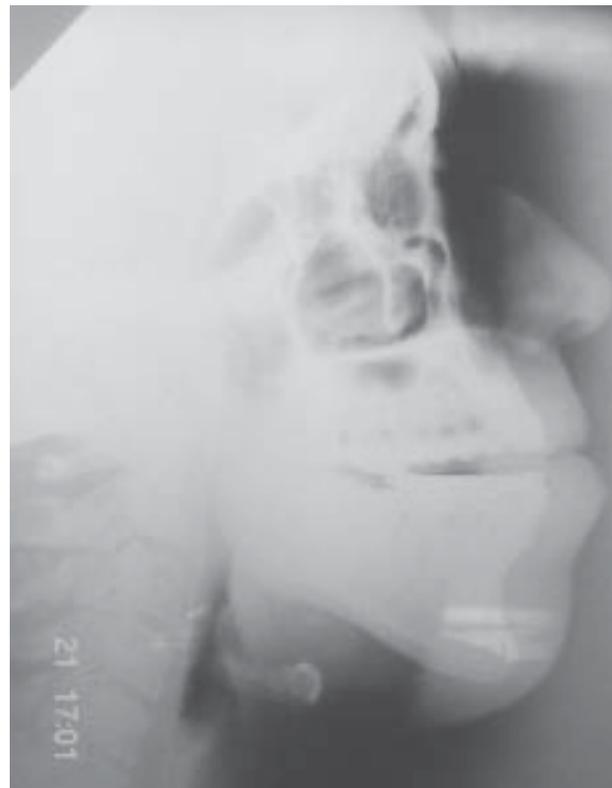


Fig 5: Lateral view of acrylic Herbst splint appliance in situ.

This design permits eccentric and vertical jaw movements during sleep. It requires adequate compliment of teeth for retention, in our case there was full compliment of teeth so we chose this design. It can also be effectively used in adults to position the mandible forward and down ward to increase the posterior airway space and decrease the distance between mandibular plane and hyoid bone as in our case. In our case cephalometric readings with appliance in situ showed increase in posterior airway space and decreased hyoid distance (Table 1, Fig 6).

Adjustable/ titratable MAD is preferred these days because they can be titrated or sequentially advanced in the saggital plane until a acceptable level of subjective improvement occurs [1]. Most modern labs make appliances with thermoplastic materials which is more comfortable to patients. Titratable mandibular advancement device helps in slowly moving the mandible either anteriorly or posteriorly using the adjustable mechanism until successful results are achieved with minimum possible protrusive position[11].Titanium Halstrom hinges and modified unidirectional expansion screw are incorporated in the appliance for incremental advancement of mandible.

Cartwright in 1982 described Tongue-retaining devices [12]. TRD is tooth-tissue borne appliance. The appliance consists of hollow bulb attached to plates that fit over maxillary or mandibular teeth or edentulous ridges. The patient projects the tip of the tongue into the hollow bulb and is retained by suction. In authors own experience patients often complained of inability to retain the tongue in the bulb for long periods of time, hence this appliance was not preferred in this case.

In cases where soft palate dimensions are large resulting in reduced retropalatal space, a customized palatal lift appliance like a speech appliance can be prescribed.

Oral appliances are often prescribed for middle aged and elderly people, so dental treatment should be completed before delivering Oral appliance. This is because oral appliances are tooth-tissue borne and can dislodge loose restorations, worsen/ extract periodontally compromised mobile teeth. In our case we had to improve the periodontal support of 46, 47, 36, 26 teeth before delivering acrylic Herbst appliance.

Conclusion

OSA can present serious health risks and must be diagnosed by physician in conjunction with sleep study. Of the non surgical treatment alternatives, continues positive air pressure has shown to be more effective than oral appliance therapy. However many patients cannot tolerate this treatment and prefer oral appliance therapy as in this case. Side effects are minor, transient and OA is viable option in the management of OSA.

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