

CASE REPORT

A Case Study Involving the Combination Treatment of an Oral Appliance and Auto-Titrating CPAP Unit

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ABSTRACT

Treating severe obstructive sleep apnea can be a challenge. In this case it necessitated combining treatments to obtain the desired result. Now that oral appliances are a viable treatment of obstructive sleep apnea, they can be combined with continuous positive airway pressure or surgery to give the physician and patient more options.

KEYWORDS: Obstructive sleep apnea, oral appliance therapy, auto-titration, CPAP, combination treatment

Oral appliance therapy (OAT) is an integral treatment modality for maintaining the airway of patients with obstructive sleep apnea (OSA).¹⁻³ Since OAT is a new treatment for OSA, few dentists or physicians are familiar with the versatility of this form of therapy. OAT can be used as a stand-alone therapy, or it can be combined with other treatments, for example, surgery or continuous positive airway pressure (CPAP), to reach a desired treatment outcome. This case report describes the combination of an adjustable mandibular appliance, a Thornton Adjustable Positioner (Airway Management, Inc., Dallas, TX), and an auto-titrat-

ing CPAP unit to treat sleep apnea that was initially resistant to CPAP.

EXAMINATION AND TREATMENT

The patient is a 5'9", 200-pound, 61-year-old Caucasian male. His medical history shows that the medications presently being taken are Effexor and Myparline for clinical depression, Zestril and Diazide for high blood pressure, and Tagamet for acid reflux. The patient was referred by his physi-

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Table 1 Patient Evaluation

Class 1 occlusion (Class 1 occlusion denotes a normal maxilla-to-mandible relationship)
Class 1 periodontal condition (Normal periodontal and gingival health with the possibility of mild gingivitis)
Normal arch width
Normal size width
Level 2 soft palate (When gentle pressure is placed on the tongue, the palatal fauces can be seen below the soft palate)
Normal uvula
Patent nostrils bilaterally
Normal protrusive jaw capability
Tenderness of the right lateral pterygoid muscle to palpation, all other muscles of mastication within normal limits to palpation
Mild bilateral asymptomatic popping of the temporomandibular joint on opening
Epworth Sleepiness Scale of 19

cian for assessment of the feasibility of OAT. He refused surgery as an option to treat his OSA, and CPAP therapy was unsuccessful. The initial oral exam on July 31, 1996, resulted in the following findings as listed in Table 1.

The original multichannel polysomnography done 4 months previously revealed an apnea hypopnea index (AHI) of 85. The lowest oxygen saturation was 87%. The patient spent 5% of the time below 90% oxygen saturation. The diagnosis was severe sleep apnea with mild to moderate periodic leg movement. No optimum CPAP pressure could control sleep events. The patient was to be brought back for an overnight titration study at a later date. The overnight titration study took place in April 1996. It revealed that no optimal CPAP or bilevel pressure could be found. CPAP settings were as high as 16 and bilevel settings ranged from 13/3 to 16/6.

After evaluation for oral appliance therapy, in August of 1996 a Thornton Adjustable Positioner (TAP) was placed in the patient's mouth. Attempts at using CPAP were stopped. The TAP is an anterior mandibular positioner (see Fig. 1). A short period of accommodation was needed for the patient to become comfortable with the appliance.

**Figure 1** A model of the oral appliance used in this study.

Overnight oximetry was used as a post-treatment screening tool.⁴⁻⁶ Multiple overnight studies using pulse oximetry were performed from August 1996 through April 1997 to assist in obtaining this optimal protrusive jaw position. The patient's T90, time above 90% oxygen saturation level, varied between 98.8% and 92.9%. His desaturation index (using 3% criteria) ranged from 36.9 to 64.4. The patient's lowest oxygen level was 75% for 0.1% of the time during all the testing times. Initially the patient had a dramatic improvement in symptoms. Over time his OSA symptoms did recur, but never to the degree he had had before his TAP was placed.

A follow-up polysomnography was performed 2 years after the initial assessment. This polysomnography revealed that the oral appliance had reduced his AHI to 40/hr, a 53% decrease. His lowest oxygen saturation was 84%. Although he had improved, we concluded that more therapy was needed to reduce residual daytime sleepiness and AHI.

In July 1999, a Thornton Adjustable Positioner with a CPAP attachment that fit an auto-titrating CPAP unit was placed (Fig. 2). The patient immediately felt better after sleeping with the combined appliance and CPAP unit. He stated that he was now getting the best sleep he could remem-



Figure 2 A demonstration of the final therapeutic combination, obviously posed.

ber. His excessive daytime sleepiness was no longer present and his energy levels were normal again. He felt he had regained a normal quality of life.

With the particular auto-titrating CPAP unit used, CPAP pressures for a period of 9 days were monitored and recorded. The mean pressure was 4.5 cm H₂O, the average peak pressure was 5.8 cm H₂O, and the peak pressure was 7.0 cm H₂O. Because the patient wore his TAP during the full time he wore his CPAP, the downloaded information revealed an average of 8.1 hours of combined usage per night.

A follow-up polysomnography was performed 1.5 years later using the combination therapy of oral appliance and an auto-titrating CPAP unit. The summary of this study indicated a complete absence of snoring with an AHI of 7/hr. There were no hemoglobin desaturations below 90% during the study.

DISCUSSION

One conclusion concerning this case and several other subsequent cases that involve this combination treatment is that a tight seal created with a closed mouth is not necessary for treatment of OSA. It ap-

pears that since the oral appliance creates some degree of a patent airway, the high pressures needed to splint the tongue when there is a total occlusion of the airway are not needed. Combination therapy requires mandatory follow-up monitoring and testing, and the patient has to be seen on a strict recall system. The impression is that patients are more comfortable with the variable flow rate of the auto-titrating CPAP unit. The auto-titrating unit may allow for more flexibility with a patient's lifestyle, such as weight gain, alcohol consumption, late night meals, than does a static, preset airflow of a conventional CPAP unit. It also allows monitoring of pressures used and required and the number of hours of use per night. The additional information allows for a more rational jaw position, which translates into longer patient usage at night.

This form of combination treatment is the exception rather than the rule when treating OSA. Clinical research is needed to confirm whether a tight seal is needed when combination treatment is utilized and which type of CPAP unit should be prescribed for the patient when combined with an oral appliance.

In summary, this case presentation is an example of how oral appliance therapy can assist patients in the management of their severe CPAP-resistant OSA. It also shows that the dental profession, utilizing oral appliance therapy, can be an integral part of the medical team treating OSA.

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