Role of Oral Appliances in Management of Sleep-disordered Breathing Patient

Oral appliance therapy (OAT) is one of many treatment modalities used to treat sleep-disordered breathing (SDB). Treatment modalities for SDB include a combination of sleep modification, oral appliances (OA), positive airway pressure (PAP), myofunctional therapies, hypoglossal nerve stimulation systems like "Inspire", and surgery.[1-4] Behavioral modifications such as weight loss, aerobic exercise, sleep position, sleep hygiene, and alcohol intake modification can assist in the management of OSA.[5-8]

The American Academy of Sleep Medicine (AASM) guidelines indicate that although OA is not as efficacious as CPAP, OA may be indicated for mild to moderate obstructive sleep apnea (OSA) when patients cannot tolerate CPAP or do not respond to CPAP.[9] Studies on the effectiveness of OA have shown no more than 56% improvement to normal AHI, with compliance as one factor contributing to improved outcomes.[10] An investigation comparing the effect of CPAP to OA on blood pressure (BP) in patients with OSA found that both CPAP and OA were associated with reductions in BP.[11] Approximately 25% of patients receiving an OA may have no improvements and may aggravate the severity of their sleep apnea.[12] PAP pneumatically opens the airway using continuous or on-demand positive air pressure, and is considered the 'gold standard' of therapy for OSA.

There are two categories of OAs for OSA: mandibular repositioning devices (MRD), or mandibular advancement devices (MAD), and tongue-retaining devices (TRD). The MRD's objective is to reposition the mandible forward, enough to enlarge the upper airway and prevent it from collapsing. The TRD's objective is to maintain the tongue in a forward position, preventing it from falling back and obstructing the airway during sleep. TRDs are poorly tolerated and are not often recommended, but may be considered in TMD patients who cannot tolerate any jaw advancement.[13] For the MRD, the patient's full range of protrusive movement is measured, and a 75% movement has been shown to be more effective than 50% advancement.[14] However, a systematic review and meta-regression analysis on the effectiveness of different mandibular advancements suggests that it would be prudent to begin therapy at minimum effective advancement, since no significant improvements were found at increased movements.[15] Patient compliance plays an important role in the long-term success of the treatment. The use of an OA concomitant with a PAP machine may reduce the pressure required to treat severe OSA, possibly increasing the acceptability of treatment and patient comfort. Thirty-nine to forty-seven percent of SB patients demonstrate greater reduction of motor activity with mandibular advancement splints than with conventional occlusal splints.[16]

Occlusal changes observed in patients after long-term use of OAs are relatively small and include decreased overbite/overjet, and posterior open-bite in the premolar region.[17,18] Prosthodontists have an in-depth knowledge of occlusion and TMJ function and are the most qualified to monitor and manage any occlusal changes that can occur with OAs. Occlusal changes will continue as long as an OA is used. Occlusal correction necessitates discontinuation of OA and alternative therapy such as CPAP.[19]

A surgical approach is most effective in children with hypertrophied tonsils and adenoids. Concurrent maxillary expansion and orthodontic/surgical correction of malocclusions will improve OSA in children.[20] Surgical procedures, such as uvulopalatopharyngoplasty (UPPP) in adults, are considered secondary to non-surgical therapy when the patient is non-responsive. [9] There are concerns regarding the predictability and stability of surgery in the adult OSA patient, but when there is a clear maxillomandibular discrepancy, orthognathic surgery is most effective.

Prosthodontists who provide OAs to patients with OSA should have ongoing training in dental sleep medicine (DSM). Understanding the symptoms of SDB, knowing when to refer to a sleep physician, and assessing the TMJ, occlusion, oropharyngeal structures, orofacial pain, and headaches requires additional training and certification, as recommended by the American Academy of Dental Sleep Medicine (AADSM)[21], American Academy of Sleep Medicine (AASM)[12], the Canadian Sleep Society (CSS).[22], and the American Dental Association.[23]

Non-Custom/Over-The-Counter (OTC) Oral Appliance Therapy

A few comments about non-custom/over-the-counter oral appliance therapy. A distinction should be made about two types of non-custom oral appliances, direct-to-consumer and doctor-directed-and-supervised. The composition of the actual devices may not vary between the two subgroups. Often both types of non-custom oral appliances are made up of a thermoplastic resin material that can be heated, molded, and fabricated intraorally. The distinction to be made is not the composition; but rather, the protocol followed by a treating sleep physician and dentist trained in dental sleep medicine versus the patient performing these diagnostic and treatment tasks by him or herself. To the authors knowledge, a majority of the clinical data supporting the effectiveness of oral appliance therapy is based off of custom-made oral appliances and does not include OTC oral appliances.[12]

With that being said, there is some data about OTC, also known as boil and bite/thermoplastic, oral appliance therapy.[24-27] With the limited data, it seems OTC oral appliances may help reduce snoring and may help reduce the AHI of some patients; however, all studies were done under the screening, diagnosis, and treatment supervision of practitioners trained in sleep medicine and/or dental sleep medicine. Thus, to extrapolate this subset of clinical literature to direct-to-consumer OTC oral appliances may be misguided.

OSA/Night-guard Consideration

The effect of the use of a night guard for SB on OSA remains uncertain; however, increasing the occlusal vertical dimension (OVD) with a maxillary night guard without mandibular protrusion has been found to aggravate OSA in some patients. It was suggested that the mechanism for increasing the severity of OSA could be related to a reduced upper airway size due to the restriction of the tongue space and the rotation/anterior translation of the condyles.[28] Practitioners should consider screening patients for OSA prior to fabricating a maxillary night guard that increases the OVD without mandibular protrusion.[29,30] Prosthodontists should consider screening patients for OSA during the treatment planning stages and be aware that treatment modalities for OSA may influence the final dental treatment plan.

Conclusion

It is the position of the American College of Prosthodontists that when prescribed by the sleep physician, prosthodontists are encouraged to fabricate the OA in treatment of OSA. OAs have been shown to be effective in the treatment of patients with mild and moderate OSA. Patients with severe OSA or those who cannot tolerate or are not compliant with PAP therapy can also benefit from the use of an OA. Prosthodontists are encouraged to seek supplemental training in dental sleep medicine in addition to their already extensive knowledge of the stomatognathic system and oro-facial anatomy.

Most recent estimates suggest that a majority of SDB patients remain undiagnosed and untreated. The field of sleep medicine as it is, will not have sufficient professional and financial resources to sustain the potential demands for treatment. Increasing training of non-physicians in the treatment of uncomplicated cases could be an avenue to meet this demand.[31] Prosthodontists receive advanced training in the oro-facial complex that may benefit the field and should seriously consider investing time in expanding their knowledge in dental sleep medicine.

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