



## Editorial

## Mandibular Advancement Devices: Tailoring New Treatments for Sleep Apnea Syndrome<sup>☆</sup>



### Dispositivos de avance mandibular: nuevos trajes a medida en el tratamiento del síndrome de apnea de sueño

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The prevalence of sleep-disordered breathing, including sleep apnea-hypopnea syndrome (SAHS), is very high. It is widely held that 10%–17% of men and 3%–9% of women are affected,<sup>1</sup> but recent studies have shown that moderate SAHS can occur in nearly 50% of men and 23% of women.<sup>2</sup> Untreated SAHS is associated with multiple adverse cardiovascular outcomes: arterial hypertension, ischemic heart disease, stroke, and increased mortality.<sup>3</sup> Snoring is also a significant social problem as it contributes to a deterioration of quality of life among bed partners due to interrupted sleep, and has an independent negative effect on health.<sup>4–6</sup>

First-line therapy, particularly for severe SAHS, is the application of continuous positive airway pressure (CPAP). When used diligently, CPAP improves sleep architecture and quality of life, and prevents cardiovascular complications and social problems.<sup>7</sup> However, tolerance and adherence can be a problem, with non-adherence rates of 20%–40% that are largely dependent on subjective symptoms such as sleepiness.<sup>8,9</sup> This situation calls for the implementation of improvements and the incorporation of new technologies.<sup>10–12</sup>

The first official joint guidelines of the American Academy of Sleep Medicine (AASM) and the American Academy of Dental Sleep Medicine (AADSM) have been published recently.<sup>13</sup> These guidelines encourage doctors and oral cavity specialists (dentists, orthodontists, maxillofacial surgeons, etc.) to work together to offer SAHS patients the best treatment. The authors made a systematic review of the literature, selecting 51 articles for retrieval, and classified the data for meta-analysis. The study shows that while CPAP is superior to mandibular advancement devices (MAD) for reducing respiratory events during sleep, eliminating arousals, and stabilizing oxyhemoglobin saturation, MADs can reduce these events significantly, and are recommended for the treatment of CPAP-intolerant adults, or those who prefer an alternative therapy.

Similar conclusions were also reached in the recently published Spanish guidelines.<sup>14</sup>

Although different systems are available, the most widely used devices advance the lower jaw gradually (they are adjustable) or deliver a fixed protrusion,<sup>13,15</sup> in such a way that by advancing the base of the tongue, they enlarge the retropharyngeal region. The most common side effects of these devices include excessive salivation, oral and dental discomfort, temporomandibular problems, and orthodontic changes. Available figures indicate 30-month compliance rates of 56%–68%.<sup>16</sup>

Evidence shows that oral appliances, particularly made-to-measure adjustable devices, can improve SAHS in adults, compared to no treatment or placebo; they are effective in a significant percentage of patients with mild and moderate SAHS, and while they are not considered first-line treatment, they can be prescribed for patients with severe SAHS who are CPAP-intolerant or non-compliant. The guidelines also recommend MADs as an effective treatment for primary snoring in adults, after other more major problems have been ruled out.

The evidence for MADs is still limited, and several questions remain to be answered. MADs do not impact significantly on sleep architecture (percentage of REM sleep) or efficiency, but they are moderately effective in reducing blood pressure.<sup>13</sup> Their effect on the cardiovascular system is largely unknown: randomized studies at equivalent levels of severity, using the gold standard CPAP as comparator, are necessary. These devices must be made to measure by a specialist, and graduated with different settings to assess their effectiveness, and their use must be closely supervised to evaluate side effects associated with the teeth, occlusion, and the temporomandibular joint. Close follow-up is also required to evaluate efficacy and to avoid dropouts, and a multidisciplinary approach and full cooperation are needed. Now that the opportunity of treating SAHS is available to different specialists, we must progress from an empirical approach to embrace the scientific method, and, as occurred with CPAP, rigorous diagnostic and titration studies must be performed, and the real effectiveness of these devices in terms of improved health must be determined.

Another hitherto unexplored approach consists of combining MAD and CPAP in the same patient, or alternating the application

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of these 2 techniques. A patient profile is already emerging from our observations in clinical practice: a generally young individual with moderate or even severe SAHS, who might be a good CPAP user during the week, but who switches to MAD at the weekend. CPAP has been shown to be effective in the reduction of cardiovascular risk (especially in young patients) if it is used at least 5–6 h/night, but we do not know what the mid-to-long-term effect of alternating CPAP and MAD might be.

Other much-needed improvements include the adoption of a consistent and standardized nomenclature for the oral appliances, objective evaluations of therapeutic adherence (as opposed to subjective impressions), and consistent and objective criteria for measuring snoring if this is the primary indication. The adverse effects of MADs must also be standardized and characterized. The high inter-individual variability of these devices calls for future studies to address cost–benefit ratios and effectiveness.

Funding for MADs in Spain is an additional problem that limits the use of these devices, and with it the performance of studies in this field, since few autonomous communities provide full or partial reimbursement. It is incongruous for the public health system to recommend MADs that must then be dispensed by the private sector, and for their effectiveness to subsequently be assessed in 1 or more sleep studies and followed up, once again, by the public system.

The future of MAD is promising and opens up new prospects for tailored treatment which takes full account of the different SAHS phenotypes, and meets the pressing demand for a multidisciplinary approach involving different sleep medicine specialists.

## References

1. Peppard PE, Young T, Barnet JH, Palta M, Hagen EW, Hla KM. Increased prevalence of sleep-disordered breathing in adults. *Am J Epidemiol.* 2013;177:1006–14.
2. Heinzer R, Vat S, Marques-Vidal P, Marti-Soler H, Andries D, Tobback N, et al. Prevalence of sleep-disordered breathing in the general population: the HypnoLaus study. *Lancet Respir Med.* 2015;3:310–8.
3. Javaheri S, Barbé F, Campos-Rodríguez F, Dempsey JA, Khayat R, Javaheri S, et al. Sleep apnea: types mechanisms, and clinical cardiovascular consequences. *J Am Coll Cardiol.* 2017;69:841–58.
4. Beninati W, Harris CD, Herold DL, Shepard JW Jr. The effect of snoring and obstructive sleep apnea on the sleep quality of bed partners. *Mayo Clin Proc.* 1999;74:955–8.
5. Al-Delaimy WK, Manson JE, Willett WC, Stampfer MJ, Hu FB. Snoring as a risk factor for type II diabetes mellitus: a prospective study. *Am J Epidemiol.* 2002;155:387–93.
6. Hu FB, Willett WC, Manson JE, Colditz GA, Rimm EB, Speizer FE, et al. Snoring and risk of cardiovascular disease in women. *J Am Coll Cardiol.* 2000;35:308–13.
7. Park JG, Ramar K, Olson EJ. Updates on definition, consequences, and management of obstructive sleep apnea. *Mayo Clin Proc.* 2011;86:549–54, quiz 54–5.
8. Weaver TE, Grunstein RR. Adherence to continuous positive airway pressure therapy: the challenge to effective treatment. *Proc Am Thorac Soc.* 2008;5:173–8.
9. Campos-Rodríguez F, Martínez-Alonso M, Sánchez-de-la-Torre M, Barbé F. Spanish Sleep Network Long-term adherence to continuous positive airway pressure therapy in non-sleepy sleep apnea patients. *Sleep Med.* 2016;17:1–6.
10. Rotenberg BW, Vicini C, Pang EB, Pang KP. Reconsidering first-line treatment for obstructive sleep apnea: a systematic review of the literature. *J Otolaryngol Head Neck Surg.* 2016;45:23.
11. Chiner E, Andreu AL, Sancho-Chust JN, Sánchez-de-la-Torre A, Barbé F. The use of ambulatory strategies for the diagnosis and treatment of obstructive sleep apnea in adults. *Expert Rev Respir Med.* 2013;7:259–73.
12. Hevener B, Hevener W. Continuous positive airway pressure therapy for obstructive sleep apnea: maximizing adherence including using novel information technology-based systems. *Sleep Med Clin.* 2016;11:323–9.
13. Ramar K, Dort LC, Katz SG, Lettieri CJ, Harrod CG, Thomas SM, et al. Clinical practice guideline for the treatment of obstructive sleep apnea and snoring with oral appliance therapy: an update for 2015. *J Clin Sleep Med.* 2015;11:773–827.
14. Guía española de práctica clínica. Utilización de los dispositivos de avance mandibular (DAM) en el tratamiento de pacientes adultos con síndrome de apneas-hipopneas del sueño. Sociedad Española de Sueño. Available from: [http://ses.org.es/wp-content/uploads/2016/12/SES.Guia-Espanola-de-practica-clinica\\_17-04-2017.pdf](http://ses.org.es/wp-content/uploads/2016/12/SES.Guia-Espanola-de-practica-clinica_17-04-2017.pdf) [accessed 10.06.17].
15. Serra-Torres S, Bellot-Arcís C, Montiel-Company JM, Marco-Algarra J, Almerich-Silla JM. Effectiveness of mandibular advancement appliances in treating obstructive sleep apnea syndrome: a systematic review. *Laryngoscope.* 2016;126:507–14.
16. Hoffstein V. Review of oral appliances for treatment of sleep-disordered breathing. *Sleep Breath.* 2007;11:1–22.