

Exploring the Dose-Response Relationship Between Mandibular Protrusion and Respiratory Effort Burden in Oral Appliance Therapy for OSA

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Abstract

Supplements

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Abstract

Rationale: Increased respiratory effort (RE) is a critical feature of obstructive sleep apnea (OSA). While prior studies have established the efficacy of mandibular advancement device (MAD) therapy in reducing the apnea-hypopnea index (AHI), the impact of MAD therapy on RE burden remains unexplored. **Objective:** In this study, we used a validated mandibular jaw movement (MJM) monitoring technology to determine the dose-response relationship between MAD protrusion levels and RE burden measured as the percentage of total sleep time (TST) spent in elevated respiratory effort (REMOV) during MAD titration. **Methods:** Ninety-three OSA patients eligible for MAD treatment were included in this prospective cohort study. A subjective titration process involved iterative adjustments based on the persistence or worsening of OSA symptoms. Optimal AHI and REMOV responses were defined as an AHI reduction of greater than 50% and a residual REMOV lower than 14% TST, respectively. MJM-based home sleep tests were conducted at initial, intermediate, and final protrusion levels. The treatment effect on REMOV was estimated by regression analysis. **Results:** AHI and REMOV reductions increased progressively with higher MAD protrusion levels, with AHI decreasing by -10.3, -12.7, and -13.0 events/h and REMOV by 14.5%, 16.8%, and 18.6% of TST across the three titration steps. However, a consistent discrepancy was observed between REMOV and AHI responses: at the end of titration, 68.8% of patients achieved optimal responses for both indices, while 15.1% had optimal REMOV response without AHI normalization, and 5.4% showed the reverse. Regression analysis showed a significant dose-response relationship for REMOV, with a 10% TST reduction within the 0–6.5 mm protrusion range and diminishing benefits beyond 6.5 mm. Of note, each millimeter advancement would yield a 2.6% TST (95%CI: -3.0; -2.1) improvement in REMOV. **Conclusion:** Our findings demonstrate a dose-response relationship between the MAD protrusion level and the improvement in RE burden. Optimal responses in both AHI and REMOV signify greater efficacy of MAD therapy in reducing obstructive respiratory events and RE burden. This underscores the benefit of using at-home MJM analysis to monitor these two critical metrics in the management of MAD therapy to achieve better clinical outcomes and enhance MAD titration efficacy.