



Effect of Mandibular Advancement Device Therapy for Sleep-Related Breathing Disorders on Tinnitus Severity: A Retrospective Observational Study

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Abstract

Background: Sleep-Related Breathing Disorders (SRBD), including Obstructive Sleep Apnea (OSA), frequently coexist with tinnitus. This study explores the incidental effects of Mandibular Advancement Device (MAD) therapy for SRBD on tinnitus severity.

Methods: A retrospective observational study was conducted on 413 patients treated for SRBD with MAD therapy. Among them, 52 had concurrent tinnitus. Patients completed the Epworth Sleepiness Scale (ESS) and the Tinnitus Handicap Inventory (THI) at baseline and follow-ups at 6 weeks, 1–2 years, and over 2 years.

Results: Tinnitus severity decreased in short-term follow-up (THI reduction by 69.93%, $p=0.038$). Two long-term cases (1–5 years) showed persistent improvement. However, no statistically significant correlation was found between ESS and THI scores ($p=0.278$).

Conclusion: MAD therapy for SRBD may incidentally reduce tinnitus severity, especially in the short term. These findings suggest a potential overlap in therapeutic mechanisms and encourage further controlled studies.

Introduction

Sleep-Related Breathing Disorders (SRBD) affect a significant proportion of the adult population and encompass a spectrum of conditions such as Obstructive Sleep Apnea (OSA), Upper Airway Resistance Syndrome (UARS), and snoring [1]. These disorders are characterized by repeated episodes of upper airway obstruction during sleep, leading to intermittent hypoxia, fragmented sleep, and excessive daytime sleepiness [2]. OSA, the most prevalent form of SRBD, has been associated with numerous systemic complications including cardiovascular dis-

ease, metabolic dysfunction, and impaired neurocognitive performance [3].

Tinnitus, on the other hand, is the perception of sound in the absence of an external auditory stimulus [4]. It affects approximately 10-15% of the adult population, and can significantly impair quality of life [5]. There is growing evidence that sleep disturbances and tinnitus may share common pathophysiological mechanisms, including neural plasticity, stress, and autonomic dysregulation [3,19].

Recent meta-analyses and population studies have further



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strengthened this association, suggesting that individuals with Obstructive Sleep Apnea (OSA) are significantly more likely to experience tinnitus, possibly due to disrupted sleep architecture and hypoxia-induced neural dysregulation [16,17]. Patients suffering from tinnitus often report insomnia or poor sleep quality, suggesting a bidirectional relationship [6,7].

Mandibular Advancement Devices (MADs) are an established therapeutic modality for managing mild to moderate OSA. They work by repositioning the mandible anteriorly, thereby enlarging the upper airway and reducing collapsibility [8,9]. While MADs have primarily been studied for their effects on sleep-disordered breathing, anecdotal reports and preliminary data suggest they may have secondary benefits on associated symptoms such as tinnitus [10]. This study seeks to explore this potential relationship by evaluating changes in tinnitus severity following MAD treatment in patients diagnosed with SRBD.

Materials and methods

This retrospective observational study was conducted from January 2010 to November 2018 at a private dental clinic in London. A total of 413 patients diagnosed with SRBD and treated with a Mandibular Advancement Device (MAD) [3] were reviewed. Of these, 52 patients reported tinnitus as part of their pretreatment screening. Data from 27 patients with complete pre- and post-treatment records of both the Epworth Sleepiness Scale [11] (ESS) and the Tinnitus Handicap Inventory [12] (THI) were analyzed.

The ESS was used to evaluate daytime sleepiness, with scores ≥ 10 indicating excessive daytime sleepiness. The THI, a validated 25-item questionnaire, was used to assess the impact of tinnitus on daily life. THI scores range from 0 to 100, with higher scores indicating more severe tinnitus. Patients were assessed at three timepoints: baseline (pre-treatment), 6–52 weeks, and at longer follow-ups (1–2 years and >2 years).

Statistical analysis was conducted using SPSS version 22.0. Means and standard deviations were computed. One-way ANOVA and Pearson's correlation were used to analyze the association between ESS and THI scores. A p-value of < 0.05 was considered statistically significant.

Results

Out of 413 SRBD patients, 76.75% were male ($n=317$) and 23.25% were female ($n=96$), with a mean age of 52.7 years. Fifty-two patients (12.6%) reported tinnitus. Among those, 27 patients had complete data sets and were included in the final analysis.

Short-term follow-up (6–52 weeks, $n=7$) showed a reduction in mean THI score from 1.43 to 0.43 ($p=0.038$). Two cases were followed for 1–2 years and over 2 years, both demonstrating sustained improvement in tinnitus symptoms (THI=0). However, there was no statistically significant correlation between ESS and THI scores ($p=0.278$).

Discussion

The results of this study demonstrate a trend toward improvement in tinnitus symptoms following the initiation of MAD therapy for SRBD, particularly in the short-term follow-up period. While the statistical correlation between ESS and THI scores was not significant, the reduction in THI scores post-treatment suggests a potential therapeutic benefit. This aligns with the hypothesis that improving sleep quality and reducing nighttime

hypoxia can modulate auditory perception and reduce tinnitus-related distress.

Several mechanisms may underlie the observed effects. The forward positioning of the mandible achieved by MADs not only stabilizes the upper airway but may also influence neuromuscular tension in the temporomandibular and cervical regions, which are known to be linked to somatic tinnitus [13,14]. Additionally, improved oxygenation and sleep architecture may have downstream effects on cortical and subcortical auditory processing centers, thereby modulating tinnitus perception [15].

These findings are consistent with newer studies suggesting that MAD therapy, while designed primarily for OSA, may influence tinnitus severity through secondary pathways such as improved sleep quality and temporomandibular relaxation [18]. However, other studies note that not all patients experience benefit, and that tinnitus may in fact worsen during fragmented sleep, such as after naps [19], highlighting the complex and heterogeneous nature of tinnitus.

This study is limited by its retrospective design and small sample size for longitudinal follow-up. The absence of a control group and lack of stratification between tinnitus subtypes (e.g., with vs. without hearing loss) further limit generalizability. However, the findings provide a foundation for prospective studies with larger cohorts and more refined diagnostic stratification. Future investigations could benefit from including objective sleep studies (e.g., polysomnography), audiometric testing, and validated psychometric instruments for assessing comorbid anxiety and depression.

Conclusion

MAD therapy for SRBD may offer additional benefits in reducing tinnitus severity, especially in the early treatment stages. While the correlation is not statistically significant, the clinical impact warrants further investigation.

Author declarations

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Conflict of interest

The authors declare no conflict of interest.

Ethics approval

This study was a retrospective review of anonymized patient records. Ethical approval was not required.

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