Tongue Base Collapse as a Predictor of Hypoglossal Nerve Stimulation Success for Obstructive Sleep Apnea

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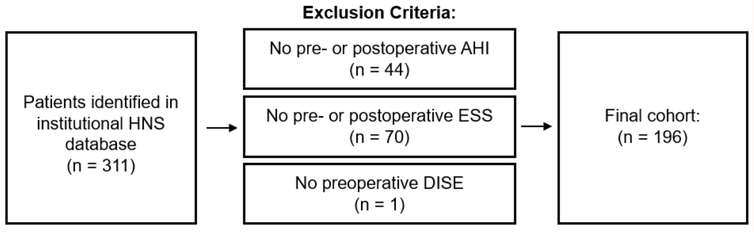
Objective

- Hypoglossal nerve stimulation (HNS) was first approved for obstructive sleep apnea (OSA) treatment for patients intolerant of continuous positive airway pressure (CPAP) therapy[1]
- Success of HNS is typically evaluated using Sher20 Criteria for objective measures and Epworth Sleepiness Scale (ESS), Functional Outcomes of Sleep Questionnaire (FOSQ), and Insomnia Severity Index (ISI) for subjective measures[2]
- Prior studies have investigated Drug-Induced Sleep Endoscopies (DISE) as predictors of HNS success, looking strictly at surgical success objectively[3]
- This study aims to determine whether Velum, Oropharynx, Tongue Base, and Epiglottis (VOTE) scores from Drug-Induced Sleep Endoscopies (DISE) are associated with discordant treatment outcomes and may help predict HNS treatment response

Methods

- Patients who underwent HNS implantation between 2019-2024 were included in this institutional cohort study
- Final cohort included 196 patients with the appropriate preoperative DISE and pre- and postoperative AHI and ESS scores (Figure 1)
- Patients were further separated into four concordance/discordance groups based on presence or lack of objective and subjective measures of improvement (Figure 2)
- Logistic regression and Fisher's exact tests were conducted to evaluate association between the groups and VOTE scores (Table 1)

Figure 1: Cohort Selection Flowsheet



Figures

Figure 2: Concordance/Discordance Groups

	Objective Success	Objective Failure
Subjective Success	Group 1: Concordant Success	Group 2: Placebo Effect
Subjective Failure	Group 3: Resistant Sleepiness	Group 4: Concordant Failure

Objective Success
Sher20 Criteria: - AHI < 20 - ≥ 50% reduction from baseline AHI

Subjective Success
- ESS decrease by ≥ 2 points pre- to post-operatively

Figure 3: DISE Tongue Base Collapse Score by Group

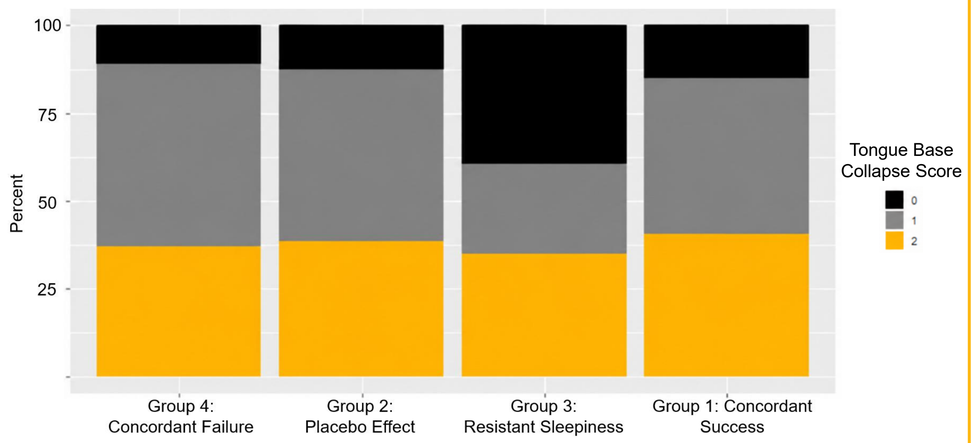


Table 1: Pairwise Post-Hoc Comparison of Tongue Base Collapse Using Fisher's Exact Test with Holm-Bonferroni Correction

Comparison 1	Comparison 2	N	Unadjusted p-value	Adjusted p-value
Group 4	Group 2	74	1.000	1.000
Group 4	Group 1	106	0.755	1.000
Group 2	Group 1	126	0.797	1.000
Group 4	Group 3	70	0.014	0.056
Group 2	Group 3	90	0.007	0.035*
Group 3	Group 1	122	0.004	0.022*

*Significance: $p < 0.05$
Group 1 = objective success and subjective success (concordant success)
Group 2 = objective failure and subjective success (placebo effect)
Group 3 = objective success and subjective failure (resistant sleepiness)
Group 4 = objective failure and subjective failure (concordant failure)

Results

- Patients with objective measures of improvement and lack of subjective improvement (resistant sleepiness) had statistically significant lower rates of tongue base collapse on DISE compared to patients in the concordant success and placebo effect groups (Table 1)
- There was no statistically significant differences in velum, oropharynx, or epiglottis VOTE scores between groups
- Rates of tongue base collapse did not differ significantly when comparing the concordant success, placebo effect, and concordant failure groups

Conclusion

- Predictive measures of concordant HNS success remains an important area of investigation, as objective improvement in sleep apnea does not always correspond with subjective symptomatic improvement
- Absence of tongue base collapse on preoperative DISE was more frequently observed among patients with objective improvement but persistent sleepiness, suggesting a potential association with discordant treatment outcomes
- Preoperative anatomic characteristics may help identify patients at risk for discordant outcomes
- Future studies should identify preoperative predictors of concordant success to improve patient selection, support individualized preoperative counseling, and establish realistic expectations regarding HNS outcomes

Citations

1. Olson, M. D., & Junna, M. R. (2021). Hypoglossal Nerve Stimulation Therapy for the Treatment of Obstructive Sleep Apnea. Neurotherapeutics, 18(1), 91–99. https://doi.org/10.1007/s13311-021-01012-x
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3. Bhat, A., Chang, J. L., & Durr, M. L. (2025). What are the Predictors of Success with Hypoglossal Nerve Stimulation? The Laryngoscope, 135(1), 5–7. https://doi.org/10.1002/lary.31740

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