https://doi.org/10.5664/jcsm.8882

JCSM | Journal of Clinical Sleep Medicine

COMMENTARY

A prognostic star was born: drug-induced sleep endoscopy for hypoglossal nerve stimulation

Commentary on Vanderveken OM, Maurer JT, Hohenhorst W, et al. Evaluation of drug-induced sleep endoscopy as a patient selection tool for implanted upper airway stimulation for obstructive sleep apnea. *J Clin Sleep Med*. 2013;9(5):433–438. doi:10.5664/jcsm.2658

Raj C. Dedhia, MD, MSCR[1,2]; Phillip Huyett, MD[3]

[1]*Department of Otorhinolaryngology, University of Pennsylvania Perelman School of Medicine, Philadelphia, Pennsylvania;* [2]*Penn Sleep Center, Penn Medicine, Philadelphia, Pennsylvania;* [3]*Massachusetts Eye and Ear Infirmary, Harvard Medical School, Boston, Massachusetts*

Hypoglossal nerve stimulation (HGNS) is a novel treatment for patients who are positive airway pressure (PAP) therapy intolerant and have moderate to severe obstructive sleep apnea. HGNS stands alone as a treatment option that specifically addresses a deficient physiologic reflex contributing to obstructive sleep apnea—namely, inadequate pharyngeal dilator muscle response. The HGNS device manufactured by Inspire Medical Systems (Minneapolis, MN) was Food and Drug Administration–approved following the publication of the pivotal STAR (Stimulation Therapy for Apnea Reduction) trial, which demonstrated a 66% response rate (apnea-hypopnea index decrease of 50% and to <20 events/h).[1] Despite upgrades in hardware, improvements in implantation technique, and enhanced knowledge of device adjustments, large postmarket studies have demonstrated modest improvements in overall response rates.[2] The response rates appear even more stagnant when nontitration studies (full night, single setting, type 3 sleep study) are used to define outcomes.[3]

Patient selection is widely felt to be the most important factor relating to success. Authors have found, among others, associations between lower therapeutic PAP pressures, older age groups, and lower preoperative oxygen desaturation index.[4,5] Others have proposed avoidance of implanting individuals with certain characteristics such as a proclivity toward insomnia or presumed low arousal threshold. In the realm of PAP alternatives, however, the assessment of an individual's dynamic upper airway anatomy during sleep reigns superlative. Drug-induced sleep endoscopy (DISE) was developed for this said purpose—to identify the functional anatomic changes that occur during pharmacologically induced sleep.

Vanderveken et al's landmark study (supported by Inspire Medical Systems) published in the *Journal of Clinical Sleep Medicine* in 2013 effectively placed DISE squarely in the HGNS spotlight.[6] In a small group of patients, the authors found that complete concentric collapse at the level of the soft palate (n = 5) during DISE resulted in unequivocally inferior polysomnographic outcomes compared with the absence of complete concentric collapse (n = 16). This specific DISE finding, complete concentric collapse, was henceforth adopted as an exclusion criterion, notably by the STAR trial and the Food and Drug Administration indication list for HGNS. Thus, as a direct consequence of this publication, DISE became a government-mandated diagnostic procedure for all patients undergoing HGNS evaluation.

Several modestly powered studies have sought to expand upon Vanderveken et al's work, seeking additional DISE findings that correlate with HGNS outcomes.[7–9] As these studies have yielded mixed results, a large multicenter, collaborative effort supported by the International Sleep Surgical Society was initiated in 2018. Using blinded DISE reviewers and the velum-oropharynx-tongue-epiglottis classification, this effort led by the last author (P.H.) has demonstrated worse HGNS outcomes with patients having complete oropharyngeal lateral wall collapse compared with those with complete tongue and anteroposterior palate collapse (unpublished data).

There remain several important limitations to current DISE practice, including a lack of standardized sedation protocols, questionable correlation to natural sleep, and most importantly, inability to provide reliable and quantifiable findings.[10] A recent effort led by first author (R.C.D.) utilized nasal PAP during DISE to determine the palatal opening pressure for each individual (n = 27).[11] The study team concluded that HGNS responders required significantly lower palatal opening pressure (5.0 vs 9.2 cm H_2O) compared with HGNS nonresponders. In this way, DISE can provide powerful predictive data by combining site of obstruction with measures of airway distensibility.

In summary, DISE provides an opportunity for physiologic study of patients undergoing evaluation for PAP therapy alternatives. As Vanderveken et al have demonstrated, DISE findings have implications on treatment success for HGNS patients. This small study provided an investigative compass

Downloaded from jcsm.aasm.org by 49.145.234.186 on March 20, 2022. For personal use only. No other uses without permission.
Copyright 2022 American Academy of Sleep Medicine. All rights reserved.

for DISE research over the last 7 years. Through continued multicenter collaboration and a focus on quantifiable, objective, and reproducible DISE measurements, this prognostic star of HGNS therapy will continue to reach new heights.

CITATION

Dedhia RC, Huyett P. A prognostic star was born: drug-induced sleep endoscopy for hypoglossal nerve stimulation. *J Clin Sleep Med*. 2020;16(suppl_1):15S–16S.

REFERENCES

1. Strollo PJ Jr, Soose RJ, Maurer JT, et al; STAR Trial Group. Upper-airway stimulation for obstructive sleep apnea. *N Engl J Med.* 2014;370(2):139–149.
2. Thaler E, Schwab R, Maurer J, et al. Results of the ADHERE upper airway stimulation registry and predictors of therapy efficacy. *Laryngoscope*. 2020;130(5): 1333–1338.
3. Dedhia RC, Woodson BT. Standardized reporting for hypoglossal nerve stimulation outcomes. *J Clin Sleep Med.* 2018;14(11):1835–1836.
4. Woodson BT, Strohl KP, Soose RJ, et al. Upper airway stimulation for obstructive sleep apnea: 5-year outcomes. *Otolaryngol Head Neck Surg.* 2018; 159(1):194–202.
5. Lee CH, Seay EG, Walters BK, Scalzitti NJ, Dedhia RC. Therapeutic positive airway pressure level predicts response to hypoglossal nerve stimulation for obstructive sleep apnea. *J Clin Sleep Med.* 2019;15(8):1165–1172.
6. Vanderveken OM, Maurer JT, Hohenhorst W, et al. Evaluation of drug-induced sleep endoscopy as a patient selection tool for implanted upper airway stimulation for obstructive sleep apnea. *J Clin Sleep Med.* 2013;9(5):433–438.
7. Mulholland GB, Dedhia RC. Success of hypoglossal nerve stimulation using mandibular advancement during sleep endoscopy. *Laryngoscope*. Published online February 28, 2020. doi: 10.1002/lary.28589.
8. Ong AA, Murphey AW, Nguyen SA, et al. Efficacy of upper airway stimulation on collapse patterns observed during drug-induced sedation endoscopy. *Otolaryngol Head Neck Surg.* 2016;154(5):970–977.
9. Xiao R, Trask DK, Kominsky AH. Preoperative predictors of response to hypoglossal nerve stimulation for obstructive sleep apnea. *Otolaryngol Head Neck Surg.* 2020;162(3):400–407.
10. Park D, Kim JS, Heo SJ. Obstruction patterns during drug-induced sleep endoscopy vs natural sleep endoscopy in patients with obstructive sleep apnea. *JAMA Otolaryngol Head Neck Surg.* 2019;145(8):730–734.
11. Seay EG, Keenan BT, Schwartz AR, Dedhia RC. Evaluation of therapeutic positive airway pressure as a hypoglossal nerve stimulation predictor in patients with obstructive sleep apnea. *JAMA Otolaryngol Head Neck Surg.* 2020; 146(8):691–698.

SUBMISSION & CORRESPONDENCE INFORMATION

Submitted for publication October 8, 2020
Submitted in final revised form October 8, 2020
Accepted for publication October 9, 2020
Address correspondence to: Raj C. Dedhia, MD, MSCR, Department of Otorhinolaryngology, University of Pennsylvania, 3400 Spruce St, Ravdin 5, Philadelphia, PA 19104; Email: raj.dedhia@pennmedicine.upenn.edu

DISCLOSURE STATEMENT

Both authors have seen and approved the manuscript. Dr. Dedhia receives associated support for this work from the National Institutes of Health (1R01HL144859-01). The authors report no conflicts of interest.

Downloaded from jcsm.aasm.org by 49.145.234.186 on March 20, 2022. For personal use only. No other uses without permission.
Copyright 2022 American Academy of Sleep Medicine. All rights reserved.