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Impact of Nasal Surgery on Post-implantation Sleep Outcomes of Hypoglossal Nerve Stimulation

Collin D. Smith, DO[1], Drew P. Phillips, DO[1], Jacob J. Markovicz, DO[1], Eric L. Bauer, MD[2] and Daniel A. Larson, MD[2]

1. Kettering Health Dayton - Otolaryngology Head & Neck Surgery
2. Southwest Ohio ENT Specialists

Abstract / Introduction

Hypoglossal nerve stimulator implantation is a growing modality in the treatment of obstructive sleep apnea (OSA) in adults. According to the American Academy of Sleep Medicine the prevalence of OSA in the general population is about 12% or approximately 29.4 million people. And of these 29.4 million only about 20% of them are diagnosed.[1] OSA carries an increased risk of cardiovascular disease, including hypertension, myocardial infarction, as well as diabetes mellitus if left untreated. These comorbidities associated with OSA have tremendous economic ramifications. Undiagnosed OSA is estimated to cost the US population upwards of $149.6 million in healthcare costs.[2] Continuous positive airway pressure (CPAP) is first line therapy, however a large subset of patients prescribed CPAP are unable to tolerate the device and have poor adherence as a result. Hypoglossal nerve stimulator implantation serves as both an adjuvant treatment with CPAP to improve adherence, and in some select patients can serve as stand alone treatment. In order to be a candidate for the hypoglossal nerve stimulator patients must have a BMI <32, an apnea-hypopnea index of 15-65, >18 yrs of age with absence of concentric airway collapse at the level of the velopharynx as confirmed on a drug induced sleep endoscopy (DISE), and tried and failed CPAP. Candidates who ultimately undergo implantation however, can have a variable response post-operatively of which older age and lower BMI have been identified as good predictors of treatment success. The need to identify additional patient specific factors that can be predictors of good treatment response still exists. We propose that patients who have received careful assessment and surgical correction of nasal obstruction symptoms prior to hypoglossal nerve stimulator implantation show improved postoperative response.

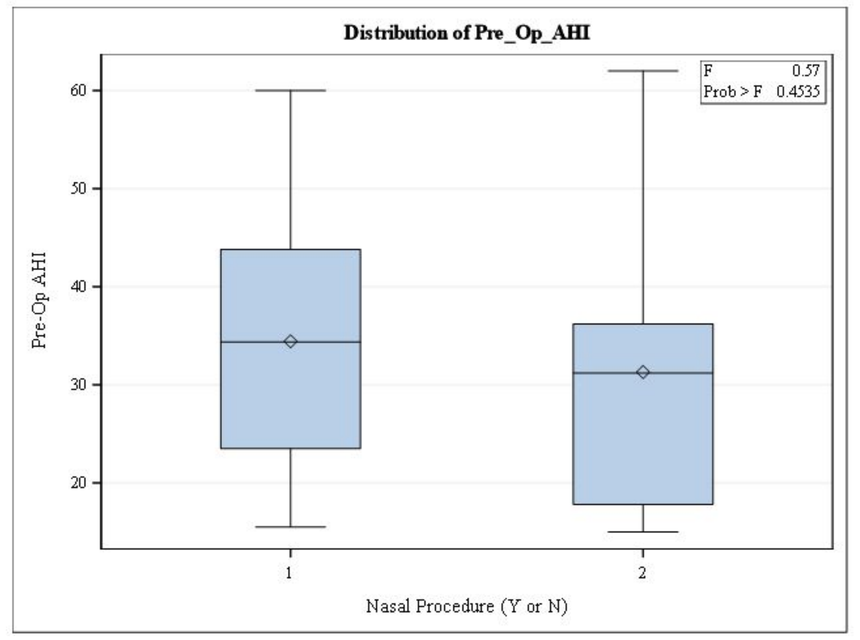
Methods

This retrospective review was performed within a local health system and data was collected between June 2020 and June 2022. Surgeries were exclusively performed by two authors, ELB and DAL. demographic information including age, sex, and BMI were obtained from the charts. In addition, patient charts were reviewed for either a past-surgical history of nasal surgery or planned nasal procedure ahead of HGNS implantation. AHI was obtained from pre- and post-operative sleep studies that were reviewed, when available. 43 Patients were identified to have undergone HGNS. They were stratified into groups by those who receive nasal surgery (NS), n=14, and those who have had no nasal surgery (NNS), n =29. Additional variables such as electrode and voltage settings were also examined. Patients were categorized into 4 groups based on electrode settings; unknown (0), positive, negative, positive (1). negative, negative, positive (2). negative, positive (3).

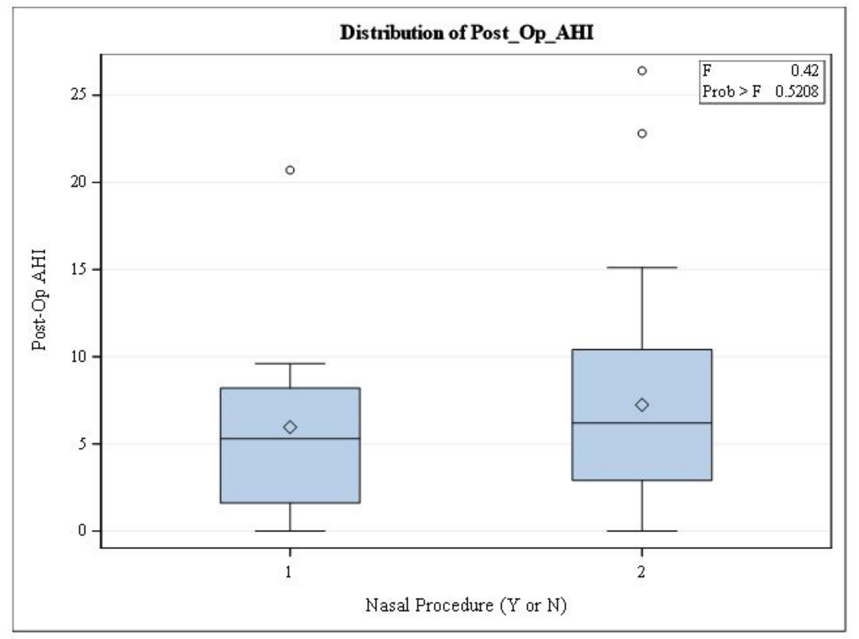
Results

Both NS and NNS experienced statistically significant decreases in the difference between pre- and post-operative AHI. The average reduction in post-operative AHI in the NS group was 86.21%, while the average reduction in the NNS group was 79.76%. However, this difference was not statistically significant (p >0.05). Pre-operative AHI distributions between the NS and NNS groups were similar as demonstrated by Figures A and B. The average adjusted AHI reduced by 90.58% in '0' group, the mean adjusted AHI reduced by 79.29% in '1' group, it reduced by 77.95% in '2' group, and it reduced by 65.59% in '3' group There is a significant change in AHI over time but "group" didn't matter. All 3 groups had a significant change.

A



B



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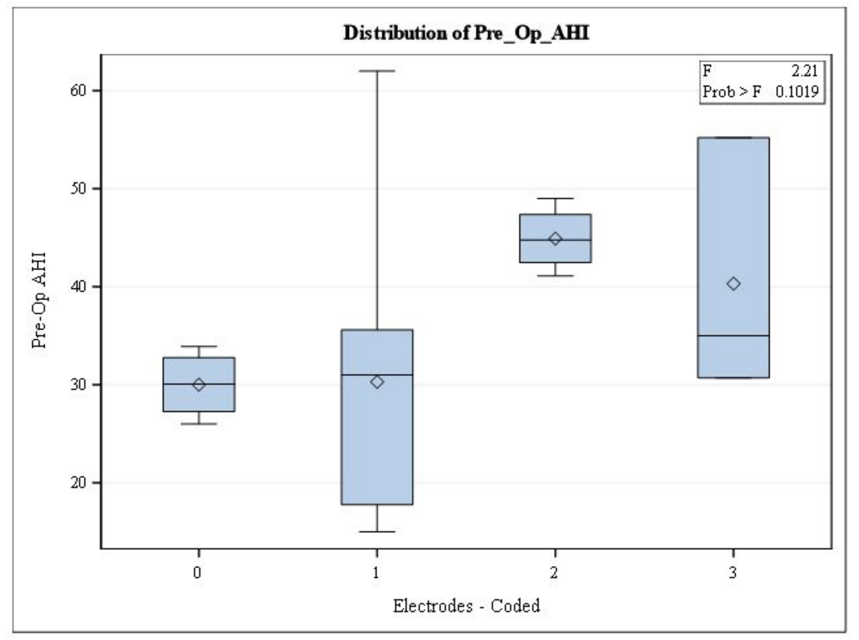

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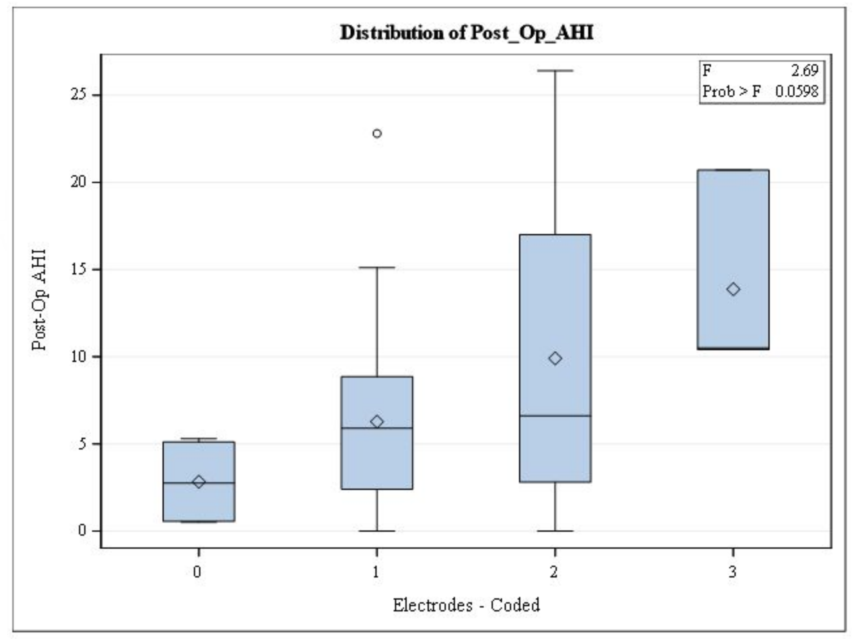

Figure A and B. Box plot comparing Pre-operative AHI distribution between the NS and NNS groups.

Figure C and D. Box plot demonstrates the mean-adjusted pre- and post-operative AHI with patient groups stratified by electrode settings.

E

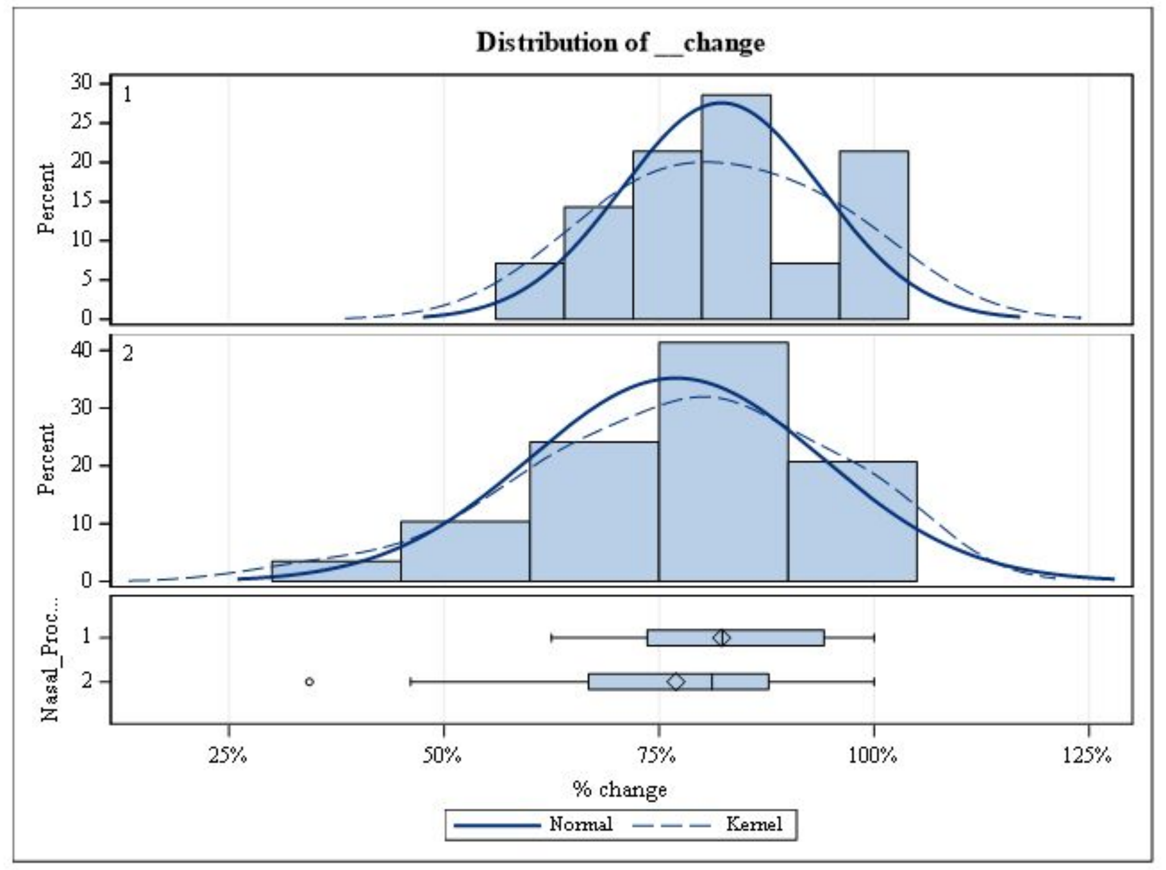

Figure E. Comparison of percent change in pre- and post-operative AHI in both the NS and NNS groups.

Conclusion

Hypoglossal nerve stimulation has revolutionized treatment for obstructive sleep apnea for patients who were previously under-treated due to intolerance of CPAP. In addition, it allows for personalized treatment in the form of post-operative titration to optimize patient comfort and impact on obstructive events. Procedures on other anatomical regions of the airway have not been well studied for their effect of working with Hypoglossal nerve stimulation. Our goal in this pilot work was to see if there is any possible relationship between nasal surgery, HGNS implantation, and overall AHI reduction. Unfortunately, we were limited to a retrospective review and our sample size is small, which likely contributed to the lack of statistical significance within our results. However, the NS group did experience a relatively larger mean decrease in post-operative AHI than the NNS group. In future works which may expand beyond retrospective review this relationship should be further elucidated and may impact surgical decision making when evaluating patients for HGNS implantation.

References

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