Successful Multilevel Surgical Management of Persistent Obstructive Sleep Apnea and Severe Nocturnal Hypoxemia Following Hypoglossal Nerve Stimulation in an Elderly Female

James L. Connolly, MD, FAASM, FAOAA, Courtney Lombardino, BS

Introduction

Persistent obstructive sleep apnea (OSA) despite excellent adherence to hypoglossal nerve stimulation (HGNS) remains a significant clinical challenge. Drug-induced sleep endoscopy (DISE) can identify residual sites of obstruction and guide adjunctive surgical intervention. We present a case of severe sleep-related hypoxemia and persistent moderate OSA despite exemplary Inspire® usage that was successfully treated with hyoid suspension.

Case Presentation

A 72-year-old female presented with moderate OSA, severe nocturnal hypoxemia, severe snoring, anxiety, and chronic insomnia. Baseline home sleep testing (HST) performed on September 25, 2024 demonstrated:

- AHI: 16.2 events/hour
- Lowest oxygen saturation (LSAT): 72%
- Time <89% oxygen saturation: 39 minutes
- BMI: 18.9 kg/mÇ
- Elevated Epworth Sleepiness Scale score

DISE demonstrated:

- Velum: V-2 (anteroposterior collapse)
- Oropharynx: O-0, Tongue base: T-2, Epiglottis: E-2

Additional findings included:

- Minimal lingual tonsil tissue & no positional improvement
- Significant tongue base & epiglottic improvement with jaw thrust
- Partial palatal improvement with jaw thrust

Based on favorable anatomy and DISE findings, Inspire hypoglossal nerve stimulation was implanted.

Initial HGNS Outcomes

After approximately two months of therapy:

- Device usage: 100%, Nights >4 hours: 97%
- Average nightly use: 9 hours 46 minutes
- Therapeutic amplitude: 2.1 volts

Despite excellent compliance, repeat HST while using Inspire at 2.1 volts demonstrated persistent disease:

- AHI: 15.3 events/hour
- LSAT: 65%
- Time <89% oxygen saturation: 131 minutes

The patient subsequently increased therapy amplitude to 2.7 volts and maintained:

- 87% of nights >4 hours
- Average nightly use: 7 hours 4 minutes

Inspire Fine-Tune Polysomnography

An attended Inspire titration study was performed with amplitudes ranging from 2.3 to 2.8 volts. Findings included:

- Poor therapeutic response across tested amplitudes
- Persistent obstructive respiratory events
- Severe insomnia
- Sleep efficiency: 53.7%
- LSAT: 72%
- Time <88% oxygen saturation: 31.2 minutes

These findings suggested persistent non-palatal airway obstruction despite effective HGNS engagement.

Adjunctive Sleep Surgery

Given persistent tongue base and epiglottic obstruction identified on DISE and inadequate response to HGNS alone, an AirLift hyoid suspension was performed on September 26, 2025.

Postoperative Outcomes

Follow-up HST while using Inspire at 2.2 volts demonstrated marked improvement:

- AHI: 4.8 events/hour
- LSAT: 81%
- Time <89% oxygen saturation: 24.3 minutes
- Mild residual snoring only

Device compliance remained excellent with average nightly use of 8 hours 59 minutes

Discussion

This case highlights several important concepts in contemporary sleep surgery:

1. Excellent HGNS adherence does not guarantee therapeutic success.
2. Persistent tongue base and epiglottic collapse may remain clinically significant despite adequate hypoglossal nerve stimulation.
3. DISE findings can guide identification of residual obstruction and selection of adjunctive procedures.
4. Hyoid suspension may provide substantial additional benefit in selected patients with persistent hypopharyngeal and epiglottic collapse.
5. Objective improvement was demonstrated by a reduction in AHI from 15.3 to 4.8 events/hour while simultaneously lowering stimulation amplitude from 2.7 to 2.2 volts.
6. Significant improvement in nocturnal oxygenation and snoring accompanied normalization of respiratory event burden.

Conclusion

A 72-year-old female with moderate OSA, severe nocturnal hypoxemia, insomnia, and severe snoring experienced persistent disease despite exceptional Inspire compliance and multiple stimulation adjustments. DISE-directed AirLift hyoid suspension successfully addressed residual hypopharyngeal obstruction, resulting in normalization of OSA severity, improved oxygenation, reduced snoring, and continued excellent device adherence. This case demonstrates the value of adjunctive sleep surgery for carefully selected HGNS nonresponders and underscores the importance of a multilevel airway management strategy.

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