

PERCUTANEOUS APPROACHES TO HYPOGLOSSAL NERVE STIMULATION

A Pilot Study During Drug-Induced Sleep Endoscopy

David T. Kent MD. & Yike Li MD., PhD.
Dept. Otolaryngology-Head and Neck Surgery

VANDERBILT  UNIVERSITY
MEDICAL CENTER

 **ATS 2024**

A19 - THE FRONTLINE SLEEP APNEA:
INNOVATIONS IN OSA (#8139)
May 19, 2024

DISCLOSURE

Li

- **None**

Kent

- Invicta Medical, Inc
 - Consultant; research support
- Nyxoah SA
 - Scientific advisory board member; intellectual property interests; research support
- Inspire Medical Systems, Inc
 - Research support

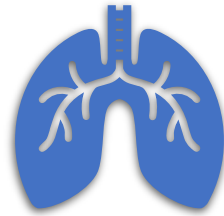
BACKGROUND



Obstructive sleep apnea (OSA)

Up to 50% prevalence

Multiple chronic comorbidities



Continuous positive airway pressure (CPAP)

Suboptimal adherence



Hypoglossal nerve stimulation (HNS)

Activating tongue protrusor

Eligibility: AHI < 65 events/hour,
BMI < 35 kg/m²

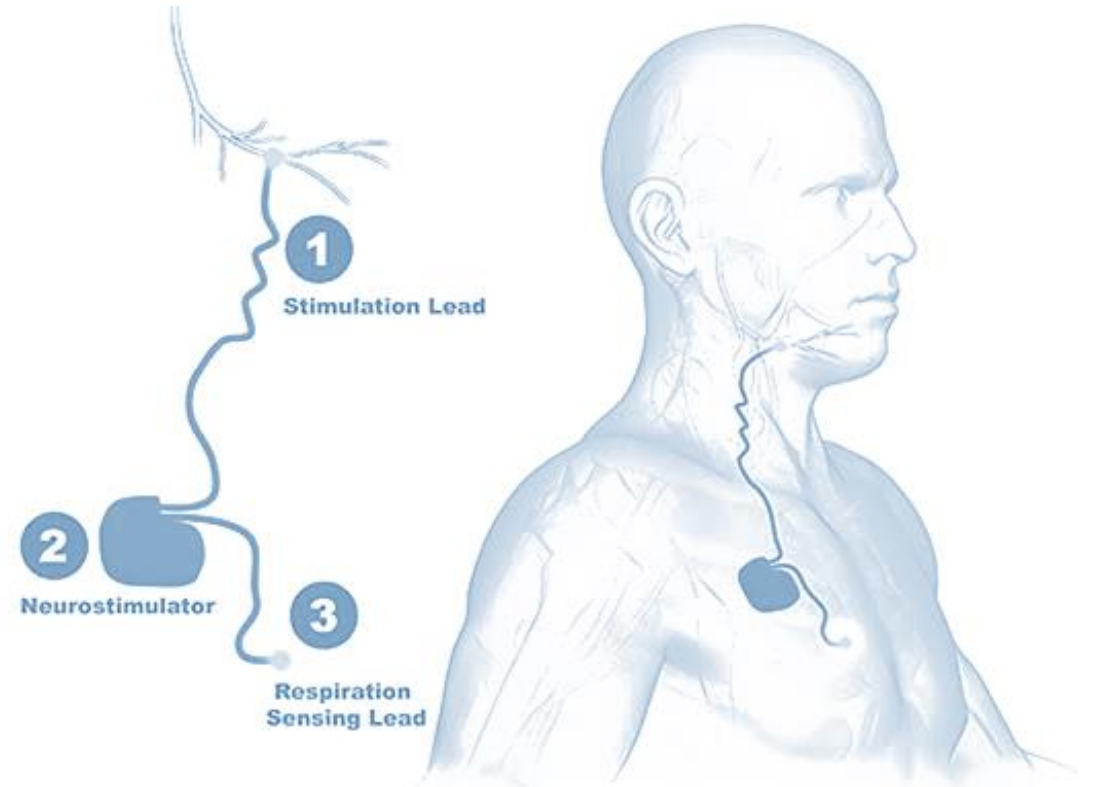
HNS AND IMPLANT SURGERY

Components

- An Implantable Pulse Generator (IPG)
- A neurostimulation lead w/ cuff
- A respiratory sensing lead
- An external control

Two incisions -> surgical morbidity

- Pain, nerve injury, pneumothorax, hematoma, & infection



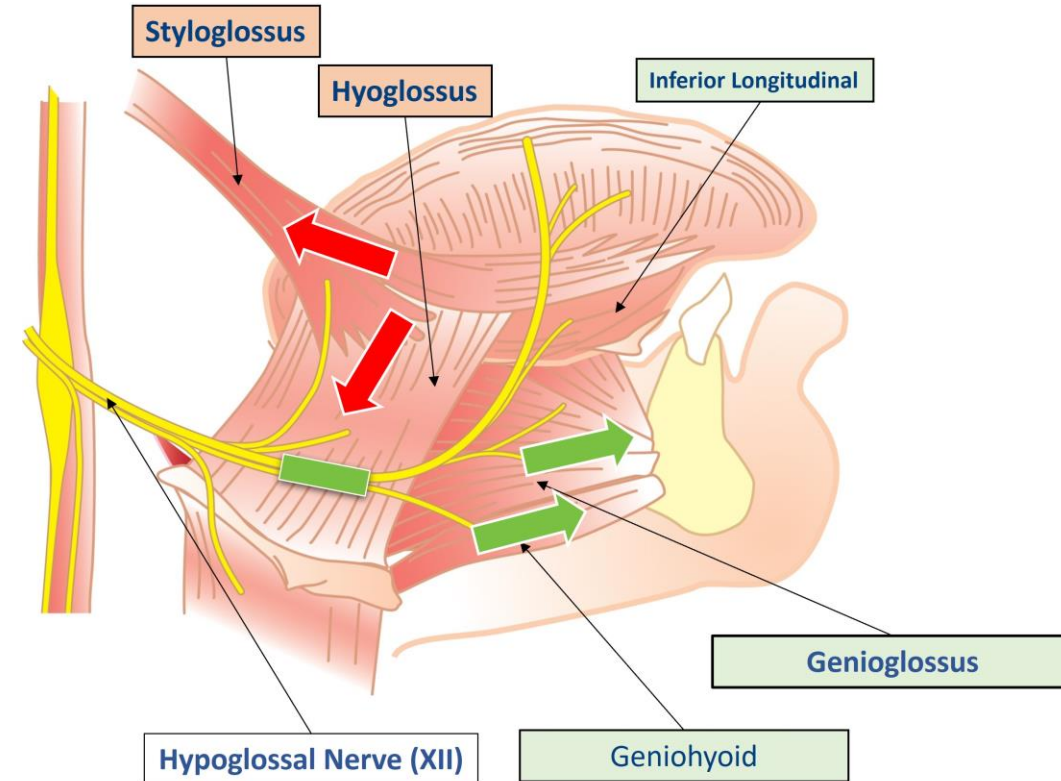
MOTIVATIONS AND OBJECTIVES

HGN identifiable via ultrasound ¹

- Electrode placement through needle insertion
- Maximize protrusion by capturing the distal branch

Goals

- Evaluate different percutaneous approaches to HNS electrode array placement
- Assess the impact on airway collapsibility



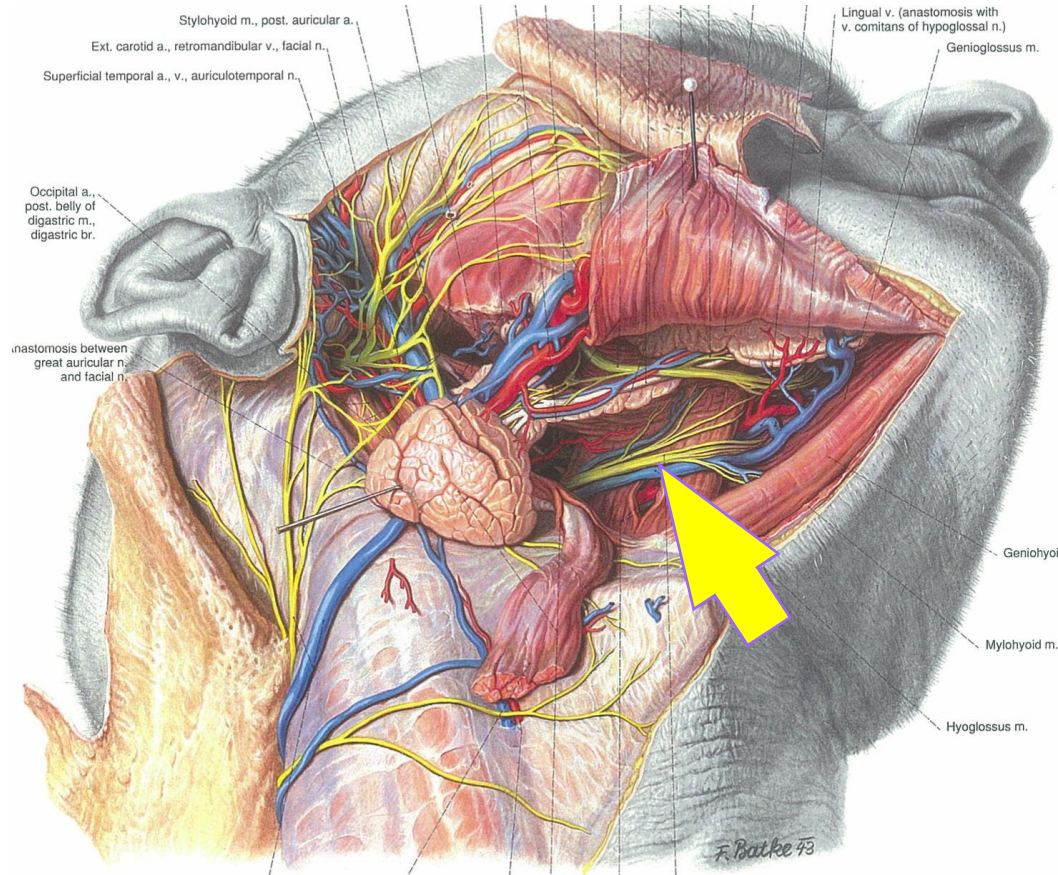
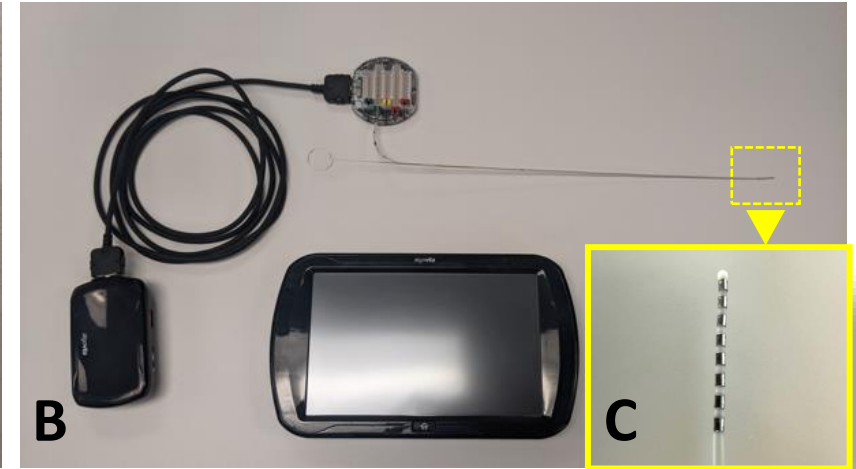
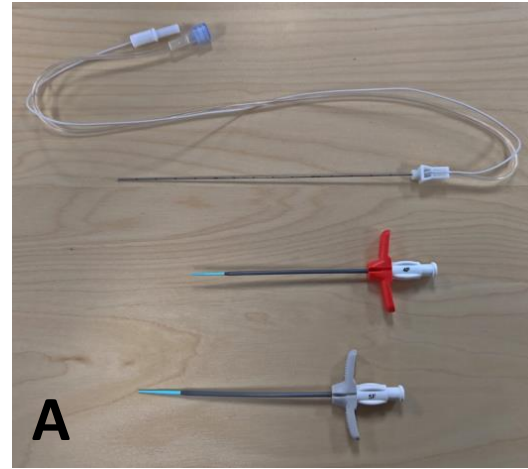
METHODS - HNS

Equipment

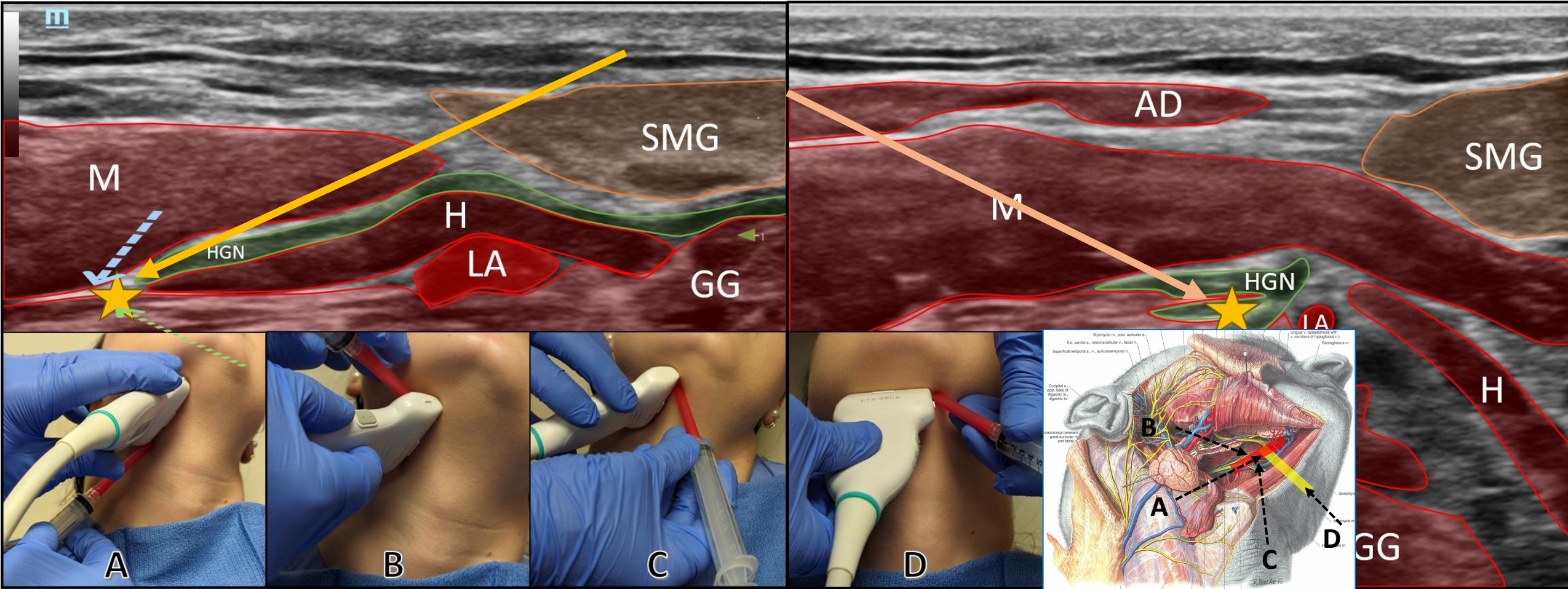
- Insertion tools (A)
- Neuromodulation system (B)
- Electrode array (C)

Anatomic approaches

- Intraoral, Posterior, Anteromedial, Anterolateral, and Paracoronal



PERCUTANEOUS APPROACHES



The posterior (A), anterolateral (B), and anteromedial (C) and paracoronal (D) approaches

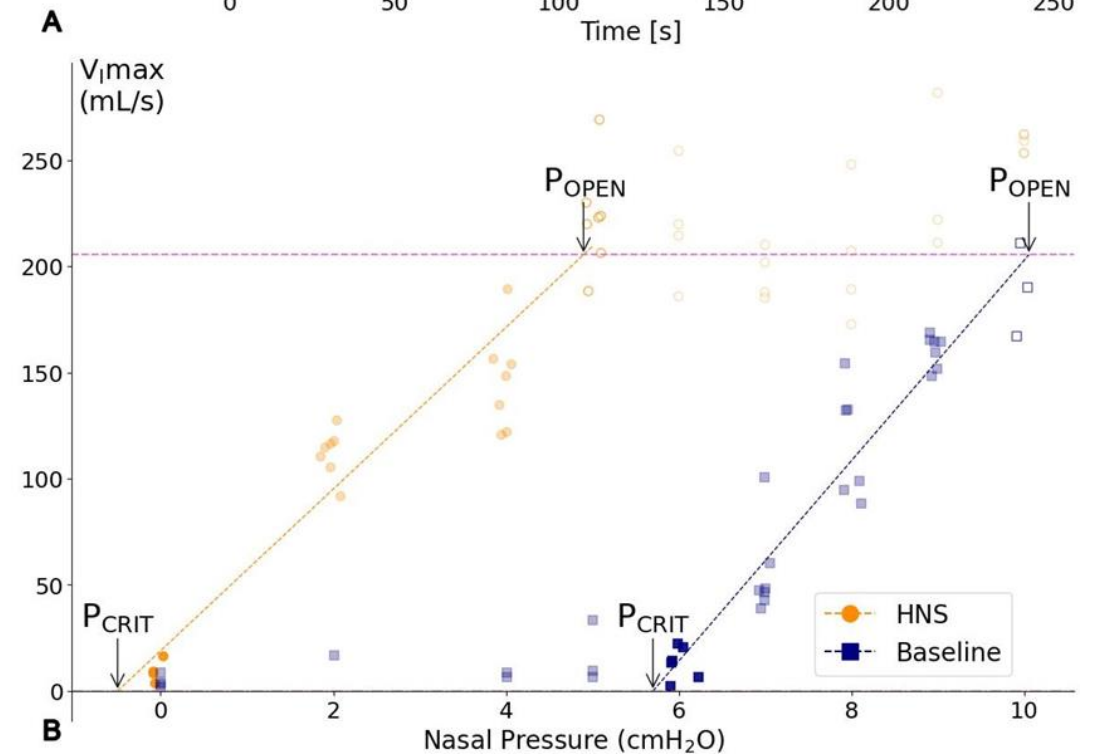
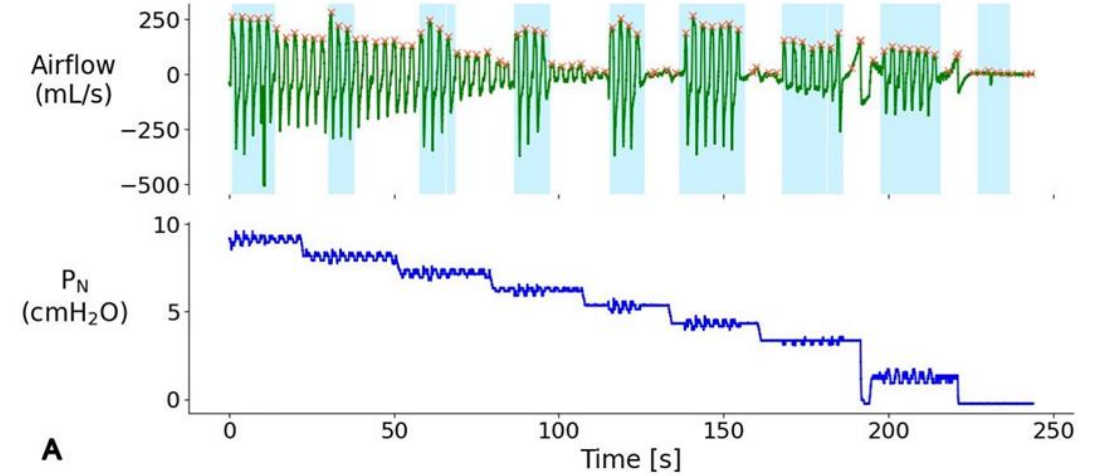
METHODS - PHYSIOLOGY

DISE

- Moderate-to-severe OSA patients

Pneumotach + Nasal mask + CPAP

- CPAP decreased in 1 cm H₂O increment
- HGNS 3 off/on/off
- Pressure-flow relationship
- ΔP_{crit} and ΔP_{open}



RESULTS

22 total attempts in 14 patients

Tongue protrusion

- Needle: 100%
- Electrode: mixed outcomes

Comparable effects to previous HNS data^{1,2}

- ΔP_{CRIT} : -3.2; ΔP_{OPEN} : -2.4

No adverse events

Anatomic Approach	Participants (n)	Guide Needle Activation (n)	Tongue Protrusion with Electrode (n)	ΔP_{CRIT} (cmH2O)	ΔP_{OPEN} (cmH2O)
Intraoral	3	3	0	-	-
Anteromedial	2	2	0	-	-
Anterolateral	5	5	5	-4.0 ± 2.0	-3.6 ± 2.4
Paracoronal	4	4	3	-3.3 ± 2.1	-5.9 ± 3.0
Posterior	8	8	2	-4.3	-7.7



1. Oliven A. et.al. 2003 *J Appl Physiol*
2. Oliven A. et.al. 2010 *J Appl Physiol*

IMPLICATIONS

Paracoronaral & anterolateral: most effective

- Orthogonal to distal HGN, ↓ risk of retrusor capture

Percutaneous electrode delivery: feasible

- Decrease surgical morbidity
- In-office procedure

ACKNOWLEDGEMENTS



David Kent, MD



Alan Schwartz, MD



David Zealear, PhD



Chris Lindsell, PhD



Matt Shotwell, PhD



Holly Budnick, APRN



Katie Hartley, RPSGT



C. LeeAnn Wells, RPSGT



Megan Hall, BS



Kate Von Wahlde, MJ, CCRP

Thank you!

VANDERBILT  UNIVERSITY
MEDICAL CENTER