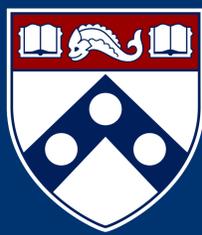


Upper Airway Collapsibility and Expansion Sphincter Pharyngoplasty Outcomes: A Preliminary Analysis



Manan H. Parekh BA¹, Eric R. Thuler MD, PhD¹, Akshay Tangutus MS¹, Everett G. Seay BS, RPSGT¹, Alan R. Schwartz MD¹, Raj C. Dedhia MD, MSCR^{1,2}
¹University of Pennsylvania – Department of Otorhinolaryngology – Head and Neck Surgery, ²University of Pennsylvania – Department of Medicine

Abstract

- Objective:** Explore the relationship between upper airway collapsibility obtained during drug induced sleep endoscopy (DISE) and AHI reduction after expansion sphincter pharyngoplasty (ESP) for obstructive sleep apnea (OSA).
- Methods:** This retrospective analysis consisted of a cohort of patients who underwent drug induced sleep endoscopy with positive airway pressure (DISE-PAP) and subsequent ESP from January 2020 to December 2022. DISE-PAP was performed pre-operatively to determine the pressure level at which inspiratory flow limitation was completely abolished (pharyngeal opening pressure). Baseline anthropometric/demographic data at initial presentation were obtained as well as pre- and post-operative full night sleep study data. A two-sided t-test was used to assess significance.
- Results:** There were 24 patients in this cohort. Patients were generally middle-aged (52.5 ± 9.1 years), White (88%), male (67%), overweight (29.6 ± 4.3 kg/m²) and with severe OSA (34.3 ± 22.0 events/hour). The mean pre-operative PhOP was 8.9 ± 3.4 cm H₂O. The mean reduction in AHI after ESP was 21.6 ± 21.0 events/hour. Higher PhOP values significantly correlated with better response after ESP ($r=0.49$, $p=0.015$).
- Conclusion:** In our cohort, higher pre-operative PhOP was significantly associated with greater reductions in AHI after ESP. Nearly all patients in our cohort had velopharyngeal and oropharyngeal collapse on DISE. Together, our data suggest PhOP presents a potential additive predictor of success after ESP.

Background

- Obstructive sleep apnea (OSA) is a sleep-breathing disorder characterized by recurrent airway collapse
- Patients intolerant to gold-standard continuous positive airway pressure (CPAP) may seek PAP alternatives, such as expansion sphincter pharyngoplasty (ESP)
- Drug induced sleep endoscopy (DISE) is commonly used to select patients for surgery commonly via the VOTE classification (velum, oropharynx, tongue, epiglottis)
- Response rate to ESP remains ~66% despite candidacy criteria of velopharyngeal/oropharyngeal collapse
- Addition of positive airway pressure during DISE enables measurement of airway collapsibility, a key pathogenic factor in OSA
- Airway collapsibility measures predict response to PAP alternatives (e.g. hypoglossal nerve stimulation)

Can pre-operative airway collapsibility measured during DISE predict response to ESP for OSA?

Methods

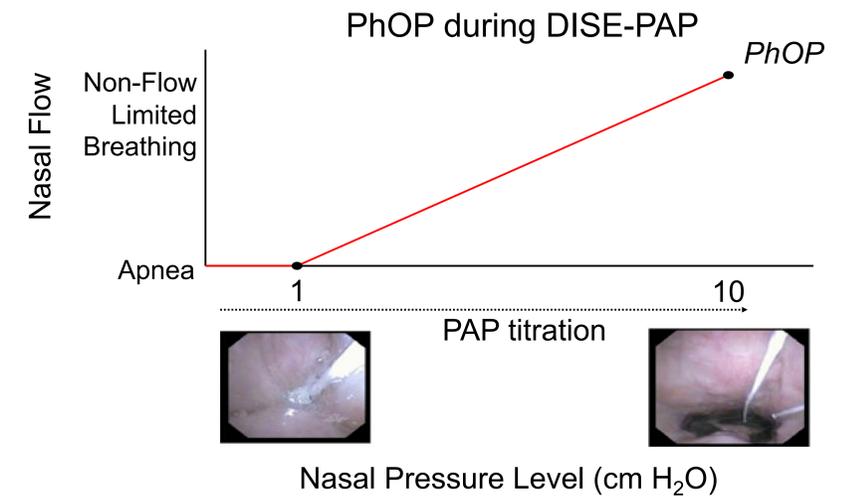
This retrospective study included a cohort of patients who underwent drug induced sleep endoscopy with PAP titration and expansion sphincter pharyngoplasty between January 2020 and December 2022.

Drug Induced Sleep Endoscopy with Positive Airway Pressure (DISE-PAP)

- Propofol-induced sleep
- Fiberoptic nasopharyngoscopy
- Concurrent pneumotachometer for objective nasal flow assessment
- Stepwise PAP titration until complete abolishment of flow limited breathing

Statistical Analysis

- Two-sided t-tests
- Regression Analysis



Results

Table 1: Patient Characteristics (n=24)

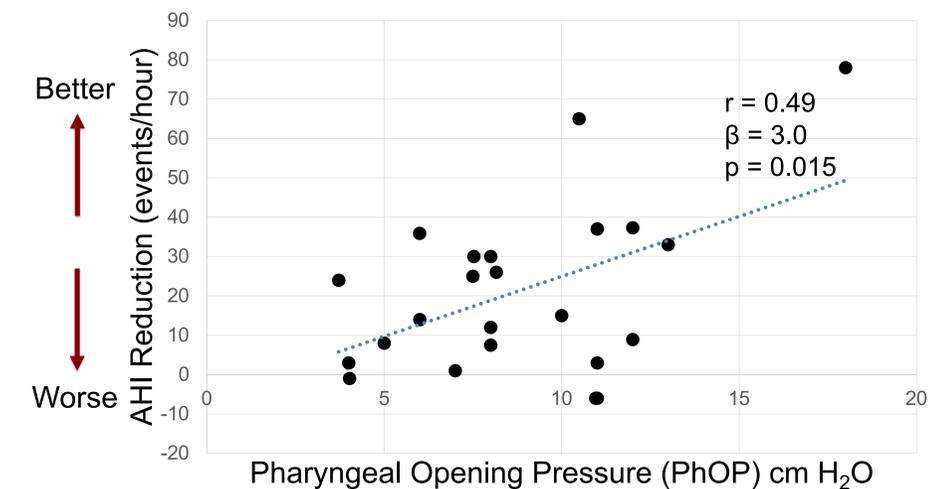
	Mean	SD		0	1	2
Male, (%)	67%	-	Velum	4%	17%	79%
Age, years	52.5	9.1	Oropharynx	0%	4%	96%
BMI, kg/m ²	29.6	4.3	Tongue	50%	42%	8%
AHI, events/hr	34.3	22.0	Epiglottis	92%	4%	4%

Table 2: Pre- and Post-operative Sleep Study Data

	Pre-ESP	Post-ESP	p
BMI	29.6 ± 4.3	27.3 ± 5.8	0.17
Supine Sleep, %	38.7 ± 22.0	42.8 ± 31.4	0.66
AHI, events/hr	34.3 ± 22.0	12.8 ± 22.5	<0.01
Supine AHI, events/hr	42.1 ± 19.9	26.1 ± 22.2	<0.01
Non-supine AHI, events/hr	18.0 ± 15.3	11.4 ± 10.5	0.59
TST <90%, minutes	17.4 ± 19.2	14.9 ± 23.4	0.69

AHI and supine AHI were significantly lower in patients after ESP

Figure 1: Pre-operative PhOP and AHI Reduction after ESP



Mean pre-operative PhOP was 8.9 ± 3.4 cm H₂O. For every 1 cm H₂O increase in PhOP, post-operative AHI improved by 3.0 events/hour after ESP

Discussion

In our cohort of patients who underwent ESP for OSA, we found patients with higher pharyngeal opening pressures (PhOP) had better reductions in AHI after surgery. Further, given that nearly every patient in this cohort had velopharyngeal collapse and every patient had oropharyngeal collapse, we posit PhOP as an additional predictor of success after ESP. We suggest velopharyngeal collapse, the proximal chokepoint in the airway, is associated with increased respiratory effort, leading to higher PhOP. Therefore, higher PhOP may identify patients in whom palatal collapse, as opposed to tongue base collapse, presents as the primary obstruction site. However, this cohort is small and further studies with a larger sample size are needed to better characterize this relationship.

Future Directions:

- Larger sample size
- Compare pre- and post-operative PhOP values to understand change in collapsibility after ESP

Strengths:

- DISE-PAP is a controlled protocol with objective collapsibility measurement
- Patients had full-night efficacy studies post-operatively

Limitations:

- Single pre- and post-operative sleep study time points are prone to variability
- Small cohort of patients limits power
- AHI is not a perfect measure of treatment success