CPAP Compliance and Cardiovascular Outcomes after Endoscopic Sinus Surgery in Patients with CRS and OSA

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OBJECTIVE

- Chronic Rhinosinusitis (CRS) is a heterogenous group of conditions characterized by >12 weeks of chronic sinus inflammation[1].
  - Associated with increased cardiovascular disease factors due to endothelial dysfunction[2].
- Obstructive Sleep Apnea (OSA) is a chronic upper-airway condition involving intermittent hypoxia, arousal, and upper airway collapse during sleep[3].
  - Independent risk factor for pulmonary hypertension (pHTN), atrial fibrillation (AFib), and hypertension (HTN) due to physiological disturbance[4].
- CRS and OSA frequently co-exist. Functional Endoscopic Sinus Surgery (FESS) is the primary treatment for CRS and Continuous positive airway pressure (CPAP) therapy is a commonly used treatment for OSA, but **nasal resistance and dryness can limit CPAP adherence** [3,5].
- **We compare the effects of FESS on CPAP adherence and cardiovascular outcomes for CRS and OSA patients.**

METHODS

- Retrospective review of 269 patients with CRS and OSA at a single institution in the last 10 years
- Patients were stratified into two cohorts based on FESS status:
  - FESS naive cohort (control): 149 patients
  - FESS cohort: 120 patients
- Controls selected using propensity-based matching; match quality was determined by demographic characteristics and number of shared baseline comorbidities.
- Assessed 5-year incidence of new-onset cardiovascular conditions after the index date between the two groups.
- CPAP adherence was also assessed (percentage of days with ≥4 hours of use)
  - Reasons for non-adherence were also collected.
  - Excluded patients with no CPAP usage in this analysis
- Descriptive statistics summarized baseline characteristics
- Incidence of outcomes was compared between cohorts using Chi-Square analysis (statistical significance defined as a two-sided p-value <0.05).
- Controlling for demographic characteristics and baseline comorbidities, univariate and multivariate logistic regression was conducted using SPSS software to estimate adjusted odds ratios for associations between FESS and new-onset cardiovascular outcomes and CPAP compliance.

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TABLES

Table 1. Baseline Demographic Characteristics of Patients with CRS and OSA Stratified by FESS Status

Demographic Variable	FESS naïve (n=149) N (%)	FESS (n=120) N (%)	p-value
Ethnicity: Hispanic or Latino	3 (2.0)	7 (5.8)	0.186
Race: Black or African American	65 (43.6)	39 (32.5)	0.071
Race: White	78 (52.3)	75 (62.5)	0.104
Sex (M)	64 (43.0)	66 (55)	0.065

Table 2. Baseline Characteristics at Index Date*

Variable	FESS naïve (n=149) N (%)	FESS (n=120) N (%)
Mean Age ± SD	55.58±13.57	52.82±13.60
BMI	35.18±9.36	35.52±7.88
Mean Antihypertensive Medications ± SD	0.524±0.958	0.593±1.026

*Index defined as date of FESS for FESS patient group and pseudo-index date was implemented for the FESS-naïve cohort, set at 1.43 years after fulfilling both CRS and OSA diagnoses

Figure 1. Multivariate Analysis: Effect of FESS on development of New-Onset Cardiovascular Disease

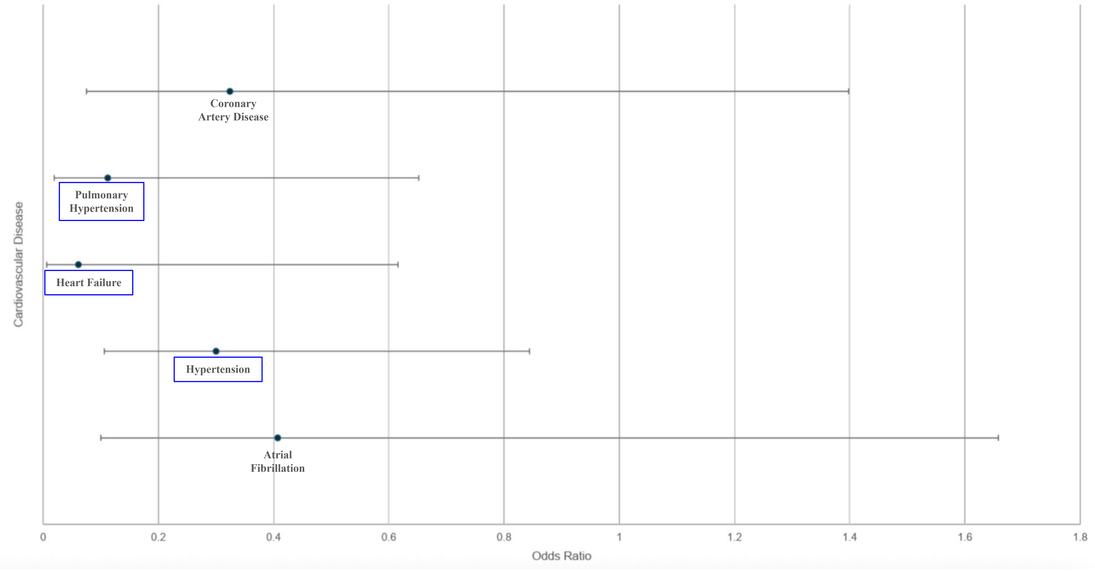


Table 3: CPAP Compliance

	FESS-naïve CPAP user (n=93)	FESS CPAP user (n=71)	p-value
CPAP adherence (prior to index/pseudo-index date) (Mean ± SD)	74.40 ± 29.00	72.97 ± 36.17	0.779
CPAP adherence (3 months following index date/pseudo-index date) (Mean ± SD)	71.88 ± 32.22	80.92 ± 30.49	0.070
Within-cohort Paired t-test p-value	0.334	**0.040**	

CPAP adherence refers to the percentage of days of CPAP use >= 4 hours per night among CPAP users in each cohort.

Table 4. Documented Reasons for CPAP Nonadherence at 3-month follow up from index date

Reasons	FESS naïve (N=56) %	FESS (N=49) %
Insurance Challenges or Cannot Afford OOP Cost	7.14	8.16
Symptoms resolved after FESS/nasal surgery	0.00	8.16
General or other reasons for intolerance	25.00	24.49
Never prescribed or needed CPAP due to mild OSA symptoms	8.93	10.20
Congestion/difficulty breathing through nose	3.57	6.12

CPAP nonadherence was defined as use for less than four hours per night on fewer than 70% of nights. Percentages are reported within each noncompliant cohort.

RESULTS

- Demographics and baseline characteristics propensity score matching revealed no significant difference (p > 0.05) for all factors.
- Multivariate analysis revealed FESS was protective against:
  - New-onset HTN: OR: 0.300; 95% CI: (0.106,0.844), p=0.023
  - New-onset HF: OR: 0.061; 95% CI: (0.006,0.616), p=0.018
  - New-onset pHTN: OR: 0.112, 95% CI: (0.019,0.652), p=0.015
  - New incidence of any cardiovascular disease: OR: 0.203; 95% CI: (0.097,0.423), p<0.001
- Multivariate analysis revealed:
  - CAD was a risk factor for new incidence of any cardiovascular disease: OR: 7.529, 95% CI: (2.485,22.811)
- CPAP Compliance was not significantly affected by FESS status between cohorts (p=0.070). CPAP Compliance within-group for users who received FESS was significantly improved (p=0.040).
- Reasons for CPAP non-adherence of note included OSA symptoms resolving after FESS, general intolerance of CPAP, mild OSA symptoms not warranting CPAP therapy, and nasal congestion.

DISCUSSION

- FESS may reduce cardiovascular risk through two possible mechanisms:
  - **Inflammatory mechanism**: CRS is often viewed as a localized condition, but it contributes to systemic inflammation. By improving sinus ventilation and drainage, **FESS enhances topical therapy delivery and reduces reliance on systemic therapy, potentially explaining the lower incidence of HTN**.
  - **Airway-related mechanism**: Nasal obstruction increases airway resistance and worsens OSA, leading to hypoxia and sympathetic activation. **Improved nasal patency via FESS may reduce nocturnal hypoxemia and autonomic imbalance, helping explain reductions in pHTN and HF**.
- No differences were observed in MI, CAD or CVA
  - These are driven by acute thrombotic events and atherosclerotic changes → may require longer follow-up to detect meaningful change.

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