Does Continuous Positive Airway Pressure Affect Patient Reported Voice Outcomes?

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Abstract

Objectives: Upper aerodigestive tract symptoms have been attributed to OSA and CPAP, the standard first-line therapy. Therapy-related side effects may limit CPAP adherence and preclude long-term use, however, controversy exists regarding the extent to which CPAP causes these symptoms. The objective of the study was to determine if PAP use increases voice, sino-nasal and/or laryngopharyngeal symptoms and to determine whether PAP settings correlate with patient reported symptom changes.

Methods: Prospective cohort study at a single academic otolaryngology sleep medicine center. Participants with a new diagnosis of OSA were evaluated before initiating PAP therapy and at 6 months after starting PAP therapy. PAP prescription and settings, Eppworth Sleep Scale (ESS), Voice Handicap Index-10 (VHI-10), Sino-Nasal Questionnaire (SNQ), Reflux Symptom Index (RSI), and Dryness scale data were collected.

Results: Data from 13 participants, with 12 meeting minimum CPAP adherence criteria were analyzed. RSI and ESS significantly improved over 6 months. No significant change was noted in dryness, VHI-10, or SNQ. No significant association was found between CPAP settings and patient reported values.

Conclusion: Voice, Sinonasal and laryngopharyngeal reflux symptoms did not worsen in the first 6 months of PAP use. PAP therapy was associated with an overall reduction in reflux symptoms.

Introduction (ctn'd)

Symptomatic obstructive sleep apnea (OSA) affects an estimated 2-4% of the US adult population, although the current prevalence is likely much higher, given the dramatic rise in obesity rates over the past 2 decades [1, 2]. Continuous (CPAP) or bilevel (BIPAP) positive airway pressure therapy remains the most commonly used first-line of therapy and acts to maintain upper airway patency and to improve control of breathing and oxygen saturations during sleep.

Introduction (ctn'd)

Although it effectively treats OSA, PAP therapy is frequently associated with a number of mask-, pressure-, and/or psychosocial-related side effects, including local symptoms of the upper aerodigestive tract (e.g. rhinitis, dry mouth/throat, aerophagia) that preclude long-term consistent use.

Data also shows CPAP treatment has a deleterious effect on voice quality. A previous study showed that non-humidified CPAP was associated with a worsening of acoustic voice. Compared to age-matched control group, CPAP users had an increase in noise to harmonic ratio (NHR), voice turbulence index (VTI), shimmer, moderate hoarseness, and relative average perturbation (RAP) following CPAP treatment [3]. The current study was conducted to determine if PAP therapy, when used with proper humidification and close physician monitoring use increases patient reported voice, sino-nasal and laryngopharyngeal symptoms and to determine if CPAP settings correlate with symptom changes.

Methods

N = 13 participants, recruited from an Otolaryngology outpatient clinic, with OSA were enrolled prior to CPAP therapy.

Participants completed the Reflux Symptom Index (RSI), Epworth Sleepiness Scale (ESS), Voice Handicap Index-10 (VHI-10), Sinonasal Questionnaire (SNQ), and a dryness Visual Analog Scale (VAS) at an initial "baseline" visit, 6 weeks post-PAP treatment, and 6 months post-PAP treatment..

Table 1 – Subject Demographics

Variable	Baseline	6-Month
Age	<=30	0
	31-40	1
	41-50	3
	51-60	7
	>60	2
Gender	M	8
	F	5
Compliance	>4 hr/night	10
	<4 hr/night	2
	N/A	1
Apnea Hypopnea Index (AHI)	Minimal (<5/hr)	11
	Mild (5-14/hr)	0
	Moderate (15-29/hr)	1
	Severe (>29/hr)	0
	N/A	1

Methods (ctn'd)

Age, gender, body mass index (BMI), polysomnography (PSG), smoking history, laryngopharyngeal reflux (LPR), current medication use, co-morbid diagnoses, mask type, pressure settings, humidity settings, and compliance of PAP use were also collected (Table 1). The data was analyzed using two-sided t-tests to evaluate interdependencies between PAP therapy and perceived voice outcomes.

Results

RSI and ESS significantly improved over 6 months (p=0.0005, 0.011 respectively). No significant change was noted at 6 months in VAS, VHI-10, or SNQ (Table 2).

Table 2 – Parameter Average Over 6 Months

Variable	Baseline	6-Month	P-value
RSI	19.39 ± 9.31	8.69 ± 8.53	0.0005
ESS	8.54 ± 3.99	5.00 ± 2.20	0.011
VAS	47.41 ± 27.76	26.55 ± 31.14	0.113
VHI-10	4.79 ± 5.53	1.53 ± 2.26	0.069
SNQ	1.35 ± 0.74	1.18 ± 0.98	0.663

Only 1 of the 13 patients started LPR therapy during the study. All other subjects did not have LPR or had been on long term therapy without any change prior to starting the study.

No significant association was found between PAP settings and patient reported values for compliance or pressure settings (Table 3).

Table 3 – Association of CPAP and Patient Reported Values

Variable	P-value	
	Compliance	Pressure Settings
RSI	0.63	0.27
ESS	0.60	0.44

Results

Patient reported laryngopharyngeal reflux symptoms improved with PAP therapy over a 6 month period. Study participants were adherent with PAP therapy during this study based on extracted equipment data. No significant association was found between CPAP variables and patient reported voice, sinonasal or dryness symptoms.

Discussion (ctn'd)

The increase in voice perturbation parameters found in the Hamdan study was not appreciated in this study's patient perceived voice, sinonasal or dryness symptoms scores. One explanation for the difference could be that PAP users in this study were using humidification, which was not present in the Hamdan study. Studies have shown that prolonged oral breathing (>15 minutes) can lead to patient voice complaints due to superficial dehydration of the upper airway including the vocal fords [3]. Non-humidified PAP therapy could exacerbate these symptoms. Further, the studies looked at different outcome measures. CPAP patients may have a change in acoustic voice outcomes, but these changes may not be great enough to affect a patient's perception of voice handicap on their daily life.

Follow up studies with a larger sample size would be useful in supporting the improvement in patient reported reflux found in this study. Furthermore, another study to evaluate additional PAP settings, such as mask type and humidification, may be beneficial.

Conclusion

Patient reported reflux symptoms improved with PAP therapy over a 6 month period and PAP therapy was not associated with a worsening of patient reported voice outcomes. It would be beneficial to evaluate additional PAP variables and their effects on patient reported symptoms in future studies.

References

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