Novel predictor for sleep surgery outcome: posterior pillar hypertrophy

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Abstract

Our study introduces a **novel anatomical index** designed to enhance patient selection and improve surgical outcomes for individuals with obstructive sleep apnea (OSA) characterized by **posterior pillar hypertrophy (PPH)**. The presence or absence of PPH is identified as a valuable indicator of surgical treatment effectiveness in OSA patients, providing a basis for both patient selection and surgical approach. Posterior pillar hypertrophy (PPH) serves as an independent anatomical indicator, supplementing the Friedman staging system.

Introduction

Obstructive sleep apnea (OSA) is a condition in which respiratory airflow is restricted by the obstruction of the upper airway during sleep. It reduces the quality of life through daytime symptoms, such as excessive daytime sleepiness, and is associated with various complications, such as cardiovascular disease, cognitive dysfunction, and malignant disease; therefore, active diagnosis and treatment are required.

Continuous positive airway pressure (CPAP) is the main treatment for OSA; however, many patients fail to adapt to CPAP and require surgery. The success rate of multilevel surgery for OSA ranges from 40.7% to 66.4% based on the Sher criteria.[1-3] This suggests that the indicators predicting surgical success are incomplete, and some patients are unsuitable for surgery.

Surgical prognostic factors have been explored; however, no studies have been conducted on posterior pillar hypertrophy (PPH).
Therefore, this study aimed to determine whether or not a thick posterior pillar can predict surgical outcomes in patients with OSA.

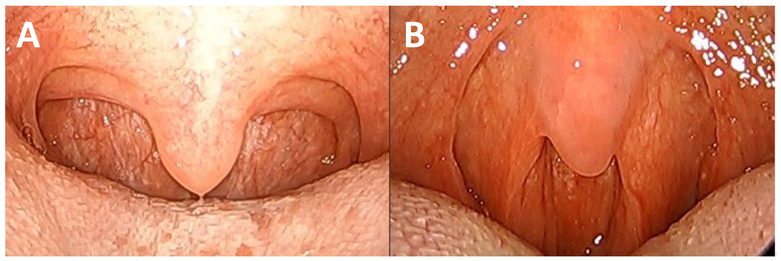

Figure 1.
A: Normal appearance of the posterior pillar
B: Posterior pillar hypertrophy: The palatopharyngeus muscle is enlarged and the lateral pharyngeal wall is fused with the posterior pharyngeal wall.

Methods and Materials

This was a retrospective study that analyzed the treatment effects in patients with OSA who had undergone palatopharyngeal surgery performed by a single surgeon at a tertiary medical institution (Severance Hospital, Seoul, Korea) from 2012 to 2021.

A logistic regression analysis was performed to identify the key variables affecting surgical success. Surgical success was considered the independent variable, whereas the dependent variables included body mass index (BMI), neck circumference, waist-to-hip ratio, tonsil grade, PPH, lingual tonsil grade, modified Mallampati class, and Friedman stage.

To evaluate only the effects of PPH, patients who met the conditions were randomly selected, and propensity matching was performed. For the main variables, independent t-test was performed for variables that followed a normal distribution and the Mann-Whitney test was performed for variables that did not follow a normal distribution.

Results

Tonsil grade, body mass index, and posterior pillar thickness were indicators of surgical success. (Table 1)

The surgical success rate differed significantly between the PPH(+) and normal control (PPH[-]) groups. The percentage of patients experiencing surgical success were 40.7% and 51.9% in the PPH(-) and PPH(+) groups, respectively.

Additionally, the PPH(+) group exhibited a significant increase in apnea-hypopnea index and oxygen desaturation index postoperatively. (Table 2)

	Odds ratio	95% CI	P value
Tonsil grade	2.244	1.541-3.268	<0.001
BMI	0.905	0.831-0.984	0.020
Posterior pillar thickness	2.794	1.144-6.823	0.024
Modified Mallampati class	0.683	0.831-0.984	0.081

Table 1.
The tonsil grade, BMI, and posterior pillar thickness were significant predictors of surgical success (CI: Confidence interval)

	PPH(-)	PPH(+)	p-value
Δ AHI	16.11 ± 14.21	29.04 ± 17.19	0.013[b]
postop AHI / preop AHI	0.578 ± 0.336	0.414 ± 0.291	0.06[a]
Δ ODI	6.55 ± 25.61	25.20 ± 20.36	0.016[a]
Δ Snoring index	-55.60 ± 150.77	-24.21 ± 162.26	0.135[b]
Δ O2 nadir	11.05 ± 17.58	8.04 ± 16.20	0.519[a]
Δ ESS	3.6 ± 4.2	1.9 ± 3.7	0.153[a]

Table 2.
the surgical success rate significantly differed between the two groups.
a. Independent T test (SPSS 26.0) b. Mann-Whitney test (SPSS 26.0)

Discussion

In this study, we presented a **novel index for predicting surgical outcomes in patients with sleep apnea**. **PPH is a positive prognostic factor of palatopharyngeal surgery outcomes**. When the multivariate analysis was conducted with various anatomical factors expected to influence surgical outcomes as dependent variables and surgical success as an independent variable, PPH demonstrated an odds ratio of 2.794. The other statistically significant factors were tonsil size and BMI.

As PPH is an anatomical indicator independent of the Friedman staging system, its incorporation with the Friedman staging system is expected to enhance the predictive accuracy of surgical success and assist in selecting the most suitable surgical technique for each patient

In patients with PPH, the hypertrophied dorsal division of the palatopharyngeal muscle causes narrowing of the lateral diameter of the upper airway, regardless of muscle function. Therefore, surgical treatment is expected to have a good clinical response owing to the volume reduction effect in these patients. Thick muscles can be used as a better material for tension remodeling in ESP.

Conclusion

In this study, **patients with OSA and PPH exhibited a more favorable response to surgery.**
Research in this area is expected to contribute to patient selection for surgery and enhance our understanding of the physiology of sleep apnea and advancements in surgical techniques.

Contact

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