Comparing Surgical Outcomes for Sleep Apnea Treatment: A Focus on Age Groups

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Comparing Surgical Outcomes for Sleep Apnea Treatment: A Focus on Age Groups

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The Master's Thesis
submitted to the Department of Medicine,
the Graduate School of Yonsei University
in partial fulfillment of the requirements for the degree of
Master of Medical Science

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December 2023

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December 2023

ACKNOWLEDGEMENTS

I would like to express my sincere gratitude to those who have supported me in various ways to complete this thesis.

First and foremost, I extend my deepest thanks to my advisor, Professor Hyung-ju Cho, for his insightful advice and patient guidance, which were instrumental in the completion of this research.

I also want to convey my appreciation to the members of the thesis committee, Professor Hwi-dong Jung and Professor Kyubo Kim, for their valuable evaluations and feedback, which contributed to the overall quality of this paper.

Furthermore, I am grateful to my colleagues and family for their unwavering support, both academically and emotionally.

Lastly, I would like to thank everyone who provided assistance and collaboration throughout the research and writing process.

Thank you.

Sincerely,

Young-woo, Lee

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ABSTRACT

Comparing Surgical Outcomes for Sleep Apnea Treatment: A Focus on Age Groups

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Objective: This study aimed to investigate the differences of obstructive sleep apnea patients in the clinical features and surgical outcomes between different age groups .

Methods: This study included 214 adults with obstructive sleep apnea (OSA) who underwent upper airway surgery between April 2012 and December 2022. The patients were divided into three groups according to age: Young group, 20–39 years; Middle-age group, 40−59 years; and Older group ≥60 years.

Results: The older age group had a lower surgery success rate (7/23, 30.4%) compared with the young age group (51/85, 60.0%), and the middle-aged group fell in between (41/106, 38.7%). Moreover, significant differences were found in the absolute reduction of Apnea-hypoapnea Index (AHI) and the AHI improvement rate among the three age groups. Binary logistic regression analysis confirmed that increased age (P=0.035) was a poor prognostic factor and female sex (P=0.014), larger tonsil size (P=0.001), and higher mean oxygen saturation (P=0.047) were good prognostic factors for surgical outcomes in OSA patients.

Conclusion: The success rate of surgery decreased significantly as the patients' age progressed beyond middle age, and the absolute improvement in AHI showed a linear decrease. Consequently, the implementation of surgical treatment in middle-aged and older patients should be carefully considered.

Key words : age, sleep apnea, palate surgery

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I. INTRODUCTION

Obstructive sleep apnea (OSA) is a common sleep disorder resulting from upper airway problems, which involve repetitive complete (causing apnea) or partial (causing hypopnea) pharyngeal collapse.[1,2] Pharyngeal collapse leads to disturbances in gas exchange, resulting in oxygen desaturation, hypercapnia, and sleep fragmentation, all of which contribute to the unhealthy consequences of OSA, such as cardiovascular, metabolic, and neurocognitive complications.[2] Although positive airway pressure (PAP) therapy is the primary treatment modality for patients with OSA, compliance has consistently been a challenge. This compliance issue is reported to be particularly more prevalent among older adults with OSA,[3,4] significantly impacting their health. Consequently, upper airway surgery is considered an alternative treatment option for those who are intolerant or unwilling to use PAP therapy, including older patients.[5]

Polysomnography (PSG) is the standard method for diagnosing OSA by providing quantitative information on sleep. OSA characteristics assessed through PSG can vary with age, particularly when comparing the features of older adults and young/middle-aged patients.[6,7] Interestingly, despite having lower obesity rates, older adults exhibit a higher prevalence of OSA compared with their younger counterparts.[6,8,9] This difference can be attributed to age-related pathophysiological changes,[10,11] which may influence the prognosis of surgical treatment.

Recognizing the need for research based on compliance issues and age-related pathophysiological differences, I aimed to determine whether surgical treatment is a viable option for the elderly and investigate whether surgical outcomes vary with age. The first objective of this study focused on age-related differences in surgical treatment. In this study, I analyzed retrospective patient data collected through whole-night PSG at a single tertiary hospital to characterize the age groups that underwent surgical intervention.

II. MATERIALS AND METHODS

1. Study participants

Medical records of patients who underwent surgery at Severance Hospital's sleep center from April 2012 to December 2022 were retrospectively reviewed. The inclusion criteria for the study were as follows: a) OSA diagnosed through in-lab PSG, b) pharyngeal surgery with or without additional upper airway surgery, and c) in-lab PSG both before and after surgery. Patients who met all the above criteria were included in the study. The exclusion criteria were as follows: a) central apnea events observed during the PSG, Central Apnea Index, cAI>5/h and b) insufficiently measured PSG parameters. This study was approved by the Institutional Review Board of Severance Hospital, Korea (IRB No. 4-2023-1528), and the requirement for informed consent was waived.

The patients were divided into three age groups: Young group, 20–39 years; Middle-age group, 40–59 years; and Older group, ≥60 years. Demographic characteristics and physical parameters were collected. Pharyngeal tonsils were graded according to Brodsky grading scale.

2. Polysomnography

In this study, all patients underwent PSG both before and after surgery. Sleep events were measured using XLTEK® (Natus, USA) or Embletta® (Natus, USA). Respiratory events were classified and scored according to the 2012 American Academy of Sleep Medicine (AASM) guidelines.[12] Apnea was defined as the absence of respiration for more than 10 seconds, accompanied by a decrease in the amplitude of airflow of more than 90%. Hypopnea was defined based on the following three criteria: 1) amplitude of airflow reduced by more than 30%, 2) duration longer than 10 seconds, and 3) respiratory depression associated with arousal and/or a decrease in oxygen saturation concentration of more than 3%. Several parameters were analyzed, including the apnea–hypopnea index (AHI), respiratory disturbance index (RDI), and O2 saturation (lowest and mean). AHI was calculated as the total number of apnea and hypopnea events per hour of sleep. Supine

AHI, rapid eye movement (REM) AHI, and non–rapid eye movement (NREM) AHI were also assessed. Additionally, Epworth Sleepiness Scale (ESS) scores were obtained using questionnaires to assess the level of daytime sleepiness. The severity of OSA was determined based on the AHI: mild OSA, 5 ≤ AHI < 15; moderate OSA, 15 ≤ AHI < 30; and severe OSA, AHI ≥ 30.

3. Surgical treatment and surgical outcome assessment

All patients underwent palate surgery, and additional upper airway surgery was performed as needed. The assessment of upper airway obstruction was conducted using Müller's maneuver and/or drug-induced sleep endoscopy. The surgical procedures were performed by a single surgeon (corresponding author H.-J.C.) under general anesthesia. Palatal surgery included the following subcategories: conventional uvulopalatopharyngoplasty,[13] lateral pharyngoplasty,[14] and expansion sphincter pharyngoplasty[15]. For tongue base resection, the surgical technique employed either an EVAC 70 XTRA Wand® (Smith & Nephew, USA)[16] or the da Vinci Surgical System (Intuitive Surgical Inv., USA).[17] Additionally, some patients received nasal surgeries, such as septoplasty, turbinoplasty, and endoscopic sinus surgery.

The success criteria for surgery were based on Sher's criteria, [18] which require an AHI of less than 20 events per hour and at least a 50% reduction in AHI after surgery. The improvement rates of AHI, supine AHI, and RDI after surgery were calculated using the following equation:

$$\text{AHI improvement (\%)} = \frac{(\text{Preoperative AHI} - \text{Postoperative AHI})}{\text{Preoperative AHI}} \times 100$$

The improvements in the lowest oxygen saturation and mean oxygen saturation after surgery were calculated by subtracting the preoperative value from the postoperative value.

4. Statistical analysis

Categorical data are presented using absolute numbers and percentages, and continuous data are presented as either means and standard deviations (SDs) or medians and interquartile ranges (IQRs) for parametric and nonparametric data, respectively. To compare variables among the different age groups, I used the one-way analysis of variance for parametric variables and the Kruskal–Wallis test for nonparametric variables. Following the initial analysis, Scheffe's multiple comparisons test for parametric data and Mann-Whitney U-test for nonparametric data were applied as a post-hoc range test to assess differences between the age groups. To assess the independent contribution of surgical outcomes based on the age group, a binary multivariate logistic regression model was constructed. All statistical analyses were two-tailed, and P-values less than 0.05 were considered statistically significant. The data were analyzed with IBM SPSS Statistics version 26.0 (IBM Corp., Armonk, NY, USA) and GraphPad Prism version 9 (GraphPad Software Inc., San Diego, CA, USA).

III. RESULTS

1. Demographic characteristics of the study participants

In this study, 214 participants were included and analyzed. Table 1 shows the demographic characteristics and physical profiles of the patients. These participants were categorized into three age groups: Young group (n=85), middle-age group (n=106), and older group (n=23).

Although most participants in all age groups were male, there was a significantly higher proportion of male patients in the young group than in the other groups ($P = 0.026$). There were no significant differences observed in smoking and drinking between the age groups. Regarding medical conditions, the prevalence rate of hypertension increased with age and showed a statistically significant difference between the age groups ($P < 0.001$). However, there were no significant differences in the prevalence of diabetes mellitus or the severity of OSA among the age groups.

Continuous physical data, such as the body mass index, neck and waist circumference, and Mallampati score, did not significant differ between the age groups. However, certain measurements, including weight and height, hip circumference, waist-to-hip ratio, and tonsil grade, exhibited significant differences between the age groups.

Table 1. Demographic characteristics and physical profiles by age group

	Young group (n = 85)	Middle-age group (n = 106)	Older group (n = 23)	F	P-value
Sex					0.026[*]
Female, n (%)	5 (5.9%)[1]	19 (17.9%)[1]	5 (21.7%)		
Male, n (%)	80 (94.1%)[1]	87 (82.1%)[1]	18 (78.3%)		
Age, years	31.0 ± 5.7[1,2]	48.6 ± 5.9[1,3]	63.9 ± 4.5[2,3]	396.0	<0.001†
Smoking					0.335[*]
Never smoker, n (%)	47 (55.3%)	57 (53.8%)	15 (65.2%)		
Ex-smoker, n (%)	6 (7.1%)	17 (16.0%)	5 (21.7%)		
Current smoker, n (%)	32 (37.6%)	32 (30.2%)	3 (13.0%)		
Alcohol					0.449[*]
Never drinker, n (%)	24 (28.2%)	31 (29.2%)	10 (43.5%)		
Ex-drinker, n (%)	2 (2.4%)	4 (3.8%)	0 (0.0%)		
Current drinker, n (%)	59 (69.4%)	71 (67.0%)	13 (56.5%)		
Hypertension, n (%)	8 (9.4%)[1,2]	41 (38.7%)[1]	12 (52.2%)[2]		<0.001[*]
Diabetes mellitus, n (%)	1 (1.2%)[1,2]	8 (7.5%)[1]	2 (8.7%)[2]		0.102[*]
Weight, kg	83.0 ± 15.7[2]	78.5 ± 18.7[3]	69.3 ± 9.6[2,3]	6.2	0.002[†]
Height, cm	174.3 ± 11.4[1]	167.9 ± 15.6[1]	167.3 ± 8.2	5.9	0.003[†]
Body mass index	26.6 ± 4.0	26.5 ± 3.9	24.6 ± 2.2	2.7	0.069[†]
Neck circumference, cm	39.0 ± 5.5	38.8 ± 6.2	40.2 ± 11.9	0.4	0.667[†]
Waist circumference, cm	93.2 ± 10.3	93.4 ± 9.9	91.3 ± 6.2	0.4	0.640[†]
Hip circumference, cm	102.2 ± 8.9[1,2]	99.5 ± 7.0[a]	96.9 ± 4.6[2]	5.7	0.004[†]
WHR	0.91 ± 0.07[1]	0.94 ± 0.06[1]	0.94 ± 0.05	3.81	0.023[†]
Tonsil grade	2.08 ± 0.83[1,2]	1.72 ± 0.89[1,3]	1.17 ± 0.65[2,3]	11.52	<0.001[†]
MMP score	2.85 ± 0.78	2.85 ± 0.71	2.91 ± 0.90	0.08	0.928[†]

MMP, Mallampati; WHR, waist-to-hip ratio.
Data are presented as number (%) or mean ± standard deviation.
[*]Statistical analysis was performed using the Kruskal–Wallis test.
[†]Statistical analysis was performed using analysis of variance.
[1]significant difference between the young group and middle-aged group
[2]significant difference between the young group and older group
[3]significant difference between the middle-aged and older group

2. Preoperative polysomnographic features

Table 2 presents the preoperative PSG test results. Although the AHI, RDI, and AHI-related measures displayed lower numerical values in the older age group, these differences did not reach statistical significance. Similarly, the ESS score tend to be lower levels in older patients, but this difference was also not statistically significant.

Table 2. Preoperative polysomnographic results by age group

	Young group (n = 85)	Middle-age group (n = 106)	Older group (n = 23)	F	P-value
AHI, events/h	47.0 ± 23.9	45.4 ± 23.8	38.3 ± 12.8	1.3	0.273†
RDI, events/h	48.1 ± 23.6	47.3 ± 22.9	39.0 ± 12.6	1.7	0.209†
Severity of OSA					0.997*
Mild, n (%)	4 (4.7%)	3 (2.8%)	0 (2.3%)		
Moderate, n (%)	20 (23.5%)	28 (26.4%)	7 (30.4%)		
Severe, n (%)	61 (71.8%)	75 (70.8%)	16 (69.6%)		
Supine AHI, events/h	57.1 ± 24.5	64.6 ± 82.7	56.1 ± 18.0	0.4	0.648†
REM AHI, events/h	44.4 ± 27.0	41.7 ± 28.4	35.2 ± 23.7	1.1	0.350†
Non-REM AHI, events/h	48.2 ± 23.5	45.2 ± 24.9	39.5 ± 14.3	1.3	0.271†
Lowest O_2 saturation, %	79.1 ± 9.9	79.5 ± 7.9	82.9 ± 5.2	1.8	0.167†
Mean O_2 saturation, %	94.3 ± 2.8	93.6 ± 3.8	94.5 ± 1.7	1.5	0.231†
Epworth Sleepiness Scale	8.6 ± 4.4	9.1 ± 4.9	7.7 ± 4.5	0.9	0.392†

AHI, apnea–hypopnea index; ODI, oxygen desaturation index; OSA, obstructive sleep apnea; RDI, respiratory disturbance index; REM, rapid eye movement.
Data are presented as number (%) or mean ± standard deviation.
*Statistical analysis was performed using the Kruskal–Wallis test.
†Statistical analysis was performed using analysis of variance.

3. Surgical outcomes

Next, I compared surgical outcomes between the groups. There were differences in the surgical method according to the patient's difference in the oropharyngeal anatomy and the accompanying nasal problem, and the surgical performance statistics can be seen in Table 3. The older age group had a lower surgery success rate (7/23, 30.4%) compared with the young age group (51/85, 60.0%), and the middle-aged group fell in between (41/106, 38.7%; P = 0.004; Table 4). Moreover, significant differences were found in the absolute reduction of AHI and the AHI improvement rate among the three age groups. In terms of the absolute reduction of AHI, there was a significant difference between the young group (26.1 ± 23.9) and the older group (12.3 ± 12.5, P = 0.016), but there was no difference between the middle-aged group (19.0 ± 20.1, Figure 1) and the other two groups. The young group had a greater AHI improvement rate (57.5% ± 35.6%) than the middle-aged group (40.5% ± 36.8%) and the older group (32.8% ± 29.3%, P = 0.001; Figure 1). Similarly, the young group displayed a higher supine AHI improvement rate (55.2% ± 37.7%) than the middle-aged group (36.8% ± 37.8%) and the older group (23.1% ± 31.3%, P = 0.001; Figure 1). Moreover, the older group showed significantly less improvement in the lowest oxygen saturation (0.3% ± 6%) compared with the young (6.6% ± 8.0%) and middle-aged groups (4.3% ± 6.1%, P < 0.001; Figure 1). Furthermore, comparisons were made regarding REM AHI, NREM AHI, and mean O2 improvement, but no significant differences were found among the three age groups.

After adjusting for potential confounding factors, binary regression analysis was conducted to determine if there was a significant association between age and the success rate of surgery. Among the demographic, clinical, and PSG variables strongly associated with surgical outcomes in the univariate analysis, age (P = 0.035, odds ratio [OR] for surgical success = 0.967, 95% confidence interval [CI] = 0.938–0.998), female sex (P = 0.014, OR = 3.592, 95% CI = 1.294–9.971), tonsil grade (P = 0.001, OR = 1.981, 95% CI = 1.314–2.985), and mean O2 saturation (P = 0.047, OR = 1.202, 95% CI = 1.002–1.442; Table 5) were found to be significantly associated with positive surgical results.

However, no significant association was found between surgical success and other variables.

Table 3. Upper airway surgical methods by age group

	Young group (n = 85)	Middle-age group (n = 106)	Older group (n = 23)
Palatal surgery			
Conventional UPPP	6 (7.1%)	10 (9.4%)	1 (4.3%)
LP	52 (61.2%)	69 (65.1%)	12 (52.2%)
ESP	27 (31.8%)	27 (25.5%)	10 (43.5%)
Tongue base surgery			
Coblator-assisted	43 (50.6%)	60 (56.6%)	12 (52.2%)
Robot-assisted	21 (24.7%)	20 (18.9%)	4 (17.4%)
Nasal surgery			
Septoplasty	41 (48.2%)	54 (50.9%)	6 (26.1%)
Turbinoplasty	46 (54.1%)	58 (54.7%)	7 (30.4%)
Endoscopic sinus surgery	0 (0.0%)	7 (6.6%)	3 (13.0%)
Combination of each surgical procedure			
Palatal only	8 (9.4%)	14 (13.2%)	3 (13.0%)
Palatal + Tongue base	31 (36.5%)	33 (31.1%)	10 (43.5%)
Palatal + Nasal	12 (14.1%)	12 (11.3%)	4 (17.4%)
Palatal + Nasal + Tongue base	34 (40.0%)	47 (44.3%)	6 (26.1%)

ESP, expansion sphincter pharyngoplasty; LP, lateral pharyngoplasty;
UPPP, uvulopalatopharyngoplasty. *Nasal surgery could have been done more than one

Table 4. The rate of surgical success by age group

	Young group (n = 85)	Middle-age group (n = 106)	Older group (n = 23)	P-value
Surgical success	51 (60.0%)[1,2]	41 (38.7%)[1]	7 (30.4%)[2]	0.004*
Surgical failure	34 (40.0%)[1,2]	65 (61.3%)[1]	16 (69.6%)[2]	

The criteria for surgical success were defined as an AHI of less than 20 events per hour and an AHI decrease of 50% or more, according to Sher's success criteria.
Data are presented as number (%).
*Statistical analysis was performed using the Kruskal–Wallis test.
[1]significant difference between the young group and middle-aged group
[2]significant difference between the young group and older group

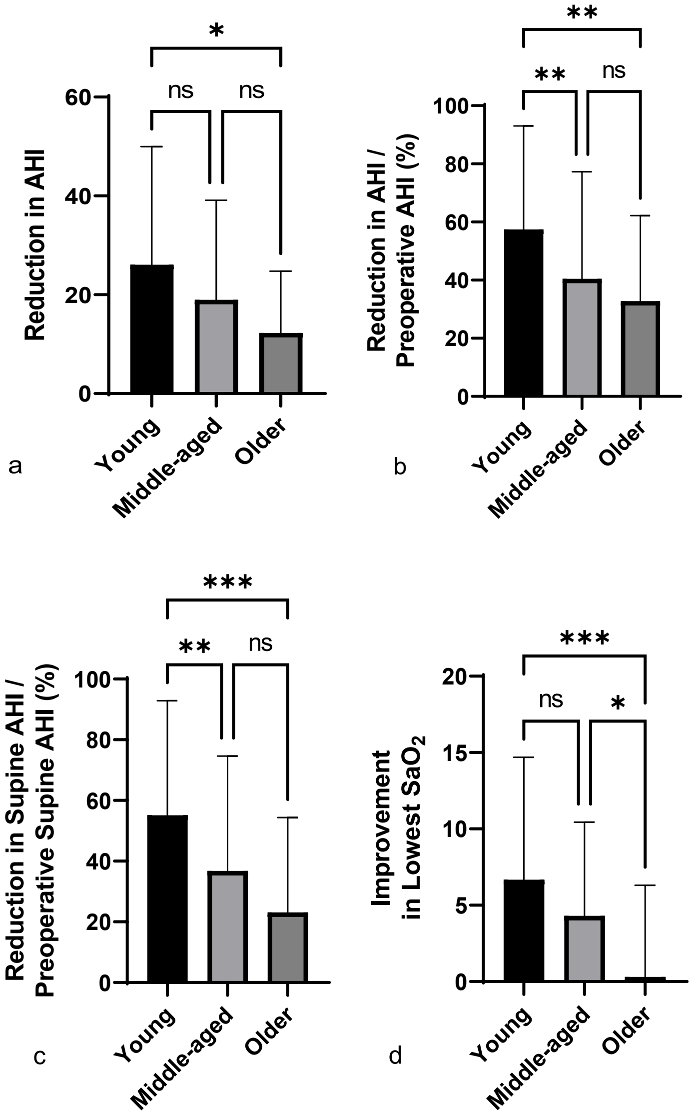

Figure 1. Surgical outcomes by age group. The improvement in parameters following surgery by age group. Data are presented as mean and standard deviation. (a) Absolute reduction of AHI, (b) reduction rate of AHI, (c) reduction rate of supine AHI, and (d) improvement of lowest oxygen saturation. *P < 0.05, **P < 0.01, ***P < 0.001.

ns, not significant; AHI, apnea–hypopnea index; SaO_2, O_2 saturation.

Table 5. Logistic regression analysis of the variables associated with surgical outcomes in patients with obstructive sleep apnea

	OR for surgical success[1]	95% CI	P-value
Age	0.967	0.938–0.998	0.035
Sex (female)	3.592	1.294–9.971	0.014
Tonsillar hypertrophy	1.981	1.314–2.985	0.001
Mean O2 saturation	1.202	1.002–1.442	0.047

CI, confidence interval; OR, odds ratio.
[1]The criteria for surgical success were defined as an AHI of less than 20 events per hour and an AHI decrease of 50% or more, according to Sher's success criteria.

IV. DISCUSSION

Currently, there are AASM guidelines for OSA patients who are eligible for surgical treatment,[19,20] but there is still a lack of discussion regarding which patients can anticipate a favorable prognosis from this intervention. Considering that studies have shown distinct pathophysiological characteristics of OSA in older adult patients,[10,11,22] it would be reasonable to assume that age could influence the outcomes of surgical treatment. In this study, I demonstrate that increased age is a negative prognostic factor for surgical outcomes in patients with OSA. These results suggest that old patients with OSA may exhibit distinct pathophysiology compared to young counterparts. Therefore, clinicians should consider patients' age when determining surgical candidates during the decision-making process.

Several previous studies have reported an increase in mean AHI with age.[7,21-23] However, I found no significant difference in PSG parameters between the groups in the preoperative PSG tests. This discrepancy can be attributed to selection bias, as the comparison in this study excluded patients who did not undergo surgery. The comparison between the groups revealed that the proportion of men was significantly higher among the younger group. This result may be due to the fact that the prevalence of OSA increases in female after menopause.[24] Expectedly, hypertension and diabetes were more prevalent among the older group. Given that OSA can have a direct impact on cardiovascular and cerebrovascular diseases and influence mortality,[2] old patients with OSA should be treated properly to minimize the risk of complications.

A key finding from this study is that the success rate of surgical treatment was significantly lower in the middle-aged and older groups compared with the younger age group. Accordingly, I observed less improvement in AHI in the middle-aged and older groups, and the improvement rates decreased with age. To support this results, additional logistic regression analysis was conducted and confirmed that age serves as an independent predictor, indicating that the success rate of surgery deteriorates as age increases. These results may be derived from several factors. First, aging may increase the propensity for pharyngeal collapse. The bony shape (anteroposterior/lateral) surrounding the pharynx changed and the parapharyngeal fat pads significantly increased in size.[11] This increased pharyngeal collapsibility may persist after surgery, affecting the airway despite improved anatomical structure. Second, in patients with obstructive sleep apnea (OSA), a high loop gain can be identified, whereas in the elderly, a low loop gain is observed.[25] It can be hypothesized that the aging process reduces the sensitivity of the respiratory control system. It may explain why AHI improvements are less evident in older adults despite improved anatomical structures. Altogether, it can be assumed that both anatomical and neuromuscular factors collectively contribute to poor surgical outcomes in older patients. In this regard, older adult patients may need a more multifaceted approach to treatment of OSA.

Other factors significantly associated with surgical success included female sex, tonsil grade, and mean O2 saturation. Notably, larger tonsil size was significantly associated with surgical success and tonsil size was smaller in the older patient group than the other groups. However, although the middle-aged group had relatively larger tonsils compared to older patient group, the similar success rate of surgery between the two groups was observed. These results suggest that tonsil size is not a sole factor determining surgical outcomes. Considering that previously reported studies have indicated lower AHI levels in women compared to men,[7,24] these differences in characteristics between men and women can also be considered as factors that may impact the success rate of surgery. Studies on oxygen saturation and the severity of OSA have been reported.[26] However, there appears to be a limitation in analyzing the correlation with the success rate of surgery, indicating the need for further research.

This study has several limitations. First, it was a retrospective cohort study, which may have introduced inherent biases and limitations in the data collection and analysis. Second, the uneven distribution of patients in each group may have affected the accuracy of the results; a larger sample size would have provided more reliable findings. Additionally, OSA severity is a potential confounding factor, and comparing patients with similar disease severity would have been ideal, especially because surgical treatment is usually performed on patients with mild OSA under the AASM guidelines.[19] Moreover, as almost patients underwent palate surgery with specific methods(lateral pharyngoplasty or expansion sphincter pharyngoplasty; see Table 5), comparing the results according to the surgical method would have improved the consistency of the findings. Recently, there have been studies showing that hypoglossal nerve stimulation (HGNS) is effective in old age,[27] but the surgical approach is different from this study and further studies are expected to be needed in a way that is not yet possible in Korea. Despite these limitations, this study has a notable strength as it is the first study to compare the surgical treatment for patients with OSA between different age groups. Consequently, it offers valuable insights into how age may impact surgical outcomes.

V. CONCLUSION

This study revealed that the success rate of surgery decreased significantly as the patients' age progressed beyond middle age, and the absolute improvement in AHI showed a linear decrease. These results suggest that OSA may be categorized differently depending on age. Consequently, the implementation of surgical treatment in middle-aged and older patients should be carefully considered. However, it is evident that surgery leads to an improvement in AHI levels, and for individuals with enlarged tonsils, surgical treatment remains a viable option to prevent sequelae caused by OSA, particularly in older adult patients with poor CPAP compliance. Our findings provide novel insights into the current knowledge and offer directions for future research.

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ABSTRACT(IN KOREAN)

수면무호흡증 치료를 위한 수술결과 비교: 연령대 중심의 분석

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목적: 본 연구는 폐쇄성 수면무호흡증 환자의 연령대별 임상 양상과 수술 결과의 차이를 알아보고자 하였다.
방법: 이 연구는 2012년 4월부터 2022년 12월까지 상기도 수술을 받은 폐쇄성 수면 무호흡증(OSA) 성인 214명을 포함했다. 환자들은 연령에 따라 세 그룹으로 나뉘었다: 젊은 그룹, 20-39세, 중년 그룹, 40-59세, 그리고 나이가 많은 그룹 ≥60세.
결과: 젊은 연령층(51/85, 60.0%)에 비해 나이가 많은 연령층은 수술 성공률(7/23, 30.4%)이 낮았고, 중년층은 그 사이(41/106, 38.7%)에 속했다. 또한 세 연령층 간에 무호흡저호흡지수(AHI)의 절대치 감소와 AHI 개선률에서 유의한 차이가 발견되었다. 이항 로지스틱 회귀 분석에서는 증가된 연령(P=0.035)이 좋지 않은 예측 요인이며 여성 성별(P=0.014), 더 큰 편도 크기(P=0.001), 더 높은 평균 산소 포화도(P=0.047)가 OSA 환자의 수술 결과에 좋은 예측 요인임을 확인했다.
결론: 환자의 연령이 중년기 이상일 때, 수면무호흡치료를 위한 수술 시행 시 수술 성공률은 유의하게 감소하였고, AHI의 절대값 수치의 호전은 선형적인 감소를 보였다. 이러한 결과는 OSA가 연령에 따라 다르게 분류될 수 있음을 시사한다. 따라서 중년기 이상의 환자에서 수술적 치료의 시행은 신중히 고려되어야 할 것이다

핵심되는 말: 나이, 수면무호흡증, 구개수 수술