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# Trends in Palate Surgery for Obstructive Sleep Apnea in Korea Over the Past 12 Years

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**Background and Objectives:** In the past, palate surgery, such as uvulopalatopharyngoplasty (UPPP), was widely performed to treat obstructive sleep apnea (OSA). However, since the introduction of reimbursement for positive airway pressure (PAP) therapy in 2018, it is believed that the frequency of these operations has significantly declined. Despite this, there are currently no definitive data to support this assertion.

**Methods:** We examined the number of palate operations conducted by utilizing medical statistical data from the Health Insurance Review and Assessment Service (HIRA) Bigdata Open portal. Within this system, we queried UPPP (Q2196), UPPP_complex (Q2195), and uvulectomy (Q2197), and collected data spanning from 2010 to 2021. The data were then analyzed according to hospital type, sex, and age groups.

**Results:** In total, 2,728 palate operations were performed in 2010; this number peaked at 4,330 cases in 2014, and then steadily decreased to 3,096 cases in 2021. Of the operations in 2010, 1,892 were conducted in general hospitals, while 836 took place in primary hospitals and clinics. However, by 2021, the number of operations performed in general hospitals had decreased to 1,002, while those performed in primary hospitals and clinics had increased to 2,093. The most common age group for these operations was 30–39 for men and 40–49 for women. Since 2019, the proportion of palate operations relative to the number of OSA patients has decreased.

**Conclusion:** The frequency of palate surgery in Korea started to decrease after 2014. Despite this, there was an increase in the number of these operations performed in hospitals and clinics, with middle-aged patients being the primary recipients. The ratio of palate operations to OSA patients has shown a notable decrease after the introduction of reimbursement of polysomnography and PAP therapy.

**Keywords:** Obstructive sleep apnea; Palate surgery; Uvulopalatopharyngoplasty; Uvulectomy.

## INTRODUCTION

Obstructive sleep apnea (OSA) is a chronic disorder characterized by repeated episodes of partial or total collapse of the upper airway during sleep. This leads to interruptions in breathing and disrupts the continuity of sleep [1]. Studies have found that the prevalence of OSA is 27% in men and 16% in women when the apnea-hypopnea index (AHI) of 5 or more is used as the threshold [2]. However, when OSA is defined by an AHI of 5 or more in conjunction with excessive daytime sleepiness, the prevalence drops to 4.5% in men and 3.2% in women [2]. The common symptoms of OSA include habitual loud snoring, morning headaches, excessive daytime sleepiness, restless sleep, and difficulty concentrating [3].

If OSA is not treated, it can significantly impact overall health, increasing the risk of severe conditions like hypertension, arrhythmia, coronary artery disease, stroke, diabetes, and even accidents due to reduced daytime alertness [4-7]. Thus, it is crucial to promptly identify the signs and symptoms of OSA and initiate suitable treatment following a precise diagnosis.

The treatment options for OSA include positive airway pressure (PAP) therapy, oral appliances, or surgical interventions designed to alleviate airway obstruction and manage OSA symptoms [8-10]. Lifestyle modifications such as weight loss, adopting a lateral sleeping position, and avoiding alcohol and

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sedatives can also be beneficial [11,12]. Surgical treatment is typically recommended for individuals with identifiable anatomical abnormalities or specific OSA subtypes that respond well to surgical approaches. It is also considered a viable option for managing OSA when non-surgical treatments, such as PAP therapy or oral appliances, have proven ineffective or have not been well-tolerated [13].

In the past, uvulopalatopharyngoplasty (UPPP) was widely performed to treat OSA [14]. However, since the introduction of reimbursement for PAP therapy in Korea in June 2018, it is thought that the number of UPPP procedures has significantly decreased [15]. This decrease is also likely due to reports highlighting the potential ineffectiveness of UPPP, as well as the risk of severe pain and complications following the procedure [16]. Despite this, recent studies have begun to reaffirm the value of UPPP, demonstrating its effectiveness and cost-efficiency compared to PAP therapy in Korea [17]. Furthermore, adherence to PAP therapy has not been as high as initially anticipated [18]. While UPPP plays a significant role in OSA treatment, there is a dearth of statistical data on its usage trends in Korea. Therefore, this study aimed to examine trends of palate surgery for OSA in Korea over the past 12 years.

## METHODS

We investigated the number of palate operations performed, using data from the Health Insurance Review and Assessment Service (HIRA) Bigdata Open portal (https://opendata.hira.or.kr/home.do), a source of medical statistical information. This system allowed us to analyze the frequency of three specific palate operations categorized under OSA surgery. The operations we focused on were UPPP (Q2196), UPPP_complex (Q2195), and uvulectomy (Q2197). The data spanned from 2010 to 2021, the maximum search range available in the system. UPPP_complex (Q2195) refers to the concurrent performance of UPPP (Q2196) and tonsillectomy. As per the Korea Health Insurance guidelines, UPPP (Q2196) is recommended for patients with an AHI of 20 or higher and oxygen saturation below 80%. In contrast, uvulectomy (Q2197) is suggested for patients with an AHI of 20 or lower. It is important to note that UPPP (Q2196) and UPPP_complex (Q2195) are essentially the same surgical procedures. Likewise, the surgical technique for uvulectomy (Q2197) does not significantly differ from the other operations. Consequently, we combined all three operations in our analysis. We also conducted a comprehensive analysis to examine the distribution of palate operations across different types of healthcare institutions. Furthermore, we performed a detailed analysis based on the demographic factors (e.g., sex and age group) of the patients who underwent these surgical interventions.

### Ethics

We utilized publicly available information and conducted research without collecting or recording personally identifiable information. Therefore, this study was exempted from review by the Institutional Review Board.

## RESULTS

### Trends in palate surgery for OSA in Korea over the past 12 years

In 2010, a total of 2,728 palate operations were conducted. The number peaked at 4,330 procedures in 2014 (Fig. 1), followed by a decline until 2017 and a subsequent increase in 2018. The number of procedures then gradually fell, with 3,096 operations performed in 2021. The overall rate for uvulectomy procedures (Q2197) remained relatively low, at 7.6%. Since its establishment as a new category in 2014, there has been a notable increase in the claim rate for UPPP_complex procedures (Q2195).

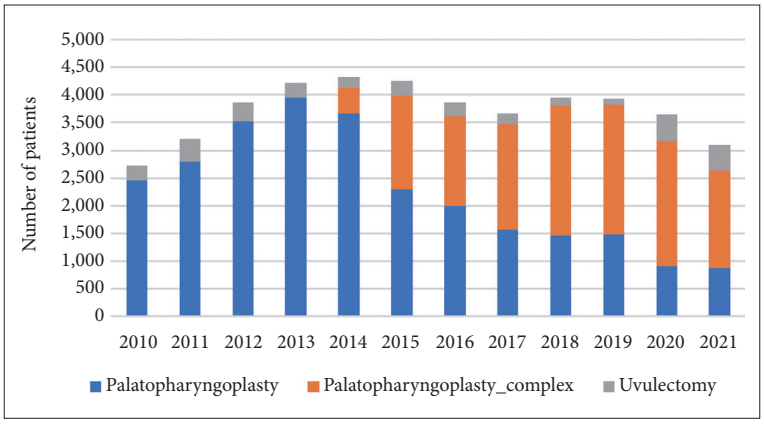


**Fig. 1.** Trends in palate surgery for obstructive sleep apnea in Korea over the past 12 years.

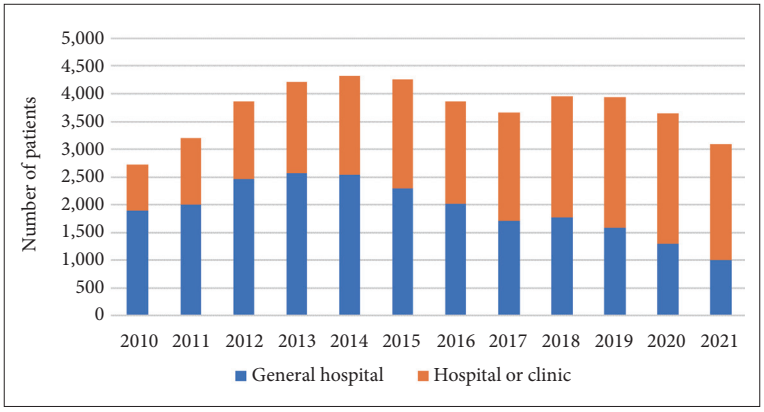


**Fig. 2.** Trends in palate surgery for obstructive sleep apnea in Korea according to hospital type.

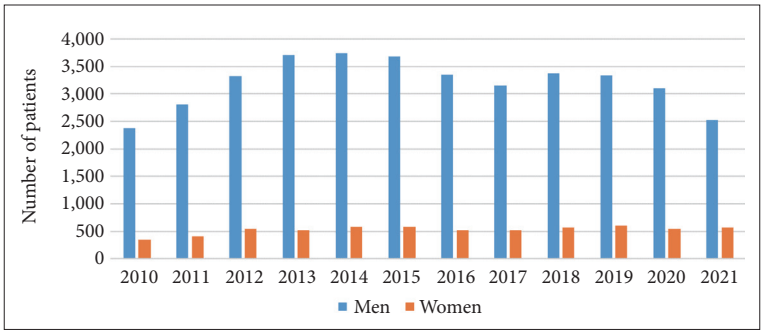


**Fig. 3.** Trends in palate surgery for obstructive sleep apnea in Korea according to sex.

## Trends in palate surgery for OSA in Korea according to hospital type

In 2010, approximately two-thirds of all palate operations were performed in general hospitals, with 1,892 procedures carried out in general hospitals and 836 procedures conducted in primary hospitals and clinics combined (Fig. 2). However, in the subsequent years, the number of palate operations performed in primary hospitals and clinics. As a result, by 2021, approximately two-thirds of all palate operations were conducted, with 1,002 procedures performed in general hospitals and 2,093 procedures performed in primary hospitals and clinics combined.

## Trends in palate surgery for OSA in Korea according to sex

In 2010, women made up only 14.5% of the total patient population, with men forming the majority (Fig. 3). However, the proportion of women has been slowly rising over time, reaching 22.5% in 2021. Conversely, the number of men has been on a downward trend since 2014. In comparison, the count of women has stayed relatively stable, with no significant fluctuations.

## Trends in palate surgery for OSA in Korea among men according to age

An analysis of the trends in palate surgery for OSA in Korea among men based on age revealed that the highest number of operations were performed on individuals in their 30s, followed by those in their 40s (Fig. 4).

## Trends in palate surgery for OSA in Korea among women according to age

According to an analysis of trends in palate surgery for OSA among women in Korea, the highest number of operations was observed among women in their 50s, followed by those in their 40s (Fig. 5).

## The ratio of the number of palate operations to the number of OSA patients

Between 2010 and 2014, there was a gradual increase in the proportion of OSA patients undergoing palate surgery, with the rate rising from 13.2% to 15.4%. However, after 2015, there was a slight decline, and starting in 2019, a significant decrease occurred, leading to a notable reduction. Ultimately, by 2021, the proportion reached a low level of 3.0% (Fig. 6).

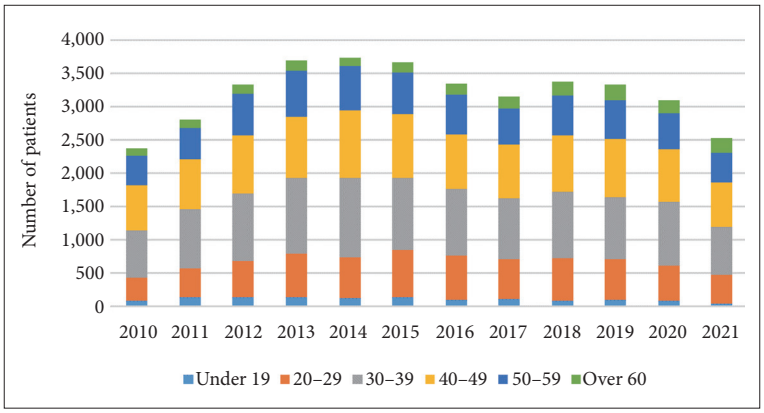


**Fig. 4.** Trends in palate surgery for obstructive sleep apnea in Korea among men according to age.

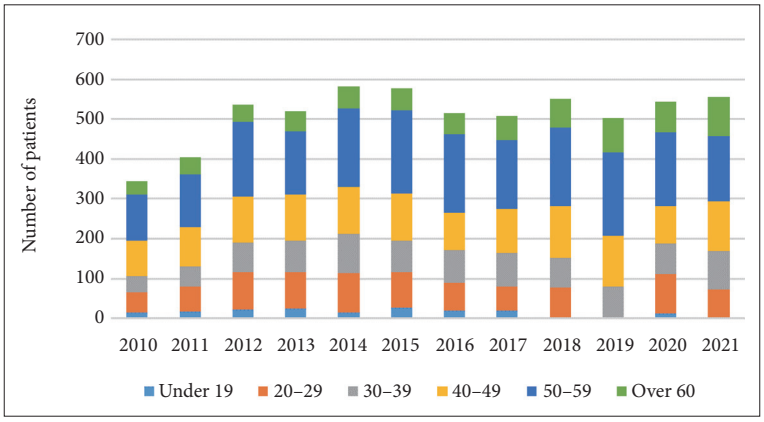


**Fig. 5.** Trends in palate surgery for obstructive sleep apnea in Korea among women according to age.

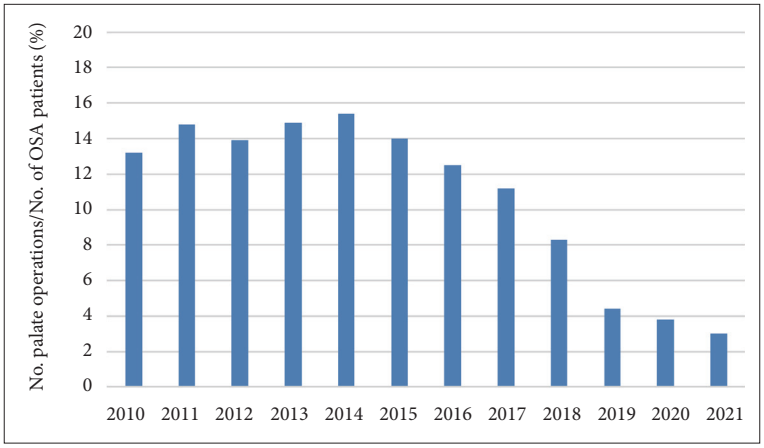


**Fig. 6.** The ratio of the number of palate operations to the number of obstructive sleep apnea (OSA) patients.

## DISCUSSION

This study aimed to examine the trends in palate surgery for OSA in Korea over a 12-year period. The number of palate operations performed varied over the years, starting with 2,728 cases in 2010, peaking at 4,330 cases in 2014, and then gradually declining to 3,096 cases in 2021. Despite the overall downward trend, there was a slight uptick in the number of palate operations in 2018 and 2019. This may be attributed to the expansion of health insurance coverage to include polysomnography and PAP therapy, leading to an increased diagnosis of OSA. Consequently, both the usage of PAP devices

and the number of palate operations increased. From 2010 to 2014, there was a steady rise in the percentage of OSA patients undergoing palate surgery, from 13.2% to 15.4%. However, post-2015, there was a minor decline, and from 2019 onwards, there was a significant drop, with the proportion plummeting to just 3.0% in 2021. The marked decrease observed from 2019 onwards is also thought to be due to a significant rise in the number of OSA patients and the use of PAP devices following the introduction of reimbursement for polysomnography and PAP therapy.

In 2010, the majority of operations, totaling 1,892 cases, were performed in general hospitals, while 836 operations were conducted in other hospitals and clinics. However, by 2021, there was a shift in this distribution. General hospitals performed 1,002 operations, while other hospitals and clinics carried out 2,093 operations. The exact reasons for this shift remain unclear. It is speculated that the increase in the number of polysomnography procedures in hospitals and clinics, following their reimbursement, could be a contributing factor. Additionally, it is hypothesized that general hospitals may prefer PAP therapy over OSA surgery to reduce the risk burden. Conversely, palate surgery is relatively favored in hospitals or clinics, likely due to economic considerations.

The most common age group for these operations in men was between 30 and 39, while in women it was between 40 and 49. The higher frequency of palate surgery for OSA in older women, compared to men, could be related to the average age at which OSA is diagnosed, which varies by sex. Furthermore, the increased prevalence of OSA in women in their 50s might be connected to hormonal shifts such as changes in estrogen and progesterone levels, or the commencement of menopause [19,20].

Currently, the national health insurance coverage for sleep apnea-related treatments in Korea includes the following reimbursable items: UPPP (Q2196), UPPP_complex (Q2195), uvulectomy (Q2197), expansion sphincter pharyngoplasty (Q2195), and radiofrequency tongue base reduction (QZ371). Non-reimbursable items include insertion of palatal implant (QZ372), genioglossus advancement (QZ373), and hyoidthyroidplexia (QZ374). In the HIRA Bigdata Open portal, only reimbursable items can be searched. However, information on expansion sphincter pharyngoplasty (Q2195) and radiofrequency tongue base reduction (QZ371) is not available due to their infrequent use. As a result, this study focused on UPPP (Q2196), UPPP_complex (Q2195), and uvulectomy (Q2197). While exact statistics are not available, it is believed that these three procedures are the most commonly performed operations for sleep apnea in Korea. For UPPP, including complex cases, the Korean health reimbursement system requires an AHI of 20 or higher, oxygen saturation below 80%, and signs, symptoms, or complications related to sleep apnea such as excessive daytime sleepiness, significant disruptive snoring, and arrhythmias. For uvulectomy, the Korean health reimbursement system requires mild OSA with an AHI of 20 or lower, no airway obstruction below the tongue base, and no hypertrophy in the palatine tonsils in patients who snore.

Palate surgery provides numerous benefits in managing OSA, such as enhanced airway dynamics, and symptom alleviation, and it serves as an alternative option for those who have not responded to non-surgical treatments [21]. Furthermore, surgery may boost compliance with PAP therapy by lowering the required PAP levels and extending the duration of PAP usage [22]. However, it is important to acknowledge the potential risks and complications linked to the procedure, as well as the variability in treatment results. A comprehensive patient evaluation and a detailed discussion of potential benefits and risks are vital when contemplating palate surgery as a treatment option for OSA.

Research using insurance claim data typically faces certain limitations, including potential selection bias, confounding variables, limited clinical information, inaccuracies in the data, and limited generalizability. The present study, which uses the HIRA Bigdata Open portal, shares these limitations. The omission of non-reimbursed data, aside from insurance claim data, could introduce selection bias into the study. Several potential confounding variables could influence the decision and execution of palate surgery, such as body mass index, anatomical findings, and comorbidities. Furthermore, the study is limited by restricted clinical information, data inaccuracies, and limited generalizability. Therefore, when interpreting this study that uses insurance claims data, it is crucial to approach the results with caution, keeping these potential limitations in mind.

In conclusion, since reaching its peak in 2014, the prevalence of palate operations in Korea has been on the decline. However, there has been a marked rise in the number of these operations performed at primary hospitals and clinics, especially among the middle-aged population. After the introduction of reimbursements for polysomnography and PAP therapy, there has been a substantial reduction in the proportion of palate operations performed relative to the number of patients with OSA.

## Availability of Data and Material

All data generated or analyzed during the study are included in this published article.

## Conflicts of Interest

Jae Hoon Cho and Ji Ho Choi who are on the editorial board of the *Journal of Rhinology* were not involved in the editorial evaluation or decision to publish this article.

## Author Contributions

**Conceptualization:** Jae Hoon Cho, Ji Ho Choi. **Data curation:** Jae Hoon Cho. **Formal analysis:** Jae Hoon Cho, Ji Ho Choi. **Funding acquisition:** Ji Ho Choi. **Investigation:** Jae Hoon Cho. **Methodology:** Jae Hoon Cho. **Supervision:** Ji Ho Choi. **Writing—original draft:** Jae Hoon Cho. **Writing—review & editing:** Jae Hoon Cho, Ji Ho Choi.

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