



Assessment of Post-Operative Outcomes of Radiofrequency Surgery in Obstructive Sleep Apnea

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ABSTRACT:

Background: Obstructive sleep apnea (OSA) is a prevalent sleep disorder characterized by repeated episodes of upper airway obstruction during sleep, leading to fragmented sleep and adverse health outcomes. This study evaluates the effectiveness of radiofrequency (RF) surgery in improving OSA symptoms and related parameters.

Objective: To assess the post-operative outcomes of RF surgery in patients with OSA, focusing on polysomnography (PSG) metrics such as the apnea-hypopnea index (AHI), oxygen saturation, snoring severity, and overall sleep quality. Additionally, this study investigates the variability in individual responses and the role of adjunctive therapies in optimizing treatment outcomes.

Methods: A prospective study was conducted on 42 patients aged 18-50 years at Sree Balaji Medical College and Hospital, Chennai. Preoperative assessments included overnight PSG and drug-induced sleep endoscopy (DISE). Postoperative outcomes were measured using PSG, the Epworth Sleepiness Scale (ESS), and the Berlin Questionnaire. Data were analyzed using SPSS version 23, with ANOVA and chi-square tests applied for continuous and categorical variables, respectively.

Results: The mean age of participants was 31.3 years (SD 9.8), and the mean BMI was 30.1 (SD 6.4). The mean duration of surgery was 72.9 minutes (SD 24.5). Post-surgery, the AHI significantly decreased from 16.06 to 8.71 ($p < 0.05$), and snoring severity improved in 57.1% of patients. Despite objective improvements, there was no significant change in daytime sleepiness or nodding-off rates. 42% of patients required additional therapy post-surgery. Complications were minimal (10%), and patient satisfaction scores had a median of 5.5. **Conclusion:** RF surgery is effective in reducing AHI and snoring severity in OSA patients, particularly among younger adults. The procedure is generally safe and well-tolerated, though a substantial proportion of patients may need adjunctive therapies for optimal outcomes. Future research should focus on refining patient selection criteria and exploring combination therapies to enhance the effectiveness of RF surgery in diverse patient populations.

Introduction

Sleep is crucial for maintaining overall health and well-being. Polysomnography (PSG) is a key diagnostic tool used to monitor various sleep parameters and identify sleep disorders, including obstructive sleep apnea (OSA). OSA is characterized by intermittent breathing pauses during sleep due to upper airway obstruction, which can lead to fragmented sleep and insufficient oxygenation. This condition often manifests as loud snoring, daytime

sleepiness, and gasping or choking episodes during sleep. OSA is prevalent in 3-7% of adult men and 2-5% of adult women globally, with increased risk factors including obesity, anatomical abnormalities, age, gender, smoking, and alcohol consumption. Women's risk of OSA tends to increase post-menopause, and the prevalence is expected to rise with growing obesity rates. Furthermore, OSA is associated with several serious health conditions, such as hypertension, cardiovascular disease, diabetes, and stroke [1][2].



RF Inferior turbinate



The primary goals of OSA management include alleviating symptoms, improving sleep quality, and reducing associated health risks. Traditional treatment options involve lifestyle modifications, continuous positive airway pressure (CPAP) therapy, and in some cases, surgical interventions. Radiofrequency (RF)

surgery is a minimally invasive procedure designed to treat OSA by targeting and modifying the tissues in the upper airway to alleviate obstruction. This approach may be particularly beneficial for patients with mild to moderate OSA or those who do not respond well to conservative treatments [8][9].

Polysomnography record



This study aims to evaluate the post-operative outcomes of RF surgery for OSA, focusing on several key parameters assessed through PSG. These include the apnea-hypopnea index (AHI), oxygen saturation levels, snoring intensity, and overall sleep architecture. Additionally, the study will explore the variability in treatment responses among individuals and the importance of long-term monitoring to ensure sustained benefits. By integrating subjective measures of daytime sleepiness and quality of life, such as the Epworth Sleepiness Scale (ESS) and the Berlin Questionnaire, this research seeks to provide a comprehensive evaluation of RF surgery's effectiveness in improving OSA symptoms and patient outcomes[4][6][7].

Methodology

This prospective study was conducted at Sree Balaji Medical College and Hospital, Chrompet, Chennai, to evaluate the post-operative outcomes of radiofrequency (RF) surgery for obstructive sleep apnea (OSA). The study included 42 patients aged 18-50 years with symptoms of snoring, excessive daytime sleepiness, and fatigability, who underwent RF surgery for OSA. Exclusion criteria encompassed individuals under 18 or over 50 years and those receiving lifestyle modifications alone. Prior to surgery, participants underwent overnight polysomnography (PSG) and drug-induced sleep endoscopy (DISE) to assess the severity of their condition and the anatomy of their upper airway. The RF surgery targeted upper airway tissues to alleviate obstruction. Post-operatively, outcomes were assessed through PSG to measure the apnea-hypopnea index



(AHI), oxygen saturation levels, and sleep architecture, as well as subjective evaluations using the Epworth Sleepiness Scale (ESS) and the Berlin Questionnaire to gauge daytime sleepiness and overall quality of life. Data were analyzed using SPSS version 23, with statistical methods including ANOVA for continuous variables and chi-square or Fisher's exact tests for categorical variables. The study anticipated evaluating the efficacy of RF surgery in improving OSA symptoms and providing insights into its long-term benefits.

Result

The study observed that the average age of participants was 31.3 years, with a standard deviation of 9.8 years, indicating most were around 31 years old. The mean BMI was 30.1, with a standard deviation of 6.4, reflecting a diverse range of body weights. The average surgery duration was 72.9 minutes, typically varying within ± 24.5 minutes. The median number of apnea events was 66.5, with most patients experiencing between 32 and 84 events. Patient satisfaction scores ranged from 3 to 7, with a median

of 5.5, and pain levels ranged from 1 to 7, with a median of 4, indicating mild to moderate discomfort post-surgery. Preoperatively, 40% of patients reported severe symptoms, 28% moderate, and 32% mild. Primary surgical methods included Tongue Base reduction and Uvulopalatopharyngoplasty (UPPP), though UPPP was less common. Post-surgery, 42% required additional therapy. Hypertension and diabetes were the most common comorbidities, affecting 32% and 16% of patients, respectively. Complications were rare (10%), with few cases of infection, bleeding, swelling, or pain, suggesting a generally safe procedure. There was no significant change in daytime sleepiness or nodding off rates post-surgery, though the Apnea Hypopnea Index (AHI) showed a significant reduction, from 16.06 preoperatively to 8.71 postoperatively, indicating improved sleep apnea. Snoring severity improved in 57.1% of patients, though individual results varied. Tiredness levels decreased slightly, but some patients reported increased tiredness almost daily. Many were unsure about their blood pressure status, highlighting the need for better hypertension education.

Variable	Mean/Median	Standard Deviation/Range	Additional Details
Age	31.3 years	9.8 years	Majority are around 31 years old.
BMI	30.1	6.4	Indicates a range of BMI around the mean.
Surgery Duration	72.9 minutes	24.5 minutes	Most surgeries are within ± 24.5 minutes of the average duration.
Number of Apneas	Median: 66.5	Range: 32-84	Middle 50% of patients had apnea events within this range.
Patient Satisfaction Score	Median: 5.5	Range: 3-7	Middle 50% of scores fall between 3 and 7.
Pain Level Score	Median: 4	Range: 1-7	Middle 50% of scores fall between 1 and 7.
Preoperative Symptoms	Severe: 40%	Moderate: 28%	Mild: 32%
Surgical Methods Used	Tongue Base, UPPP	PP less common	42% required additional therapy post-surgery.
Health Conditions	Hypertension: 32%	Diabetes: 16%	Most prevalent health conditions among patients.
Postoperative Complications	10%	Low incidence of infection, bleeding, swelling, and pain	Indicates overall safety and tolerability.
Daytime Sleepiness	No significant change	-	Surgery did not affect daytime sleepiness levels.



Variable	Mean/Median	Standard Deviation/Range	Additional Details
Apnoea Hypopnea Index (AHI)	Pre: 16.06	Post: 8.71	Significant decrease indicating improved sleep apnea.
Snoring Severity	Pre: Loud	Post: Slightly louder than breathing	57.1% saw improvement, with varied individual outcomes.
Tiredness Levels	Pre: 50% 1-2 times a week	Post: 28.6% 1-2 times a week	Increased tiredness almost daily; no significant overall change.
Nodding Off Rates	No significant change	-	Most patients reported nodding off 1-2 times a week.
High Blood Pressure Awareness	Many patients unsure	-	No significant change in blood pressure levels; need for better education.

Discussion

This study's findings on the surgical management of obstructive sleep apnea (OSA) align with several key points established in the existing literature. The mean age of the participants in our study was 31.3 years, which is younger than typical cohorts, as reported by Olszewska et al. (2024), who described a broader age range in their consensus on palatal surgeries across European centers. Our observation of significant improvement in the Apnea Hypopnea Index (AHI) post-surgery, from 16.06 to 8.71, is consistent with the outcomes reported by MacKay et al. (2020), who noted that well-selected patients for surgical intervention often experience substantial reductions in AHI, though they emphasized the variability in outcomes depending on surgical technique and patient characteristics.

The prevalence of comorbidities such as hypertension and diabetes among our participants is like the findings of Spyropoulou et al. (2022), who reported that these conditions are frequently observed in OSA patients and can influence surgical outcomes. Despite these comorbidities, our study showed minimal postoperative complications, supporting the conclusions of Bage et al. (2019) that surgical management of OSA can be safe and effective when performed with careful patient selection and perioperative management.

Our study's observation that 42% of patients required additional therapy post-surgery underscores the complexity of OSA management, as noted by Means et al. (2016), who found that while radiofrequency ablation and other surgical techniques can provide

relief, many patients continue to need adjunctive therapies for optimal outcomes. Similarly, DU et al. (year not specified) highlighted the role of additional interventions such as continuous positive airway pressure (CPAP) therapy in cases where initial surgical outcomes were suboptimal.

Patient satisfaction scores in our study, with a median of 5.5, indicate moderate satisfaction post-surgery, mirroring findings from MacKay et al. (2020), who noted that patient expectations and education are crucial in achieving satisfactory outcomes. The discrepancy between clinical improvements and patient-reported outcomes, such as unchanged daytime sleepiness and nodding off rates, suggests that surgical success does not always translate into perceived symptom relief, a point echoed by Bage et al. (2019).

Overall, our study reinforces the need for comprehensive preoperative assessments, as advocated by Olszewska et al. (2024), and a multidisciplinary approach to managing OSA, particularly in patients with significant comorbidities. Future research should focus on refining patient selection criteria and exploring the role of combination therapies, as suggested by Spyropoulou et al. (2022), to enhance the effectiveness of surgical interventions in diverse patient populations.

Conclusion

This study demonstrates that radiofrequency (RF) surgery is an effective intervention for improving the Apnea Hypopnea Index (AHI) and reducing snoring severity in patients with obstructive sleep apnea



(OSA), particularly among younger adults with a mean age of 31.3 years. The procedure was generally well-tolerated, with minimal postoperative complications and moderate levels of patient satisfaction. However, the need for additional therapies in 42% of the patients post-surgery highlights the complex and multifactorial nature of OSA management. While RF surgery significantly improved objective sleep parameters, subjective outcomes such as daytime sleepiness and quality of life showed variable responses, emphasizing the need for tailored patient education and expectations management.

The presence of comorbidities such as hypertension and diabetes did not significantly impact the safety of the procedure, aligning with existing literature that supports careful patient selection and comprehensive perioperative management to optimize outcomes. The findings suggest that RF surgery should be considered a viable option for patients with mild to moderate OSA who are not responsive to conservative treatments. However, the variability in patient responses underscores the importance of a multidisciplinary approach, incorporating long-term follow-up and adjunctive therapies as needed to achieve sustained benefits.

Future research should aim to refine patient selection criteria and investigate combination therapies to improve outcomes across diverse patient populations. Additionally, more studies are needed to explore the long-term efficacy and patient satisfaction following RF surgery, particularly in those with significant comorbidities. Overall, this study contributes valuable insights into the role of RF surgery in OSA management and highlights the need for individualized treatment plans to address the complex nature of this condition effectively.

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