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Original Research Article

Efficacy of coblation assisted surgery in obstructive sleep apnea with obstruction at the retropalatal level

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ABSTRACT

Introduction: Obstructive sleep apnoea syndrome (OSAS) is a common sleep disorder caused by abnormalities in the pharynx and upper airway muscles. Uvulopalatopharyngoplasty (UPPP) is the commonly indicated surgical procedure for the management of OSA. Recent studies state that coblation assisted UPPP can improve the outcomes of OSA.

Aim: To study the efficacy of coblation assisted uvulopalatopharyngoplasty in Obstructive Sleep Apnea Syndrome with isolated obstruction at the retropalatal level.

Materials and Methods: This prospective before-after analysis was conducted in Government Kilpauk Medical College Hospital and Government Royapettah Hospital attached to Kilpauk Medical College from September 2016 to September 2017. After a thorough examination, patients with moderate and severe OSA with obstruction at the retropalatal level were selected for the study. Institutional ethical clearance was obtained and all patients signed the written informed consent form.

Results: A total of 25 patients were selected for the study and a male predominance was observed (80%). Tonsil size was graded using the Friedman grading scale and the majority of the patients had grade II tonsillar enlargement (52%). Based on tonsil size and Friedman's palate position, the patients were classified using Friedman's system. 11 patients were classified as stage 1, 10 patients were classified as stage 2, 4 patients were classified as stage 3. A success rate of 68% was observed following surgery based on the 50% reduction in the AHI criterion.

Conclusions: Uvulopalatopharyngoplasty is effective in the management of OSA. Coblation assisted procedures can reduce postoperative pain and improve the outcomes of surgical therapy.

1. Introduction

Obstructive sleep apnoea is a potentially serious sleep disorder where the throat muscles intermittently relax and block the airway during sleep. According to WHO, obstructive sleep apnoea syndrome (OSAS) is a clinical disorder marked by frequent pauses in breathing during sleep and is usually accompanied by loud snoring.[1] This can cut off the oxygen supply and halt the removal of carbon dioxide from the body, leading to the brain's awakening, reopening the airways, and restarting breathing.[2] When this cycle gets repeated throughout the night, proper sleep is impossible. It may also be associated with poor social performance during the daytime, headaches, difficulty concentrating, neurocognitive impairment and cardiovascular disease.

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The prevalence of obstructive sleep apnoea (OSA) in men was 24% and in women was 9%.[3] OSA also imposes an economic burden on health care and has greater risks of road traffic accidents.[4] The condition is not life-threatening by itself but may result in other cardiovascular and cerebrovascular complications and impact life quality. OSA is diagnosed through polysomnography (PSG) and pulse oximetry, which measures blood oxygen.[5] The primary non-surgical management of OSA includes weight loss, avoidance of alcohol at least 4 hours before bedtime, oral appliances [mandibular repositioning appliances and tongue retainers] and sleeping on the side. Moderate to severe cases are treated by continuous positive airway pressure (CPAP), the gold standard for OSA management.[6]

CPAP therapy acts as a pneumatic splint and keeps the airways from collapsing during sleep. However, long-term compliance is not achieved with this therapy and may result in skin irritation, mask discomfort and claustrophobia. Therefore, pharmacological management of OSA is by modafinil to treat daytime sleepiness and topical nasal corticosteroids like fluticasone to prevent allergic rhinitis in patients undergoing CPAP.[7,8] Surgical management is opted in severe OSA cases and in patients who do not show CPAP compliance.

Uvulopalatopharyngoplasty (UPPP) is the most common surgical procedure for OSA, where excess tissue from the soft palate and pharynx is removed, which are common sites of obstruction in many patients.[9] The success rate of UPPP is relatively low (33%-50%) and efficacy decreases with time.[10]

2. Aim

To study the efficacy of coblation assisted uvulopalatopharyngoplasty in Obstructive Sleep Apnea Syndrome with isolated obstruction at the Retropalatal level.

3. Materials and Methods

This prospective analytical study was conducted in the department of ENT from September 2016 to September 2017 in Government Kilpauk Medical College Hospital. Institutional ethical committee approval was obtained EC approval No.06/2016. A total of 25 patients were included in the study and diagnosis was made based on polysomnography after informed consent was signed. A thorough examination of the patients and the necessary investigations were done. Those with moderate & severe OSA levels were further evaluated by Drug-Induced Sleep Endoscopy (DISE) and Sleep MRI to find the level of obstruction. Only patients with moderate and severe levels of obstructive sleep apnea (Apnea-Hypopnea Index greater than 5), patients with isolated obstruction at the retro-palatal level (Fujita Type-I) [as shown by an investigation with Drug-Induced Sleep Endoscopy and with Sleep MRI] and patients greater than 20 years of age were included in the study. Patients with Body Mass Index (BMI) greater than or equal to 40 Kg/m2 (i.e.) Obese Class III or very severely obese, those with high surgical risk according to the classification of the American Society of Anaesthesiologists (ASA), i.e., greater than ASA class III and patients with multilevel obstruction or obstruction at other levels were excluded from the study.

UPPP was performed on all the patients and repeat polysomnography was done after one month. The primary endpoint was the Apnea-Hypopnea Index (AHI) and the secondary endpoints were Arousal Index, Oxygen Desaturation Index and Awakenings Index. The results were classified as: a. Surgical Success: Reduction of AHI by more than 50% of the preop value. b. Non-responder: Less than 50% reduction in AHI.

Data are presented as mean, standard deviation, percentages and number of cases. The difference between continuous variables was analyzed using paired sample t-test. Significance was defined by P values less than 0.05 using a two-tailed test. Data analysis was performed using IBM-SPSS version 21.0 (IBM-SPSS Science Inc., Chicago, IL).

4. Results

Among the 25 study patients, 20 patients (80%) were males and 5 patients (20%) were females. This shows a male predominance in obstructive sleep apnoea cases Figure 1.

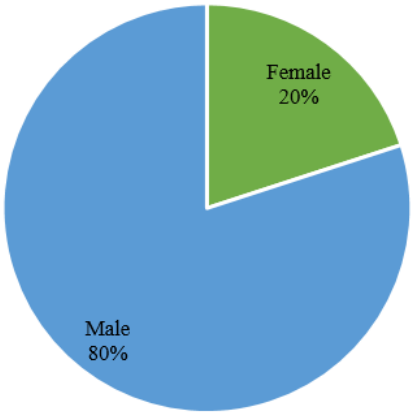

Fig. 1: Gender distribution

The patients' average age was 36 years, with a standard deviation of 9 years Figure 2.

All the cases were classified using the Apnea-Hypopnea Index (AHI) with AHI > 15 classified as moderate OSA and AHI > 30 as severe OSA. 8 patients had moderate OSA and 17 patients had severe OSA Table 1 &Figure 3.

The patients were classified based on BMI according to the WHO criteria for Asian populations. Thus, 10 patients

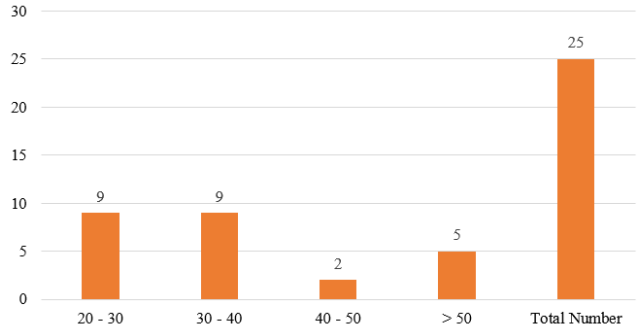

Fig. 2: Age distribution

Table 1: Distribution according to disease severity

Disease Severity	Number
Moderate OSA (AHI>15)	8
Severe OSA (AHI>30)	17

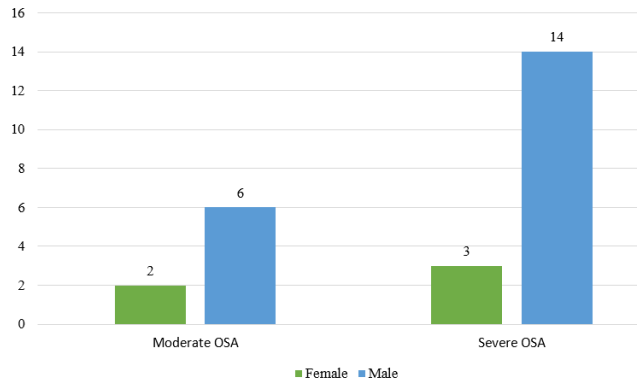

Fig. 3: Disease severity - Gender distribution

(40%) were Pre-Obese, 10 (40%) were Obese class 1 and 2 patients (8%) were obese class 2. According to the revised criteria, of the 3 patients with normal BMI, 2 were classified as Normal with increased risk, obese Class 3 was excluded Figure 4.

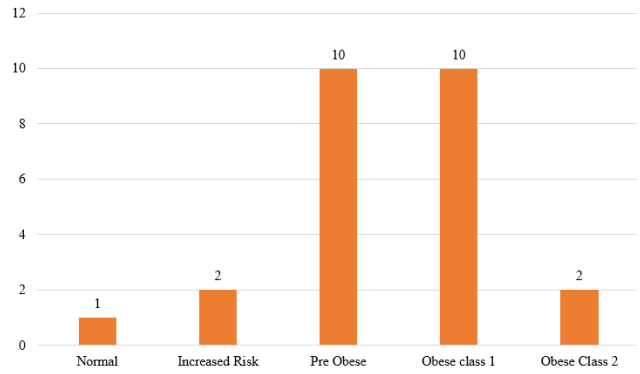

Fig. 4: BMI classification

Tonsil size was graded using the Friedman grading scale. 13 patients had grade II tonsillar enlargement, 8 patients had grade III, 3 patients had grade IV and only 1 patient had grade I tonsillar hypertrophyFigure 5.

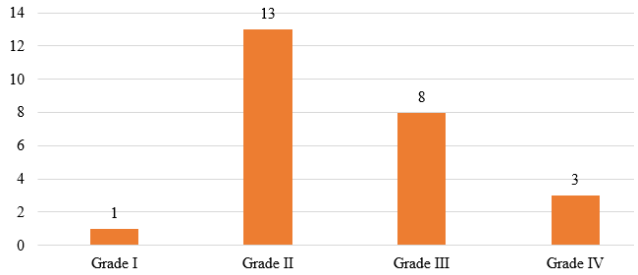

Fig. 5: Tonsil size distribution

The Friedman tongue position was calculated for all the patients. 20 patients scored 2 on the scale, 4 patients scored 3 and 1 patient scored 1 Figure 6.

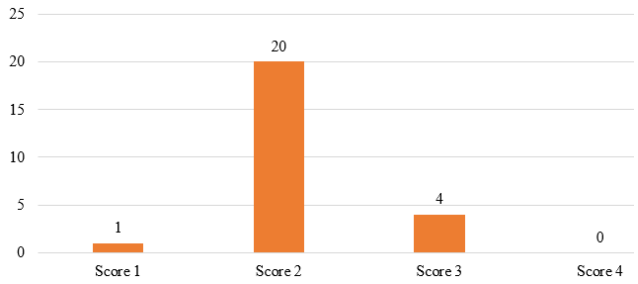

Fig. 6: Friedman tongue position

Using the data collected regarding tonsil size and Friedman palate position, the patients were classified using Friedman's system. 11 patients were classified as stage 1, 10 patients were classified as stage 2, 4 patients were classified as stage 3. There were no patients in stage 4 as patients with BMI > 40 were excluded from this study Figure 7.

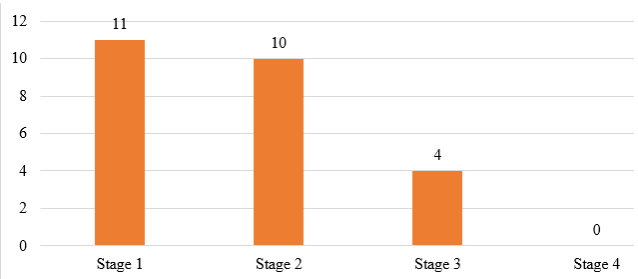

Fig. 7: Friedman staging system

Using the standard criterion of 50% post-op reduction in AHI, 8 cases were deemed to have failed. In the remaining cases, the criterion was achieved, producing a success rate of 68% Figure 8.

Table 2: Pre-op and post-op comparison of AHI

Group	Number	Pre-op AHI	Post-op AHI	P-Value
Success	17	52.1000 ± 26.79573	13.5471 ± 5.25073	<0.0001
Failure	8	36.0000 ± 20.44127	23.1125 ± 10.50108	0.010

Table 3: Comparison ofarousal index

Group	Number	Pre-op arousal index	Post-op arousal index	P-Value
Success	17	27.6000 ± 11.93069	10.6059 ± 4.23534	<0.0001
Failure	8	28.4500 ± 14.20020	15.6125 ± 6.87967	0.025

Table 4: Comparison of awakenings index

Group	Number	Pre-op index	Post-op index	P Value
Success	17	9.4353 ± 6.44641	1.8824 ± 0.65501	<0.0001
Failure	8	9.3875 ± 9.21791	3.7250 ± 2.65263	0.51

Table 5: Comparison of oxygen desaturation index

Group	Number	Pre-op ODI	Post-op ODI	P-Value
Success	17	45.9529 ± 31.88158	11.9941 ± 6.38352	<0.0001
Failure	8	24.0188 ± 19.02729	15.3125 ± 12.23443	0.012

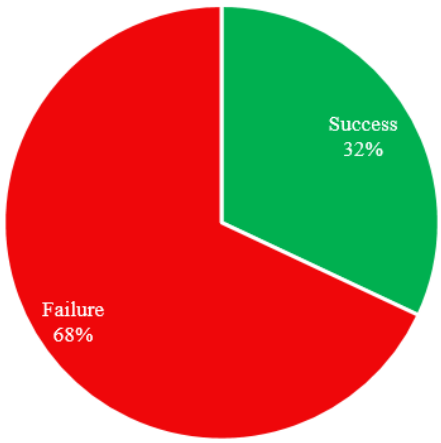

Fig. 8: Reduction in AHI

The pre-operative and postoperative comparison of the study parameters is shown in Tables 2, 3, 4 and 5.

5. Discussion

Uvulopalatopharyngoplasty (UPPP) is the first surgical procedure concretely designed to treat obstructive sleep apnoea (OSA). Fujita first described the procedure in 1981, who modified an earlier treatment method for snoring by Ikematsu.[11,12] In UPPP, the retropalatal airway is enlarged by excision of the tonsils (if they are not previously extirpated), followed by shaving and reorienting the tonsillar pillars excision of the uvula and posterior soft palate. Many promising modifications have been made to this surgical technique, including the creation of uvulopalatal flap instead of extirpation of the uvula and posterior soft palate, combined palatal flap and tonsil reduction by coblation instead of tonsillectomy.[13] Different surgical tools such as electrocautery, scalpel and Laser-assisted uvuloplasty (LAUP) can be applied to achieve this procedure. There are multiple approaches to UPPP, including relocation pharyngoplasty, lateral pharyngoplasty, Z-palatoplasty and palatal advancement. However, unlike nasal surgery, UPPP resulted in large oral leaks and decreased CPAP compliance (continuous positive airway pressure).[14] Therefore, surgeons must exercise the utmost care to limit the palatal resection in patients requiring CPAP following the procedure.

Like any other surgical procedure, UPPP also leads to complications like velopharyngeal insufficiency, difficulty in swallowing and nasopharyngeal stenosis and has an overall success rate of 40% (UPPP alone) according to a study by Lefebvre et al.[15] Coblation assisted UPPP is found to increase the efficacy and success rates. In our study, an efficacy rate of 68% was achieved with a success rate of 90.9% in stage I patients, 60% in stage II patients and 25% in stage III patients. Coblation is an advanced technology that effectively removes and reduces the size of the soft palate's bulky tissues and base of the tongue. The technique uses mild radiofrequency energy and saline instead of a heat-driven process. This allows for the surrounding healthy tissue to be preserved, resulting in easy and speedy recovery.[16]

Choi et al. in 2013, studied 20 patients with OSA who underwent UPPP in South Korea and achieved a 55% success using the 50% reduction in the AHI criterion.[17] Similarly, Sommer et al. showed a 64.5% success rate with statistically significant improvement in daytime sleepiness and snoring.[18]

In our study, males (80%) were more likely to have snoring when compared to females (20%). This finding is comparable to Nawal Alhulimi et al., who demonstrated an incidence of 96.25% OSA occurrence in males.[19] The disease severity was also more among males in our study, 44% of the patients in this study belonged to Stage I Friedman's classification and 40% belonged to Stage II. Based on the 50% post-op reduction in AHI, our study had a success rate of 68% with coblation assisted UPPP. The mean pre-operative AHI in the success group was 52.1±26.79 and the mean postoperative AHI was found to be 13.54±5.25 with a p-value of <0.0001 Table 2. Similarly, statistically significant p values were obtained between the pre-op and post-op values of arousal index (p<0.0001) Figure 3, awakenings index (p<0.0001) Figure 4 and oxygen desaturation index (p<0.0001) Figure 5. All these findings indicate the success and efficacy associated with coblation assisted UPPP.

Success rates were calculated for each Friedman stage. Stage 1 patients had a very good success rate of 90.9%, stage 2 had a success rate of 60%, while stage 3 patients had a poor success rate of only 25%. Stage 1 had a similar success rate to previous studies while there was an improvement in stage 2 in our study. Stage 3 results remain poor.[20]

Coblation is a minimally invasive, low thermal surgery (40-70°C) for effective dissection and precise removal of tissues with minimal damage to the surrounding tissues. Coblation also greatly reduces postoperative pain and can be utilised for additional procedures for improvement in OSA outcomes.

6. Conclusion

In conclusion, uvulopalatopharyngoplasty is a valuable treatment option in OSA, provided that when it is done as a single-stage procedure, the patient selection is done very rigorously. In addition, Coblation assisted procedures can be utilized for improvements in OSA outcomes.

7. Limitations

The major limitation of this study was that subjective symptoms of the patients were not analysed. The other limitations include the small sample size and the study design. Further studies with a bigger sample and with a Randomised control trial design may be conducted.

8. Conflict of Interest

None.

9. Source of Funding

None.

10. Acknowledgement

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