A Prospective Study on Surgical Outcomes In Obstructive Sleep Apnoea– A Series of 40 Cases

M K Rajasekar, Venkata Subramaniam Jagannathan Vikram, Ronald Anto

Madras Medical College

ABSTRACT

Obstructive sleep apnea syndrome (OSAS) is characterised by repetitive sleep-related upper airway obstructions resulting in sleep fragmentation and decrease in blood oxygen saturation. It is seen approximately in 1-5% of adult men and in 1.2-2.5% of adult female [1, 2, 3]. Guilleminault, Eldridge, and Dement were the first to first sleep syndrome in 1973 with establishing one of the first sleep clinics in the world [4]. Polysomnography is the gold standard for the diagnosis of OSAS [5], providing information about the severity of OSAS and degree of sleep fragmentation but not the level of upper airway obstruction. The site of upper airway obstruction can be assessed by magnetic resonance imaging, computerised tomography, lateral Cephalometrics and nasopharyngoscopy [6-9].

A rational approach needs to be devised, by analysing both anatomical and physiological parameters for optimal management [10]. The purpose of the study is to compare surgical outcomes in patients with obstructive sleep apnoea.
Materials and Methods

This prospective study of 40 patients was conducted over one year period, in patients with snoring and OSA who reported in the Department’s Snoring and Sleep Disorder Clinic in our institute between the months of January 2014 to January 2015.

The patients were selected in to the study after establishing a clinical diagnosis of OSAS and Epworth sleepiness scale scores above ten (out of 24) indicates excessive day time sleepiness. After the institutional ethical committee approval obtained, the study group was formed by counselling and obtaining informed consent for participation in the study.

The inclusion criteria includes (1) age between 25 to 50 years (2) BMI >30 and <40 (3) both sexes male and female (4) neck circumference >17 inches for men and > 15 inches for women (5) AHI > 5 (6) Epworth sleepiness scale >10 and (7) unsuccessful or refused CPAP therapy.

The exclusion criteria include (1) age below 25 and above 50 years (2) BMI >40 (3) associated craniofacial abnormalities (4) hypothyroidism or other metabolic abnormalities (5) unstable cardiovascular and severe pulmonary disease.

A detailed Performa evaluated for each patient including history (including snoring, it’s intensity, presence of chocking episode during sleep , sleep awakening, excessive day time sleepiness, nasal obstruction, prior medical or surgical history, smoking and alcohol consumption history), complete physical examination (including BMI, neck and abdominal circumference), general and ENT examination. The basic investigations were done to rule out metabolic disorders. In all patients’ pre operative assessment were done including polysomnography, dynamic MRI, drug induced sleep endoscopy. Patients with hypothyroidism, CPAP failure and other metabolic disorders were excluded from the study.

Patients were evaluated based on 5 parameters namely severity of snoring, sleep awakening, Epworth sleepiness scale score, polysomnography and findings on dynamic MRI and segregated in to two groups.

Group A- Those with mild OSA with AHI of 5-20 and primary snorers with AHI <20, Friedman’s tongue position of grades 1 and 2, elongated thick uvula, webbing of soft palate and posterior pillars were included in group A which included 20 patients and underwent radiofrequency reduction. Preoperative diagnostic nasal endoscopic and DISE(Drug induced sleep endoscopy with Propofol) were performed to conclude the site of obstruction, to assign the type of radiofrequency procedure which includes palatoplasty for retro-palatal collapse, turbinoplasty for turbinate hypertrophy, tonsillectomy for enlarged tonsils and Radio Frequency tongue base reduction for bulky tongue base and retroglossal collapse.

Group B- Those with severe OSA with AHI of >20 were included in group B which included 20 patients. Retro-palatal collapses in DISE were subjected to UPPP, patients with severe circumferential retro-palatal collapse underwent zetapalatopharyngoplasty and patients with retro-palatal lateral wall collapse underwent Expansion sphinterpalatopharyngoplasty.

All surgeries were performed by senior consultants. A total of 40 patients were included for the study and underwent respective surgeries based on the preoperative investigations and type of collapse in DISE.
All patients were reviewed after 3 months postoperatively and assessed based on the 5 parameters. The success of surgical treatment for OSA was categorized by Sher et al. [11] which defined as apnoea index below 10 from the pre-operative level.

Analysis

A total of 40 patients were included in the study comprising of 27 males and 13 females. This eventually shows that 67.5% are males and 32.5% are females, hence it relies on that OSA is most common in males.

In comparison of snoring symptoms there was 80% (n=16) complete remission in study population after radiofrequency reduction and 75% (n=15) after other major surgeries. Analytical values of PSG scores shows that 85% (n=17) were reduced to <5 with radiofrequency procedures and 60% (n=12) with <5 for major surgeries. Sleep awakening was completely absent in 90% (n=18) with radiofrequency surgeries and 85% (n=17) with other surgeries. EPS postoperatively was also in range of 0-10 in 85% (n=17) and 70% (n=14) of study group respectively. Dynamic MRI shows complete absence of obstruction postoperatively in 85% (n=17) of study group with radiofrequency and 85% (n=17) with other major surgeries.

All patients included in the study are age between 25 to 50 years and BMI >30 and <40. The effectiveness of surgical outcome was evaluated preoperatively and 3 months after surgery. The number of cases in each group and the type of surgery performed based on dynamic MRI and drug induced sleep endoscopy were summarized in flow chart above.
UPPP - Uvulopalatopharyngoplasty, ZETA - zetapalatopharyngoplasty, ESP - Expansion sphincter palatopharyngoplasty, TBR - Tongue base reduction

<table>
<thead>
<tr>
<th>Surgery</th>
<th>Comparing Index</th>
<th>Snoring</th>
<th>SLEEP Awakening</th>
<th>EP worth Sleepiness Scale (EPS)</th>
<th>Polysomnogram (PSG)</th>
<th>Dynamic MRI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>To wake others</td>
<td>Lou</td>
<td>quiet</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Radio Frequency = 20</td>
<td>Pre-CP</td>
<td>11</td>
<td>2</td>
<td>15</td>
<td>15</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Post-OP</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>18</td>
<td>1</td>
</tr>
<tr>
<td>UPPP = 11</td>
<td>Pre-CP</td>
<td>11</td>
<td>0</td>
<td>8</td>
<td>8</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>Post-OP</td>
<td>1</td>
<td>2</td>
<td>10</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>ZETA = 8</td>
<td>Pre-CP</td>
<td>1</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Post-OP</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>ESP = 1</td>
<td>Pre-CP</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Post-OP</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>TBR with Coblation = 2</td>
<td>Pre-CP</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Post-OP</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Total = 40</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The average PSG score reduction was 7.35 with radio frequency and 37.75 with major surgeries is shown in table 2. The reduction of AHI was significant in both within the groups (p < 0.001).

<table>
<thead>
<tr>
<th>Polysomnography scoring (AHI)</th>
<th>Radiofrequency (mean value)</th>
<th>Major surgeries (mean value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-operative</td>
<td>10.20</td>
<td>46.75</td>
</tr>
<tr>
<td>Post-operative</td>
<td>2.85</td>
<td>9.30</td>
</tr>
<tr>
<td>Improvement in AHI scoring</td>
<td>7.35</td>
<td>37.45</td>
</tr>
</tbody>
</table>

Pre Op and Post Op Analysis of symptoms and investigations

Photograph of Dynamic MRI Preoperatively
Discussion

The study was started with the aim of evaluating the outcome of surgery in OSA and snoring patients. The study population chosen was scrutinized with proper implementation of the inclusion criteria. Those with confounding factors like other systemic disorders are excluded. Various symptoms and signs are compared pre and post operatively.

Group A:

Woodson et al in 2003 published results regarding radiofrequency ablation of the turbinate’s and soft palate. In his study, he included only mild to moderate obstructive sleep apnoeic patient’s i.e. AHI involving 10 to 30 in pre-operative polysomnographic screening. These patients are randomly subjected to radiofrequency ablation, CPAP, and placebo. “Significant results are not obtained when compared with placebo. However, there was moderate decrease in AHI and RF patients reported statistically significant improvements in quality of life, airway volume, apnoea index, and respiratory arousal index”. The major limitation of study is due to loss of significant population in the follow up period.

Staid and Strome (2003) “conducted a retrospective review of 39 patients, those received RFVTR of the soft palate for snoring. Telephone interviews were used to collect long term follow-up info on efficacy and sequelae. Average follow-up time was 14 months. All measures were self-reported. Snoring scores decreased an average of 52%. 67% of patients reported they were satisfied. No significant complications or long-term sequelae were reported. Based on these results the authors felt that RFVTR of the palate is a relatively safe and effective long-term treatment for snoring”.

In 2004, Stuck et al published a report on OSA with a frequency of 20 patients regarding combined temperature controlled RF volumetric reduction of the base of tongue and soft palate. He included the patients who had obstruction at both palate and retro-lingual region of upper airway system. The pre and post operative questionnaire regarding excessive day time sleepiness, and quality of life is used for assessment. PSG was also done in two consecutive nights at 12 weeks postoperative period. “Results showed no changes in functional parameters and a significant improvement in daytime sleepiness. 6 out of 18 patients were cured after a mean of 2.7 treatments. Based on the results of the 12 week follow-up the authors found the procedure to be a safe and effective treatment for OSA”.

In 2009 Fibbi et al published results regarding the study of mild OSA patients. 24 patients are included in this study and they are treated with either lingual suspension or RFVTR (radiofrequency volumetric tongue reduction), EPS, Cephalometrics analysis, and Muller’s maneuver were used as parameters for assessment of patients. Post operative follow-up was done at 6 and 24 months. “At 6 months, 67% of lingual suspension and 75% of radiofrequency patients had success. At 24 months, the success rate dropped to 42% and 33% respectively”.

Drtbalu’s Otolaryngology online
While comparing snoring symptoms in our study group there was 80% (n=16) complete remission in study population after radiofrequency reduction and Analytical values of PSG scores shows that 85% (n=17) were reduced to <5 with radiofrequency procedures surgeries. Sleep awakening was completely absent in 90% (n=18) while EPS postoperatively was also in range of 0-10 in 85% (n=17) respectively. Dynamic MRI shows complete absence of obstruction postoperatively in 85% (n=17) of study group with radiofrequency.

Group B:

Fujita et al (1985); published results regarding the outcome of UPPP surgery. The total study population had an average age of 44 years and a BMI of 29 kg/m². The study population included 90% of males and only 10% females. He used multi-channel in-lab polysomnography for AHI assessment. The average pre-operative apnea-hypopnoea index is 40.3/hour. Post-operative follow up was done between 3 months to one year later. “Following UPPP, there was an overall reduction in AHI of 33% (95% CI 23% to 42%). Post-operative residual AHI remained elevated, averaging 29.8/hour”.

Lojander et al. (1996); also conducted a randomized control trial. In this study two groups are used; one with a frequency of 44 for CPAP and another group with a frequency of 32 for UPPP. These study results are parallel and prevented their direct comparison. However, considering the results of UPPP alone there was “statistically significant improvements in daytime sleepiness and snoring but not with oxygen saturation levels during sleep”.

Walker et al. (1997); conducted a nonrandomized comparative study on outcome in terms of efficacy between UPPP and LASER assisted UPPP (LAUPP). They had a frequency of 41 and 38 respectively. “The response rate, defined as a > 50% reduction in the postoperative respiratory disturbance index, was 51% of UPPP-treated patients and 47% of LAUPP-treated patients. Patients in the UPPP group had higher respiratory disturbance indexes prior to surgery (52.1) compared with those who underwent LAUPP (30.3), which may have had an impact on outcome”.

In our study population in group B, the reduction of snoring symptoms was 75% (n=15), while PSG scores shows 60% (n=12) with <5. Sleep awakening was absent 85% (n=17) with surgeries. EPS postoperatively was 70% (n=14) of study group B. Dynamic MRI shows complete absence of obstruction postoperatively in 85% (n=17) of study group B.

Complications following major surgeries were difficulty in swallowing (most common), nasal regurgitation, taste disturbances and voice changes which subsided in the second postoperative period.
“The above bar chart shows the comparison of AH1 before and after UPPP in all publications ranged from 1985 to 2006 in a chronological order”. In our study the average PSG score reduction was 7.35 with radiofrequency and 37.75 with major surgeries. The reduction of AH1 was significant in both within the groups (p < 0.001).

Conclusion

Radiofrequency for upper airway reconstructive surgery in sleep disordered breathing for the nasal inferior turbinate, the soft palate, and the tongue base offers additional therapeutic options in the surgical armamentarium in an area in which there were once limited options. The important advantage of radiofrequency procedures are technically simple and minimally invasive; they are associated with reduced postoperative pain compared with major surgical approaches and they can be performed in an outpatient setting under local anaesthesia with a low complication rate and generally good therapeutic results. Radiofrequency surgery should be considered as the treatment of choice for mild OSA with AH1 <20. Nevertheless, the necessity of repeated treatment sessions and the significant costs for the radiofrequency generators and needle devices should be kept in mind as a disadvantage of this technique.

Future studies will aid in delineating the specific role of RF in sleep disordered breathing. Major surgeries like Uvulopalatopharyngoplasty, zetapalatopharyngoplasty, ESP and tongue base reduction are considered for severe snoring with PSG scores >20.
References:


16. Chris Yang, MD, B. Tucker Woodson, MD, Upper airway physiology and obstructive sleep-disordered breathing, Otolaryngologic Clinics Of North America, 36 (2003), 409-421


18. K. Christopher McMains, MD, David J. Terris, MD, FACS, Evidence-based medicine in sleep apnea surgery, Otolaryngologic Clinics Of North America, 36 (2003), 539-561

19. Marc G. Dubin, MD, Brent A. Senior, MD, The Limitations of isolated palatal surgery for patients with obstructive sleep apnea, Otolaryngologic Clinics Of North America, 36 (2003), 511-517