



SURGICAL MODIFICATIONS OF THE UPPER AIRWAY AND ITS OUTCOME IN PATIENTS WITH SNORING AND OSA

Otolaryngology

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ABSTRACT

Snoring is noise generated from upper airway due to partial upper airway obstruction. Snoring affects at least 40% of men and 20% of women and is a significant sleep disorder. Depending on intensity of snoring sounds and frequency of snoring as experienced by partners, snorers are occasional, habitual, alcohol associated or heroic snorers.

Snoring is associated with drug resistant hypertension, diabetes, Obstructive sleep apnea syndrome [OSA], heart failure, obesity, night time heart attacks and coronary artery disease. Most of our study population attributes snoring to a good night's sleep and hence most people don't seek medical help unless brought in by their partners.

The problems associated with snoring and sleep disordered breathing, causative factors, methods of prevention, population education and the management modalities available have been undermined so far in the population under study and hence an effort is made to compute some data with available resources.

KEYWORDS

Epworth, STOPBANG, OSA, Snoring

INTRODUCTION:

STUDY METHOD: This is a prospective study carried out in the Dept. of ENT, Govt. General Hospital, Kakinada between December 2014 and August 2016 and includes 148 cases of snoring with obstructive etiology. The study has been approved by the ethics committee of the institution.

PATIENTS AND METHODS:

All cases have been first evaluated clinically by detailed history, STOPBANG questionnaire⁵ and Epworth Sleepiness Score [ESS]⁴, Clinical examination, Diagnostic nasal endoscopy and video laryngoscopy, Investigations for co-morbid conditions, Cephalometry 8 by skiagrams, Hormonal analysis, CT imaging, MRI Cephalometry, Polysomnography⁹ and Sleep Endoscopy [DISE]¹⁰.

After careful examination and patient selection, surgeries were performed after informed consent. Post operatively patients were followed up to assess the cessation of snoring, improvement in quality of life and decrease in co-morbid conditions. Effect of exercise and control of hormonal disturbances on snoring is noted.

Inclusion criteria:

Both male and female patients belonging to different socioeconomic statuses and of various age groups and having a complaint of snoring with excessive day time sleepiness are included in the study.

Exclusion criteria:

1. Patients above 80 yrs of age who were considered unfit for surgery or anesthesia have been excluded.
2. Patients refusing surgery or patients with severe periodontic problems and craniofacial anomalies were excluded.

OBSERVATION AND RESULTS

Table 1. Age and Sex incidence:

35% of the study group population was in second decade of life; about 30% were in 3rd decade and 16% in 4th decade. 67% of the study group was male and 33% were female. Both male and female groups were most affected in 2nd decade.

AGE	MALE	FEMALE	Total
00-10 yrs	2	0	2
11-20	36	16	52
21-30	29	15	44

31-40	15	9	24
41-50	9	5	14
51-60	6	4	10
61-70	2	0	2
71-80	0	0	0
Total	99	49	148

Table 2. Weight and Sex

BMI over 23kg/m² is considered overweight.³ Further definitions: Normal BMI: 18.5-22.9 kg/m², Overweight: 23.0-24.9 kg/m², Obesity: >25 kg/m².

38.25% was obese [26.8% male and about 11.4% female], 35.5% was overweight [23.5% male and 12% was female] and 25.5% of the study group was of normal BMI [16% male and 9.5% female].

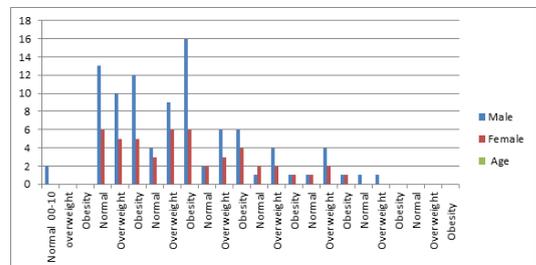


Table 3: Epworth sleepiness score [ESS]

Epworth sleepiness score [ESS] > 10 depicting excessive day time sleepiness²

36.2% of study population [54 patients] has ESS > 10. Of which 21.5% were male [32 patients] and 14.7% were female [22 patients].

AGE	MALE	FEMALE
00-10 yrs	0	0
11-20	4	3
21-30	6	5
31-40	11	6
41-50	5	4
51-60	4	4
61-70	2	0
71-80	0	0
Total	32	22

Table 4: STOPBANG questionnaire

SCORE: If YES>3 then patient is further evaluated for snoring with sleep apnea. Patients with score greater than 3

AGE	MALE	FEMALE
00-10 yrs	0	0
11-20	0	0
21-30	3	3
31-40	13	6
41-50	8	3
51-60	5	3
61-70	0	0
71-80	0	0
Total	29	15

29.5% [44 patients] of the study group scored more than 3 on STOPBANG questionnaire⁵.

Obesity	57
OSA	31
Diabetes	18
Hypertension	11
Hypothyroidism	6
Heart diseases	0

5. Incidence of comorbid conditions

Obesity was the most documented comorbidity¹⁸ with presence in 38% of study group [57 patients]. OSA was seen in 21% [31 patients], diabetes in 12% [18 patients], hypertension in 7.4% [11 patients] and hypothyroidism in 4% [6patients].

6. Friedman staging⁷

Most of the study population [62 patients, 42%] was in Friedman stage I. 42 patients [28.4%] were in stage III, 25 patients [17%] in stage II and remaining 19 patients [12.7%] were in stage IV.

7. Cephalometry⁸

The retro-glossal space (also called posterior airway space, PAS), is measured from the base of the tongue to the posterior pharyngeal wall.

PAS<10mm= OSA. PAS<5mm = severe OSAS

SNA angle = maxillary anterior point in relation to sella-nasion axis [<82 s/o maxillary hypoplasia]. SNB angle = mandibular anterior point in relation to sella-nasion axis [<80 s/o retrognathia, SNB <75 severe craniofacial deficiency]. MPH: Mandibular plane to hyoid distance. Normal=11-19mm. Increased MPH = Increased OSA

SNA angle < 82Degrees was seen in 28 patients [18.9 %], SNB angle < 80 degrees was seen in 14 patients [9.5%] and PAS < 10mm was seen in 4 patients [2.7%]

Measurement	No. of patients
Mandibular Plane– Hyoid bone distance >19 cm	0
SNA < 82 degrees	28
SNB < 80 degrees	14
PAS < 10 mm	4
PAS < 5mm	0

Table 8. Pre-operative Polysomnography⁹

In the current study, all people who scored more than 10 on the Epworth sleepiness scale or BMI > 25Kg/m2 or STOPBANG score >3 were sent for Polysomnography. The results of 54 patients are as follows

Apnea- Hypopnea Index	MALE	FEMALE	Total
AHI < 5	12	13	25
AHI: 5 – 14: mild OSA	9	6	15
AHI: 15 – 29: Moderate	7	1	8
AHI: > 30. Severe OSA	4	2	6
Total	32	22	54

Of the 54 patients who underwent Polysomnography, 46% [25 patients] had an AHI < 5, 28% [15 patients] had an AHI 5 -14 [mild OSA], 15% [8 patients] had an AHI 15-29 [moderate OSA] and 11% [6patients] had AHI > 30 [severe OSA].

Table 9. Pre-operative MRI

Awake MRI findings showed 31% [33 patients] had multilevel obstruction, 30% [32 patients] had oropharyngeal obstruction, 20%

[21 patients] had obstruction at hypopharyngeal level [base of tongue], 11% [12 patients] had obstruction at level of soft palate, 8% [8 patients] had obstruction at level of lateral pharyngeal wall. Patients who had obvious nasal pathology like deviation of nasal septum, ac polyps and nasal polyposis [42 patients] were not taken up for MRI.

Level of Obstruction	No. of patients
Soft palate	12
Oropharynx	32
Hypopharynx	21
Lateral Pharyngeal wall	8
Multilevel	33

Table 10. DISE: Drug Induced Sleep Endoscopy

Level of obstruction	Total
Velum	16
Oropharynx	59
Tongue	34
Epiglottis	0
Multilevel	39

Level of obstruction was determined using sleep endoscopy^{7,8}. Obstruction was at level of Oropharynx in 40% [59 patients], multilevel in 26% [39 patients], Base of tongue in 23% patients [34 patients] and at level of velum in 11% [16 patients] of study population.

Table 11. Type of surgery performed

The most common surgery done was adenotonsillectomy in 28% [42 patients] of study group, septoplasty in 22% [33 patients], Endoscopic surgery for ethmoidal polyposis in 19% [27 patients], AC polyp removal in 14% [21 patients], excision of benign nasal masses by either endoscopic or open approach in 11% [16 patients], Modified Uvulopalatopharyngoplasty in 3%[4 patients], laser assisted tongue base reduction in 1%[2 patients], nasal foreign body removal in 1% [2 patients] and tracheostomy in 1% [1 patient].

Adenotonsillectomy	42
Septoplasty	33
Removal of antrochoanal polyp	21
Removal of ethmoidal polyposis	27
Excision of Benign nasal masses	16
Modified Uvulopalatopharyngoplasty	4
Removal of nasal foreign body	2
Laser assisted tongue base reduction	2
Tracheostomy	1

12. Post-operative Polysomnography

Post-operative polysomnography was done 6 months after surgery. Of the 54 patients who underwent Polysomnography after surgery, AHI had returned to normal [AHI<5] in 7 patients who previously had AHI > 5. 59% [32 patients] had an AHI <5, 33% [18 patients] had an AHI 5 - 14 [mild OSA], 8% [4 patients] had an AHI 15-29 [moderate OSA] and none had AHI > 30 [severe OSA].

13. Post-operative MRI:

Post operative MRI imaging was done 6 months after surgery. Awake MRI findings showed 48% [12 patients] had obstruction at hypopharyngeal level [base of tongue], 28% [7 patients] had multilevel obstruction, none had oropharyngeal obstruction, 16% [4 patients] had obstruction at level of soft palate, 8% [2 patients] had obstruction at level of lateral pharyngeal wall.

14. QOL measurements:

Patients were asked questions from the CALGARY SAQLI¹⁴ [Sleep Apnea Quality of Life Index] and a note was made of subjective feeling of quality of life of patient before and 6months after surgery. 24 patients admitted to be persisting snorers 6 months after surgery. This was also corroborated by the partners. These 24 people also had persisting obstruction on Post-op MRI and also had mild or moderate OSA as projected by AHI scores on post op PSG.

Patients scored better on quality of life questionnaires after surgery with significant improvement in alertness, memory and ability to concentrate. Social and family interactions improved with improvement in sexual intimacy in married couples with improvement in self perception. There was reduction in excessive daytime

sleepiness and subjective happiness of a good night's sleep improved generally in all patients. Non surgical treatment related questions were not put to the patients.

DISCUSSION:

35% of the study group population was in second decade of life. Some of the children were overweight. This may be an indicator that pediatric OSA is on the rise in our population and along with chronic adenotonsillitis, as an indication for adenotonsillectomy^{12,13}. The male-to-female was 2:1. Androgenic patterns of body fat distribution (deposition in the trunk, including the neck area) predispose men to OSA. In general, sex hormones may affect neurologic control of UA-dilating muscles and ventilation.²

In our study, Obesity was the most documented comorbidity with presence in 38% of study group [57 patients]^{11,12,13}. Obesity and diabetes are on the rise in Indian population and as recent research suggests, Indians have a tendency to have more fat percentage for the same BMI when compared to a Caucasian.³ The weakness of this study is not having evaluated the people not taken up for surgery, which would have projected some data about coronary artery diseases, heart failure, arrhythmias, strokes and MI in snorers.

In our study, we found that patients who scored higher on the Friedman staging also scored high on ESS and STOPBANG, had significantly higher AHI on PSG and had some kind of narrowing on Cephalometry^{15,16,17}. Patients who had multilevel obstruction on DISE and MRI before surgery and underwent surgeries for obstruction only at one level, didn't show return of AHI to normal after surgery¹⁹. This may indicate that further soft tissue procedures of skeletal surgeries may be required in a patient with multilevel obstruction¹¹.

CONCLUSION

1. Management of the snoring patient is challenging. In the clinic and daily handling of these patients, all treatment options, both non-surgical and surgical, should be regarded as a spectrum of possibilities. The options often supplement each other when customizing an often life-long treatment to each patient individually.
2. Clinical practice of informing all patients of the importance of a stable weight or the need for weight loss should be emphasized. In all studies, especially in long-term follow-up studies, there is always a risk of other changes: for example, in lifestyle or other treatments that may influence the results.
3. The patient and procedure selection is important and procedure should be tailored for the patient.
4. Airway evaluation by means of DISE or MRI is critical to plan the type of surgery required and predict or evaluate the outcome of surgery.
5. Surgical correction of nasal pathology is pivotal but not primary. Patients will require additional correction of soft tissues of airway which is guided by DISE and MRI.
6. Snoring when present in non obese patients with craniofacial anomalies may require a skeletal correction as primary surgery. Cephalometry is crucial in such people.
7. Success of surgery should not be based on objective indicators like AHI on polysomnography alone as many patients subjectively report better quality of life [QOL] scores after surgery even in mild reduction of AHI.
8. Patient's success criteria should be based on improvement in BMI, AHI, blood pressure, Epworth sleepiness score and quality of life scores.
9. Adequate time is required to assess whether there is reduction in comorbid conditions associated with snoring after surgery.
10. Modified UPPP is considered a stable and successful treatment after 5-15 years of surgery. We require further follow up in this UPPP group to measure the reduction of nightly respiratory disturbances and daytime sleepiness symptoms. In our study, no increased mortality was seen compared to the normal population.
11. In patients failing first upper airway surgery, additional treatments with MRD or CPAP or a second surgery may be required. In summary, the studies in this thesis show that there is a definite place for surgical treatment in snoring and that surgery can be safe and effective after adequate evaluation of level of obstruction.
12. Elective tracheostomy is a definitive and most effective treatment of snoring. It improves all the symptoms of the patient.

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