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A Study of Effectiveness of Minimally Invasive Surgery in Patients with Obstructive Sleep Apnoea

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Abstract: *Obstructive sleep apnoea (OSA) is a condition characterized by repetitive upper airway obstruction leading to sleep fragmentation, cardiovascular stimulation and oxygen desaturation during sleep. Together, these lead to symptoms such as snoring, unrefreshing sleep, excessive daytime sleepiness(EDS) and the increased risk of cardiovascular disease, hypertension, insulin resistance, cerebrovascular disease and road traffic accidents.With the current growth of obesity, ENT surgeons, Cardiologists,Endocrinologists as well as sleep clinicians are witnessing a large increasein the prevalence of OSA in their practices.[1]*
minimally invasive upper airway surgery include the sparing of the overlying mucosa and decreased operative morbidity and postoperative complications
Materials and methods:This is a longitudinal study conducted in Department of Otorhinolaryngology, Govt ENT hospital, Koti, Osmania Medical College, Hyderabad.
StudyGroup: 40 patients diagnosed as OSA
Study Period: 2 years from November 2017 to October 2019.
Conclusion:*The minimally invasive surgeries such as coblation assisted adenoidectomy,coblation assisted tonsillectomy and septoplasty and submucosal diathermy of inferior turbinates considered in this study were effective in reducing the severity of snoring and obstructive sleep apnea in properly selected patients based on the anatomical abnormality of airway detected at various levels .*

Keywords*: obstructive sleep apnoea, coblation,,hypopnoea index, excessive day time slepiness ,polysomnogram, epworth sleepiness scale.*

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I. Introduction

Obstructive sleep apnoea (OSA) is a condition characterized by repetitive upper airway obstruction leading to sleep fragmentation, cardiovascular stimulation and oxygen desaturation during sleep. Together, these lead to symptoms such as snoring, unrefreshing sleep, excessive daytime sleepiness(EDS) and the increased risk of cardiovascular disease, hypertension, insulin resistance, cerebrovascular disease and road traffic accidents.With the current growth of obesity, ENT surgeons, Cardiologists,Endocrinologists as well as sleep clinicians are witnessing a large increase in the prevalence of OSA in their practices.[1]It is diagnosed based on an individual who has excessive daytime somnolence and snoring with an apnoea hypopnoea index (AHI) of more than five on polysomnogram (overnight sleep study).[1] The non surgical treatment of choice is being Continuous positive airway pressure (CPAP) device [2] and weight reduction. Custom made oral appliances arealso used to improve upper airway patency during sleep. But, most of the patients are unable to tolerate CPAP and oral appliances. Sleep disordered breathing is associated with increased mortality and high cardiovascular risk, and therefore should be treated as early as possible. Leaving patients who cannot use first-line therapy (CPAP) without any treatment option does not seem to be in accordance with good medical practice. Although surgical therapy does not always cure OSA, it does provide significant benefits. Surgery reduces disease severity, early mortality risk and cardiovascular risk. Studies have shown improvement in reaction time, quality of life, and motor vehicle crash risk.

Compared with traditional snoring and OSA operations, the main advantages of minimally invasive upper airway surgery include the sparing of the overlying mucosa and decreased operative morbidity and postoperative complications. Because a subset of patients cannot tolerate CPAP or oral appliances and are also not willing to Obstructive sleep apnoea (OSA) is a condition characterized by repetitive upper airway obstruction leading to sleep fragmentation, cardiovascular stimulation and oxygen desaturation during sleep. Together, these lead to symptoms such as snoring, unrefreshing sleep, excessive daytime sleepiness(EDS) and the increased risk of cardiovascular disease, hypertension, insulin resistance, cerebrovascular disease and road traffic accidents.With the current growth of obesity, ENT surgeons, Cardiologists,Endocrinologists as well as sleep clinicians are witnessing a large increase in the prevalence of OSA in their practices.[1]It is diagnosed based on an individual who has excessive daytime somnolence and snoring with an apnoea hypopnoea index (AHI) of

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II. Objectives

To study the affectiveness of minimally invasive surgeory in cases of obstructive sleep apnoea.

III. Materials and methods

This is a longitudinal study conducted in Department of Otorhinolaryngology, Govt ENT hospital, Koti, Osmania Medical College, Hyderabad.

StudyGroup: 40 patients diagnosed as OSA **Study Period**: 2 years from November 2017 to October 2019

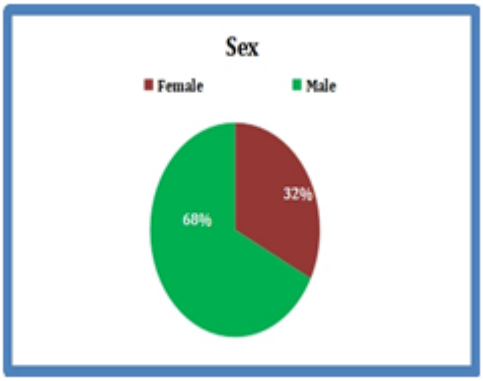
Inclusion criteria: Patients diagnosed to have OSA between age group 20-60 yearsPatients with associated anatomical abnormalities like DNS, inferior turbinate hypertrophy, adenoid and tonsillar hypertrophy.OSA patients with mild to moderate obesityOSA patients noncompliant to CPAP **Exclusion criteria:** Age < 18 yearsHigh risk patients with more comorbidities **Methodology**: All the Patients who came with complaints of snoring to GOVERNMENT ENT HOSPITAL, KOTI, were further evaluated clinically. Clinical assessment of OSA done with the attender present during the consultation. Detailed history of all the patients in this study was taken and they underwent a thorough clinical examination. It includes examination of nose, nasopharynx, oral cavity, oropharynx, hypopharynx and larynx. Examination done by diagnostic nasal endoscopy and videolaryngoscopy.

Measurement of height and weight was done to calculate body mass index.Examination of cardiovascular and respiratory system was done to establish potential OSA complications. Overnight polysomnography wad done using Alice 5 diagnostic recording device and Apnea Hypopnea Index (AHI) was calculated for all the patients prior to the surgery. Patients diagnosed as having obstructive sleep apnea and non- compliant to CPAP were enrolled into the study after taking informed and written consent .Surgical profile which includes a complete blood count, random blood sugar, blood urea, serum creatinine, PT with INR, ECG, Chest x ray, 2D ECHO, cardiology consultation and pre anesthetic checkup were carried out prior to the surgery. The type of surgery is decided based on the anatomical abnormality detected at various levels of airway . The surgeries included in this study are coblation assisted adenoidectomy, coblation assisted tonsillectomy and septoplasty and submucosal diathermy of inferior turbinates done under general anesthesia. The patients were subjected to surgery with adequate pre and postoperative care. Further follow up after 3weeks, 6weeks, 3 months and 6months of surgery were carried out. During the 6^{th} week follow up patients were asked about the improvement of symptoms such as snoring, excessive daytime sleepiness. Post op overnight polysomnography was done to assess Apnea Hypopnea Index 3 months after the surgery. Assessment of excessive daytime sleepiness was done using Epworth Sleepiness Scale to all patients 3 months after the surgery.

IV. Observations And Results

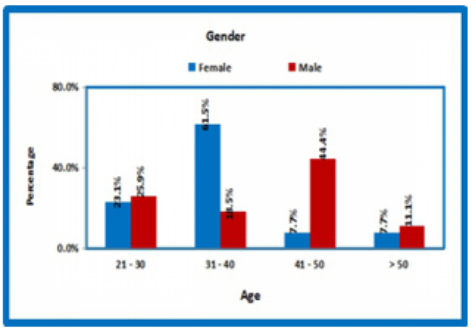
The present study was conducted on 40 patients in a period of 2 years from November 2017 to October 2019 at government ent hospital, koti, osmania medical college, hyderabad.**Frequency distribution of sex:**

Sex	Frequency	Percent
Female	13	32.5
Male	27	67.5
Total	40	100.0



Age and sex distribution:

	Sex				Total	
	Female		Male			
	Count	%	Count	%	Count	%
21 – 30	3	23.1%	7	25.9%	10	25.0%
31 – 40	8	61.5%	5	18.5%	13	32.5%
41 – 50	1	7.7%	12	44.4%	13	32.5%
> 50	1	7.7%	3	11.1%	4	10.0%
Total	13	100.0%	27	100.0%	40	100.0%

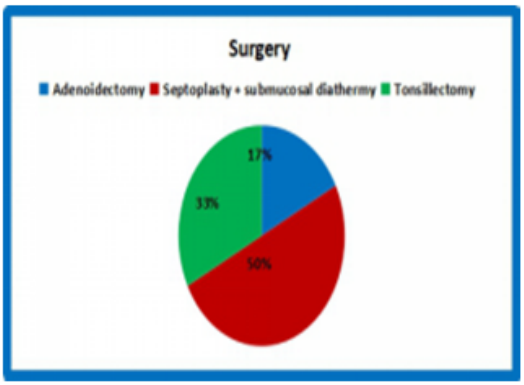


Symptomatology:

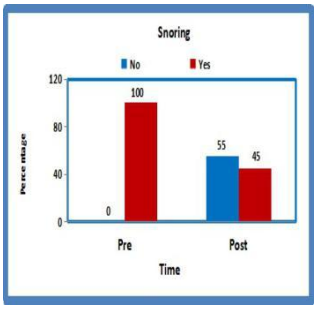
Symptoms	Frequency	Percent
Snoring	40	100
Apneic spells	17	42.5

Type of surgery performed:

Surgery	Frequency	Percent
Adenoidectomy	7	17.5
Septoplasty + submucosal diathermy	20	50.0
Tonsillectomy	13	32.5
Total	40	100.0

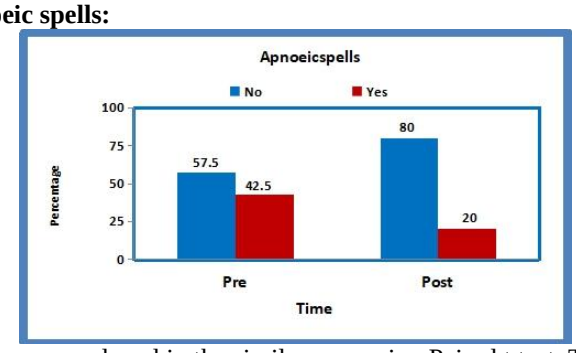


Effects of surgeryon snoring :



Post surgery results of snoring was evaluated and we found that there was an improvement in snoring. Out of 40 patients, 22 patients (89%) were completely free of snoring, which is statistically significant as the P value is <0.01 by paired T test.

Efficacy of surgery on apnoeic spells:

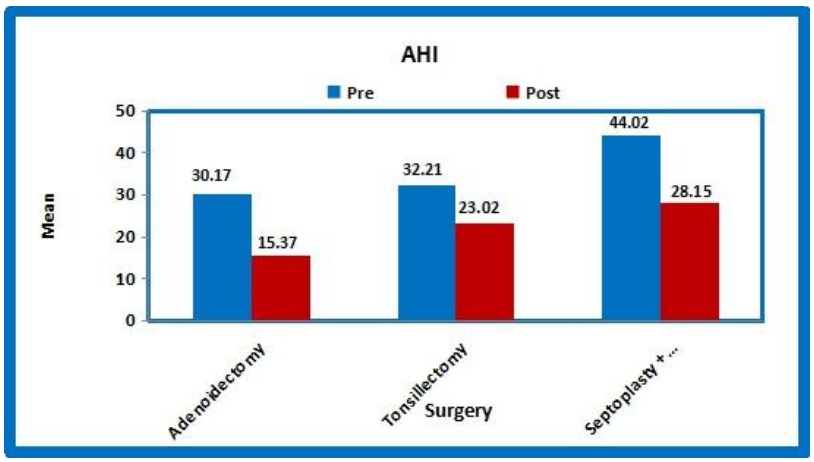


Pre and post op apnoeic spells was analyzed in the similar way using Paired t test. The results showed significant reduction of symptoms with p value = 0.03.

Out of 40 patients with pre op AHI, 22 patients reviewed with post op polysomnography AHI. Comparative studies were carried out in those 22 patients with post op AHI using paired T test.

Pre op and post op ahi based on the type of surgery:

Surgery	AHI						P-value
	Pre-Op			Post-Op			
	N	Mean	SD	N	Mean	SD	
Adenoidectomy	7	30.17	16.77	6	15.37	8.90	<0.01*
Tonsillectomy	13	32.21	12.96	5	23.02	9.97	<0.01*
Septoplasty + submucosal diathermy	20	44.02	16.51	11	28.15	9.65	<0.01*



V. Discussion

Obstructive sleep apnoea syndrome is a condition characterized by repetitive upper airway obstruction leading to sleep fragmentation, cardiovascular stimulation and oxygen desaturation during sleep. Many people suffering from severe antisocial snoring, excessive daytime sleepiness, poor memory and concentration with undiagnosed obstructive sleep apnea.Multiple treatment modalities have been practiced for this condition, ranging from weight reduction, Continuous positive airway pressure (CPAP) and Custom made oral appliances(OA) to extensive surgery (e.g. UPPP, RFTVR of soft palate, laser assisted uvuloplasty, LAUP,CAPSO, Zeta palatoplasty, tongue base reduction, genioglossus advancement surgeries). Only a few studies were published reporting the outcome of minimally invasive surgeries. There is also a lack of data on the long term outcome of these surgeries in the local setting.

The present study is a hospital based interventional study conducted at GOVERNMENT ENT HOSPITAL, OSMANIA MEDICAL COLLEGE, Koti, Hyderabad, from November 2017 to October 2019. 40 patients diagnosed with Obstructive sleep apnea who were refractory to non-surgical treatment were admitted and included in the study with informed and written consent. Coblation assisted adenoidectomy, coblation assisted tonsillectomy, septoplasty and submucosal diathermy of hypertrophied inferior turbinates, were done to the patients based on the anatomical abnormality of airway detected under general anesthesia with adequate pre and post-operative care.

In the present study, 32.5% of patients were female and 67.5% of patients were male. The age of the patients in the present study ranged from 22 years to 55 years and the mean age was 37.65 years.

The BMI of the patients ranged from 20.7 to 35.9 kg/m^3 and mean BMI is 28.6.

12.5% of patients are in normal range of BMI, 60% are overweight and 27.5% are obese.

In the present study, all the patients 100% had a history of snoring, which is mostly of regular basis associated with poor memory and concentration, headache (usually in the morning time). Around 62.5% patients presented with Excessive Daytime Sleepiness (EDS) which is evaluated using the Epworth Sleepiness Score (ESS).

In present study 17 patients about 42.5% of the study subjects had a history of multiple regular apneic spells at night with unrefreshing sleep.

In all patients pre-op polysomnography is performed. Among 40 patients

5 patients (12.5%) are classified as mild OSA

13 patients (32.5%) are classified as moderate OSA

22 patients (55%) are classified as severe OSA

Based on the symptoms and anatomical abnormality of airway detected in eac patient, the type of surgery to be performed was individualized. Among 40 patients, 7patients (17.5%) have undergone coblation assisted adenoidectomy, 13 patients (32.5%) have undergone coblation assisted tonsillectomy and 20 patients (50%) have undergone septoplasty and submucosal diathermy of inferior turbinates.

The effect of surgery is studied on the study group based on the improvement of the symptoms.

- Snoring is completely reduced in 22 (55%) patients after surgery which is statistically significant as the P value is <0.01 by paired T test. 18 (45%) patients continued to have snoring, which is mostly positional in nature.
- Snoring is resolved in 6 (85.7%) patients who underwent coblation assisted adenoidectomy , 9 (69.2%) patients who have underwent coblation assisted Tonsillectomy , and 11 (55 %) patients who underwent septoplasty with submucosal diathermy of inferior turbinates

- Excessive daytime sleepiness reduced in 16 (64%) out of 25 (100%) with EDS and the remaining 9 patients fall into the mild category of ESS after surgery. All the patients were advised to control or reduce weight following surgery as it got a significant relation in the development of OSA.

- Apneic spells reduced from 17 (42.5%) patients to 8(20%) with p value = 0.03. withsignificant improvement in quality of life and refreshing sleep. These patients were advised to use CPAP for symptomatic improvement post-operatively.
- Apnea Hypopnea Index: Out of 40 patients, 22 patients have undergone polysomnography 3months after surgery. 6 out 7 patients who have undergone coablation assisted adenoidectomy were reviewed with post op AHI, 5 out of 13 patients who have undergone coablation assisted tonsillectomy were reviewed, and 11 out of 20 patients who have undergone septoplasty with bilateral submucosal diathermy of inferior turbinates were reviewed.
- Rest of the patients were lost for follow-up.

-Comparative studies were carried out in those 22 patients with post op AHI using paired T test. The mean pre op AHI was 37.76 %, which had been reduced markedly to 12.93% with significant p value < 0.01.Out of them, 7 patients have improved from moderate to mild AHI (31.8%), 8 patients have improved from severe to

moderate AHI(36.3%), 1 patient have improved from severe to mild AHI(0.04%), There was no improvement in post op AHI in 6 patients (27.27%)

VI. Summary & Conclusion

Summary: In the present study of 40(100%) patients diagnosed to have OSA, which consists of 13 females and 27 males, all the patients (100%) had a history of regular snoring, 62.5% patients presented with Excessive Daytime Sleepiness (EDS), 40% of the study subjects had a history of multiple regular apneic spells at night.

All patients underwent surgery based on the anatomical abnormality detected in the airway and were followed up after 1 week, 3weeks , 6weeks, 3 months and 6 months of surgery. Post op overnight polysomnography was done to assess Apnea Hypopnea Index and assessment of excessive daytime sleepiness was done using Epworth Sleepiness Scale to all patients 3 months after the surgery.

Snoring completely reduced in 22 (55%) patients after surgery and 18 (45%) patients continued to have snoring, which is mostly positional in nature.

Excessive daytime sleepiness reduced in 16 (64%) out of 25 (100%) with EDS and the remaining patients falls into the mild category of ESS after surgery.

Apnoeic spells reduced from 17 (42.5%) patients to 8(20%).

Apnoea Hypopnoea Index: Out of 40 patients, 22 patients have undergone polysomnography 3months after surgery. Out of them, 7 patients have improved from moderate to mild AHI, 8 patients have improved from severe to moderate AHI, 1 patient have improved from severe to mild AHI, 6 patients had no improvement

Conclusion

1.The minimally invasive surgeries such as coblation assisted adenoidectomy, coblation assisted tonsillectomy and septoplasty and submucosal diathermy of inferior turbinates considered in this study were effective in reducing the severity of snoring and obstructive sleep apnea in properly selected patients based on the anatomical abnormality of airway detected at various levels .

2. Long term follow up is required after surgery as the patients need regular checkups and constant motivation to reduce weight or to prevent weight gain.

3. Long term follow up studies are necessary to know the effectiveness of these procedures in the treatment of Obstructive Sleep Apnoea.

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