Obstructive Sleep Apnea: Role of an Otorhinolaryngologist

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Abstract Obstructive sleep apnea is a disorder resulting from collapse of the upper airway during sleep. Its etiology is multifactorial, resulting from the interdependence of structurally vulnerable upper airway anatomy interacting with physiologic mechanism of ventilator instability during sleep. The ENT causes for OSA are relatively simple conditions that can be treated by safe and simple medical and/or surgical procedures. To assess the prevalence of ENT disorders in patients presenting to the sleep clinic. Patients presented to sleep clinic were submitted to an assessment protocol including clinical history, otorhinolaryngology examination and a polysomnography. Total 69 patients were included and distributed into two groups according to AHI: patients with sleep disordered breathing only (simple snorer and/or $AHI \leq 5$) and patients with obstructive sleep apnea syndrome ($AHI > 5$). There was significant statistical difference for deviated nasal septum ($p = 0.0004$) and inferior turbinate hypertrophy ($p = 0.03$) in both groups. Most patients were in the class III and IV of

Mallampati classification. Odds of having OSA increases more than 1.5 folds as the level of Mallampati classification increases by one class. ENT disorders were more common in the patients with OSA than in simple snorers and have impact on pathophysiology of OSA and its treatment modality. Hence, ENT examination in all patients with sleep disordered breathing will be helpful.

Keywords Obstructive sleep apnea · Deviated nasal septum · Inferior turbinate hypertrophy · Mallampati classification

Introduction

Obstructive sleep apnea (OSA) was first defined in 1973 by Guilleminault et al. [1, 2] but awareness regarding the same developed very slowly. However our understanding of the pathophysiology of OSA has evolved over the last few decades as population-based studies revealed an unexpectedly high prevalence of OSA. OSA can lead to many long term consequences including cardiovascular and cerebrovascular morbidity. It is also evident that the treatment of OSA will decrease the blood pressure and significant modification in cardiovascular risk. But despite the recent advances in diagnosis and increased awareness of OSA in the public, a majority of those affected are still undiagnosed. Therefore, it is important for primary care physicians and specialists to be competent to recognize and identify those affected subjects for early and appropriate treatments. Many ENT disorders may lead to obstructive sleep apnea [3]. Certain examples are (1) obstructed nasal airways: in cases of nasal polyps or inferior turbinate hypertrophy, (2) deformities of the nose or nasal septum, such as deviated septum, double septum, septal hematoma

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can cause an obstruction, (3) inflammatory conditions of nose: cold, chronic rhinosinusitis or allergic rhinitis, (4) long soft palate and/or uvula and (5) excessive bulkiness of throat tissue: children with large tonsils and adenoids often snore. Overweight people have bulky neck tissue. Cysts or tumors can also cause bulk which may cause snoring. This study will lead to the diagnosis of any causative ENT disorder for the obstructive sleep apnea. It will also document whether the OSA is due to ENT disorder only or has any other underlying factor also. Once diagnosed, the patient can be offered an array of choices for the treatment with appropriate information regarding the pros and cons of each. The ENT causes are relatively simple conditions that can be treated by safe and simple medical and/or surgical procedures. Hence this study becomes important in view of treating the patient of the condition.

Aim

To assess the prevalence of ENT disorders in patients presenting to the sleep clinic.

Materials and Methods

The present study was conducted in the Department of Otorhinolaryngology, Smt. B. K. Shah Medical Institute and Research Centre, Dhiraj Hospital, Piparia. The study was approved by the institutional ethics committee vide letter number SVIEC/ON/MEDI/BN-PG12/D12259. The study was carried out from August 2012 to July 2014. Total 69 patients were included. Patients with evident cause of central sleep apnea were excluded in the study. It is a prospective study. All the patients underwent an assessment protocol of detail history, ENT examination and polysomnography (PSG). *Nasal examination* was performed by anterior rhinoscopy using a speculum with the patient seated with the head slightly back. If required diagnostic nasal endoscopy was also done using rigid nasal endoscopes. *Throat examination* included examination of pharyngeal tonsils and Mallampati score. A standard I to IV grading system was used [4]. *Radiological examinations* including CT scan PNS for nose and paranasal sinuses pathology and X-ray nasopharynx (soft tissue neck-lateral view) for adenoid hypertrophy were done in suspicious patients. Finally the patients were submitted for overnight sleep study (PSG). To grade the severity of sleep apnea, the number of events per hour is reported as the Apnea–Hypopnea index (AHI). All results were collected, tabulated and analyzed. We used Epi info 7 software for data analysis with application of appropriate tests. $p < 0.05$ was considered significant.

Results

Total 69 patients were included in the study and they show the following distribution. There were 53 (76.81 %) males and 16 (23.19 %) females. The male to female ratio in the study is 3.3:1. The commonest age group was 50–59 years which had 25 (36.23 %) patients. Mean age of the patients was 48.95 ± 10.86 . The youngest patient was 21 years old and the oldest patient was of 72 years. Out of total 69 patients 47 (68.11 %) had Deviated nasal septum and 25 (36.23 %) had Inferior turbinate hypertrophy. Tonsillar hypertrophy was noted only in 5 patients (7.24 %). Only 2 (2.89 %) patients were having Allergic rhinitis as shown in Table 1. On Mallampati classification class III and IV contain most number of patients, 25 (36.23 %). Total 52 patients underwent polysomnography. According to AHI distribution commonest was severe OSA group (55.76 %) followed by moderate OSA group (26.92 %). Mild OSA group and group of simple snorer contained only 6 (11.53 %) and 3 (5.76 %) patients respectively as can be deduced from Table 2. All the patients who presented to sleep clinic were divided according to Apnea Hypo-apnea Index into two groups: Group A: Patients with sleep disordered breathing only (Simple snorer and/or $AHI \leq 5$) Group B: Patients with Obstructive Sleep Apnea Syndrome ($AHI > 5$). Out of total 69 patients 20 patients were in the Group A and 49 patients were in Group B. Different data distribution is as follows. 75.5 % of patients (every two in three patients) from the Group B had DNS. Proportion patients having DNS was high in Group B. Using Fischer's Exact test $p = 0.0004$ (test value 0.049869) which means there is statistical difference for DNS in both groups. Proportion of presence of Inferior Turbinate Hypertrophy was higher (40.81 %) in Group B when compared to Group

Table 1 ENT disorders distribution

Disorder	No. of patients	Percentage
Deviated nasal septum	47	68.11
Inferior turbinate hypertrophy	25	36.23
Tonsillar hypertrophy	5	7.24
Allergic rhinitis	2	2.89

Table 2 Apnea Hypo-apnea index (AHI) distribution

Group	AHI (events/h)	No. of patients	Percentage
Normal	<5	3	5.76
Mild OSA	5–15	6	11.53
Moderate OSA	15–30	14	26.92
Severe OSA	>30	29	55.76

Table 3 ENT disorders distribution (Fischer exact test: DNS test value 0.049869 and $p = 0.0004$; ITH test value 0.2753 and $p = 0.03$; TH test value 1 and $p = 0.5$)

Groups	DNS		ITH		TH	
	Present (%)	Absent (%)	Present (%)	Absent (%)	Present (%)	Absent (%)
A	50	50	25	75	5	95
B	75.5	24.5	40.81	59.18	8.16	91.84

Table 4 Mallampati classification (odds of having OSA increase more than 1.5 folds as the class of Mallampati classification increases)

Class	Groups	
	A	B
I	1	5
II	3	10
III	7	18
IV	9	16

A (25 %). There is statistical difference noted in both groups as $p = 0.03$ by Fischer's Exact test (test value 0.2753). Both the groups have very low proportion of presence of Tonsillar hypertrophy. This is because most of the patients were above age of 40 years when Tonsillar hypertrophy is very rare ($p = 0.5$) (test value 1) (Table 3). Most patients were in the class III and IV of Mallampati classification in both groups shown in Table 4. Odds ratio test shows that odds of having OSA increase more than 1.5 folds as the class of Mallampati classification increases.

Discussion

Obstructive sleep apnea (OSA) may affect as many as one in five adults and has the potential for causing long-term health consequences, including cardiovascular disease, hypertension, stroke and reduced quality of life [5]. Despite years of research into the causes and complications of OSA the early identification of the patients who are most at risk remains challenging. Gender: The male to female ratio was 3.3:1. Thus the study revealed a male preponderance. Observations of the present study are consistent with the literature. Many different reasons for higher prevalence of OSA in males have been discussed. There are also studies reported that female hormones are protective [6]. Age: In the present study the age of the patients ranged from 21 to 72 years. Among several different age dependent factors, Malhotra et al. [7] found an age dependent decrease in the response to negative pressure, an increased deposition of para-pharyngeal fat, a lengthening of the soft palate and change of the shape of the bones surrounding the pharynx. All these can lead to upper airway collapse during sleep.

However Izu et al. [8] noticed that frequency of mouth breathing disorders, especially primary snoring and OSA, is very significant in their study age group of 0–13 years. The peak prevalence happened between 4 and 7 years, an age at which the adenoids and tonsil naturally grow. Clinical history: Snoring was the principal symptom in both groups which may be the most common reason for presentation to sleep clinic. Day time sleepiness and frequent awakening at night were present in some but not in majority of patients. Nasal and throat related complaints were present in very few patients. Nose: The influence of nasal obstruction in OSA is controversial. In the early era of OSA Lavie et al. and McNicholas et al. found a positive correlation between nasal obstruction and AHI however such a correlation was proved wrong by Miljeteig et al. and Atkins et al. [9]. Later on it was suggested that nasal obstruction may be a risk factor for OSA and may deserve attention during the investigation of snorer referred for suspected OSA. After dividing the whole group in two groups (Group A and B) it was found that nasal abnormalities like DNS, ITH and AR were more common in Group B (patients with OSA). 75.5 % of patients (every 2 in 3 patients) from the Group B had DNS. Proportion of patients having DNS or not was high in the Group B and that's why DNS was statistically significant ($p = 0.0004$). The presence of a blocked nose can interfere with CPAP acceptance and compliance, leading to the need for a higher pressure that can be uncomfortable for the patients. Friedman et al. [10] reported that nasal surgery has a partial influence on the AHI but it is effective to reduce nasal CPAP pressure. Nasal obstruction leads to mouth breathing; as a consequence, the mandible is placed downward and backward, which facilitates obstruction of the base of the tongue. We think that nasal obstruction must be investigated during the patient's initial visit, and if it is present, a specific examination and treatment must be performed. Tonsil: Friedman et al. [11] found a positive correlation between enlargement of tonsil and presence of OSA. Our study, however, was not able to find such a correlation as most of the patients were above the age of 40 years and tonsil hypertrophy is rare in this age group. Mallampati classification: We were able to validate the clinical usefulness of the Mallampati score in patients with OSA. This scoring system, which is non-invasive and

assessed in seconds, was associated with both the presence and severity of the OSA. The present study shows, on average, for every 1 point increase in Mallampati score, the odds of having OSA increased more than 1.5 folds. One interesting point also suggested by Rodriguesl et al. that patients with high Mallampati score tend to have a high Friedman score and a lower uvulopalatopharyngoplasty success. Patients with such condition associated with nasal obstruction must be better assessed, since one can reduce the severity of apnea with the correction of the nasal obstruction, either medically or surgically.

Conclusion

This is a study with 69 patients to identify the prevalence of ENT disorders in patients presenting to sleep clinic. ENT disorders like deviated nasal septum, inferior turbinate hypertrophy, allergic rhinitis, tonsillar hypertrophy and high Mallampati score were more common in the patients with OSA than in simple snorers and have impact on pathophysiology of OSA and its treatment modality. These ENT causes are relatively simple conditions to diagnose and can be treated by safe and simple medical and/or surgical procedures and thus contributing to a less collapsible upper airway during sleep. Hence, ENT examination in all patients with sleep disordered breathing will be helpful.

Compliance with Ethical Standards

Conflict of interest All the authors declare no conflict of interest whatsoever.

Ethical Approval All the procedures performed in studies involving human participants were in accordance with the ethical standard of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable

ethical standards. This article does not contain any studies with animals performed by any of the authors.

Informed consent Informed consent was obtained from all individual participants included in the study.

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