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Evaluation of sinonasal complaints in obstructive sleep apnea

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Local ethics committee (Yozgat Bozok University Clinical Research Ethics Committee, Ref. No=2017-KAEK-189_2019.04.24_08).
All procedures in this study involving human participants were performed in accordance with the 1964 Helsinki Declaration and its later amendments.

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Abstract

Background/Aim: Sinonasal complaints are frequently observed in patients with obstructive sleep apnea (OSA). This study aimed to correlate the severity of OSA with sinonasal complaints.
Methods: A total of 90 patients, including 30 patients with mild, 30 with moderate, and 30 with severe OSA, were enrolled in this cross-sectional study. None of the patients received any treatment for OSA at the time of enrollment. All participants were asked to complete the SNOT-22 questionnaire. Subdomain scores obtained from the patients with the SNOT-22 questionnaire, total scores, and scores obtained for each complaint were investigated for any correlations with severity of OSA. Also, mild, moderate, and severe OSA groups were compared with each in terms of these scores.
Results: A significant, positive correlation was found between AHI values and "nasal obstruction," "runny nose," "lack of a good night's sleep" and "waking up tired" items of the SNOT-22 (P=0.008, P=0.022, P=0.037, P=0.005, respectively) and nonrhinologic otolaryngologic subdomain scores (P=0.036). A significant, positive correlation existed between the severity of OSA and sleep subdomain score (P=0.039) and the total score (P=0.047) in addition to all the above-mentioned elements. There was no difference between mild and moderate OSA groups in nasal obstruction and runny nose complaints (P=0.858, P=0.990, respectively) but a difference was noted between mild and severe (P=0.016, P=0.011, respectively), and moderate and severe OSA groups (P=0.015, P=0.011, respectively). While there was no difference between mild and moderate (P=0.268), and moderate and severe OSA groups (P=0.036) in terms of the 'waking up tired' item, the mild and severe OSA groups differed significantly (P=0.009).
Conclusion: OSA causes various sinonasal complaints such as nasal obstruction, runny nose, and waking up tired. An increase in OSA severity leads to an increase in these complaints, and treatment may lead to increased quality of life.

Keywords: Obstructive sleep apnea, Sinonasal complaints, Apnea-hypopnea index

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Introduction

The collapse of the upper airway during sleep is the hallmark of OSA and breathing is interrupted for at least 10 seconds [1, 2]. Complete cessation of breathing is repeated many times during sleep, due to which the amount of oxygen in the blood decreases and several systems are adversely affected [3]. In the treatment of OSA, numerous methods are used to prevent the collapse of the upper respiratory tract. These therapeutic modalities generally include Positive Airway Pressure (PAP) therapy, surgical interventions, and medical treatments. The target organ in most of these treatments is the upper respiratory tract. The effects of OSA on many systems in the body were investigated in several studies in the literature [4-6]. However, there are a limited number of studies revealing the impact of OSA on the upper respiratory tract and related complaints.

This study aimed to investigate the correlation between OSA severity and sinonasal complaints.

Materials and methods

This study was conducted in the otorhinolaryngology department of a tertiary hospital after the approval of the local ethics committee (Yozgat Bozok University Clinical Research Ethics Committee, Ref. No=2017-KAEK-189_2019.04.24_08) was obtained. Ninety patients who were diagnosed with obstructive sleep apnea by a polysomnography test performed in our institution were included in the study. Thirty of these patients had mild, 30 had moderate and 30 had severe obstructive sleep apnea. The minimum sample size (30 patients in a group) was calculated for each group at a 95% significance level and 90% statistical power based on a similar study [7]. Written informed consent was obtained from all subjects before enrollment. Those with upper respiratory tract infection, allergic rhinitis, eustachian dysfunction, nasal septum deviation, nasal polyposis, previous otolaryngological operations, ear pathology, psychiatric diseases, and smokers were not included in the study. Forty-nine patients were male and 41 were female. The mean age of the patients was 54.60 years. Polysomnography was performed on all patients using a 31-channel ALICE 6 LDe device (Respironics, Murrysville, PA, USA). AHI values obtained as a result of polysomnography were recorded in all participants. The patients were divided into 3 groups according to their AHI values as mild, moderate, and severe OSA. A special effort was made to assign 30 patients to each group. Before inclusion in the study, it was ensured that the patients were not receiving any treatment for obstructive sleep apnea. All patients were asked to fill in the SNOT-22 questionnaire. There are 22 complaints including the rhinologic, nonrhinologic-otolaryngologic, sleep, and psychological complaints in the SNOT-22 questionnaire. Patients are asked to rate these complaints according to the problems they have experienced within the last 2 weeks. Each item is rated as follows: 0=No problem, 1=Very mild problem, 2=Mild or slight problem, 3=Moderate problem, 4=Severe problem, 5=Very severe problem. The rhinologic complaints subdomain contains 'need to blow nose', 'nasal obstruction', 'sneezing', 'runny nose', 'postnasal drip', 'thick nasal discharge', 'loss of smell' and 'taste complaints'; nonrhinologic-otolaryngologic subdomain includes 'cough', 'ear fullness', 'dizziness', ear pain, facial pain/pressure' complaints; the sleep subdomain comprises 'difficulty falling asleep', 'waking up at night', 'lack of a good night's sleep', 'waking up tired' complaints, and the psychological subdomain has 'fatigue', 'reduced productivity', 'reduced concentration', 'feeling frustrated/restless/irritable, sad, embarrassed' complaints. A low total SNOT-22 score indicates a better quality of life. Subdomain scores, total scores, and scores obtained for each complaint were correlated with the AHI scores and severity of OSA in the patients, obtained by the SNOT 22 questionnaire. The mild, moderate, and severe OSA groups were compared with each other in terms of subdomain scores, total scores, and scores obtained for each complaint in SNOT-22.

Statistical analysis

SPSS software (version 20.0 for Windows, IBM Corp., Armonk, NY, USA) was used for all data analyses. Spearman Correlation Analysis was used to correlate SNOT-22 parameters with AHI values and severity of OSA. A *P*-value of less than 0.05 was considered significant. The Kruskal Wallis test was used to compare mild, moderate, and severe OSA groups in terms of SNOT-22 data. Bonferroni Correction and Post hoc tests were used for the significantly differing parameters. The *P*-value obtained with Bonferroni Correction was 0.017. A *P*-value of less than 0.017 in post hoc test results was considered statistically significant.

Results

No difference was found between the groups in terms of age, gender, and body mass index (P=0.548, P= 0.140, and P=0.798, respectively).

AHI values were significantly positively correlated with 'nasal obstruction', 'runny nose', 'lack of a good night's sleep', 'waking up tired' items (P=0.008, P=0.022, P=0.037, P=0.005, respectively) and nonrhinologic-otolaryngologic subdomain scores (P=0.036, Table 1).

Table 1: Correlation between SNOT-22 items and AHI/OSA Degree

SNOT-22 items	Score	*P*-value	
	Mean (SD)	AHI	OSAS Degree
Rhinologic	5.89 (4.17)	0.172	0.102
Need to blow nose	0.88 (1.14)	0.856	0.694
Nasal Obstruction	1.47 (1.37)	0.008*	0.012*
Sneezing	1.09 (0.97)	0.371(-)	0.485(-)
Runny Nose	0.34 (0.78)	0.022*	0.006*
Postnasal Drip	1.01 (1.31)	0.992(-)	0.952
Thick Nasal Discharge	0.31 (0.74)	0.445	0.465
Loss of Smell and Taste	0.79 (1.16)	0.292	0.235
Non Rhinologic Otolaryngologic Complaints	4.09 (3.69)	0.036*	0.040*
Cough	0.93 (1.14)	0.159	0.177
Ear Fullness	1.00 (1.11)	0.212	0.155
Dizziness	1.07 (1.15)	0.531	0.600
Ear Pain	0.39 (0.80)	0.567	0.428
Facial Pain/Pressure	0.70 (1.09)	0.532	0.493
Sleep	8.09 (4.51)	0.050	0.039*
Difficulty falling asleep	1.44 (1.57)	0.797(-)	0.853
Wake up at night	2.14 (1.37)	0.123	0.146
Lack of good night's sleep	2.10 (1.58)	0.037*	0.040*
Waking up tired	2.40 (1.27)	0.005*	0.004*
Psychological	6.23 (5.27)	0.623	0.448
Fatigue	1.36 (1.34)	0.118	0.064
Reduced productivity	1.08 (1.35)	0.508	0.404
Reduced concentration	0.99 (1.31)	0.164	0.109
Frustrated/Restless/irritable	1.17 (1.33)	0.689	0.313
Sad	0.89 (1.20)	0.249	0.191
Embarrassed	0.76 (1.03)	0.790	0.843
Total	24.31(13.84)	0.072	0.047*

* Statistically significant, (-) Negatively correlated

The severity of OSA was significantly, positively correlated with the 'nasal obstruction', 'runny nose', 'lack of a good night's sleep', 'waking up tired' items (P=0.012, P=0.006, P=0.040, P=0.004, respectively) and nonrhinologic-

otolaryngologic, sleep, total SNOT-22 scores (P=0.040, P=0.039, P=0.047, respectively, Table 1).

Comparison of 3 groups concerning SNOT-22 items revealed a statistically significant difference between the three groups in 'nasal obstruction', 'runny nose', and 'waking up tired' items (P=0.019, P=0.007, P= 0.017, respectively, Table 2). While there was no statistically significant difference between mild and moderate OSA groups (P=0.858) in terms of 'nasal obstruction', a significant difference was found between mild and severe OSA groups (P=0.016) and between moderate and severe OSA groups (P=0.015). The mild and moderate OSA groups (P=0.990) were similar in terms of 'runny nose', while mild and severe OSA groups (P=0.011) and moderate and severe OSA groups (P=0.011) significantly differed. The mild and moderate OSA groups (P=0.268) and the moderate and severe OSA groups (P=0.036) did not differ in terms of the 'waking up tired' item, while the mild and severe OSA groups did (P=0.009).

Table 2: Comparison of three groups in terms of SNOT-22 items

SNOT-22 items	Kruskal Wallis	Post Hoc Tests		
		P-value		
	P-value	Mild/Moderate	Mild/Severe	Moderate/Severe
Rhinologic	0.105			
Need to blow nose	0.074			
Nasal Obstruction	0.019*	0.858	0.016*	0.015*
Sneezing	0.767			
Runny Nose	0.007*	0.990	0.011*	0.011*
Postnasal Drip	0.325			
Thick Nasal Discharge	0.088			
Loss of Smell and Taste	0.488			
Non Rhinologic	0.121			
Otolaryngologic				
Cough	0.278			
Ear Fullness	0.336			
Dizziness	0.698			
Ear Pain	0.498			
Facial Pain/Pressure	0.687			
Sleep	0.120			
Difficulty falling asleep	0.422			
Wake up at night	0.327			
Lack of good night's sleep	0.102			
Waking up tired	0.017*	0.268	0.009*	0.036
Psychological	0.312			
Fatigue	0.110			
Reduced productivity	0.384			
Reduced concentration	0.152			
Frustrated/Restless/irritable	0.373			
Sad	0.417			
Embarrassed	0.972			
Total	0.098			

* Statistically Significant

Discussion

The collapse of the upper airway during sleep is the hallmark of OSA and breathing is interrupted for longer than 10 seconds. This cessation of breathing is known as apnea, and it occurs many times during sleep. Hypoxia due to apnea adversely affects several systems. Mouth breathing is frequently observed in OSA patients [8]. The autonomic nervous system is also affected in OSA [9]. Furthermore, many craniofacial abnormalities such as mandibular insufficiency, maxillary hypoplasia, the inferior position of the hyoid bone, narrowing of the posterior airway, and drooping soft palate can be encountered [10, 11]. Tonsillar hypertrophy, hypertrophy of the base of the tongue, nasal septum deviation are also common pathologies seen in OSA. There may be also an increase in the frequency of sinonasal complaints due to the interruption of the air passage from the upper respiratory tract, frequent mouth breathing, frequent anatomical disorders related to the upper respiratory tract, and changes in the autonomic nervous system. Various studies demonstrated an increase in sinonasal complaints among OSA patients [12, 13]. In the literature, a reduction is reported in these complaints with CPAP treatment [14].

SNOT-22 is not a diagnostic test, but a method used in the follow-up of various pathologies that measures the quality of life. In previous studies, SNOT-22 items were divided into various subdomains [15, 7]. In this study, similar to previous studies, SNOT-22 items were divided into 4 groups as rhinologic, nonrhinologic-otolaryngologic, sleep, and psychological subdomains. This distinction allowed the evaluation of subdomain scores as well as the total score in various pathologies. It is not surprising that higher scores were obtained in the sleep subdomain in OSA. In many studies in the literature, sleep-related complaints were more severe in patients with OSA compared to the control group or those with other pathologies. Moxness et al. [16] found that all sleep parameters were higher in the OSA group than in the control group. However, higher scores were obtained in the OSA group in all parameters, except for 3 of the 20 items evaluated in this study. Lanchanas et al. [17] compared OSA patients with chronic rhinosinusitis patients in terms of sinonasal complaints in their study. Except for the 'difficulty falling asleep' item, higher scores were obtained for all other sleep-related items in the OSA group. On the other hand, Kuan et al. [7] did not reveal a correlation between OSA severity and sleep-related complaints in their study. However, the number of participants in this study was small. Ji et al. [18] compared patients with OSA and chronic rhinosinusitis in terms of symptom profile and found that nasal, extranasal, and ear-facial symptoms were more common in patients with chronic rhinosinusitis, while psychological and sleep subdomain scores were higher in patients with OSA. However, when the sleep-related items were analyzed one by one in this study, no significant difference was found between the two patient groups. In our study with ninety participants, a correlation was found between the "waking up tired" and "sleep" subdomain score and the AHI score. Although OSA is a sleep-related pathology, it does not result in a significant increase in all sleep-related complaints.

In numerous studies in the literature, patients with chronic sinusitis were compared with patients with OSA in terms of sinonasal complaints. Again, many studies have investigated the severity of sinonasal complaints in OSA. The reason for this is that in daily practice, rhinologic and nonrhinologic sinonasal complaints are frequently encountered in patients with OSA. When studies comparing patients with OSA with patients with chronic rhinosinusitis in the literature are reviewed, it is seen that patients with chronic rhinosinusitis have higher scores than those with OSA in postnasal drip and nasal discharge complaints [17, 18]. Considering the pathophysiology of chronic sinusitis, this result is not surprising. On the other hand, the absence of a significant difference between chronic sinusitis, which is a pathology that directly affects the upper respiratory tract, and OSA in terms of other rhinologic and non-rhinologic elements suggests that OSA causes rhinologic and non-rhinologic complaints more frequently. In our study, a correlation was found between AHI score, OSA severity and nasal obstruction, runny nose, and nonrhinologic-otolaryngologic complaints. Furthermore, a difference was found between the three groups in terms of nasal obstruction and runny nose complaints, and this

difference is more pronounced when comparing patients who suffer from severe OSA with other groups.

Depressive symptoms and cognitive impairments are frequently observed in OSA patients [19]. Sleep quality was associated with depression, anxiety, and stress [20]. Although there are more detailed tests to reveal psychiatric disorders, there is also a psychological subdomain in the SNOT-22 questionnaire. This subdomain allows evaluation of the patients in this respect as well. In several studies in the literature, in which SNOT-22 was used, high scores were found in psychological items in OSA patients [16, 17]. However, in some studies, no correlation was detected between the severity of OSA and these items [7]. Similarly, a study in the literature showed that there was no difference in terms of psychological factors in the comparison of OSA patients with chronic sinusitis patients [18]. In our study, no correlation was found between the AHI score and psychological parameters, and there was no difference between mild, moderate, and severe OSA groups concerning psychological elements. This result can be attributed to the fact that the psychological elements in the SNOT-22 test roughly assess the psychiatric condition.

The high number of patients can be considered the strength of our study. On the other hand, we had no control group. Further studies with more patients, including the control group, may provide more detailed information on this subject.

Conclusion

OSA causes various sinonasal complaints such as nasal obstruction, runny nose, and waking up tired. An increase in OSA severity leads to an increase in these complaints, and treatment may lead to an increased quality of life.

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