Correlation Between Otorhinolaryngologic Evaluation and Severity of Obstructive Sleep Apnea Syndrome in Snorers

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Objectives: To examine whether medical history and nasopharyngeal examination are useful for predicting obstructive sleep apnea syndrome (OSAS) and to compare these findings with those of the gold standard, polysomnography.

Design: Patients underwent polysomnography recordings for 2 nights and an otorhinolaryngologic examination, including flexible endoscopy and the Müller maneuver. Nasal and pharyngeal findings were scored in a semiquantitative way. The medical history of each patient was taken using a standardized questionnaire. Anatomic and functional findings and patient history were correlated with the mean apnea-hypopnea index (AHI).

Setting: An otorhinolaryngologic clinic.

Patients: A total of 101 patients presenting with a primary complaint of snoring.

Main Outcome Measures: Differences between patients with OSAS and primary snorers were assessed using the Mann-Whitney test (anatomic findings), t test (Müller maneuver), and \( \chi^2 \) test after Pearson correlation (questionnaire). \( P \) values less than .05 were considered statistically significant.

Results: The mean ± SD AHI of the patients was 19.7 ± 21.5; 52 patients had an AHI higher than 10, which confirmed the diagnosis of OSAS. These patients tended to report the occurrence of apneas more frequently than patients with an AHI of 10 or lower. The average ranks (Mann-Whitney findings) of patients with AHI higher than 10 vs those with AHI of 10 or lower were 52 vs 50 for septal deviation; 50 vs 52 for tonsil size; 53 vs 49 for low velum level; and 56 vs 46 for hyperplasia of the tongue base. None of these differences reached statistical significance. Mean ± SD narrowing of the airway during the Müller maneuver was significantly (\( P < .05 \)) more pronounced in patients with an AHI higher than 10 than in patients with an AHI of 10 or lower at the levels of the velum (80% ± 20% vs 68% ± 30%) and the tongue base (57% ± 24% vs 44% ± 27%).

Conclusions: None of the reported medical history and/or anatomic parameters alone or in combination could be used to distinguish patients with OSAS in a group of patients who present to an ENT clinic with a chief complaint of snoring. Snoring patients, therefore, should be examined at least by a nocturnal screening test for OSAS before any therapeutic decision is made.


Snorinng is one of the main symptoms of obstructive sleep apnea syndrome (OSAS). Often, patients first seek an otorhinolaryngologic (ENT) evaluation rather than presenting to a sleep center. Snoring has a prevalence of 30% to 50% in the general population, while the prevalence of OSAS is only 2% to 4%. The ENT specialist, therefore, must differentiate between these 2 entities to provide appropriate treatment.\(^1,2\) Toward this end, oxygen saturation and airflow are commonly measured with screening instruments, but polysomnography is considered the gold standard for diagnosis of OSAS. However, both techniques are cumbersome. Thus, it would be useful to have a simple tool for predicting OSAS based on history and physical examination.

In populations with suspected sleep apnea, physical features may be predictive of OSAS severity,\(^3,4\) but it is not known whether physical examination can be used to distinguish patients with OSAS in a group of patients who present to an ENT clinic with a chief complaint of snoring. Our aim was therefore to assess the predictive power of history and routine physical examination as performed by an ENT specialist to identify OSAS in patients seeking treatment for snoring.

METHODS

We evaluated 101 patients who presented to an ENT clinic with a chief complaint of snor-
Total sleep time as well as percentages of sleep stages were scored based on the criteria set out by Rechtschaffen and Kales, Munich, Germany). Sleep stages were scored in a semiquantitative manner. The patients were monitored for 2 nights, but only the second night was analyzed to allow for the first-night effect. Sleep stages were scored based on the criteria set out by Rechtschaffen and Kales. Total sleep time was calculated. A respiratory event had to be of at least 10 seconds' duration and was classified as an apnea if there was a 90% reduction in airflow and as a hypopnea if there was a 50% reduction in airflow combined with at least a 4% oxygen desaturation. Apneas and hypopneas were combined to calculate the apnea-hypopnea index (AHI). An AHI higher than 10 indicated OSAS.

Anatomic and functional findings and patient history were correlated with the AHI. Differences between patients with OSAS and primary snorers were assessed using the Mann-Whitney test (anatomic findings), t test (Müller maneuver), and χ² test after Pearson correlation (questionnaire). P values less than .05 were considered statistically significant.

### RESULTS

The mean ± SD total sleep time for the 101 patients was 404 ± 63 minutes. Patients spent a mean ± SD of 14.5% ± 13.5% of time in stage 1 sleep, 56.5% ± 10.9% in stage 2 sleep, 9.5% ± 9% in stage 3 sleep, 3.9% ± 6.6% in stage 4 sleep, and 18.3% ± 6.3% in rapid-eye-movement sleep. The mean ± SD AHI of the 101 patients was 19.7 ± 21.5; 52 patients had an AHI higher than 10 (classified as patients with OSAS); 49 patients had an AHI of 10 or lower (classified as primary snorers).

Based on the questionnaire, all patients complained of snoring; 72% reported nocturnal breathing pauses; and 61% complained of EDS. There were no significant differences between the number of patients with an AHI higher than 10 (OSAS) and those with an AHI of 10 or lower (snorers) who reported either nocturnal breathing pauses (Figure 1) or EDS (Figure 2). The results of the physical examination for the patients with OSAS and primary snorers are compared in Figures 3, 4, 5, and 6. The mean ranks (Mann-Whitney test) of patients with OSAS vs snorers were as follows: septal deviation, 52 vs 50; tonsil size, 50 vs 52; velum level, 53 vs 49; and size of tongue base, 56 vs 46. There were no significant differences between the patients with OSAS and the snorers based on physical examination. Patients with OSAS had a significantly greater reduction in mean ± SD airway diameter than snorers (t test, P <.05) during the Müller maneuver at the velar level (80% ± 20% vs 68% ± 30%) and at the tongue base level (57% ± 24% vs 44% ± 27%).

### COMMENT

The significance of patient history for detection of OSAS is controversial. In a study of 354 patients with possible OSAS, Foulou et al predicted that patients with an Epworth Sleepiness Scale score of less than 12 and a body mass index lower than 28 would not have OSAS. Only 2 of 33...
patients fulfilling those above criteria had OSAS, meaning that Pouilot's et al prediction was correct in 31 patients. However, neither Crocker et al nor Viner et al could confirm any positive predictive value of reported daytime sleepiness. The present study also shows no significant predictive value of subjectively reported daytime sleepiness in patients with OSAS compared with snorers.

Flemons et al found a significant difference between patients with OSAS and asymptomatic controls in their history of breathing pauses and snoring. Crocker et al also found a higher incidence of reported nocturnal breathing pauses in patients with OSAS than in controls. However, in the present study, we did not find a significant correlation between reported breathing pauses and the presence or absence of OSAS. These differences may be a consequence of different study populations. Only 64% and 79% of patients complained of snoring in the studies by Flemons et al and Crocker et al, respectively, while the primary complaint of all our patients was snoring. Therefore, it seems that questions concerning daytime sleepiness, fatigue, or reported apneas are not able to distinguish between snorers and snorers with OSAS.

The influence of nasal obstruction in OSAS is controversial: While Lavie et al and McNicholas et al found a positive correlation between nasal obstruction and AHI, such a correlation was refuted by Miljeteig et al and Atkins et al. The results of the present study support the latter findings. Enlarged tonsils can cause OSAS, and surgical removal usually results in a cure. Friedman et al found a positive correlation between tonsillar enlargement and presence of OSAS. Our study, however, was unable to confirm such a correlation and that the mean age of our study population was 55 years, and tonsillar hypertrophy was rare. A low-set soft palate was found more frequently in patients with OSAS than in snorers in our study, although the difference was not significant. These characteristics
of the palate in patients with OSAS were described earlier in cephalometric studies. Friedman et al and Zonato et al found a significant positive correlation between a low-set soft palate and OSAS, but Woodson and Haga-
numa, reporting results similar to ours, did not find a significant association. These results show that although a low-set soft palate may be commonly found in patients with OSAS, it is not a sufficient predictor of OSAS.

Base of tongue hypertrophy has also been found to be predictive of OSAS, as confirmed in studies using cephalometrics. However, the present study and Woodson and Haganuma did not find a significant positive correlation between tongue base hypertrophy, assessed by physical examination, and AHI.

The Müller maneuver has been validated by Sher et al as a functional examination to select patients for uvu-
lopalatopharyngoplasty. As the only statistically signif-
ificant finding, we confirmed a positive correlation be-
tween the degree of obstruction and presence of OSAS. However, the Müller maneuver is performed on an awake patient and heavily depends on the patient’s cooperation, which may explain why neither Woodson and Haganuma nor Friedman et al found a positive correlation between performance on the Müller maneuver and the presence of OSAS.

In contrast to our findings, Viner et al, Friedman et al, and Zonato et al concluded that it is possible to identify patients with OSAS based on history and/or anatomic findings. What are the reasons for these different results and conclusions? In general, all of the measurements described herein concerning the size of the tonsils or the shape of the palate have a subjective component, which makes it difficult to compare the results of different investiga-
tors. Digital picture analysis might provide more consist-
tent results in the future. In addition, our patient popu-
lation was different from that used in previous studies in several aspects: while other study populations were com-
posed of about 90% snorers, all of our patients were snor-
ers who primarily sought therapy for snoring. Also, the other study populations were preselected regarding sus-
ppected OSAS. In the study by Friedman et al, for example, 400 patients had to complete a questionnaire con-
cerning daytime sleepiness and other symptoms of OSAS: 260 of these patients were suspected of having OSAS, and only 172 finally underwent polysomnography. Also, the anatomic findings were different between studies. In con-
trast to the findings of Friedman et al, tonsillar hyper-
plasia was rare in our population, possibly because the pa-
tients in our study were slightly older.

Different statistical methods might also have contrib-
te to different findings between studies. Most authors used the Pearson product moment correlation coefficient for comparing anatomic findings and the AHI. This analy-
isis presupposes that the intervals between the grades for tonsil size, for example, are equal, which, in our opinion, is not the case. Therefore, we used the Mann-Whitney test to compare the average ranks of simply snorers and snor-
ers with OSAS. These factors may explain why we did not find any predictive value for OSAS with the methods ap-
plied (except weakly for the Müller maneuver).

We also doubt that the physical examination correla-
tions found by Viner et al (specificity of 28% and sensi-
tivity of 94%) and Friedman et al (positive predictive value of 90%, negative predictive value of 67%) are adequate to predict OSAS. In our opinion, all patients seeking treat-
ment for snoring should be screened overnight using a de-
vice measuring at least oxygen saturation and airflow. If the results are suggestive of OSAS, or if patients complain of EDS, standard polysomnography should be applied. In conclusion, we believe that medical history, anatomic find-
gings, and functional factors are insufficient to adequately predict the presence or absence of OSAS.

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