ORIGINAL STUDY

The acute effects of the PAP treatment on nasal mucosa in patients with OSAS

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ABSTRACT

BACKGROUND. Obstructive sleep apnea syndrome (OSAS) is a common disease in developed countries. PAP (Positive Airway Pressure) therapy is the most commonly used treatment modality, particularly in moderate to severe OSAS patients. However, several side effects make PAP treatment challenging to tolerate. This study examined the acute effects of PAP treatment on nasal functions.

MATERIAL AND METHODS. This study included 32 patients who were diagnosed with severe OSAS following a PSG test and started PAP treatment. Symptom analysis was carried out with the SNOT-20 questionnaire; nasal physiological analysis was carried out with rhinomanometry and acoustic rhinometry tests performed before and after PAP treatment for one night and for one month. A saccharin test was carried out to assess the nasal mucociliary clearance before and after the treatment.

RESULTS. A statistically significant difference between nasal symptom scores (p=0.003) and sleep quality (p=0.006) was observed in SNOT-20 questionnaire results. Total nasal resistance was significantly increased after one night's sleep with PAP and after a one-month treatment with PAP. It was found that there was a statistically significant relation between the total nasal resistance value and PAP pressure.

CONCLUSION. This study shows that PAP treatment increases nasal congestion after one night of treatment and after one month of treatment with a cumulative effect. PAP therapy positively affects sleeping quality and life quality, while negatively affecting nasal functions in the acute period.

KEYWORDS: OSAS, PAP treatment, nasal function, nasal mucosa.

INTRODUCTION

Obstructive sleep apnea syndrome (OSAS) affects 2-4% of the adult population nowadays[1]. Positive airway pressure (PAP) treatment is frequently used to prevent obstructive sleep apnea (OSA) and its complications that develop secondarily to the disease[2]. However, intolerance to PAP treatment could limit the success of this therapy. It was proven that the mortality for unadaptable patients to PAP treatment was higher than for adaptable patients[1,3]. The relationship between OSAS and the congestion of the upper respiratory tract mucosa was searched in the literature. It was noted that, although PAP treatment alleviated several symptoms of OSAS, it was not effective in treating the local inflammation observed together with OSAS[4]. Depending on PAP usage, local congestion is the side effect most commonly seen. It decreases PAP compliance and causes low sleep quality[5]. The nasal inflammation or congestion, which is a result of the disease or is a cause of the disease, is increased with PAP treatment. Increased nasal congestion can increase nasal resistance and may disturb PAP compliance.

In this study, we evaluated the side effects of PAP treatment on nasal resistance, which can occur acutely during a one-night PAP usage and cumulatively after a PAP treatment period of one month.

MATERIAL AND METHODS

The study was carried out prospectively and included 32 patients (age range 26 -68 yr.; mean 46.9 yr.; 9 women and 23 men) who were diagnosed with severe sleep apnea and were suggested for PAP treatment with poly-

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somnographic (PSG) tests in our hospital's sleep disorders laboratory.

Before starting the PAP treatment, all the patients underwent a detailed otorhinolaryngologic examination. Bilateral nasal passages and upper respiratory tracts were evaluated utilizing endoscopic examination. Patients with nasal pathology and local or systemic severe diseases were excluded from the study.

The institutional ethics committee approved the study (491-2012, Ethic Committee of Ankara Numune Educational Research Hospital), and informed consent was obtained from all patients.

A SNOT-20 questionnaire was conducted for symptomatic analysis. The patient's nasal and sleep symptoms were separately asked before and at the end of the first month of treatment with PAP. The initial tests were conducted between 08.00 and 10.00 AM before the commencement of the treatment.

Acoustic rhinometry and rhinomanometric measurements were performed using the ECCOVISSION (Model AR-1003, Hood Laboratories, Pembroke, MA). Acoustic rhinometry and anterior rhinomanometry tests were performed on the patients to evaluate nasal congestion. The patients who received treatment for a minimum of 30 days were tested with acoustic rhinometry and anterior rhinomanometry tests between 16:00 and 18:00 on the 31st day in the evening and between 08:00 and 10:00 AM on the morning of the 32nd day following the one-month treatment.

A saccharin test was performed to assess nasal mucociliary clearance before the treatment. The SNOT-20 and the saccharin test were carried out on the patients again on the 30th day, after the beginning of the treatment, at the same time.

Statistics

The SPSS 17.0 packet program was used to analyze the data statistically. The Wilcoxon test was used to compare the constant measurements between groups. The correlations between the variables were tested with the Spearman correlation test. The statistical significance level was taken as 0.05 in all tests.

RESULTS

Thirty-two patients were included in the study. The youngest was 26, and the oldest was 68. The average age was calculated as 46.9. Nine of the patients were women, and 23 were men.

When the results of the SNOT-20 questionnaire, which included sleep and nasal symptoms and a comparison before and after treatment, were evaluated, we did not find a significant difference (p= 0.841). However, when nasal symptom scores were separately assessed, it was observed that nasal symptoms increased significantly compared to the symptoms before PAP treatment (p=0.003). The scores of sleep symptoms following PAP treatment were statistically considerably decreased (p= 0.006) (Table 1).

Table 1. Results of SNOT-20 questionnaire.

Patients	Mean Scores of Pre-PAP Treatment	Mean Scores of After-PAP Treatment
1	1.25	1.30
2	1.20	1.05
3	1.35	1.30
4	1.80	0.90
5	1.15	1.15
6	0.55	0.55
7	1.30	1.40
8	1.70	1.50
9	1.40	2.15
10	1.30	1.25
11	1.70	1.55
12	2.25	1.90
13	1.30	1.40
14	1.35	1.10
15	1.40	1.35
16	0.65	0.75
17	1.65	1.75
18	2.80	2.05
19	1.20	1.25
20	1.30	1.55
21	1.35	1.25
22	0.65	0.55
23	1.80	1.30
24	2.10	1.40
25	1.20	1.10
26	1.25	1.25
27	2.20	1.45
28	1.40	1.20
29	1.65	1.85
30	1.45	1.65
31	2.15	1.80
32	1.65	1.50

MCA (Minimal cross-sectional area) values obtained in acoustic rhinometry carried out in the morning before treatment were compared with those of the night and morning following the treatment. MCA values were measured following treatment and significantly decreased as

Table 2. Statistical table of the Acoustic Rhinometry and Anterior Rhinomanometry results.

	PAP Treatment					
	Before (A)	After-PAP Evening (B)	After-PAP Morning (C)	P-value		
	Median	Median	Median	A-B	A-C	B-C
TNR	0.2 (0.1-0.5)	0.2 (0.1-0.4)	0.3 (0.2-0.7)	0.011	0.0001	0.0001
MCA (cm^2)	1.7 (1.2-2.2)	1.7 (1.1-2.1)	1.2 (1.0-1.7)	0.045	0.0001	0.0001

TNR (Total Nasal Resistance); MCA (Minimal cross-sectional area)

before the treatment (p=0.0001) (Figure 1, Table 2). A statistically significant pdecrease was observed between the MCA values in the evening and the following morning after the treatment (p=0.0001).

Total Nasal Resistance (TNR) values were measured with anterior rhinomanometry. TNR values were measured in the morning before treatment and compared with those measured in the evening following the treatment. The values following the treatment were statistically significantly increased (p=0.011) (Table 2, Figure 2).

When TNR values in the morning before treatment were compared with the values in the morning following treatment, it was observed that TNR values following treatment were significantly increased (p=0.0001) (Table 2). When the TNR values, which were measured following treatment in the evening and the following day after one night's sleep, were compared, it was observed that the morning values were statistically significantly increased (p=0.001).

A statistically significant difference was not observed between the anterior rhinomanometry and acoustic rhinometry values, measured in the evening and the following day after one night's sleep, before and after treatment.

There was no statistical significance in the saccharin test before and after treatment.

DISCUSSIONS

PAP treatment is the most frequently used treatment modality in severe OSAS for preventing complications that develop secondarily to the disease[1]. Various undesired effects that belong to the PAP treatment can disrupt compliance to treatment[6,7]. It has been found that the mortal-

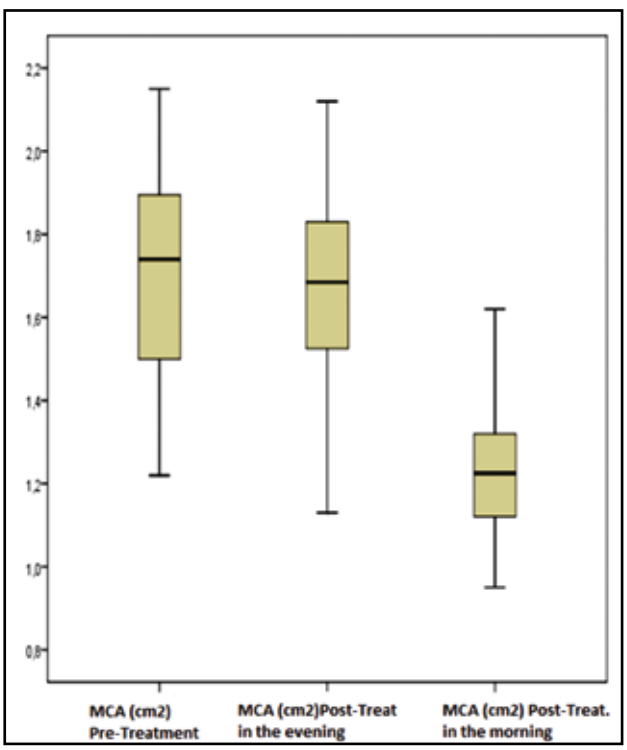

Figure 1. Results of anterior rhinomanometry, pre-PAP, and post-PAP treatment (MCA: Minimal cross-sectional area).

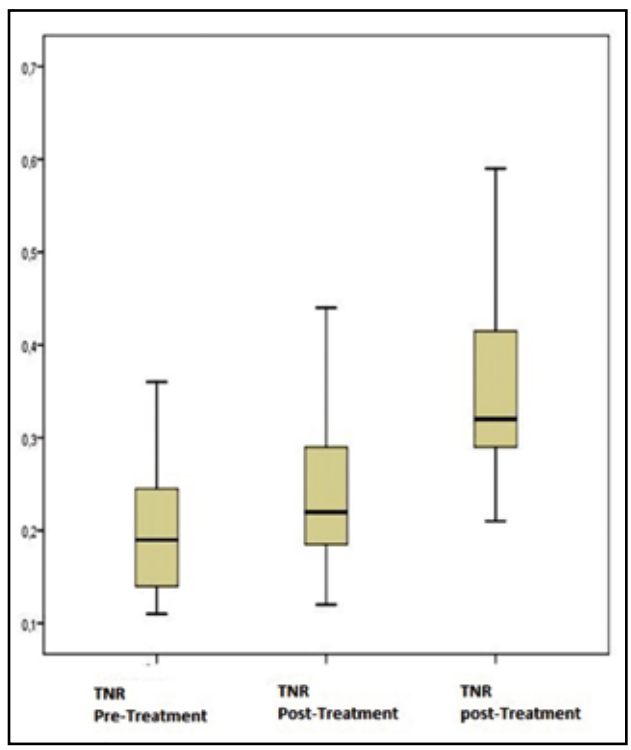

Figure 2. Results of acoustic rhinometry, pre-PAP, and post-PAP treatment (TNR: Total Nasal Resistance).

ity of patients who are not compliant with continuous positive airway pressure (CPAP) was higher than that of patients who were more compliant with CPAP[1,3]. Studies show the relationship between the severity degree of OSAS and PAP compliance. However, it is noted that age, gender, socioeconomic status, and personal characteristics are less definitive factors[1,8]. The problems that may arise from the side effects are usually observed in the first few weeks, which may lead to the discontinuation of the PAP treatment[7]. It has been noted that treatment compliance in the first few months determined the adherence to treatment at the end of the three months[9,10]. For this reason, the effects of the treatment in the first few months are essential. In our study, we evaluated the nasal effects of the PAP treatment at the end of one month.

Many different side effects of PAP treatment have been noted. In a study carried out by Baltzan et al.[5], the most frequently seen side effects connected with CPAP usage were mask leakage, involuntary mask removal, and nasal congestion. These side effects decreased CPAP compliance and caused low sleep quality.

The literature contains many studies about symptomatic analysis after PAP treatment. Some studies say that nasal symptoms increase with PAP treatments, while others say that nasal symptoms do not change with PAP treatment[6,11,12].

Different studies have shown that inflammation in the upper and lower respiratory tract and congestion in the upper respiratory mucosa are related to OSAS[13,14]. Although CPAP treatment alleviates many symptoms arising from OSAS, it has been noted that it is ineffective in treating local inflammation seen together with OSAS[4]. OSAS patients usually complain of nasal symptoms before and while using CPAP, and this could be related to increased upper respiratory tract resistance[15,16]. Skoczynski et al.[15] noted in their study that CPAP usage increased nasal inflammation unrelated to the nasal congestion complaint. Increased congestion and inflammation in the upper respiratory tract before CPAP treatment in OSAS patients are already present. CPAP treatment does not heal this inflammation and congestion[15].

Moreover, the literature has already found that CPAP treatment increases inflammation and congestion[4,15]. Nakata et al. calculated in their study that CPAP tolerance was low in patients having high nasal resistance using rhinomanometry[17].

Desfonds et al. noted that nasal resistance decreased when CPAP treatment was utilized[18]. Bossi et al. stated that a difference in the nasal resistance measured with anterior rhinomanometry was not found before and after CPAP treatment[19]. Skoczynski et al. noted that CPAP usage did not lead to a change in nasal resistance measured with anterior rhinomanometry[15].

Our study separately evaluated the effect of PAP treatments on nasal resistance after one month and after one night. Total nasal resistance (TNR) measured with anterior rhinomanometry was increased statistically significantly compared to before treatment (p=0.011).

Accordingly, when we compared the TNR measured with anterior rhinomanometry before treatment with the TNR taken following treatment, we found that the TNR after the treatment increased statistically significantly (p=0.011).

We wanted to determine the acute effect of PAP treatment after one night. For this reason, we compared TNR values in the evening with TNR values in the morning after the one-month PAP treatment. Finally, for the first time in the literature, we showed that the acute damage of PAP treatment on nasal resistance is statistically significant (p=0.001).

We also measured MCA values by rhinomanometry before and after the one-month PAP treatment. We found that MCA values statistically significantly decreased after the one-month treatment than before (p=0.0001). There was a decrease in the morning values after one night of treatment (p=0.001).

We evaluated nasal mucosal clearance with a saccharin test before and after PAP treatment. There was no significant difference in mucosal clearance.

In a study, for the first time in the literature, Iriz et al. have shown that acute effects of CPAP decrease over time[20]. These findings support that PAP treatment increases nasal resistance and nasal mucosal oedema freely from OSAS. These side effects have an increased correlation with the PAP pressure and Apnea-Hypopnea Index (AHI) in our previous study (p= 0.0001)[20].

The nasal symptoms index increased in the SNOT-20 questionnaire after the treatment (p= 0.003). Long-term usage may increase nasal resistance and may disrupt compliance with PAP treatment.

We determined that the total nasal resistance was significantly increased before and after treatment (p=0.01).

CONCLUSIONS

This study shows that PAP treatment increases nasal congestion after one night of treatment and after one month of treatment with a cumulative effect. PAP therapy positively affects sleeping quality and life quality, while negatively affecting nasal functions in the acute period.

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