Original Article

ISSN: 1735-0344 *Tanaffos 2016; 15(1): 25-30*

TANAFFOS

Continuous Positive Airway Pressure Compliance in Patients with Obstructive Sleep Apnea

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Received: 29 October 2015
Accepted: 12 January 2016

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Background: Obstructive sleep apnea (OSA) is a common condition in adults. In most cases, first-line therapy includes treatment with positive airway pressure devices. However, because of discomfort, continuous positive airway pressure (CPAP) compliance is often poor. To determine the willingness of patients to use CPAP device, the relationship of demographic and polysomnographic variables with tolerance and the willingness to use CPAP, was evaluated.

Materials and Methods: In this cross- sectional study, 120 OSA patients who were treated with CPAP in Baqiyatallah Hospital, Tehran, Iran, were selected by Convenience sampling. Polysomnographic variables, willingness to use CPAP for short and long periods of time and possible complications were evaluated.

Results: One hundred-twenty cases with a mean age of 53±10.3 years were assessed. The mean Epworth Sleepiness Scale (ESS) score was 11.9 ± 6.2 in CPAP users versus 11.8±6.1 in patients who did not use CPAP. The willingness to use CPAP for short-term was significantly different between the two groups (P=0.008). The average minimum oxygen saturation rate of patients was 75.21% in CPAP users versus 71.63% in non CPAP users. Also, the average desaturation index was higher in CPAP users (54.5 vs. 44.98). The mean ESS was 14.03 ± 6.19 in those who accepted long-term treatment versus 8.85 ± 4.89 (P=0.003). Skin wounds and rhinitis were reported in 4.1% and 4.1% of patients, respectively.

Conclusion: It is concluded that high CPAP compliance rates are achievable through comprehensive CPAP therapy.

Key words: Sleep Apnea, Obstructive; Continuous Positive Airway Pressure; Compliance

INTRODUCTION

Obstructive sleep apnea is a common condition affecting 2% of adult female and 4% of adult male populations (1). Obstructive sleep apnea has been associated with multiple poor outcomes, including impaired quality of life (2), high accident rates (3) and increased cardiovascular morbidity and mortality (4, 5). Treatment is aimed at decreasing symptoms and cardiovascular morbidity and reducing mortality (5, 6).

In most cases, first-line therapy for OSA includes treatment with positive airway pressure devices (6). This type of treatment is highly effective for controlling OSA and decreasing the related symptoms (6, 7). Moreover, the

use of CPAP can decrease systemic blood pressure and improve cardiovascular function; as the result, cardiovascular morbidity and mortality associated with OSA decrease. However, in those who accept treatment with CPAP compliance is often poor because of discomfort. Poor compliance may lower the efficacy of treatment or even result in treatment failure (8, 9). The nasal mask interface may cause complications such as pressure sores, persistent air leak, claustrophobia and nasal congestion (10).

To determine the willingness of patients to use CPAP device, this study sought to assess the relationship of demographic and polysomnographic variables with tolerance and the willingness to use CPAP.

MATERIALS AND METHODS

In this cross- sectional study, after obtaining the ethics approval and patients' written informed consent, 120 OSA cases treated with CPAP in Baqiyatallah Hospital in Tehran, Iran in 2014 were selected by convenience sampling. The OSA was diagnosed by a pulmonologist with 10 years of clinical experience. Polysomnographic variables included minimum oxygen saturation and respiratory disturbance index (RDI). Willingness of the patients to use CPAP for a short (one day after polysomnography) and long periods of time (six-12 months after polysomnography) was evaluated. If the patient did not use CPAP device, we asked the reasons. Also, we asked about possible complications such as skin wounds and rhinitis.

The indications for use of CPAP, and a time interval of minimum of six months since recommending CPAP therapy were the inclusion criteria. Patients who had not undergone polysomnographic assessment, those not consenting to participate in the study and patients with a history of stress or anxiety and cardiovascular or neurological diseases were excluded from the study.

The patients received sleep hygiene education and were requested to sign an informed consent form before filling out the questionnaire. The questionnaires were filled out anonymously.

The data were analyzed using SPSS version 16 (SPSS Inc. Chicago, IL, USA). The variables with normal distribution (approved by one-sample Kolmogorov–Smirnov test) were compared using independent sample t-test between the groups and paired sample t-test within the groups. Chi square test was also used to compare categorical variables between the two groups. P value<0.05 was considered statistically significant.

RESULTS

Totally, 120 cases with a mean age of 53±10.3 years were evaluated; 71 patients (59.2%) did not use CPAP device. The maximum and minimum age was 80 and 26 years, respectively.

Eight patients (6.7%) were Illiterate and 44 patients (36.7%) had academic education. Total ESS score was 11.87±6.15 with a maximum of 24 and minimum of zero (Table 1).

Of 120 patients, 14 (11.7%), 34 (28.3%) and 72 (60%) patients had mild, moderate and severe obstructive RDI, respectively.

Table 1 shows the willingness of patients to use CPAP for a short period of time based on the use or no-use of the device. The willingness of patients to use CPAP for a short period of time was significantly different between the two groups (P=0.008).

Average minimum oxygen saturation of patients was 75.21 % in CPAP users versus 71.63% in non-users. Also, the average desaturation index in CPAP users was higher (54.5 versus 44.98). The difference in the minimum oxygen saturation and desaturation index was not significant. (P=0.24 and P=0.14, respectively, Table 2).

Table 1. Demographic data

	CPAP user	Non CPAP user	P value
Mean age	53 ± 8.3 years	52 ± 11.49 years	0.71
Sex: Male/ Female	89.8% / 10.2%	81.7% / 18.3%	0.23
ESS score	11.9 ± 6.2	11.8 ± 6.1	0.94
Willingness for short-term use (willingness/reluctance)	77.6%/ 22.4%	49.3%/ 50.7%	0.008

Table 2. Minimum oxygen saturation and desaturation index

Use of CPAP variable	Number	Minimum	Maximum	Average	Standard deviation
Yes-minimum oxygen saturation	49	20	90	75.21	15.03
No-minimum oxygen saturation	71	21	91	71.63	18.28
Yes- desaturation index	49	1.7	165	54.05	35.56
No - desaturation index	71	2.3	154	44.98	32.24

Of 49 patients who had used CPAP device, 29 patients (59.2%) were willing to use it for long-term. Thus, final compliance rate was estimated to be 59.2%. The rate of compliance was higher in patients with weight loss (20.4%) compared to those without weight loss.

The mean age was 56.37 ± 8.99 years in patients who accepted long-term use of CPAP and 49.1 ± 5.08 years in patients who did not accept the long-term use of CPAP. The difference in the mean age between the two groups was significant (P=0.02).

Of 29 patients who used CPAP for a long period of time, 24 were males. Sex did not significantly affect acceptance of CPAP (P=0.07).

In patients who accepted long-term therapy with CPAP, 34.5% had academic education; this rate was 20% in the other group. Education level did not significantly affect long-term acceptance of CPAP device (P=0.09).

The mean ESS score was 14.03 ± 6.19 in those who accepted long-term treatment and 8.85 ± 4.89 in those who did not accept it. The difference in the mean ESS score between the two groups was significant (P=0.003).

The relationship between RDI and long-term use of CPAP device was not significant (P=0.33). Table 3 shows the correlation between long-term use of CPAP and obstructive RDI.

The mean minimum oxygen saturation in CPAP users and non-users was 67.54 and 75.55, respectively. This difference was not significant (P=0.05).

The mean desaturation Index was 62.22 in CPAP users and 43.20 in non-users. This difference was not significant (P=0.05).

A total of 12.2% of patients were not satisfied with the CPAP device and the most common reason was the high price of the device. Table 4 shows reasons for not using CPAP device by patients.

Of 49 patients who used CPAP device, 59.2%, 28.6%, and 12.2% used the device five to seven, three to five and one to three times a week, respectively.

The CPAP device caused no complication in 81.6% of patients; 10.2% of patients reported skin wounds with rhinitis. Skin wounds were reported by 4.1% and rhinitis was reported by 4.1% of patients.

Of 120 patients, 50 patients (41.7%) had chemical injuries. Among them, 11 patients (9.2%) had mild RDI; 10 patients (8.3%) had moderate and 29 patients (24.2%) had severe RDI. These values for non-chemical injuries were 2.5%, 20%, and 35.8%, respectively. The RDI and chemical injury had a significant correlation (P=0.007).

The mean ESS score was 11.54±5.37 in chemical injuries and 12.11±6.69 in non-chemical injuries. This difference was not statistically significant (P=0.61).

According to Table 5, the mean minimum oxygen saturation rate was 74.22 ± 15.20 in chemical injuries and 73.41 ± 17.40 in non-chemical injuries. The difference in minimum oxygen saturation rate between the two groups was not significant (P=0.79).

Table 3. Obstructive respiratory disturbance index (RDI) and long-term use of CPAP

RDI	Long-term use of CPAP	Not willing to use CPAP for long-term	Total
Mild	10.2%	4.1%	14.3%
Moderate	10.2%	14.3%	24.5%
Severe	38.8%	22.4%	61.2%

Table 4. Reasons for not using the CPAP device

Reasons	High price	Not fitting patient's face	Not believing in its efficacy	Use of alternative therapies	Miscellaneous	Total
Frequency	24.6%	20.4%	24.6%	21.7%	8.7%	100%

Table 5. Lowest oxygen saturation rate according to the presence/absence of chemical Injury

Chemical injury	Number	Minimum lowest O_2	Maximum lowest O_2	Average lowest O_2	Standard deviation
Yes	50	31%	90%	74.22%	15.20
No	70	20%	91%	73.41%	17.40

DISCUSSION

We found that 40.8% of patients used the device and the compliance rate was 59.2%. In patients who used CPAP, the ESS score was significantly higher compared to non-users (16.5 vs. 11.8, P=0.003). This study showed that the association between apnea-hypopnea index and chemical injury was significant (P=0.007). In fact, this relationship described the severity of symptoms of chemical injuries; also, the ESS score was not significantly higher in patients with chemical injury (P=0.61).

This study showed that weight loss was followed by a feeling of satisfaction. The main causes of dissatisfaction with the device were mask size mismatch, feeling of suffocation and complications such as nasal congestion and irritation. Lasters et al. (11) demonstrated the significant effect of treatment of nasal symptoms on patients' compliance. The main cause of not using CPAP was the high cost of the device.

According to Engleman and Wild (12), about 50% of patients who received CPAP therapy discontinued it within the first year. It was shown that humidification, mask selection, and patient education played important roles in improving compliance (13-16).

Boyacı et al. (17) reported compliance rate of 81.9% in patients with obstructive sleep apnea, which was higher than the rate in our study (59.2%). Due to the differences in the details of the study sample size and the type of device (Smart type), such a difference in the rate of compliance was expected. Also, they concluded that patients with higher ESS had higher tolerance and acceptance of CPAP device, confirming the results of our study.

In the recent study, the relationship between apnea/hypopnea index and the compliance of patients was not significant (p=0.33). This finding was highlighted in some previous studies as well (17-20). According to Hui et al, (21) this association was significant and it was the only predictive factor contributing to better compliance in use of the device (P=0.04).

The difference in minimum oxygen saturation and desaturation index between the two groups was not significant and there was no significant relationship between the level of compliance and these two variables in our study but according to Sarrell et al, (22) this relationship was significant.

According to Boyacı et al, (17) gender significantly affected the admission of patients to use CPAP device. But,

it was not in line with our findings. Considering the low number of female patients in this study and variable gender distribution, this difference can be justified.

Boyacı et al. (17) showed that people with higher educational level had better compliance. We achieved these findings in our study as well.

Hui et al. (21) mentioned the role of treatment cost in the selection process. In our study, cost of treatment was so high that it was the first complaint of patients.

In our study, 18.4% of the users of the device had complications, which was lower than the rate reported by Boyacı (17) (18.4% vs. 62%)

CONCLUSION

In conclusion, we can state that high CPAP compliance rates are achievable in the community through a comprehensive CPAP program that provides insurance coverage for CPAP devices, extensive education, and follow-up services for symptomatic OSA patients. Finally, further studies with a larger sample size are suggested to confirm the results of this study.

Conflict of interest

All authors certify that they have no affiliations with or involvement in any organization or entity with any financial interest (such as honoraria; educational grants; participation in speakers' bureaus; membership, employment, consultancies, stock ownership, or other equity interest; and expert testimony or patent-licensing arrangements), or non-financial interest (such as personal or professional relationships, affiliations, knowledge or beliefs) in the subject matter or materials discussed in this manuscript.

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