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Compliance with CPAP in elderly patients with OSA

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Abstract

Background: Obstructive sleep apnea (OSA) is common in the general population and especially in the geriatric age group. Nasal continuous positive airway pressure (CPAP) is a highly effective treatment but can be difficult for some patients to use.

Objective: We investigated the question if older patients were less compliant with CPAP therapy than younger patients and may not realize its benefits.

Methods: We conducted a prospective, non-randomized study comparing use of CPAP in patients over age 65 with patients under age 65. One hundred and seven consecutive patients with a new diagnosis of obstructive sleep apnea were started on therapy with nasal CPAP. We obtained follow-up data on all 107 patients. Compliance with CPAP was assessed by patients subjective report of use and, in a subset of 21 patients, by objective measurement using a microchip installed in the CPAP unit that measures actual hours of use at therapeutic pressure.

Results: The percentage of patients using CPAP regularly was not different in the two groups: 70% of patients in the over age 65 group used CPAP regularly vs. 72% of patients under age 65. The over 65 group used CPAP 6.5 nights per week, an average of 6.5 h of use per night. The under 65 group was not significantly different, using CPAP 6.8 nights per week, a mean of 6.7 h of use per night.

Conclusion: Patients over age 65 are able to tolerate CPAP as well as patients under age 65.

Keywords: Continuous positive airway pressure compliance; Geriatrics; Sleep apnea; Sleep disorders; Positive pressure therapy; Continuous positive airway pressure

1. Introduction

Obstructive sleep apnea is a very common medical condition. One study estimated that OSA, as defined as an respiratory disturbance index (RDI) of 5 events per hour or more, is present in about 24% of men and 9% of women ages 30–60 years [1]. The presence of an RDI greater than 5/h plus the complaint of excessive daytime sleepiness occurs in about 4% of men and 2% of women. In the elderly, the prevalence is estimated to be higher. Ancoli-Israel [2] reported on sleep disordered breathing in a community dwelling elderly population. She found that 62% had an RDI greater than 10, and 44% had an RDI greater than 20. Nasal continuous positive airway pressure (CPAP) is a highly effective treatment that can reliably eliminate snoring and obstructive breathing by applying air pressure through the nose and stabilizing the upper airway during sleep and preventing collapse of the upper airway. However CPAP should be used on a regular basis to be maximally effective. Inability to tolerate CPAP has been a significant problem in achiev-

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ing effective treatment of OSA. Because CPAP can be cumbersome and difficult for many patients to use, we were concerned that our elderly patients might have difficulty obtaining the benefits of CPAP therapy. In our clinical practice we have seen a high percentage of patients over the age of 65 years with obstructive sleep apnea, and we questioned if our patients over the age of 65 years were able to tolerate CPAP any differently than patients below the age of 65 years. We examined our experience in 107 consecutive patients with obstructive sleep apnea specifically to look at the compliance with CPAP therapy in patients over the age of 65 versus patients under the age of 65.

2. Methods

Patients were seen at Mayo Clinic Scottsdale Sleep Disorders Center by one of two pulmonary sleep specialists (J.M.P. and P.J.L.). Patients seen initially for consultation were referred for polysomnography based on clinical indications suggestive of OSA such as excessively loud snoring, observed apneas by a bed partner, nocturnal choking or dyspnea, or excessive daytime sleepiness and fatigue. Polysomnography was performed by monitoring electroencephalogram (EEG), electrooculogram (EOG), submental electromyogram (EMG), tibial EMG, respiratory effort by impedance plethysmography, airflow by thermocouple, one lead electrocardiogram (ECG), and oxyhemoglobin saturation by oximetry. Data was recorded on Grass model 8-24 polygraph. Studies were scored by registered polysomnographic technicians and reviewed by a board certified sleep specialist (J.M.P.). Sleep stages were scored according to the criteria of Rechtschaffen and Kales. Apneas were defined as a cessation in the oronasal flow of at least 10 s. Hypopneas were defined as an approximate 50% reduction in the airflow signal associated with an arousal from sleep and/or a 3% fall in the oximetry recording. An arousal was defined as a sudden increase in frequency of the EEG tracing. The total number of obstructive apneas plus hypopneas were divided by the hours of sleep to obtain a respiratory disturbance index (RDI). CPAP was initiated in the second half of the night if significant OSA was identified in the first part of the study. The criteria for a split night study were more than 30 apneas or hypopneas in the first 3 h of the study, or disordered breathing events with oxyhemoglobin saturation below 70% or associated with cardiac arrhythmias. CPAP was titrated to eliminate apneas, hypopneas, and snore-related arousals.

All patients were seen following their studies to review the results, and treatment options were reviewed. If the patients had significant OSA (RDI >5) and symptoms compatible with obstructive sleep apnea syndrome, a recommendation was made to initiate CPAP therapy based on the results of the CPAP titration done in the laboratory. All patients received intensive education by a registered nurse familiar with OSA and CPAP equipment (J.W.). A telephone call was made to the patient within the first week to monitor compliance with CPAP and provide an opportunity for the patient to have questions answered and also to identify and help solve any problems the patient is having with CPAP. A follow-up office visit was scheduled within the first month to monitor compliance and to troubleshoot problems. At each visit or telephone call the patient was asked how many nights per week they were using CPAP and how many hours per night the CPAP was being used. Follow-up was obtained by either telephone or office visit at 3, 6, and 12 months.

In order to obtain some assessment of the reliability of patients self reported use of CPAP, 21 patients in this group were provided with CPAP machines with a microprocessor that measures time of use at therapeutic pressure (Respironics Virtuoso T®). None of these patients had prior experience with CPAP. The patients were unaware of the presence of the microprocessor. All 21 received standardized instructions in starting CPAP by the Sleep Center staff and by the home health provider. When patients came back for a follow-up visit, they were asked to fill out a questionnaire about CPAP usage. They were asked for their estimate of average total time in bed and for their estimate of the number of hours of CPAP use each night. Data from the CPAP unit was downloaded into a personal computer giving a measurement of hours of use per night at therapeutic pressure.

3. Results

We initiated CPAP therapy on 107 consecutive

patients forming the basis of this study. There were 71 patients over the age of 65 years, 59 (83%) were males and 12 (17%) were females. The mean age was 72.8 years (range 65–87 years). The mean body mass index was 28.3 (range 15.6–44.9). The mean respiratory disturbance index in this older group was 44.5 events/h (range 10.5–91.1 events/h). The mean CPAP pressure setting was 7.8 cmH_2O (range 5–13 cmH_2O).

We initiated CPAP therapy in 36 patients under the age of 65. Thirty-one (86%) were males and five were females (14%). The mean age was 53.6 years (range 29–64 years). The body mass index was 33.9 (range 22.1–49.5). The mean respiratory disturbance index in the under 65 group was 41.7 events/h (range 11.5–101 events/h). The mean CPAP setting was 8.4 cmH_2O (range 5–13 cmH_2O). The only significant difference between the two groups other than age was BMI (Table 1).

All patients had follow-up for at least 3 months. The range of follow-up was 3–13 months. Fifty of 71 patients (70%) were using CPAP on a regular basis in the over 65 group at follow-up at 3 months, while 26 of 36 (72%) were using CPAP on a regular basis in the under 65 group. Hence the percentage of patients compliant with CPAP by self-report was not different between the two groups and is consistent with prior studies on the compliance with CPAP therapy. In the over 65 group, of the patients still using CPAP at 3 months, the mean use was 6.5 nights/week and 6.5 h/night. This result was not significantly different than the under 65 group who used CPAP 6.8 nights/week and 6.7 h of use per night by self-report (Table 2).

Complaints related to mask intolerance seemed to occur more frequently in the under 65 group. Eighteen of 50 (36%) in the over age 65 group and 15 of 26 (57%) in the under 65 group complained of difficulty tolerating the mask. Complaints related to the mask consisted of soreness over the nose or air leak. Nasal discomfort complaints were similar between the two groups, 31 of 50 (62%) in the over 65 group and 15 of 26 (72%) in the under 65 age group.

In the twenty-one patients in whom CPAP compliance was objectively measured, the following data was obtained. There were 17 males and three females. The mean age and standard deviation was 63.6 ± 14.19 years (range 35–88 years), the mean BMI and standard deviation was 32.20 ± 5.97 (range 24.5–48.9). In this group, the mean respiratory disturbance index was 38.24 ± 31.08 events/h (range 5.5–106.5 events/h). The average length of CPAP use at the time of compliance measurement was 3.52 ± 1.47 weeks (2–6 weeks). The mean self reported use of CPAP was 5.81 ± 2.08 h/night (range 3–9 h/night). The microprocessor measurement of use was 5.53 ± 1.82 h (range 3.3–9.5 h). The 21 patients were further divided into under age 65 and 65 years and older. We found no difference in the use of CPAP in these two groups (Table 3). We found that patients over-reported their use of CPAP by a small amount. There was a good correlation between patient report and microprocessor data.

There were 31 patients that were intolerant of CPAP and discontinued its use prior to 3 months. There was one reported death in the over age 65 group not related to CPAP therapy. One patient reported surgical intervention with a uvulopalatopharyngoplasty (UPPP). The number of CPAP intolerant patients did not differ between the two groups.

Table 1
Characteristics of study patients[a]

	Age <65 years ($N = 36$)	Age ≥65 years ($N = 71$)	P (t-test)
Males	31	59	
Age (years)	53.6 ± 9.17 (29–64)	72.8 ± 5.05 (65–87)	
Body mass index (BMI) (kg/m^2)	33.9 ± 6.96 (22.1–49.5)	28.3 ± 5.17 (15.6–44.9)	<0.001
Respiratory disturbance index (RDI) (apneas + hypopneas/h)	41.7 ± 28.95 (11.5–101)	44.5 ± 24.35 (10.5–91.1)	0.641
CPAP pressure (cmH_2O)	8.4 ± 2.47 (5–13)	7.8 ± 1.96 (5–13)	0.231

[a] Data presented as mean ± standard deviation. Range in parentheses.

Table 2
Patient's subjective report of CPAP use at follow-up

	Age <65 years ($N = 36$)	Age ≥65 years ($N = 71$)	P (t-test)
Number (%) using on a regular basis	26 (72%)	50 (70%)	
Nights per week of use[a]	6.8 ± 0.71	6.5 ± 1.43	0.274
Hours of use per night[a]	6.7 ± 1.68	6.5 ± 1.72	0.285
Hours in bed per night[a]	7.1 ± 0.84	7.4 ± 1.11	0.148

[a] Standard deviation, range.

4. Discussion

Obstructive sleep apnea is a common medical condition in the general population and is especially common in the elderly. Young et al. have shown in middle aged adults age 30–60 years that 9% of women and 24% of men have sleep apnea [1]. The prevalence of sleep disordered breathing (SDB) varies in the literature depending on the definition of sleep apnea used. Severity of sleep apnea is usually defined as an apnea plus hypopnea index or a respiratory disturbance index (number of apneas plus hypopneas per h of sleep). Ancoli-Israel demonstrated that of people over age 65 years, 62% have significant OSA as defined as more than 10 respiratory disturbance events/h [2]. In an earlier study, using an RDI of 10 as a cutoff, 10% of independently living elderly had SDB, 21% of elderly on a medical ward had SDB, and 26% in a nursing home had SDB [3]. SDB increases with age: 2.9% of 60-year-olds have an AHI >5, 33% of 70-year-olds have OSA while 39.5% of 80-year-olds have OSA [4]. SDB has been shown to be a significant predictor of mortality in elderly women [5] OSA has been associated with an increased risk of mortality [6], neurocognitive impairment [7–10] hypertension [11–13], excessive daytime sleepiness [14], and reduced quality of life [15,16]. CPAP has been shown to be an effective therapy for OSA [17–20], but is only effective when used. The critical factor in obtaining successful outcomes in treating any disease is to have effective treatment that patients are able to use on a regular basis. Successful treatment must reverse the underlying pathophysiology of the disease, have few side effects, be well tolerated and be used on a regular basis. CPAP reverses the underlying pathophysiology of OSA and has few serious side effects [21], but must be used on a regular basis to obtain maximum benefit. However, the device can be somewhat cumbersome to use for some patients and requires determination and motivation to use on a nightly basis. Even one night without CPAP reverses virtually all of the sleep and daytime alertness gains derived from prior treatment with CPAP [22]. Rolfe [23] found that overall tolerance of CPAP was about 64%, and was least for patients with snoring alone, better for patients with OSA and subjective hypersomnolence, and best for those with OSA and hypoxemia. Compliance with CPAP seems to fall into two different patterns [24]. Approximately 50% of subjects use CPAP regularly 6 h/night and on 90% of the nights. The second pattern is that of intermittent use, where users wear CPAP 2–79% of the nights and use it only

Table 3
Subjective vs. objective reported use of CPAP according to age groups.

	Age <65 years ($N = 9$)	Age ≥65 years ($N = 12$)
Length of use (weeks)[a]	3.8 ± 1.45 (2–6)	3.3 ± 1.48 (2–6)
Patient report of use (h)[b]	5.8 ± 1.94	5.7 ± 2.25
Hours of CPAP use objectively[c]	5.0 ± 1.82	5.9 ± 1.83
Correlation coefficient	$r = 0.822$	$r = 0.828$

[a] Data presented as mean ± standard deviation. Range in parentheses.
[b] Mean ± standard deviation.
[c] Mean ± standard deviation measured by microprocessor.

3.5 h on average. The difference in use of CPAP appears to be determined within the first week of initiation of therapy. Therefore, if clear determinants or predictors of CPAP non-compliance can be identified, improvements at CPAP education or CPAP technology can be addressed. To improve compliance with CPAP it is necessary to delineate determinants of CPAP non-compliance.

Because CPAP can be difficult and cumbersome to use, compliance with CPAP is a significant concern in the elderly although many authors believe compliance with medical treatments in general are not different in the elderly [25]. Because we were seeing a large percentage of patients over the age of 65 years with OSA, we were concerned about the ability of older patients to tolerate CPAP well and to comply with it as well as younger patients. We found no difference in the compliance with CPAP between patients over age 65 and those under 65 years. Mean nights of use per week and mean hours per night were not essentially different between the two groups. In order to assess the possibility of inaccurate self-reports of CPAP use we were able to obtain objective measurements of CPAP use in a group of twenty-one patients who were supplied a CPAP machine with a microprocessor providing objective evidence of CPAP usage. We found that, contrary to prior reports [26], in our patients there was no significant difference in our patients self report and objective measurement of CPAP. We are uncertain about the explanation for this discrepancy. During this study, our patients were given extensive instruction in CPAP and had frequent telephone follow-up and office visits to solve problems with CPAP and this may have led to accurate reporting on CPAP use. However, our overall success rate with CPAP was no different than in other studies. Nevertheless, we did not observe a significant difference between the subjective reports of CPAP use and the objective measurement by compliance meter in either group of patients.

Our patients over 65 years had a mean BMI significantly lower than our patients under 65, despite having sleep disordered breathing of equal severity. This observation leads to the speculation that in the older age group, increased body weight may not be as significant a risk factor for OSA as it is in the younger group.

In summary, we have found that age over 65 years is not a significant determinant for non-compliance with CPAP. In this study patients over the age of 65 years tolerated CPAP as well as patients under the age of 65 years and there was no difference in compliance at three months of follow-up. CPAP is tolerated well in about two thirds of patients given intensive education and instruction in its use, and hence represents an effective method of treatment for OSA in the elderly.

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