RESPIRATORY MEDICINE (2000) **94,** 145–149
doi:10.1053/rmed.1999.0703, available online at http://www.idealibrary.com on IDEAL®

What characterizes patients who are unable to tolerate continuous positive airway pressure (CPAP) treatment?

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Continuous positive airway pressure (CPAP) is the treatment of choice for obstructive sleep apnoea syndrome (OSAS), but many patients find this treatment intolerable. The aim of this study was to characterize patients who were unable to tolerate CPAP treatment (non-complaint) as opposed to those who continued using CPAP (complaint).

A case-control study was performed in which the cases comprised of 40 patients who had been started on CPAP treatment but had found the treatment unacceptable and had ceased to use CPAP. The controls comprised of 63 patients with OSAS who had been prescribed CPAP and were still using it (follow-up period 18 months to 10 yr).

The patients who stopped CPAP treatment had a higher mean age, had more frequently undergone uvulopalatopharyngoplasty (UPPP) and had a lower mean oxygen desaturation index (ODI) than patients who continued using CPAP. ODI was an independent negative predictor of non-compliance ($OR_{5units} = 0{\cdot}6(0{\cdot}4–0{\cdot}8)$, $P < 0{\cdot}01$). The two most common reasons for non-compliance were problems in the nose or pharynx and lack of subjective effect by the treatment. High age was an independent risk factor for non-compliance because of problems in the nose or pharynx ($OR_{10\ years} = 2{\cdot}8(1{\cdot}3–6{\cdot}1)$, $P < 0{\cdot}01$), while having undergone UPPP was a risk factor for non-compliance because of lack of effect ($OR = 4{\cdot}5$ (1·1–19·1), $P < 0{\cdot}05$).

In conclusion, patients with less severe OSAS are more likely to discontinue CPAP treatment. The risk of experiencing nasal and pharyngeal side-effects of such severity that the patient stops using CPAP increases with age and patients who have undergone UPPP are less likely to experience a clinical improvement after being started on CPAP therapy.

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Introduction

Treatment with continuous positive airway pressure (CPAP) is usually regarded as the treatment of choice for obstructive sleep apnoea (OSAS). CPAP treatment has been shown to improve daytime sleepiness (1,2) and daytime performance (1,2) to reduce the risk of traffic accidents in patients with OSAS (3) and it has also been indicated that it reduces mortality in patients with severe OSAS (4). One drawback when it comes to CPAP treatment, however, is that many patients find this treatment unacceptable (1,5,6) and it has been estimated that more than 50% of patients who are selected for CPAP therapy stop the treatment or only use it for part of the night (7).

Received 9 June 1999 and accepted in revised form 22 September 1999.
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The aim of this study was to characterize the patients who were unable to tolerate CPAP treatment as opposed to those who continued using CPAP over a long period of time.

Materials and methods

In this investigation, a case-control study was performed.

PATIENTS

The cases comprised of all the patients with OSAS at our department who had been started on CPAP treatment during the time period 1986–95 but had found the treatment unacceptable and ceased to use CPAP after a time interval of 3 months to 3 years ('non-complaint', $n = 40$).

The controls comprised patients with OSAS in our department who had been prescribed CPAP, who were still using it and had been followed for at least 18 months (18 months to 10 yr) ('compliant' $n = 63$).

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All the patients had been referred to our department because of verified or suspected OSAS. The diagnosis was confirmed by a full-night recording with oximetry and an airflow thermistor. Some of the patients ($n=23$) had undergone uvulopalatopharyngoplasty (UPPP) before being referred to our department for CPAP treatment.

CLINICAL INVESTIGATION

Before the introduction of the CPAP treatment, all the patients were seen by a physician for a clinical examination. The weight and height of the patient were recorded and the body mass index (BMI) was calculated.

The patients classified their symptoms on a five-point scale in a multiple choice format (8,9). In the subsequent analyses of excessive daytime sleepiness, scores of 4 and 5 ('severe' and 'very severe') were regarded as representing major complaints, a score of 3 represented a moderate complaint and scores of 1 and 2 no complaints. Scores of 4 and 5 ('often and very often') for snoring were regarded as habitual, a score of 3 ('sometimes') as occasional and scores of 1 and 2 as no complaints.

NIGHTLY OXIMETRIC INVESTIGATION

The patients were investigated on three consecutive nights with oximetry (OXI3, Radiometer, Copenhagen, Denmark). This was done in hospital under the supervision of a nurse, who also noted regularly whether or not the patient was asleep. The oximetric curves were evaluated manually, with calculations of the number of desaturations of at least 4% points compared with baseline during the night divided by the time spent in bed, thereby producing the oxygen desaturation index (ODI). The lowest oxygen saturation during the night was recorded. No CPAP was used on the first night. The second night was used for pressure titration and, on the third night, the patients were treated with the pressure that was found to be optimal during the second night.

All but two patients were prescribed conventional fixed pressure CPAP units, the most common being Tranquillity Plus (Health Dyne, Pittsburg, U.S.A.) ($n=59$) and REM Plus (Sefam, Nancy, France) ($n=20$). Two patients were prescribed auto-adjusting CPAP (Morphee Plus, Pierre Medical, Nancy, France). No humidifiers were prescribed to any of the patients.

FOLLOW-UP

After the introduction of CPAP, all the patients were followed up with a clinical investigation and oximetry for one night after 3 and 12 months. A specially trained nurse who saw the patients at least once a year then followed-up patients in whom the CPAP treatment was judged to be working satisfactorily. In 24 of the patients, the prescribed CPAP unit was subsequently (3 months–7 y) changed. The units that were switched to were another fixed pressure CPAP in 19 patients, an auto-adjusting CPAP in four patients and bilevel positive airway pressure (BiPAP-S, Respironics, Murrysville, Pensylvanian, U.S.A.) in one patient.

Patients who returned their units were also seen by the same nurse who registered the reason why the patient did not find the CPAP treatment tolerable and referred and patient to a physician for a decision on alternative treatment.

STATISTICS

The statistical analysis was performed using the Statistica 5·0 software package (StatSoft Inc, Tulsa, OK, U.S.A.). The paired t-test, Mann–Whitney U-test and χ^2-test were used to compare compliant and non-compliant patients. Logistic regression was used for multivariate analysis. The minimal statistical significance level for all analyses was $P<0·05$. Mean values are presented as the mean (SD) and odds ratios as OR (95% CI).

Results

The patients who discontinued the CPAP treatment had a higher mean age, a lower BMI and had more frequently undergone UPPP compared with patients who continued using CPAP (Table 1).

For the whole group, the mean ODI before CPAP treatment was 30 (19). Patients who continued using CPAP had a higher ODI (Fig. 1) and a lower minimal oxygen saturation (69(15) *vs.* 78(8)%) ($P<0·001$) before treatment than non-complaint patients. The group that continued using CPAP required a slightly higher pressure (9(3) *vs.* 8(3) cm H_2O, $P<0·05$) than the patients who discontinued the treatment, but no difference was found in ODI or minimal oxygen saturation between the two patient groups after pressure titration.

TABLE 1. Characteristics of patients that continued using continuous positive airway pressure (CPAP) and patients who quitted the treatment [(%) and mean (SD)]

	Compliant ($n=63$)	Non-compliant ($n=40$)	
Women	10	15	
Age (years)	53 (9)	58 (10)	*
Current smokers	29	24	
BMI (kg m^2)	32 (5)	29 (4)	***
UPPP	16	36	*
Hypertension	39	50	
Cardiac disease	22	43	
Diabetes	14	14	
Airway disease	29	20	
Psychiatric disorder	8	12	

*$P<0·05$; ***$P<0·001$.

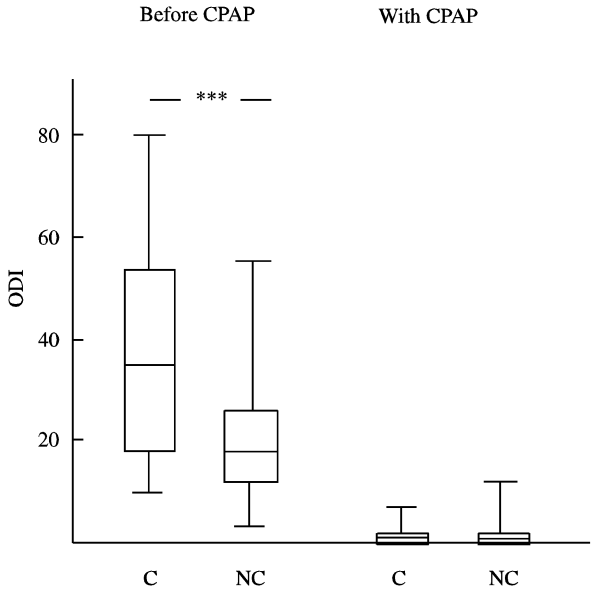

FIG 1. Box plot indicating median, inter-quartile deviation and range for oxygen desaturation index (ODI) before continuous positive airway pressure (CPAP) and with CPAP after pressure titration in complaint (C) and non-complaint (NC) patients (***$P<0{\cdot}001$).

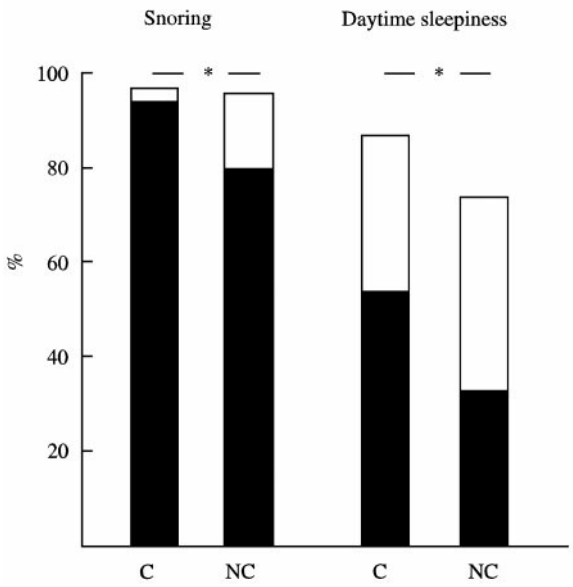

FIG 2. Reported snoring and daytime sleepiness before treatment in compliant (C) and non-compliant (NC) patients. Filled boxes represent habitual/major compliants and open boxes occasional/moderate complaints (*$P<0{\cdot}05$).

The patients who continued using CPAP had more self-reported snoring and daytime sleepiness before starting treatment than patients who stopped the treatment (Fig. 2).

There was a non-significant trend that patients that had undergone UPPP had a lower ODI before treatment than patients who had not undergone UPPP (25(17) vs. 32(20)) ($P=0{\cdot}15$). In the non-complaint group, no difference in ODI was found between those who had undergone UPPP and those that had not [20(12) *vs.* 9(13)].

ODI was an independent negative predictor for discontinuing the CPAP treatment after adjustment for age, gender, BMI and pre-treatment UPPP by means of logistic regression ($OR_{5units}=0{\cdot}6(0{\cdot}4–0{\cdot}8)$, $P<0{\cdot}01$).

The two most common reasons for discontinuing CPAP treatment were problems from the nose or pharynx ($n=14$) and a lack of subjective effect from the treatment ($n=14$). Eight patients stated that the mask gave them a feeling of panic or claustrophobia, five patients said that they were disturbed by the noise of the CPAP unit and three patients had problems with leakage from the mask.

High age was an independent risk factor for discontinuing the treatment because of problems from the nose or pharynx, while having undergone UPPP was a risk factor for discontinuing the CPAP treatment because of lack of effect (Table 2).

TABLE 2. Risk factors for discontinuing continuous positive airway pressure (CPAP) treatment because of problems from the nose and pharynx and lack of subjective effect after adjustment for all variables in the table. (OR = odds ratio, CI = confidence interval)

	Nose or pharynx OR (95%CI)	Lack of effect OR (95%CI)
Age†	2·8 (1·3–6·1)**	1·5 (0·7–2·8)
BMI‡	0·7 (0·3–1·7)	0·5 (0·2–1·3)
UPPP	1·4 (0·3–6·0)	4·5 (1·1–19·1)*
ODI‡	0·9 (0·6–1·3)	0·6 (0·3–1·1)

†$OR_{10\ years}$; ‡$OR_{5\ units}$. *$P=0{\cdot}05$; **$P<0{\cdot}01$

Discussion

The main finding in this study is that patients with less severe OSAS are more likely to find CPAP treatment intolerable. In our investigation, side-effects from the nose or pharynx and lack of subjective effect were the two most prevalent reasons for discontinuing the treatment. The risk of discontinuing the treatment because of nasal or pharyngeal side effects increased with age, while patients who had undergone UPPP were more likely to discontinue the treatment because of lack of effect.

This investigation was conducted in a clinical setting and there are some clear limitations to our study. We have no data on the actual use of CPAP in the group who continued with the treatment. Some of the patients who were defined as compliant may therefore be using CPAP only intermittently. This may lead to an under-estimation of the actual

differences between patients who are successfully treated with CPAP compared with those who were unable to tolerate CPAP therapy at all. Another reason why may have under-estimated the actual differences between compliant and non-compliant patients is the fact that a few of the patients in the non-compliant group discontinued their treatment 2–3 yr after CPAP treatment was initiated. This may lead to a degree of misclassification, as the shortest follow-up period for patients in the compliant group was 18 months. We also based our estimation of OSAS severity exclusively on ODI and not on the frequency of apnoeas and hypopnoeas. Despite these drawbacks, we believe that this study yields information that is of value when it comes to identifying patients who are at risk of not being able to tolerate CPAP treatment.

There is little dispute that CPAP is the treatment of choice for patients with severe OSAS. CPAP is also effective in relieving daytime sleepiness and improving daytime performance in mild OSAS (1,10,11) but, in accordance with our results, other investigators have found that patients with mild OSAS are more likely to discontinue CPAP therapy than patients with a more severe OSAS (1,6).

In our study, more than one-third of the patients who discontinued CPAP therapy stated that nasal and pharyngeal side-effects were an important reason for stopping treatment. Nasal side-effects are reported to occur in 15–45% of patients using CPAP (7). These side-effects include nasal dripping, congestion and mucosal drying. The mechanism behind these side-effects is not fully known, but vasodilatation through the provocation of pressure-sensitive mucosal receptors and mouth leak causing high unidirectional nasal air flow may be two of the underlying mechanisms (7,12). The results of our studies indicate that this may be more common in elderly patients and is perhaps related to a higher incidence of mucosal atrophy in elderly patients. It is possible that some of the patients with side-effects from the nose would have been able to continue with CPAP if a heated air humidifier had been added (12,13). At the time of the study, air humidifiers were, however, not routinely prescribed at our clinic.

Uvulopalatopharyngoplasty (UPPP) was introduced as a method of surgery for OSAS at the beginning of the 1980s (14). Long-term follow-ups of OSAS patients undergoing UPPP revealed, however, that many patients experiencing a good short-term effect from the operation subsequently relapse (9,15,16). These patients are then often referred for CPAP therapy. Mortimore *et al.* found that UPPP increases the mouth air leakage during CPAP therapy and postulated that this could reduce tolerance and compliance during CPAP therapy (17). In the present study we found that patients who underwent UPPP discontinued CPAP more frequently than patients who had not undergone this procedure. The main reason for a higher discontinuation rate in these kinds of patient were, however, that patients who had undergone UPPP were less likely to find the CPAP therapy effective. The reason for this may be that patients who have undergone UPPP often report that the treatment was symptomatically effective, even when night recordings show a return of apnoeas or desaturations (9,15,16).

In conclusion, patients with less severe OSAS are more likely to discontinue CPAP treatment. The risk of experiencing nasal and pharyngeal side-effects of such severity that the patient stops using CPAP appears to increase with age and patients who have undergone UPPP are less likely to experience a clinical improvement after being started on CPAP therapy.

Acknowledgement

This work was supported by the County Council of Uppsala and the Swedish Heart and Lung Foundation.

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