



A Study on the Effect of CPAP Treatment on Sleep Fragmentation: A Study on Eastern India Population

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ABSTRACT

Aims and objectives: In this study, we aimed to show that sleep stage percentage alteration is an indication of the severity of the disease and impairment of the sleep stage percentage can be restored by CPAP treatment.

Sleep disordered breathing constitute a broad spectrum of disorders which is characterized by repeated episodes of partial or complete collapse of pharynx for 10 seconds or more during sleep leading to sleep fragmentation and oxyhemoglobin desaturation. The different conditions included under its domain in the increasing order of severity are habitual snoring, upper airway resistance syndrome, obstructive sleep apnoea and hypopnoea syndrome and obesity hypoventilation syndrome.

5% of adult men and 3.6% of adult women i.e. more than 60 million Indians are estimated to have some degree of obstructive sleep apnoea. Of these six million are estimated to have cases severe enough to warrant immediate therapeutic intervention. While obstructive sleep apnoea is commonly associated with obesity and male gender, it affects broad cross section of the population.

Keywords: Spectrum, Desaturation, Oxyhemoglobin, Hypopnoea syndrome, Obesity hypoventilation syndrome

INTRODUCTION

Traditional therapy for obstructive sleep apnoea includes nightly use of Continuous Positive Airway Pressure (CPAP) and it has been the most common form of therapy for sleep apnoea since 1982 [1-6].

Sleep deprivation and sleep apnoea have similar characteristics, furthermore sleep apnoea per se a kind of sleep deprivation. Many studies have shown that brief arousals during sleep systematically reduced daytime alertness. It is known that many of the older individuals have frequent arousals that occur during sleep because of apnoea. The number of these arousals is correlated with the magnitude of daytime sleepiness in these patients [7-9].

Rechtschaffen showed that prolonged sleep deprivation would lead to death in rats [10-13]. Sleep apnoea also is a debilitating disorder, which can be fatal if not treated [14-16]. In addition recovery from sleep deprivation and treatment of sleep apnoea have common characteristics. One of these is alteration of sleep stage percentage. Both in the recovery sleep of sleep deprivation and in CPAP treatment subjects showed a REM sleep percentage increase.

Aims and objectives: In this study, we aimed to show that sleep stage percentage alteration is an indication of the severity of the disease and impairment of the sleep stage percentage can be restored by CPAP treatment.

MATERIALS AND METHODS

In our sleep laboratory we evaluated 63 obstructive sleep apnoea patients, 14 women and 49 men during a one year period. Of these patients the youngest was 15 and the oldest was 72 years old and the mean of age was 44. Of these 33 had Respiratory Disturbances Index (RDI) greater than 20 and were administered CPAP therapy. Sleep parameters were recorded by Medilog SAC SRI model polysomnography.

We compared some sleep parameters of these patients with and without CPAP treatment. These sleep parameters were sleep stage percentage alteration, obstructive apnoea count, the longest apnoea duration. Mean apnoea duration and RDI. Statistical analysis was performed using student's t test, statistical evaluation done by SPSS software package. Data was expressed as the mean.

RESULTS AND DISCUSSION

Sleep stage percentage alteration values are shown in Table 1. Before CPAP treatment we found that stage I constituted 27%-21%, stage II 60%-73%, stage III 6.43%, stage IV 4.25% and REM sleep 1.30% of the total sleep time. With CPAP treatment we found these values as 19.99, 50.46, 14.14, 10.30 and 9.28 respectively.

Table 1 Sleep stage percentages.

	Without CPAP (%)	With CPAP (%)	Significance (P)
Stage I	27.22	19.98	<0.05
Stage II	60.72	50.44	>0.05
Stage III	6.43	14.14	<0.05
Stage IV	4.24	10.31	<0.05
Stage REM	1.30	9.28	<0.05

We measured the obstructive apnoea count, the longest apnea duration and mean apnea duration with and without CPAP treatment; these values are shown in Table 2. We found that obstructive apnoea count is 133.06 before CPAP treatment and 26.43 with CPAP treatment. The longest apnea duration was measured as 64.87 seconds before CPAP treatment and 30.20 seconds with CPAP treatment. We measured the mean apnea duration as 19.83 seconds before CPAP treatment and 17.76 seconds with CPAP treatment. We also measured the RDI as 55.65 before CPAP and 16.04 with CPAP treatment.

Table 2 Obstructive sleep apnea count, longest apnea duration, mean apnea duration and RDI values.

	Without CPAP	Without CPAP	Significance (P)
Obstructive apnea count	133.06	26.43	<0.001
The longest apnea duration (in seconds)	64.87	30.20	<0.05
Mean apnea duration (in seconds)	19.83	17.76	>0.05

RDI	55.65	16.04	<0.001
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According to our data, CPAP treatment corrects REM sleep percentage effectively although it does not correct completely. It also corrects slow wave sleep (stage 3 and stage 4) percentage. Correction of these parameters was consistent with subjective expression of wellbeing of the patients. Our data also shows that obstructive apnoea count and its reflection RDI were reduced significantly by CPAP treatment. In addition to this finding we found that longest apnoea duration reduced more than 50% although mean apnoea duration was not reduced significantly.

CONCLUSION

In conclusion this study indicates that CPAP therapy is effective in obstructive sleep apnoea patients by means of RDI reduction and sleep stage percentage correction.

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