

# Dream Content Analysis at the Initiation of CPAP for Obstructive Sleep Apnea

Sinziana Lovin<sup>1\*</sup>, Carmen Rusu<sup>2</sup>, Mihai Mutica<sup>3</sup>, Anamaria Necula<sup>4</sup> and Costinela Georgescu<sup>5</sup>

<sup>1</sup>University Lower Danube, Faculty of Medicine, Galati, Romania

<sup>2</sup>Psychotherapy practice, Galati Romania

<sup>3</sup>Hospital of Psychiatry, Galati, Romania

<sup>4</sup>Hospital of Pneumology, Timisoara, Romania

<sup>5</sup>University Lower Danube, Faculty of Medicine, Galati, Romania

## Abstract

Obstructive Sleep Apnea Hypopnea Syndrome (OSAHS) is a condition characterized by repeated episodes of airway obstruction during sleep, causing intermittent asphyxia and sleep fragmentation. The goal of this study was to assess dream content analysis before and during the first night of treatment for OSAHS using Continuous Positive Pressure (CPAP). We included 38 patients diagnosed using complete overnight polysomnography (PSG), who received CPAP therapy during a second night under PSG. Dream content (word count, thematic units, and emotional content) and the percent of REM sleep were analyzed after both nights. There was an increase in the percent of REM under CPAP (from 16,7% to 26,8%). There was an increase in the number of thematic units (1,36 without CPAP versus 1,82 under CPAP) and in the word count (30,52 without CPAP versus 45,22 under CPAP) and a change in the dream content (unpleasant content in 50% without CPAP versus 37,5% under CPAP). Under CPAP, more patients recalled their dreams than without CPAP (94,2% versus 57,9%). In conclusion, at the initiation of CPAP for OSAHS, there is a rebound of REM sleep associated with a quantitative increase in dream recall and a change in dream content.

**Keywords:** Obstructive Sleep Apnea Hypopnea Syndrome (OSAHS); Polysomnography; Continuous Positive Airway Pressure (CPAP)

## Introduction

Obstructive Sleep Apnea Hypopnea Syndrome (OSAHS) is caused by repeated episodes of upper airway obstruction during sleep, associated with intermittent oxygen desaturation and sleep disruption. The main features of OSAHS are nocturnal breathing pauses and daytime somnolence caused by sleep fragmentation [1].

OSAHS is defined by the presence of 5 or more apneas (pauses exceeding 10 seconds) or hypopneas (significant flow reduction) per hour of sleep in symptomatic (somnolent) patients. The severity of OSAHS is expressed in terms of AHI (apnea hypopnea index per hour of sleep). OSAHS is mild for an AHI between 5 and 15 per hour, moderate for an AHI between 15 and 30 and severe for an AHI exceeding 30/h.

The gold standard for the diagnosis of OSAHS is polysomnography, a complex investigation including measurement of: electric brain activity during sleep, respiratory flow, pulse oxymetry and other parameters. The standard treatment for OSAHS is nocturnal ventilation with Continuous Positive Airway Pressure (CPAP), a mechanical aid which maintains airway patency and prevents intermittent asphyxia and sleep fragmentation [2].

Dreams are associated with the REM stage of the human sleep, characterized by rapid eye movements, intense unconscious brain activity, and muscle atonia. The only muscular activity in REM is represented by the oculomotor, cardiac and diaphragmatic movements. Since the ventilation is assured by the diaphragm alone in REM stage, patients with ventilatory impairments (such as emphysema, kyphoscoliosis, obesity etc) are at risk for desaturations especially during this stage. The oxygen desaturations produce micro-arousals responsible for sleep fragmentation and for a selective REM sleep deprivation. Patients with sleep disturbed breathing are REM deprived

and present a rebound of the REM stage at the initiation of the therapy for their sleep disturbed breathing [3].

The literature addressing dream content in patients with OSAHS shows controversial data. Much of the literature shows that OSAHS patients report mostly dreams with negative emotional content. In some studies, patients with OSAHS report their dreams to be predominantly negatively toned prior to continuous positive airways pressure (CPAP) therapy and more negatively toned on non-CPAP nights compared to CPAP treatment nights [4,5]. Other studies report an inverse correlation between the severity of OSAHS and the negative content of the dreams and a higher amount of dream recall under CPAP therapy than without treatment [6,7]. The study published by Carrasco in 2006 [5] concludes dream recall is decreasing with CPAP, which is in contradiction to the other results in the literature.

## Objective

To study dream content in patients with severe OSAHS at the initiation of nocturnal Continuous Positive Airway Pressure (CPAP) treatment for OSAHS in relation to the Rapid Eye Movement (REM) sleep stage.

## Methods

Multichannel video-polysomnography was used to diagnose

\*Corresponding author: Sinziana Lovin, Faculty of Medicine, University Lower Danube, Galati, Romania, E-mail: [sinziana\\_lovin@yahoo.com](mailto:sinziana_lovin@yahoo.com)

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OSAHS and to supervise the initiation of CPAP. We have included 38 consecutive patients with severe OSAHS and an indication for CPAP, who presented spontaneous awakenings in REM sleep during both nights (the diagnostic night and the first night under CPAP), and who recalled dreams during at least one of the nights. The second night under PSG (and the first night with CPAP) was not directly recorded after the first (diagnostic) night; the period between the two nights was 1 to 3 weeks. Exclusion criteria were: inability to speak, severe mental disorders, previous treatment for OSAHS (such as surgery or mandibular advancement splint), and patient refusal. The dream recall was elicited verbally by the medical staff who supervised the polysomnographic recordings. The dream recall was done immediately after the spontaneous awakening from REM sleep. Video recordings were used to analyze dream content (word count, number of thematic units, emotional content). A change in the thematic unit was considered when the main setting of the dream, the main character or the course of action changed. The emotional content was considered either positive, negative or neutral according to the theme expressed by the patient (the interpretation was made by an experienced clinical psychologist) or according to the spontaneous interpretation offered by the patient. The percent of REM and the severity of OSAHS expressed by the number of respiratory events per hour of sleep (apnea-hypopnea index - AHI) were assessed using the polysomnography software.

The statistical analysis was performed using SPSS -18 and Excel for Windows Vista. Informed consent was obtained from all the patients included in the study. The review board of the Faculty of Medicine Galati approved the project before inception.

## Results

In our group, there were 21 men and 17 women. The mean age was 57 years and the mean AHI was 52,05/h.

There were more thematic units in the dreams described under CPAP than during the night without CPAP (1,82 thematic units under

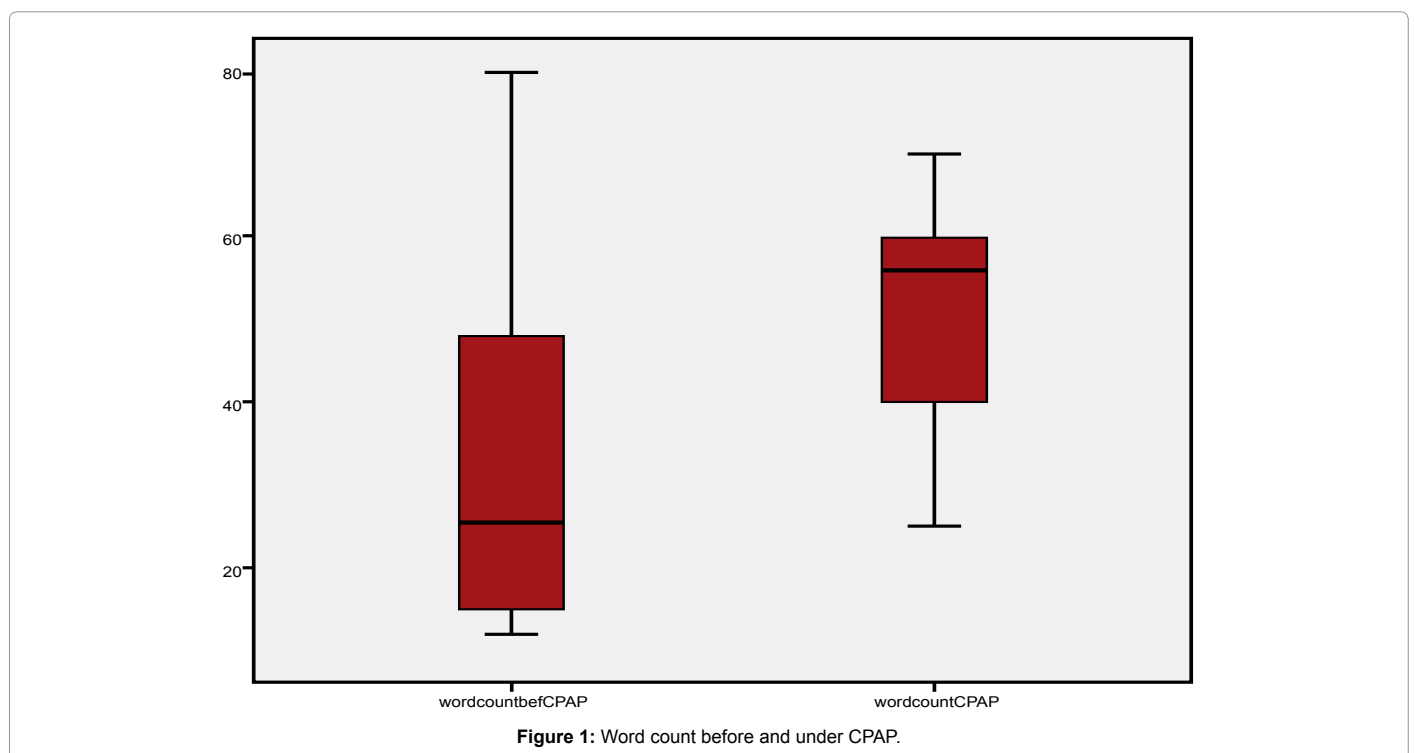
CPAP versus 1,36 thematic units without CPAP; t Student's  $p < 0.01$ ), the patients used more words to describe their dreams under CPAP (45,22 words under CPAP versus 30,52 words after the night without CPAP; t Student's  $p < 0.05$ ) and the percent of REM sleep was higher under CPAP than during the diagnostic night (26,81% REM sleep under CPAP versus 16,71% REM sleep without CPAP; t Student's  $p < 0.01$ ). Table 1 shows the characteristics of the whole group and the mean parameters before and under CPAP.

More patients recalled their dreams under CPAP than without CPAP: of the 38 patients, 32 recalled their dream content under CPAP (84.2%) versus 22 during the night without CPAP (57.9%). The dream content was less unpleasant under CPAP: 12 patients (37.5% of the recallers) reported unpleasant dream content under CPAP versus 11 patients (50% of the recallers) without CPAP. The dream content was neutral in 8 patients (25% of the recallers) under CPAP versus 8 patients (36% of the recallers) without CPAP. The dream content was pleasant in 12 patients (37.5% of the recallers) under CPAP versus 3 patients (14% of the recallers) without CPAP Figure 1.

When we compared men to women, the only parameter which has shown a significant difference was age (mean age in women was 61,64 years versus 53,85 years in men; t Student's  $p < 0.05$ ). The rest of

Parameter	Mean ± SD	
	Without CPAP	Under CPAP
Age	57.34 ± 10.34	
AHI	52.05 ± 14.43	
Men	21	
Women	18	
Word count	30.52 ± 18.37	45.22 ± 16.07
Thematic units	1.36 ± 0.56	1.82 ± 0.85
% REM	16.71 ± 4.68	26.81 ± 6.13

**Table 1:** The characteristics of group and the mean parameters before and under CPAP.



the diferences were non significant, although there was a tendency in women to have more thematic units and to express their dream content in more words then men, both before and under CPAP. Table 2 shows the values of the main parameters in men and in women.

There was a strong negative correlation between the severity of OSAHS expressed by AHI and the percent of REM sleep before CPAP (Pearson’s  $r=-0.59$ ). The correlations between AHI and age, the word count before CPAP and with the number of thematic units before and after CPAP were non-significant ( $r<0.2, p>0.05$ ). There was a surprising negative correlation between the AHI and the word count after CPAP (Pearson’s  $r=-0.66$ ). In contrast with this finding, the percent of REM sleep under CPAP did not show a significant negative correlation with AHI; in other words, REM rebound under CPAP did not correlate with the severity of the condition prior to treatment. Figure 2 shows the scatter plot illustrating the negative correlation between AHI and the percent of REM sleep before CPAP.

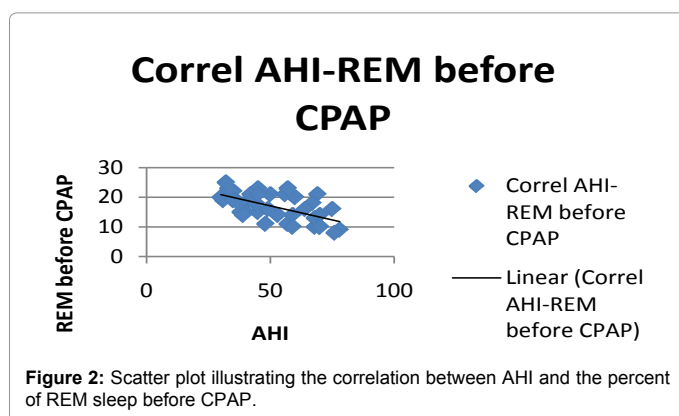
### Discussions

The possible explanations for the tendency to report dreams with a negative content in untreated sleep apnea would be nocturnal asphyxia on one hand and the tendency of OSAHS patients to be more depressive than other patients on the other hand. Regarding the alternative situation described in the literature (the increase of the negative content of the dreams under CPAP), the possible explanations may be the REM rebound under CPAP (with a more vivid content of the dreams), and a better cognitive function after the nights spent under treatment (with an improved capacity to recall dreams).

Our data are consistent with those in literature showing the increase in dream content under CPAP. There is also a change in the emotional dream content, which may be explained by the better quality of sleep, the lack of asphyxia, or an improved mood in the morning.

Women		Men	
Parameter	Mean ± SD	Parameter	Mean ± SD
Age	61.64 ± 6.25	Age	53.85 ± 11.75
AHI	49 ± 14.47	AHI	54.52 ± 14.27
Word count before CPAP	33.1 ± 24.32	Word count before CPAP	28.8 ± 13.80
Word count under CPAP	47.94 ± 17.37	Word count under CPAP	42.94 ± 14.99
Units before CPAP	1.5 ± 0.71	Units before CPAP	1.26 ± 0.45
Units under CPAP	1.87 ± 0.81	Units under CPAP	1.78 ± 0.91
%REM before CPAP	18.17 ± 5.17	%REM before CPAP	15.52 ± 3.98
%REM under CPAP	26.53 ± 6.56	%REM under CPAP	27.04 ± 6.17

Table 2: Main parameters in men and in women.



The higher percent of the patients who are able to recall their dreams after the first night of therapy may be explained by a better cognitive function after therapy.

The paradoxical results reported by Carrasco et al. [5] is explained by the long extent of the observation period, which exceeds the interval in which REM rebound has been reported at the initiation of CPAP in most of the studies; in the study by Carrasco, dream recall decreased the first months of CPAP and recovered 2 years later [5]

In our study, an interesting aspect of the REM rebound under CPAP is that the percent of REM sleep without CPAP is suboptimal (16.71% REM sleep without CPAP, when the normal amount of REM sleep in adults is between 20% and 25%), while the percent of REM sleep under CPAP is 26,81%, which exceeds the normal range.

The clinical implications of the REM sleep rebound under CPAP may imply an increased severity of sleep disturbed breathing during the titration night, hypothetically requiring a higher therapeutic pressure during the first night of treatment [8].

Another aspect of the REM sleep rebound under CPAP is represented by the improvement in the subjective quality of sleep and an increased early compliance to CPAP [9]. One possible explanation for this association may be represented by an improvement in dream recall and in dream content, which are non-traditional markers of sleep quality. Dream content has been considered a mirror of mental health, especially in the psychoanalysis theory. More research is needed in order to properly assess the potential benefits of CPAP therapy on mental health, which have been so far massively related to an improvement in daytime vigilance, but which may encompass more subtle psychological pathways, such an improvement in dream mentation.

In our study, women presented their dreams using more words and thematic units than men, which is consistent with the general tendency of women to share their dreams more often than men [10]. However, dream sharing is a delicate subject and is influenced by many factors which have not been adressed in this study, such as age, social class and education, factors which might point to class-specific attitudes toward dreams.

### Conclusions

There is a rebound in REM sleep associated with an increase in dream recall and a change in dream content at the initiation of treatment for obstructive sleep apnea. The severity of sleep apnea correlates negatively with the percent of REM without therapy and with the increase in word count under CPAP.

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