

PAP efficiency on OSAS

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ABSTRACT

Obstructive Sleep Apnea Syndrome(OSAS) is one of the most common sleep pathologies, assuming minimum 5 respiratory pauses per hour of sleep, with a time period of 10 seconds. OSAS diagnosis requires a broad medical approach between pneumologist, neurologist, ENT physician, cardiologist, nutritionist. OSAS treatment depends on the severity of the disease as well as the patient's comorbidities, the standard treatment option of OSAS being the use of PAP (Positive Airway Pressure). In this article I present the results obtained from a prospective observational study conducted over 12 months, the purpose being to show the effect of PAP treatment on OSAS, respectively framing the disease to another degree of severity. In "Marius Nasta" Pneumophthisiology Institute Bucharest 51 patients were monitored from the moment of diagnosis with OSAS and the patients were then periodically called for control, respectively at 2 months, 4-6 months and 12 months.

Keywords: OSAS, PAP, AHI

INTRODUCTION

OSAS is one of the most common sleep pathologies, with a prevalence of 3-7% among men and 2-5% among women, being more common in obese patients and in developing countries (1,2). Often OSAS is undiagnosed (3), studies showing high percentages of 93% in males and 82% in women with moderate and severe OSAS (4), OSAS pathology being complex and accomplished by multiple mechanisms still inadequately known (5). The underlying element of this disease is recurrent obstructive episodes that frequently occur in the oropharynx, which cause the absence or reduction of airflow, although respiratory muscular activity persists. In OSAS, during inspiration, there is a critical pressure under atmospheric pressure that exceeds the ability of the upper airway muscles to keep them open, a phenomenon that will lead to airway collapse. During these events the hypoxemia episodes occur, with the subsequent increase in CO₂, which causes the transmission of cerebral impulses to restart the breath. Thus, the „microwake-ups”

appear, which means the end of the apneic episode, unconscious by the patient, the number of them reaching even 400-500 at night, thus determining the serious fragmentation of sleep (6-8).

OSAS severity is quantified by the apnea-hypopnea index (AHI-Apnea-Hypopnea Index), which is determined by the number of apnea and hypopnea events occurring in an hour of sleep, while quantifying and assessing the degree of blood oxygen desaturation. Depending on the AHI value, OSAS is classified as mild, moderate and severe. In mild OSAS, the AHI range is between 5 and 14 episodes per hour, in moderate OSAS the AHI range is between 15 and 30 episodes per hour and in severe OSAS AHI is greater than 30 episodes per hour (9).

OSAS's optimal treatment was introduced in 1971 in the US (10) and involves providing positive pressure (PAP) by means of a device, maintaining open upper airways (11,12) along with increased lung volume, thus preventing upper airways collapse (13).



FIGURE 1. OSAS treatment using PAP

Source: (14)

Depending on the pressure delivery mode, there are several types of PAP: CPAP machines, which provide continuous pressure supply, Auto-CPAP, which uses self-pressurized pressures and BiPAP devices that use two pressures: one for inhalation, with a high value and an exhalation pressure with lower values (15,13).

MATERIALS AND METHODS

A prospective observational study was conducted over 12 months at the “Marius Nasta” Pneumophysiology Institute Bucharest, with 51 patients being monitored from the time they were diagnosed with OSAS and who subsequently accepted the use of PAP, the patients being included in the study in the order in which they came to the doctor.

Over the 12 months of the study, patients were periodically called for medical check-up, respectively 2 months, 4-6 months and 12 months, monitoring the AHI value provided by the PAP device, thus monitoring PAP efficacy on the decrease severity of OSAS.

At the start of the study each patient signed the informed consent that allowed the use of personal data. The ethics commission of “Marius Nasta”

Pneumophysiology Institute also approved the study needed to carry out this study. Statistical analysis was performed with IBM SPSS program.

RESULTS

Of the 51 patients, most were diagnosed with OSAS severe form, 86.3%, followed by those with OSAS medium in a 13.7%, data in according to the literature that designates PAP treatment for severe and moderate OSAS form, only in exceptional cases can be applied in OSAS mild form.

TABLE 1. Sample distribution of OSAS severity

| | | Experimental group | | | |
|-------|----------|--------------------|--------------|--------------------|-------------------------|
| | | Frequency | Percentage % | Valid Percentage % | Cumulative Percentage % |
| Valid | Mild | - | - | - | - |
| | Moderate | 7 | 13.7 | 13.7 | 13.7 |
| | Severe | 44 | 86.3 | 86.3 | 100.0 |
| | Total | 51 | 100.0 | 100.0 | |

AHI evolution during the study

Within the studied group, the evolution of the AHI parameter was monitored periodically at 2, 6 and 12 months throughout the study, AHI being determined by the PAP.

In order to verify the assumption of the normality of AHI data, the patients sample was subjected to the Shapiro - Wilk normality tests. From the initial AHI normality test, $p = 0.126$ after the Shapiro - Wilk test, greater than 0.05, therefore the difference is not statistically significant and as a result of these findings, the data is distributed close to the Gauss form. In contrast, for AHI at 2, 6 and 12 months the data no longer have normal distribution, ($p = 0.000$), which is why the Wilcoxon statistical test was used.

Following the Wilcoxon test, statistically significant differences between AHI at baseline and AHI were obtained after 2 months ($p < 0.001$), 6 months ($p < 0.001$) and 12 months ($p < 0.001$), thus showing

TABLE 2. Descriptive statistics

| PAP Usage | N | | Mean | Median | Std. Deviation | Minimum | Maximum |
|---------------|-------|---------|--------|--------|----------------|---------|---------|
| | Valid | Missing | | | | | |
| 1 AHI initial | 51 | 0 | 49.939 | 46.000 | 19.0297 | 12.0 | 87.0 |
| AHI 2months | 47 | 4 | 4.7985 | 3.5000 | 5.02060 | .70 | 30.00 |
| AHI 6months | 44 | 7 | 4.332 | 2.900 | 5.0914 | .6 | 30.0 |
| AHI 12months | 39 | 12 | 3.649 | 2.500 | 4.3245 | .6 | 26.0 |

TABLE 3. Testing the norm of the AHI parameter

| PAP Usage | | Norm Testing | | | | | |
|-----------|---------------|---------------------------------|----|------|--------------|----|------|
| | | Kolmogorov-Smirnov ^a | | | Shapiro-Wilk | | |
| | | Statistic | Df | Sig. | Statistic | df | Sig. |
| 1 | AHI initial | .130 | 39 | .097 | .955 | 39 | .126 |
| | AHI 2 months | .217 | 39 | .000 | .656 | 39 | .000 |
| | AHI 6 months | .246 | 39 | .000 | .633 | 39 | .000 |
| | AHI 12 months | .243 | 39 | .000 | .594 | 39 | .000 |

a. Lilliefors Significance Correction
Data show normal distribution if p > 0.05

TABLE 4. Statistical test – Time Comparison – Wilcoxon Signed Ranks Test

| PAP Usage | | Test Statistics ^a | | |
|-----------|------------------------|------------------------------|----------------------------|-----------------------------|
| | | AHI 2 months – AHI initial | AHI 6 months – AHI initial | AHI 12 months – AHI initial |
| 1 | Z | -5.968 ^b | -5.777 ^b | -5.443 ^b |
| | Asymp. Sig. (2-tailed) | .000 | .000 | .000 |

a. Wilcoxon Signed Ranks Test
b. Based on positive ranks.

the influence of PAP use on the value mean AHI, its value decreasing from 49.93, initially recorded to 3.64 at the end of the study.

CONCLUSIONS

In this study, it is observed that most patients are at an advanced stage of the disease, 86.3% of pa-

tients being diagnosed with OSAS severe form, the second being patients diagnosed with OSAS moderate form, in a percentage of about 13.7%. A possible explanation for the late diagnosis of patients in an advanced form is that the person with OSAS is rarely aware of having difficulty breathing even after awakening. Symptoms may be present even

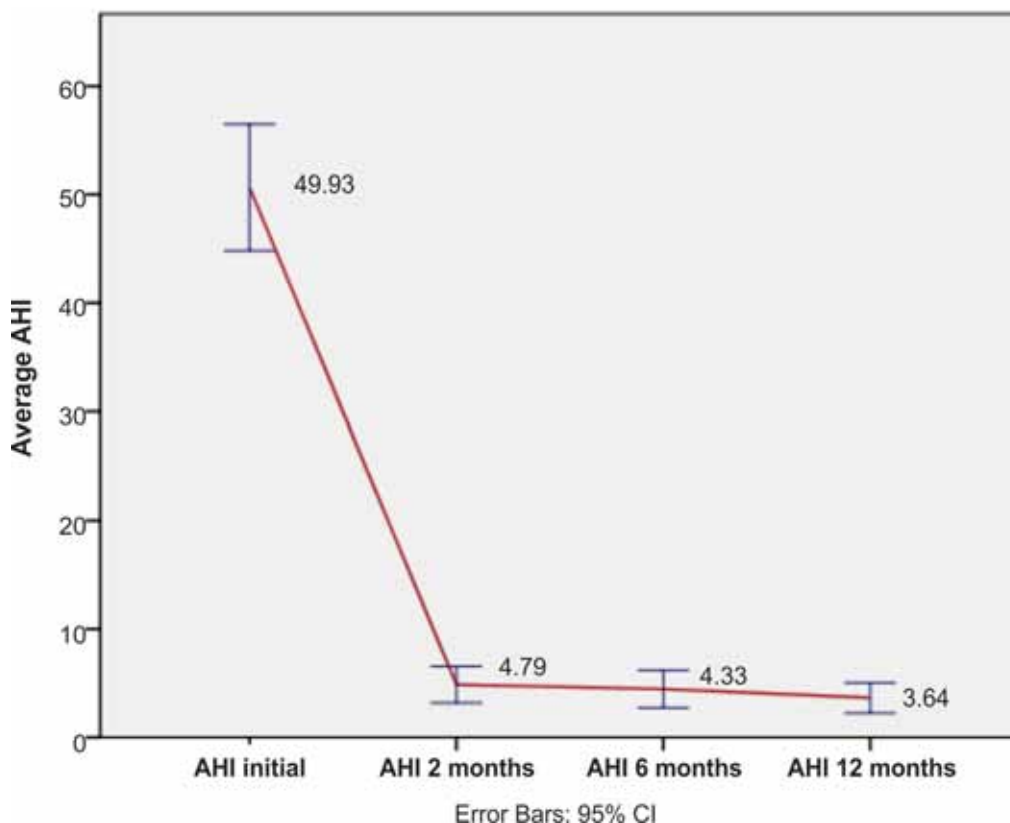


FIGURE 2. The average AHI parameter evolution over the study period with a confidence interval of 95%

for decades without being noticed, during which the individual may become conditioned by daytime fatigue and drowsiness associated with significant sleep impairment.

Within the study group, monitoring the AHI value during the study at 2, 6 and 12-month regular time intervals, there were statistically significant differences between AHI at baseline and AHI after 2 months, 6 months and 12 months, showing thus

the influence of PAP use on the mean AHI, its decrease being from 49.93, initially recorded, to 3.64 at the end of the study, which indicates the influence of PAP in decreasing OSAS severity.

Early diagnosis and treatment of OSAS is of major significance, as complications of this disease are prevented, such as strokes, heart failure, rhythm disorders, diabetes, sudden death, contributing to the increase in life expectancy of patients.

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