Accepted manuscripts are the articles in press that have been peer reviewed and accepted for publication by the Editorial Board of the Vojnosanitetski Pregled. They have not yet been copy edited and/or formatted in the publication house style, and the text could still be changed before final publication.

Although accepted manuscripts do not yet have all bibliographic details available, they can already be cited using the year of online publication and the DOI, as follows: article title, the author(s), publication (year), the DOI.

Please cite this article: USING RESPIRATORY POLYGRAPHY IN DIAGNOSING OBSTRUCTIVE SLEEP APNEA - OUR EXPERIENCES

PRIMENA RESPIRATORNE POLIGRAFIJE U DIJAGNOSTIKOVANJU OPSTRUKTIVNOG POREMEĆAJA DISANJA TOKOM SNA – NAŠA ISKUSTVA


UDC:

DOI: https://doi.org/10.2298/VSP170504015N

When the final article is assigned to volumes/issues of the Journal, the Article in Press version will be removed and the final version appear in the associated published volumes/issues of the Journal. The date the article was made available online first will be carried over.
USING RESPIRATORY POLYGRAPHY IN DIAGNOSING OBSTRUCTIVE SLEEP APNEA - OUR EXPERIENCES

Primena respiratorne poligrafije u dijagnostikovanju opstruktivnog poremećaja disanja tokom sna – naša iskustva

Dobrivoje Novković*, Gordana Cvetković*, Slobodan Aćimović*, Rade Milić*, Sanja Šarac*, Radmila Urošević†,
* Clinic for pulmology MMA Belgrade
† General hospital Jagodina

Primena respiratorne poligrafije u dijagnostikovanju opstruktivnog poremećaja disanja tokom sna – naša iskustva

Dobrivoje Novković, mail: dobrivojenovkovic@yahoo.com. tel.3608 899
Klinika za pulmologiju,VMA Beograd
Abstract:

Introduction:

Obstructive sleep apnea involves repeated episodes of cessation of breathing that occur due to a decrease in pharyngeal muscle tone. This disorder is more common in men and represents a significant risk factor for serious cardiovascular and cerebrovascular events.

The gold standard in the diagnosis of this disorder represents a polysomnography (PSG), which is technically complex and multidisciplinary method. Respiratory polygraphy (RP) may constitute an adequate replacement for most uncomplicated cases of obstructive sleep apnea.

Goal:

To examine the efficacy of using respiratory polygraphies in diagnosing of obstructive sleep apnea.

Method:

On all the patients with suspected obstructive sleep apnea, respiratory polygraphy and a retrospective analysis of the obtained results were performed.

Results:

By completing our examination, we proved that there is a positive correlation between the results obtained with respiratory polygraphy and predictors of obstructive sleep apnea such as EPFORT-s score, neck circumference and, body mass index.

Conclusion:

Respiratory polygraphy represents a cheaper and simpler replacement for polysomnography, especially with uncomplicated obstructive breathing disorders during sleep.

Keywords: obstructive, respiratory, apnea, sleep, polysomnography, polygraphy
**Introduction:**

Obstructive sleep apnea (OSA) is regarded as continuing episodes of obstruction of upper airways which cause lowered saturation of blood with oxygen and interrupted sleep. More precisely, OSA implies more than five breathing abortions and/or significant reduction of ventilation during one hour of sleeping. These episodes are quantified with the apnea/hypopnea index (AHI). Breathing disorder is the consequence of reduction muscle pharynx’s tone and the cause of specific day-night symptoms which significantly decrease the quality of life and increase the risk of lethal cerebral and cardiovascular events (1, 2).

In general adult population, frequency of OSA was in 4% of males and 2% of females.

Physical constitution and age are tightly connected with occurrence of OSA.

Obese and middle aged people are more likely to have OSA, particularly patients with the body-mass index over 35kg/m2, where incidence is between 7 and 11% (3, 4, 5).

In this disorder, the main pathophysiological change consists of continuing episodes of hypoxemia which cause complex inflammatory mechanisms and accelerate pathological processes in organism, such as arteriosclerosis (3, 6, 7).

Interrupted sleep, intermittent hypoxia, systemic inflammation and chronically raised tone of sympathetic nerve system caused by OSA make many cardiovascular disorders, such as arterial hypertension, ischemic heart disease, congestive heart failure and disturbance of heart rhythm (8, 9).

Except the negative effect on brain and cardiovascular diseases, OSA makes already existing lung diseases such as bronchial asthma, chronic obstructive pulmonary diseases significantly and deepens respiratory insufficiency (10).
OSA leaves serious consequences on gastrointestinal tract and on endocrine system which are manifested through gastroesophageal reflux disease - GERD and disturbance of liver and pancreatic functions (11).

The diagnosis of this disorder is based on typical anamnestic data, results gathered from various questionnaires at the end, on specific examination - recording respiratory acts during sleeping.

Initially, hetero-anamnestic data, obtained from family members often has a crucial part in the diagnostic process of this disorder(12,13).

This way, many diagnostic procedures contribute to raising the number of diagnosed cases in real conditions by increasing the number of the diseased(14).

Epforth’s sleepiness scale (ESS) is one of the most frequently used tests for estimating somnolence which consists of 8 questions focused on problem intensity caused by interrupted sleep. Answers are graded with points from 0 to 3. According to this test, a score of 10 or more points is regarded as an indication for examination. (15)

In order to verify a sleeping disorder, standards require usage of polysomnography (PSG) with registering several vigilance and somnolence parameters (electroencephalogram, electrooculogram, electromyogram), as well as cardiorespiratory (airflow, oximetry, effort, respiratory movement...) and visual parameters.

Polysomnography (PSG) is technically complex and expensive, which makes it often unavailable method. Because of its complicatedness, the need for a faster, simpler and less expensive method has aroused(16).

Respiratory polygraphy (RP) is a technically simpler and much cheaper method which can play an important role in the diagnosis of obstructive sleep apnea.

**Goal:**

To show the efficiency of using respiratory polygraphy in diagnosing obstructive sleep apnea and examine the correlation between AHI index obtained with respiratory polygraphy
and scoring achieved by using Epforth sleepiness scale, body-mass index and neck circumference, as well as risk factors for the existence of sleep apnea.

**Method:**

Examination includes 61 patients, 52 men and 9 women, age from 30 to 76 years old, with suspicion of having breathing sleep disorder. All of them completed the Epforth sleepiness scale test after patient history was gathered and physical examination performed. Everyone got their neck circumference measured as well as their body-mass index calculated. After that, patients who had positive anamnestic data and the result on Epforth sleepiness scale of at least 10- did a respiratory polygraphy. We conducted a retrospective analysis of the results.

**Results:**

By analyzing the distribution of patients by sex and age, we have obtained the following results:

Most of our patients were middle-aged and elderly men, average age of 59 years. (Fig.1,2)

On further analysis, we performed an examination of the correlation of AHI index and parameters which represent known risk factors, such as Epforth sleepiness scale, neck circumference and body mass index.

The results obtained from Epforth sleepiness scale were in positive correlation with AHI index acquired by respiratory polygraphy. (Fig.3)

We found that patients with increased neck circumference and raised body-mass index had a bigger AHI index. (Fig. 4 and 5.)
Discussion:

Verification of obstructive sleep apnea is the most important step in the process of diagnosis and successful treatment. Although PSG (polysomnography) is recommended as a "gold standard", there is a growing interest in alternative diagnostic methods that could quickly and easily give the same or similar data.

In support of this fact is an increasingly frequent application of RP, especially in the pediatric population (17).

Besides accepting RP by the clinician, the need for new diagnostic methods has been recognized by the relevant world organizations.

Based on the number of measured variables, the American Academy of Sleep Medicine (AASM) has classified the sleep study in four main types, of which three can be performed with the portable monitoring (18).

Despite the fact that the portable devices measured the same parameters as PSG, there are authors who believe that portable monitoring has variable sensitivity and specificity for OSA.

These attitudes largely result in the lack of research on this type of devices (19,20).

The existence of conflicting opinions didn’t reduce the interest for RP. Consequently, numerous studies have confirmed the compatibility of the AHI index obtained after PSG and RP.

In one big study Iber et al., showed that portable devices achieved a very low degree of failure in diagnosing apnea (21).

Other studies proved acceptable sensitivity and specificity of portable devices with very low percentage of falsely positive results (about 3%) (22).

In randomized study CAMPBELL and NEILL, pointed that a portable diagnosis without supervision was proven to be an adequate PSG alternative (23).
This knowledge encouraged us to perform our study whose aim was to examine the effectiveness of respiratory polygraphies in the diagnosis of obstructive sleep apnea.

The results we obtained mostly confirmed well-known views on the possibilities of RP.

The population of our examinees had a typical demographic characteristics of people with obstructive sleep apnea, that is largely made up of elderly and middle-aged men, which is consistent with previous findings.

By examining the correlation between the results obtained by Epworth’s sleepiness scale and the AHI index determined by RP, we demonstrated a positive correlation between these two parameters \((p<0.0001; r = 0.53; n = 61)\). In other words, the higher the score on the test, the higher the AHI index.

We examined the relationship between the neck circumference and AHI index and we also got a positive correlation \((p<0.0001; r = 0.46; n = 61)\).

Similarly happened in comparing the value of body mass index with the AHI index obtained by RP because we have proven a positive correlation between these two parameters. The greater body mass index was associated with a higher index of AHI \((p<0.0001; r = 0.49; n = 61)\).

Our results showed that there is no inferiority of respiratory polygraphies compared to a complete polysomnography in diagnosing obstructive disorders of breathing during sleep.

Of course, our conclusions, and the conclusions of other authors are primarily related to the obstructive sleep apnea in conditions where there are no significant comorbidities (24,25).

**Conclusion**

Although PSG is the "gold standard" in the diagnosis of obstructive sleep apnea, respiratory polygraphy can be an adequate substitute especially when it comes to obstructive disorders.

The significance of this method is even greater if we take into account the fact that financially PG is significantly more favorable, technically simpler and therefore more accessible for wider use.
Fig. 3

Fig. 4
**Fig. 1** Distribution of patients by gender

**Fig. 2** Distribution of patients by age

**Fig. 3** Correlation between ESS score and AHI index (p < 0.0001; r = 0.53; n = 61)

**Fig. 4** Correlation between body mass index and AHI index (p < 0.0001; r = 0.49; n = 61)

**Fig. 5** Correlation between neck circumference and AHI index (p < 0.0001; r = 0.46; n = 61)