

SLEEP APNEA – RISK FACTOR RESPONSIBLE FOR SCORE RISK WORSENING IN THE PATIENTS WITH MODERATE AND SEVERE COPD

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Abstract: Objectives: This study aims at assessing the importance and usefulness of routinely performing night cardiorespiratory polygraphy as a method of screening for sleep apnea in patients with moderate and severe COPD, as well as the correlation with Systematic Coronary Risk Evaluation (SCORE) cardiovascular risk. Materials and methods: The study was conducted on a sample of 61 patients with COPD, classified according to the degree of respiratory function impairment as moderate and severe COPD, studying the presence of respiratory disorders during sleep through nocturnal cardiorespiratory polygraphy. SCORE cardiovascular risk was also calculated, assessing the correlations between this one and the presence of sleep apnea in patients with moderate and severe COPD. Results: Sleep apnea was identified in higher proportion in COPD patients compared to the general population. There has been demonstrated the impact of obstructive sleep apnea in worsening the SCORE risk of developing cardiovascular events after 10 years in COPD patients. Conclusions: The use of nocturnal cardiorespiratory polygraphy as a screening method in patients with moderate and severe COPD is justified, often revealing the presence of respiratory disorders during sleep. Also, given the statistical correlations and the seriousness of the SCORE risk, evolution and prognosis of patients associating COPD and sleep apnea may be reduced by the simultaneous treatment of both diseases.

INTRODUCTION

Possible association of sleep apnea in patients with chronic obstructive pulmonary disease (COPD) was a subject of interest for many researchers. These studies provide evidence on the involvement of obstructive sleep apnea in cardiovascular pathology and in the development of additional cardiovascular risk in patients with COPD, as well as the importance of early diagnostic and therapeutic complex approach. Specialized studies on this subject bring diverging data. It appears that sleep apnea affects about 16% of men and 5% of women aged between 30 and 65 years old.(1)

Current guidelines for the assessment of nocturnal oxygen saturation in patients with COPD who do not have daytime hypoxemia are quite restrictive except for patients showing polycythemia or clinical features of chronic cor pulmonale. Nocturnal polysomnography is not routinely recommended.

Krieger et al. concluded that COPD is not a risk factor for sleep apnea and nocturnal hypoventilation.(2)

Weitzenblum and collaborators, based on epidemiological studies, have also shown that the prevalence of the syndrome of sleep apnea is not higher in COPD patients than in the general population and that the coexistence of the two diseases is due to chance and not to some pathophysiological links between them.(3)

Patients with overlap-syndrome (associating sleep apnea and COPD) presents increased risk of developing hypercapnic respiratory failure, pulmonary hypertension compared to those who show only sleep apnea or only COPD.

Other recent studies have identified the presence of obstructive sleep apnea syndrome (OSAS) in patients with COPD with a frequency similar to that of the general population

(between 22% and 25-29%), while COPD in patients with OSAS with increasing frequency (29-40%).(4) It seems that in the general population, overlap-syndrome prevalence is 1% in adult males.

The presence of sleep apnea in patients with COPD stresses the secondary systemic inflammation, endothelial dysfunction and the elevated sympathetic tone, contributing to the pathogenesis of cardiovascular diseases. The importance of identifying sleep apnea lies in the fact that such patients exhibit higher risk of pulmonary hypertension and right ventricular failure than in patients who only have one of the conditions.(5,6,7)

PURPOSE

The study aims at assessing the importance and usefulness of routinely performing night cardiorespiratory polygraphy as a method of screening for sleep apnea in patients with moderate and severe COPD, as well as the correlation with Systematic Coronary Risk Evaluation (SCORE) cardiovascular risk.

MATERIALS AND METHODS

The study was conducted on a sample of 61 patients with COPD, aged between 44 and 78 years old. Patients were classified in terms of pulmonary function impairment degree, 38 have been diagnosed with COPD GOLD stage II and 23 with GOLD stage III. Nocturnal cardiorespiratory polygraphy was performed using a portable device, STARDUST II (Germany), with the following channels: pulse, oxygen saturation, nasal cannula for nasal airflow and snoring, thoracoabdominal belt for the position during sleep and thoraco-abdominal breathing movements.

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Classification of severity of obstructive sleep apnea syndrome (OSAS) was made on apnea-hypopnea index (AHI).

- easy OSAS – AHI < 15 events/hour of sleep;
- moderate OSAS - 16 < AHI < 30 events / hour of sleep;
- severe OSAS – AHI > 31 events/ hour of sleep.

SCORE risk calculation - SCORE- system – estimates the risk at 10 years after the fatal atherosclerotic event, such as myocardial infarction, stroke, aortic aneurysm etc. SCORE (Systematic Coronary Risk Evaluation) algorithm provided by the European Society of Cardiology allows the assessment of risk of death in the next 10 years for atherosclerotic cardiovascular diseases. In the study patients, this risk was calculated and, statistically there were analyzed correlations with the presence of sleep apnea in patients with moderate and severe COPD.

RESULTS AND DISCUSSIONS

Within our group, we diagnosed the presence of obstructive sleep apnea syndrome in 36 of the 61 patients with COPD using STARDUST II polygraph. The remaining 25 patients had an index of apnea - hypopnea below 5 per hour of sleep, therefore in these patients, obstructive or central sleep apnea syndrome was excluded. In 5 patients, there was seen nonapneic nocturnal desaturation (SaO₂ below 90% over 30% of the registered time), all with stage III COPD – nocturnal desaturators. Average AIH of 40.6 ± 23.9 / h.

Of 36 patients with overlap-syndrome (co-existence of COPD and sleep apnea):

- 7 were diagnosed with easy OSAS (average AIH-12,37/h);
- 4 with moderate OSAS, (average AIH-24,5/h);
- 25 with severe OSAS, (average AIH-48,6/h).

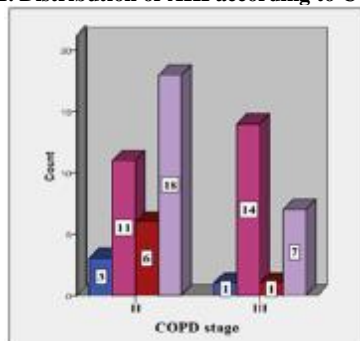
In the study group, distribution of sleep apnea based on the stages of COPD is shown in table no. 1.

Table no. 1. Frequency of sleep apnea according to COPD stages

		AHI classification				Total
		Normal	Moderate apnea	Easy apnea	Severe apnea	
COPD stage	II	18	3	6	11	38
		47.4%	7.9%	15.8%	28.9%	100.0%
	III	7	1	1	14	23
		30.4%	4.3%	4.3%	60.9%	100.0%
Total		25	4	7	25	61
		41.0%	6.6%	11.5%	41.0%	100.0%

To check for a possible correlation between the degree of respiratory functional impairment and sleep apnea severity, χ^2 test was applied. In our study, it has been established whether there is a significant association between COPD stage and severity of sleep apnea measured by apnea hypopnea index (AHI) (test χ^2 , $p = 0.048$, $\alpha = 0.05$).

Figure no. 1. Distribution of AHI according to COPD stage



Similar studies have shown that the degree of functional impairment correlates well with the severity of respiratory sleep apnea.(8) This means that COPD worsening progressively leads to the frequent association of sleep apnea.

SCORE risk assessment in the patients with moderate and severe COPD confirms our hypothesis that chronically respiratory patients have an increased cardiovascular risk. By assessing cardiovascular risk and respiratory disorders during sleep, there has been highlighted the level of participation of sleep apnea syndrome to increased cardiovascular risk in patients with COPD.

It is important to note that a large number of patients (15 to 24.9%) associated type II diabetes, many had hypertension (50 to 71.96%), left ventricular hypertrophy, which increased the absolute cardiovascular risk.

Cardiovascular risk in COPD patients was found to be higher due to common risk factors, namely smoking, physical inactivity, obesity, high levels of serum lipids, impaired glucose tolerance, more frequent association of obstructive sleep apnea or high pressure. All these combined factors lead to an increased risk of cardiovascular events. In 3 patients, SCORE cardiovascular risk could not be calculated due to the age over 75 years. There was established a statistically significant association (χ^2 test, $p = 0.008$, $\alpha = 0.05$) between COPD stage and SCORE risk.

SCORE risk has been shown to be statistically significantly correlated with COPD stage measured by FEV₁. It seems that with the progression of COPD, patients are confronted with an increasingly growing risk to have major cardiovascular events.

To study the contribution of the presence of sleep apnea on SCORE risk, I used the χ^2 test.

Table no. 2. SCORE risk correlated with sleep apnea

		SCORE risk			Total
		Increased risk	Average risk	Low risk	
Sleep apnea	NO	6	11	5	22
	YES	9	7	20	36
Total		15	18	25	58

The association between the presence of sleep apnea and SCORE risk is significant (χ^2 test, $p = 0.025$) which highlights an important contribution of sleep apnea as a risk factor responsible for producing important cardiovascular events (RR = 1.66).

Sleep apnea leads to repetitive nocturnal decreases of oxygen saturation and hypercapnia, significant decreases of intrathoracic pressure and increases in pulmonary artery pressure. Recent studies have demonstrated the presence of pulmonary hypertension during daytime in 20-40% of patients with sleep apnea without other cardiopulmonary causes and decreased pulmonary arterial pressure after treatment.

Spectrum of secondary cardiovascular comorbidities of sleep apnea includes systemic hypertension (40-60%), pulmonary hypertension (20-30%), congestive heart failure (5-10%), coronary artery disease (20-30%) and stroke (5-10%). Sleep apnea is now considered the most common cause of secondary hypertension.

It seems that the presence of apnea-hypopnea index over 30 is accompanied by increased mortality. Epidemiological studies have shown that the presence of sleep apnea increases cardiovascular risk independently of other concomitant factors, such as obesity or metabolic syndrome.(9,10)

Thus, introduction of cardiorespiratory nocturnal polygraphy in the assessment algorithm is justified in patients with moderate and severe COPD, as a cheap and accessible screening method. Through simultaneous treatment of the two diseases commonly associated, quality of life can be improved,

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as well as the long-term evolution and prognosis of patients with COPD.

CONCLUSIONS

1. Obstructive sleep apnea syndrome has been diagnosed in more than half of the patients with moderate and severe COPD taken in the study, obtaining different results ac compared to those of other similar studies.
2. There has been identified a significant association between COPD stage and severity of sleep apnea measured by apnea-hypopnea index (χ^2 test, $p = 0.048$, $\alpha = 0.05$).
3. 27% average SCORE cardiovascular risk in the group with stage III COPD is superior to those with stage II COPD (12.37%) with a statistically significant difference. Cardiovascular risk in patients with COPD is higher due to common risk factors, such as smoking, physical inactivity, obesity, elevated serum lipid levels, impaired glucose tolerance, more frequent association of obstructive sleep apnea or hypertension. The presence of sleep apnea is associated with increased SCORE risk. The association between the presence of sleep apnea and cardiovascular risk is significant (χ^2 test, $p = 0.025$) sleep apnea representing the risk factor for SCORE growth (RR = 1.66).
4. There has been established a statistically significant association between COPD stage and SCORE risk (χ^2 test, $p = 0.008$, $\alpha = 0.05$). Thus, with the progression of chronic lung disease, aggravation of cardiovascular risk in patients with COPD is estimated.

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