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Respiratory Disturbance Index and Severity of Airway Obstruction in COPD Patients

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ABSTRACT

Background: *Chronic obstructive pulmonary disease (COPD) is a common disease and concomitant occurrence with obstructive sleep apnea (OSA) has been reported in some studies. This coincidence can result in exacerbation of common complications like exacerbated hypoxemia, hyperpnea and right-sided heart failure. Thus, we decided to evaluate and compare respiratory disturbance index (RDI) and sleep apnea in COPD patients.*

Materials and Methods: *For this purpose, 50 COPD patients with OSA were studied between 2003 and 2004. OSA criteria included obstructive apnea and clinical symptoms of snoring, sleep disorder and RDI≥5. The patients were divided in to two groups: group 1 consisted of 11 patients (22%) with FEV1/FVC<70 with the mean age of 36.18±14 and group 2 was included 39 patients (78%) with FEV1/FVC≥70 with the mean of 84.75±6.6%. RDI was compared between the two groups using independent sample t-test. Multiple regression analysis was also used for comparing other variables like height, weight, age, etc.*

Results: *The understudy patients were included 19 females (38%) and 31 males (62%) with the mean age of 53.7±14.8 yrs. There were statistically significant differences in RDI and height between the two groups (p=0.028 and p=0.00, respectively). However, no significant difference was detected between the two groups in terms of weight and body mass index (BMI).*

Conclusion: *The possibility of concomitant occurrence of COPD and OSA should be considered due to co-occurrence of significant respiratory symptoms (like dyspnea, sleepiness, etc.) and assessed by adding RDI to important indices like height and so on.* ***(Tanaffos 2008; 7(3): 18-22)***

Key word: *Respiratory disturbance index, Sleep apnea, COPD*

INTRODUCTION

Obstructive sleep apnea (OSA) is a relatively common syndrome especially in men over 40 years of age. Its prevalence has been reported to be 2-8%.

Chronic obstructive pulmonary disease (COPD) is a common disease and concomitant occurrence of these two conditions in some studies has reported to be up to 10% (1-3). However, simultaneous occurrence of these two conditions in one patient may be coincidental because both conditions are highly prevalent and may affect the patient at a same time. Also, these two conditions may accompany

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each other as the result of similar pathophysiology (4-6).

The significance of this incident is the exacerbation of common complications of these conditions such as exacerbated hypoxemia, hyperapnea (increased blood level of CO2) and right heart failure (7-13). However, separation of these two is really important because the patient management is completely different in each condition (14-16).

In some studies, prevalence of sleep apnea was not higher in mild COPD patients with respiratory disturbance index (RDI) more than 10 compared to those without mild COPD (17).

In another study during screening of severe COPD patients, 20% had OSA (8).

Therefore, considering the importance of both conditions and their impact on patients' quality of life, further evaluations are required in this regard. FEV1 is an important parameter in determining the severity, prognosis and treatment of COPD. Severity of sleep apnea is determined by adding the number of apneas, hypopnea and RDI. Considering the significant prevalence of these two conditions, we aimed to evaluate the correlation between two important parameters of these conditions.

MATERIALS AND METHODS

This study was conducted on 50 COPD patients during a one year period (2003, 2004). These patients were suffering OSA despite their underlying pulmonary disease. Diagnosis of COPD in these patients was based on spirometric pattern, history, clinical examination and chest x-ray. Patients with both obstructive and restrictive patterns due to fibrosis and obesity were assessed. OSA criteria included obstructive apnea and clinical symptoms of snoring and sleep disorder and RDI≥5. Patients were in ideal condition according to GOLD guidelines in terms of treatment of underlying COPD (18).

Standard spirometry based on the statement of ATS was performed in all patients (19,20). RDI was measured by using Poly MESAM unit, SOMNO Medees device. The reliability of this device has been compared with poly somnography several times in different studies (20).

The exclusion criteria were as follows:

- age above 80 years old
- Gasteroesophageal reflux disease
- Congested heart failure
- Fifty consecutive patients who suffered from both conditions at the same time entered the study. Sampling was not randomized. The patients were divided into 2 groups: group 1 consisted of 11 patients (22%) with FEV1/FVC<70 with the mean of 36.18±14 and group 2 of 39 patients (78%) with FEV1/FVC≥70 with the mean of 84.75±6.6%. Height, weight, age, FVC (Lit), FEV1 (Lit) and RDI were measured and compared in both groups. RDI was compared in both groups of patients by using statistical tests.

Statistical analysis

All data were shown as mean ±SD and since RDI did not have normal distribution, its *log* was used in the t-test. Two groups of patients were compared by using independent sample t-test. For determining the correlation between other variables multiple regression analysis model was used.

RESULTS

There were 19 females (38%) and 31 males (62%) with the mean age of 53.7±14.8 yrs., the mean weight of 87.88±19 Kg and a mean height of 165.7±11 cm. Mean hypopnea-apnea index was 26±22 RDI/h.

In the first group, 11 patients (22%) had

FEV1/FVC<70 and in the 2nd group, 39 cases (78%) had FEV1/FVC≥70. RDI was 14.5±11 and 29.7±23 in the first and 2nd groups respectively; this difference was statistically significant (p=0.028). However, no significant difference was detected between the two groups in terms of weight and BMI.

A significant difference was detected between the 2 groups in terms of height (p=0.00).The results are shown in tables 1-6.

Table 1. Gender distribution of patients.

		Frequency	Percent	Valid Percent	Cumulative percent
Valid	Female	19	38	38	38
	Male	31	62	62	100
	Total	50	100	100	

Table 2. Descriptive statistics of all patients.

	N	Minimum	Maximum	Mean	Std. Deviation
Age (yrs)	50	14	79	53.74	14.866
FEV1	50	15%	134.5%	57.436%	27.0551%
FVC%	50	20	123	59.75	23.998
FEV1/FVC%	50	23	99	78.647	14.1508
RDI(5)	50	5	82	26.38	22.707
Height	50	144	195	165.78	11.32
Weight	50	43	130	87.88	19.318
BMI	50	16.9	50.15	31.8852	7.45727
Valid N (listwise)	50				

Table 3. Frequency distribution of patients based on FEV1.

		Frequency	Percent	Valid percent	Cumulative percent
Valid	Mild	12	24	24	24
	Moderate	13	26	26	50
	Severe	20	40	40	90
	Very severe	5	10	10	100
	Total	50	100	100	

Table 4. Frequency distribution of patients based on FEV1/FVC<70.

	N	Minimum	Maximum	Mean	Std. Deviation
Age (yrs)	11	42	70	58.82	8.292
FEV1	11	15.0%	60.0%	36.182%	14.3862%
FVC%	11	20	77	53.27	17.059
RDI(5)	11	5	45	14.55	11.869
Height	11	154	174	167	8.112
Weight	11	50	117	85	20.273
BMI	11	16.90	42.16	30.5791	7.76340
FEV1/FVC%	11	23	67.2	57.007	12.4331
Valid N (listwise)	11				

Table 5. Frequency distribution of patients based on FEV1/FVC≥70.

	N	Minimum	Maximum	Mean	Std. Deviation
Age (yrs)	39	14	79	52.31	16.041
FEV1	39	28.0%	135.5%	63.431%	26.8655%
FVC%	39	26	123	61.58	25.503
FEV1/FVC%	39	72.1	99.0	84.750	6.6142
RDI(5)	39	5	82	29.72	23.996
Height	39	144	195	165.44	12.139
Weight	39	43	130	88.69	19.234
BMI	39	18.36	50.15	32.2536	1.43069
Valid N (listwise)	39				

Table 6. Regression analysis of variables.

Regression Considering weight, FEV1 grading, RDI>5 Dependent variable			
Model	Beta	t	Sig(p)
Weight	0.109	0.817	0.418
BMI	0.105	0.771	0.445
Height	0.409	2.732	0.009*
FEV1 (Grad)	-0.242	-1.745	0.087
Age	-0.141	-1.066	0.292
Sex	0.013	0.067	0.947

DISCUSSION

Most patients suffering from both conditions are middle-aged men with a mean age of 53.74±14 years. This is an important point indicating the decreased age of occurrence of significant respiratory symptoms in COPD patients due to concomitant

occurrence with OSA. This has also been confirmed in other studies. In a considerable number of patients dyspnea symptoms, sleepiness and other complaints were not proportional to the intensity of FEV1 decrease. We expect FEV1 less than 30% to be accompanied by increased CO_2 and sleepiness. There were significant differences between the 2 groups regarding RDI. By using different variables in regression analysis it was revealed that these differences were not due to the different rates of FEV1, weight and age because these variables were excluded in the analysis. Considering the p-value>0.05, height was the only variable remaining in the different regression analysis models (Table 6). Therefore, height was an important variable in this study which has not been evaluated in other studies.

Considering the exclusion of FEV1 value by using regression analysis, no correlation was found between the severity of RDI and FEV1.

The possibility of concomitant occurrence of COPD and OSA should be considered and assessed by adding the RDI index to the afore-mentioned indices because occurrence of OSA and COPD is associated with higher rate of pulmonary dysfunction.

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