Original Article

Spiro metric Tests and Thyroid Hormone Concentrations in sample of Iraqi Patients with Chronic Obstructive Pulmonary Disease.

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Summary:

Background: Chronic obstructive pulmonary disease (COPD) is a preventable disease with some significant extra pulmonary effects that may contribute to the severity in individual patients.. The systemic manifestations of COPD include a number of endocrine disorders , such as those involving the pituitary, the thyroid , the gonads, the adrenals and the pancreas. The mechanisms by which COPD alters endocrine function are incompletely understood but likely involve hypoxemia , hypercapnia , systemic inflammation and glucocorticoid administration.

Objective: To evaluate the relationship between pulmonary function tests and thyroid gland function in patient with chronic obstructive pulmonary disease (COPD).

Subjects and Methods: Cross sectional study was done in Baghdad teaching hospital from April 2012 to October 2012 in respiratory outpatient. Thirty eight patients were included in the study (36 male and 2 females) who had stable COPD , thyroid function tests and FEV1% were done to all of them. Patients were classified into four groups according to GOLD criteria: mild COPD (> 80) FEV1% , moderate (80 – 50)%, severe (50 – 30)% and very severe < 30%.

Results: one patient has decreased level of TSH , one patient has decreased T3 hormone and one patient has increased free T3 hormone level, all other patient had normal thyroid hormones levels. The results of study showed no significant changes in thyroid hormones concentrations with COPD and its severity.

Conclusion: We found no significant changes in thyroid hormones in patients with COPD, and any changes that occur in TFT in these patients are may be due to other causes than COPD.

Keyword: COPD, : Chronic Obstructive Pulmonary Disease. TSH:Thyroid function test.

Introduction:

Chronic obstructive pulmonary disease (COPD) is a preventable disease with some significant extra pulmonary effects that may contribute to the severity in individual patients. Its pulmonary component is characterized by airflow limitation that is not fully reversible. The airflow limitation is usually progressive and associated with an abnormal inflammatory response of the lungs to noxious particles or gases.(1)

Clinical features &PFTs are used to diagnose COPD , determine the severity of the airflow obstruction, and follow disease progression. The most important values measured are the forced expiratory volume in one second (FEV1) and the forced vital capacity (FVC).An (FEV1/FVC ratio) less than(0.70 %) generally indicates airway obstruction.(2,3) COPD is confirmed when a patient, who has symptoms that are compatible with COPD, is found to have airflow obstruction (FEV1/FVC ratio less than 70% and an FEV1 less than 80 percent of predicted) and there is no alternative explanation for the symptoms and airflow obstruction (e.g., bronchiectasis , vocal cord paralysis, tracheal stenosis). The lower limit of normal of the FEV1/FVC ratio has been advocated as an alternative to the absolute value of an FEV1/FVC < 70%, the usual diagnostic criterion for airflow limitation .(9)Chest radiography and computed tomography are imaging studies that are commonly performed in patients with COPD. Chronic obstructive pulmonary disease (COPD) is no longer considered to affect only the lungs and airways but also the rest of the body. The systemic manifestations of COPD include a number of endocrine disorders , such as those involving the pituitary, the thyroid , the gonads, the adrenals and the pancreas. The mechanisms by which COPD alters endocrine function are incompletely understood but likely involve hypoxaemia , hypercapnia , systemic inflammation and glucocorticoid administration. Altered endocrine function can worsen the clinical manifestations of COPD through several mechanisms, including decreased protein anabolism, increased protein catabolism, non enzymatic glycosylation and activation of the rennin–angiotensin–aldosterone system. Systemic effects of endocrine disorders include abnormalities in control of breathing , decreases in respiratory and

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limb-muscle mass and function, worsening of respiratory mechanics, impairment of cardiac function and disorders of fluid balance .An important function of thyroid hormone is regulation of metabolism and thermogenesis. Abnormalities in thyroid function potentially influence energy balance and body composition. Hypermetabolism is commonly observed in patients with COPD; this has been attributed to increased energy expenditure both at rest,(4) and during physical activities(5). A hypermetabolic state in combination with insufficient dietary intake will result in a negative energy balance and may conceivably contribute to weight loss in COPD.(13). Abnormalities in thyroid function tests commonly occur in patients with various non-thyroidal illnesses;(6) these include low concentrations of serum triiodothyronine (T3) , thyroxine (T4) , and free Thyroid hormone concentrations .(7) Severe illness is associated with suppression of TSH secretion(8) and Blunting or even failure of responses to TRH in the elderlyIn contrast, delayed responses to TRH have been observed in patients with either chronic obstructive lung disease or pulmonary fibrosis, hypoxia being implicated as a causative factor. (9,10) Abnormal plasma levels of thyroid hormones have been reported in patients with a variety of no thyroidal illnesses. (11)

Patients and Methods:

This cross sectional study was conducted from April 2012 to October 2012 in respiratory consultation clinic in Baghdad Teaching Hospital. in which(38) COPD patients (36 male and 2 female) were included. Diagnosis of COPD is based on history , radiological findings and pulmonary function tests and postbronchodilator response.

Exclusion criteria:

Patients with other respiratory diseases.

A known thyroid disease or previous thyroid surgery.

The patients who received iodine containing drugs.

(Patients on other medications were not excluded).

Study design: A clinical history was obtained and a physical examination performed on these patients ,in all cases spiromery were done .FEV1, Forced vital capacity (FVC) and FEV1/ FVC were recorded.Whole blood samples was obtained on the same day, a 5 milliliters of venous blood was aspirated from each patient and collected in tube without additives or anticoagulant substances, then centrifuge the specimen to separate the serum from red blood cells. The specimens were deep freezing to(-20c) tempreture ,and analyzed by quantitative determination of TSH ,total T3,total T4 ,free T3 and free T4 by using the commercial kit (tosoh). The reference values of our laboratory were as the following:

TSH	(0.38 – 4.31)miu/ml.
Total T3	(0.79 -1.58)ng/ml.
Total T4	(4.9-11.0) ng/ml.
Free T3	(2.1- 3.8)PG/ml.
Free T4	(0.81-1.63)ng/dl.

Statistical analysis: Data were translated into a computerized database structure. The database was examined for errors using range and logical data cleaning methods. Statistical analyses were done using SPSS (Statistical Package for Social Sciences) version 18 computer software. Frequency distribution tables had been performed, descriptive statistics for continuous variables (age, TSH, T3, T4, freeT3 and free T4) are presented in mean ± standard deviation, while for categories were presented in frequencies (count) and proportions (percentages). Statistical significance of correlation between FEV1 and each of thyroid hormones was assessed using chi square and Bivariat analysis under control for covariates (Sex, age, smoking, history of hypertension and DM).

Data and results were presented in multiple tables and figures. Level of significance ≤ 0.05 was considered as significant.

Results:

There were 38 patients recruited in this study, 36 (94.7%) were males and only 2 (5.3%) females. the mean age of patients was (63.3) years with a range of (45 – 77) years.Regarding smoking habit, all patients were smokers, are devided into three groups , group (1) : 7 (18.4%) of patients had smoked < 20 pack.year , group(2): 21 patients (55.3%) had smoked 20 – 50 pack. year and group(3): 10 patients (26.3%) had smoked > 50 pack. year.Hypertension and DM history was positive in 17 cases (44.7%) and 12 cases (31.6%) respectively , table 1. The mean values for thyroid hormones and FEV1% are listed in table 2, while categories are summarized in tables 2 and 3; one patient has decreased level of TSH, one patient has decreased T3 hormone and one patient has increased free T3 hormone level, all other patient had normal thyroid hormones levels which is not significant. On the other hand FEV1 levels were shown; out of total patients,(4 %) were with > 80 FEV1%, (26 %) with (80 – 50),(8 %) with(50 – 30) and none of the patients with < 30.

The testing of correlation between FEV1 and each thyroid hormone revealed no statistical significance, in all comparison P.value > 0.05), tables (4,5,6,7,8).

Table 1.Socio-demographic characteristics and medical history of study population (N=38)

Variable			N	%
Age years	Mean ± Std*	63.3 ± 7.2		
	Range	45 - 77		
gender		Male	36	94.7%
		Female	2	5.3%
Smoking \pack.year		< 20	7	18.4%
		20-50	21	55.3%
		> 50	10	26.3%
History of Hypertension		Positive	17	44.7%
		Negative	21	55.3%
History of diabetes mellitus		Positive	12	31.6%
		Negative	26	68.4%

Table 2. Mean values of Thyroid hormones and FEV1of study population (N=38).

Variable	Mean ± std	Minimum - maximum
FEV1 %	65.5 ± 13.2	38 – 95
TSH value	1.29 ± 0.97	0.29 – 3.95
T4 value	6.24 ± 1.3	4.28 – 9.32
T3 value	1.17 ± 0.36	0.27 – 1.78
FreeT3 value	2.81 ± 0.59	1.53- 4.17
Free T4 value	1.31 ± 0.26	0.80 – 1.96

Table 3. Distribution of study population according to the levels of Thyroid hormones.

Hormone	Normal	Increased	Decreased
TSH	37	0	1
	97.4%	0%	2.6%
T4	38	0	0
	100%	0%	0%
T3	37	0	1
	97.4%	0%	2.6%
freeT3	37	1	0
	97.4%	2.6%	0%
freeT4	38	0	0
	100%	0%	0%

Table 4. Correlation between FEV1 and TSH level

TSH level	FEV1 %			Total
	>80	80-50	50-30	
Normal	4	25	8	37
	100.0%	96.2%	100.0%	97.4%
Increased	0	0	0	0
	0%	0%	0%	0%
Decreased	0	1	0	1
	0%	3.8%	.0%	2.6%
Total	4	26	8	38
	100%	100%	100%	100%
P Value = 0.85 not significant				

Table (5) correlation between FEV1 and T3 hormone level

Table 6. Correlation between FEV1 and free T3 hormone level

Free T3 level	FEV1 %			Total
	>80	80-50	50-30	
Normal	3	26	8	37
	75.0%	100%	100%	97.4%
Increased	1	0	0	1
	25.0%	.0%	.0%	2.6%
Decreased	0	0	0	0
	100%	100%	100%	100.0%
Total	4	26	8	38
	100%	100%	100%	100%
P.value = 0.1 not significant				

Table 7 .Correlation between FEV1 and T4 hormone level

T4 level	FEV1 %			Total
	>80	80-50	50-30	
Normal	4	26	8	38
	100%	100%	100%	100%
Increased	0	0	0	0
Decreased	0	0	0	0
Total	4	26	8	38
	100%	100%	100%	100%
P.value cannot be calculated				

Table 8. Correlation between FEV1 and free T4 hormone level

Free T4 level	FEV1 %			Total
	>80	80-50	50-30	
Normal	4	26	8	38
	100%	100%	100%	100%
Increased	0	0	0	0
Decreased	0	0	0	0
Total	4	26	8	38
	100%	100%	100%	100%

P.value can not be calculated

Discussion:

There is an apparent clinical resemblance between a hyperthyroid state and advanced chronic obstructive pulmonary disease(COPD). In both conditions tachycardia ,weight reduction and loss of muscle mass may be found. In this study , There were (38) COPD patients recruited in the study, the testing of correlation between FEV1% and thyroid hormone revealed one patient has decreased level of TSH , one patient has decreased T3 hormone and one patient has increased free T3 hormone level, all other patient had normal thyroid hormones levels these results indicate that there is no significant changes in thyroid hormones concentrations with changes in FEV1 This may suggests that COPD is not causing disturbances of hypothalamic-pituitary function in patients with chronic obstructive lung diseases These results agreed with Bank and Cooper who found no relationship between hormonal levels and lung function in patients COPD , and they suggested that most of endocrine dysfunction ascribed to COPD was probably due to factors other than hypoxia or hypercapnea.(27) Gow et al. , who Investigated thyroid function in 20 patients with exacerbation, having severe COPD) highest FEV1 40% of predicted). They did not find any correlation between arterial blood gas measurement and thyroid hormone concentrations in patients with COPD.(28) Semple et al. They measured serum TT3 and TT4 levels in 16 patients with stable COPD having a mean FEV1 below 40% of predicted and did not find any difference among hypercapnics , normocapnics and controls.(29)

This study disagreed with Okutan et al. who found that level of FT3 was higher in stable COPD than control group. They reported that there was negative correlation between pulmonary function tests and PaO2 or FT3., with no changes in other thyroid hormones .this perhaps due to increased respiratory workload .(25) Dimopoulou et al. who found that all patients had normal values for resting thyroid hormone . However, in severe COPD, a certain degree of thyroid dysfunction was evident they reported that there was positive correlation between total T3/ total T4 ratio and PaO2, and that severity of the disease through hypoxemia was important in determining the peripheral metabolism of thyroid hormones.(30).

Conclusion:

We found no significant changes in thyroid hormones in patients with COPD, and any changes that occur in TFT in these patients are may be due to other causes than COPD.

Author contributions:

Study conception & design by prof: kassim.M.Sultan. Acquisition of data analysis by Dr:Muhanned Ayal.
Drafting of manuscript & revision by Assis.
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