

The relationship between cortisol and thyroid function tests in geriatric Patients with psychiatric disorder.

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Abstract

The aim of this study was to investigate the relationship between serum cortisol and thyroid function tests in geriatric patients with psychiatric disorder. We assessed serum cortisol and thyroid function tests in newly admitted 35 geriatric age group patients in psychiatric ward and in 35 sex- and age matched controls. Study group included geriatric patients with psychiatric disorder diagnosed by a psychiatrist. Thyroid function tests contained serum concentrations of total cortisol (TC) triiodothyronine (T3), thyroxine (T4) and thyrotropin (TSH). The serum concentration of TC was increased significantly in study group as compared with controls ($P < 0.001$). T3 and T4 levels were slightly decreased in geriatric group as compared with controls ($P < 0.05$). A positive and significant correlation was observed between TC and TSH. We concluded that the hypothalamic–pituitary–thyroid (HPT) axis and the hypothalamic–pituitary–adrenal (HPA) axis are impaired in geriatric patients with psychiatric disorder.

Key words: Total cortisol, thyroid function tests, geriatric patients.

Accepted March 01 2010

Introduction

Alteration in the hypothalamic–pituitary–thyroid (HPT) axis and the hypothalamic–pituitary–adrenal (HPA) axis is a main cause of depressive disorder. In the HPT axis make change in thyroid function tests have been reported by various authors [1,2]. The detection of anti-thyroid peroxidase (TPO-Ab), and anti-thyroglobulin (TG-Ab) antibodies in the context of the clinical presentation of thyroid dysfunction, confirms the diagnosis of thyroid autoimmune disease [3,4]. Serum cortisol concentration elevated in patients with depression has been reported by many authors [5].

In old age, brain has diminished homeostatic reserve and is vulnerable to disturbances in internal milieu [6]. Geriatric subjects impair the interaction between the brain and the thyroid gland [7–10]. We therefore planned the present study with the aim to assess serum cortisol and thyroid function tests in geriatric patients.

Material and Methods

This study was carried out at Department of Biochemistry, Grant Medical College and Sir J.J. Group of Government Hospitals, Mumbai. Newly admitted 35 geriatric age

group patients in psychiatric ward in the age group of more than 60 years were studied for estimation of serum total cortisol (TC) triiodothyronine (T3), thyroxine (T4), and thyrotropin (TSH) and in 35 sex- and age matched controls over a period of one year. Study group were included geriatric patients with psychiatric disorder and diagnosed by psychiatrist.

Inclusion criteria for control group was normal renal and liver function. Exclusion criteria were use of medications (therapy involving carbamazepine, phenytoin, 6-azauridine, anthopterin, antifolates, anticonvulsant agents, tamoxifen, and theophylline), diabetes mellitus, cancer, anemia, and systemic illness. The Institutional Ethical Committee at the Grant Medical College and Sir J.J. Group of Government Hospitals, Mumbai, India, approved the study.

Blood sample collection:

Venous blood samples were collected in test tube with aseptic precautions. After 2 hours of collections sample was centrifuged at 3000 rpm for 5 minutes. Serum was separated and collected in polythene tube with cork. The sera with no sign of hemolysis used for the analysis of TC, T3, T4, TSH.

Biochemical Analysis

Serum TC estimated by the method of solid-phase, competitive chemiluminescent enzyme immunoassay. [11]. Serum triiodothyronine (T3) and Thyroxine (T4) were estimated by solid-phase, competitive chemiluminescent enzyme immunoassay method [12]. Serum thyrotropin (TSH) was estimated by the method of solid-phase, two-site chemiluminescent enzyme immunometric assay method [13]. We used fully automated enzyme amplified chemiluminescent immunoassay based Immulite 1000 analyzer.

Statistical Analysis

Numerical variables were reported in terms of mean and standard deviation. Statistical analysis of results was done

by normal 'z' test. In this analysis, variables showing p value lower than 0.05 and 0.001 ($P < 0.05$ and $P < 0.001$) were considered to be statistically significant and highly significant respectively. Pearson correlation test was used to test correlation in MS-Excel XP 2000 software.

Results

On comparison, serum TC and TSH levels were found to be significantly ($p < 0.001$) higher in study group of geriatric patients with psychiatric disorder than the controls. Serum T3 and T4 concentrations were decreased significantly ($p < 0.05$) in geriatric study subjects as compared to controls (Table 1).

Table 1. Serum total cortisol and thyroid profile in controls and geriatric patients with psychiatric disorder.

Sr. No.	Biochemical Parameters	Control (n=30)	Patients (n=30)
1.	Total cortisol ($\mu\text{g/dL}$)	6.59 \pm 2.41	22.1 \pm 7.69**
2.	Triiodothyronin (ng/dL)	108 \pm 12.6	99.1 \pm 11.2*
3.	Thyroxine ($\mu\text{g/dL}$)	11.5 \pm 3.84	9.17 \pm 1.80*
4.	Thyrotropin ($\mu\text{IU/mL}$)	3.01 \pm 1.59	13.2 \pm 5.67**

The results were compared between control group and smoker group. The values are mean \pm S.D. * $P < 0.05$ ** $P < 0.001$.

Table 2. The correlation between serum TC and thyroid profile parameters in geriatric patients with psychiatric disorder.

Sr. No.	Biochemical Parameters (n=30)	r	P
1.	TC Vs T3	-0.0212	NS
2.	TC Vs T4	-0.0566	NS
3.	TC Vs TSH	+0.5142	< 0.001

r = correlation coefficient, NS = not significant

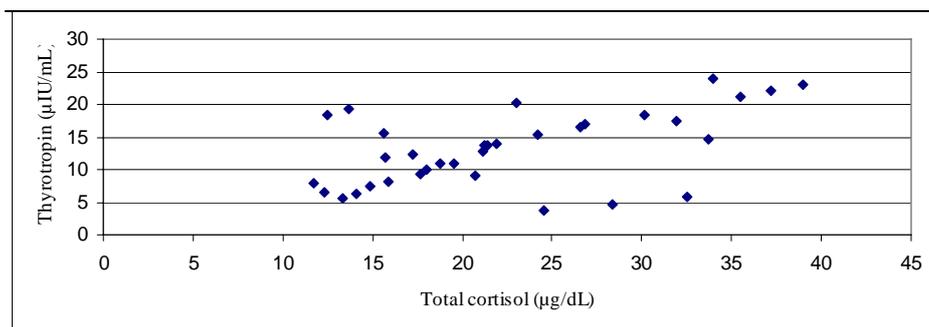


Figure 1. Correlation between TC and TSH in geriatric patients with psychiatric disorder.

Discussion

Several previous studies investigated the relationship between thyroid disease and psychiatric illness in Western countries but the present study was conducted on geriatric

subjects of Mid-Western India. It has been recommended that thyroid function screening is a worthwhile procedure [14-16]. Many of the abnormal results in these studies, however, reflected a transient disturbance of thyroid function, and all the study subjects showed a minimal hypothyroidism which was confirmed biochemically.

Our study is the first to elucidate the relationship between serum TC with thyroid profile in geriatric patients with psychiatric disorder. Increased TC levels in geriatric patients indicate the dysregulation of the hypothalamic-pituitary-adrenal (HPA) axis activity. Various authors reported that elevated values of cortisol in geriatric subjects with psychiatric disorder were indication of Cushing's syndrome [17-20]. The level of TC thyroid tests are higher in geriatric patients with psychiatric disorder than in age and sex-matched healthy subjects, which confirms results of a previous study [21,22]. Hypothyroid geriatric patients indicate the hypoactivity of the hypothalamic-pituitary-thyroid (HPT) axis.

In our study, a negative and minimal correlation ($r = -0.0212$) was observed between serum TC and T3 in study subjects. Correlation between the serum TC and T4 was analyzed statistically using MS-Excel. The serum TC was found to have slightly negative correlation with the serum T4 in all geriatric patients with ($r = -0.0566$). A significant, positive correlation ($r=0.5142$) was found between serum TC and TSH in geriatric cases is as per figure 1. The impairment of both HPA and HPT in our geriatric patients with psychiatric disorder support this good correlation between serum TC and TSH.

We concluded that in geriatric patients elevated cortisol and thyroid alterations are associated with psychiatric disorder. We propose that the alterations described in the literature are influenced by mental status of patient. Our data support these finding, that the hypothalamic-pituitary-thyroid (HPT) axis and the hypothalamic-pituitary-adrenal (HPA) axis is impaired in geriatric patients with psychiatric disorder.

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