ORIGINAL ARTICLE

Serum Creatine Kinase Activity in Thyroid Disorders

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Abstract

Thyroid function and creatine kinase activity was measured in 50 patients of thyroid disorders. The decreased serum levels of triiodothyronine (T3), thyroxine (T4) and increased level of Thyroid stimulating hormone (TSH) in hypothyroid patients is well established but whether there is any correlation of creatine kinase (CK) with hypothyroidism is not well established. Therefore, a study of serum CK and thyroid profile was carried out. In hypothyroid patients with decrease in serum T3, there is a significant increase in CK and findings were reversed in hyperthyroid patients. Serum creatine kinase levels thus, show an inverse relation with serum T3 and T4 levels.

Key Words

Creatine kinase, Hypothyroidism, Hyperthyroid, Triiodothyronine (T3)

Introduction

Serum creatine kinase (CK) was first used as a diagnostic aid in progressive muscular dystrophy in 1959 by Ebashi *et al* (1). It has since become an important Clinical marker for muscle damage. The serum CK level in healthy individuals depends on age, race, lean body mass and physical activity (2, 3). Musculoskeletal disorders often accompany thyroid dysfunction. In addition to the well known observation that these disorders are common in patients with hypothyroidism, they are also observed in patients with thyrotoxicosis (4). Out of some common causes, hypothyroidism is a common cause of an elevated creatine kinase in serum (5). In recent years studies have been conducted to establish a relationship of creatine phosphokinase levels in thyroid diseases (6). A majority of patients with hypothyroidism have been shown to have an increased serum CK (7,8,9,10,11). The exact etiology is not known (12,13,14). Skeletal muscle is affected by hypothyroidism more profoundly in cases of overt hypothyroidism, less so when subclinical hypothyroidism is present (15,16). The assay of creatine kinase activity in serum is extremely valuable in screening hypothyroidism and in present study, an attempt has been made to correlate CK levels with triiodothyronine (T3), thyroxine (T4) and thyroid stimulating hormone (TSH) in hypo and hyperthyroidism.

Material and Methods

The present study was conducted on 50 patients, out of which 30 were hypothyroid and 20 were hyperthyroid attending the O.P.D. of Himalayan Institute of Medical Sciences, Dehradun. 25 healthy age sex matched subjects were taken as control. The fasting venous blood samples were collected by standard aseptic techniques. Serum was separated and assays were performed.

Serum T3, T4 and TSH were measured by microplate enzyme Immuno assay (ELISA technique) (Monobind, Costa Mesa, USA). Serum creatine kinase activity was measured by Autoanalyser Synchron CX5, (using reagents supplied by Wipro Biomed). Data collected was subjected to standard statistical analysis.

Results

Results are given in Tables 1-3. In the present study, in hypothyroid subjects the mean value of T3, T4 and TSH were found to be 0.82 ±0.41 ng/ml, 5.54 ± 2.57 mg/dl and 18.37±11.54 mIU/ml respectively (Table 1). The mean CK levels in these subjects were found to be 186.53 ± 34.79 IU/L (Table 2). In hyperthyroid subjects the T3, T4 and TSH levels were 3.94 ± 2.87ng /ml, 15.56± 6.22 mg/dl and 0.17±0.20 mIU/ml respectively (Table 1). The mean CK levels in these subjects were found to be 54.80 ±22.30 IU/L (Table 2). The results show that mean CK levels in hyperthyroid subjects are significantly lower as compared to hypothyroid subjects. In normal healthy subjects the mean serum CK levels were found to be 70.28±30.41 IU/L and in hypothyroid subjects, it is significantly increased i.e. 186.53±34.79 IU/L as compared to the control subjects.

Table 3 shows that the serum CK levels in hypothyroid subjects have inverse relation with T3 concentration. A

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Table 1 - Levels of Serum T3, T4 and TSH in Controls, Hypothyroid and Hyperthyroid subjects

Study group	Normal range	Control (n=25)	Hypothyroid (n=30)	Hyperthyroid (n=20)
T3 (ng/ml)	0.8 - 1.9	1.052 ± 0.17	0.82 ± 0.41	3.94±2.87
Mean ± SD range		(0.88 - 1.22)	(0.41 - 1.23)	(1.07 - 6.81)
T4 (mg / dl) range	5.0 - 13.0	7.42± 1.63	5.54 ± 2.57	15.56 ± 6.22
Mean ± SD range		(5.79- 9.05)	(2.97- 8.11)	(9.34 - 21.78)
TSH (mIU/ml)	0.4 - 5.75	2.23 ± 0.93	18.37 ± 11.54	0.17 ± 0.20
Mean ± μD range		(1.30 - 3.17)	(6.83 - 29.91)	(0.00 - 0.37)

Table 2 - Levels of serum CK in controls, Hypo and Hyper thyroid patients

Study group	CK (IU / L)
Controls (n=25)	70.28 ± 30.41
Mean ± SD range	(39.87 - 100.69)
Hypothyroid (n=30)	186.53 ± 34.79
Mean ± SD range (P = < 0.001)	(151.17 - 221.32)
Hyperthyroid (n = 20)	54.80 ± 22.30
Mean ± SD range	(32.50 - 77.10)

n = number of subjects P = < 0.001 (highly significant)

Table 3 - Levels of serum CK and T3 in Hypothyroid patients

T3 (ng / ml)	CK (IU/L)
<0.8	
(n=9)	224.71± 22.90
Mean ± SD range	247. 67)
> 0.8	
(n = 21)	160.57 ±25.19
Mean ± SD range	185.76

marked decrease in T3 concentration is associated with increase in serum CK level, suggesting that the severity of hypothyroidism increases CK level.

Discussion

Serum creatine kinase activity demonstrates an inverse relationship with thyroid activity. About 60% of hypothyroid subjects show an average elevation of creatine kinase activity over the upper limit of the reference interval. By contrast in hyperthyroidism, the serum CK activity tends to be at the low end of the reference interval (17,18). Hypothyroid patients have increased concentration of creatine kinase that is mostly due to increased CK-MM. However, CK-MB has also been reported to increase above reference values in hypothyroid patients without apparent myocardial damage (19,20).

Conclusion : There is an inverse relation in the serum levels of T3 and CK in thyroid disease. In hypothyroid patients with decrease in serum T3 there is a significant increase in CK the fact that may be used as a parameter for screening hypothyroid patients. Thus the estimation of serum CK levels will be extremely valuable in screening for hypothyroid patients.

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