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THE ALTERATION OF SERUM THYROID HORMONE AND ITS STIMULATING IN NANO SCALE ON ATHLETICS MEN

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The purpose of this research is the study of serum triiodothyronine (T3) hormone concentration alterations and thyroid stimulating hormone (TSH), according to nano millimeter and nano IU micro litter in athletes. Very insignificant alterations in mentioned hormones cause the alteration of metabolism base in human. For this purpose, 12 male students were selected voluntarily. Variables such as height, weight, blood pressure have been measured and recorded. At first stage, 5 cc has bled from subjects, and then each of them has done the Bruce protocol aerobic test on the treadmill. The second stage of bleeding has done immediately after training protocol and the third stage, 24 hours later. Totally, bleeding has done 3 times. The results of these 3 stages of bleeding indicate that TSH hormone serum's mean has increased to 0.533% n IU/mic L immediately after exercise training. This significant increase has been gained ($p = 0.048$). The comparison of TSH hormone serum's mean between the second stage and the 24 hours rest after that shows that the mean has decreased to 41.38% n IU/mic L and it's significant ($p = 0.039$). The comparison of TSH hormone serum's mean between the first stage and after the Bruce test training shows no significant result ($p = 0.214$). The comparison of T_3 serum hormone's mean between the first stage and 24 hours rest was significant and its decrease was equal to 9.27% ng/ml ($p = 0.022$). We conclude that Bruce training protocol causes stimulation of TSH hormone and this hormone has made its impression on thyroid gland and secreted T3, T4 hormones and caused metabolism alterations in human body. After TSH hormone's secretion, it takes time to put effect on thyroid gland and causes T3 hormone secretion. This period has not been determined in physical exercise yet.

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1. Introduction

It is a well-known fact that exercise affects the activity of many glands and the production of their hormones. One of the glands affected is the thyroid. Thyroid gland secretes two separate amino acid-iodine bound thyroid hormones known as 3-5-3' triiodothyronine (T3) and 3-5-3'-5' tetraiodothyronine (T4, thyroxine) both of which are also found in the free form (fT4, fT3), whose importance on the regulation of general metabolism, growth, and tissue differentiation as well as gene expression has been known for a long time [1].

It is also known that thyroid hormones act in fatty acid oxidation and thermoregulation [2]. Thyrotropin-releasing hormone (TRH) secreted from hypothalamus stimulates anterior pituitary to release thyrotropin (TSH, thyroid stimulating hormone) [3, 4, 2]. When exercise is repeated at certain intervals, there is a pituitary-thyroid reaction that is properly coordinated by increasing turnover of thyroid hormones [5]. When thyroxine turnover and related hormonal action is increased, this would lead to hyperthyroidism [2, 6].

Peripheral metabolism of thyroid hormones can be changed significantly by a number of physiological and pathological conditions, which can alter the deiodination pathway and lead to a change in the circulating level of thyroid hormones. The biological effects of short-term changes in the thyroid hormone levels are not currently completely understood but are potentially important in the body's adjustment to stressful or catabolic states [7]. Multiple biological and environmental factors impact the life span of an organism. The endocrine system is a highly integrated physiological system in mammals that regulates metabolism, growth, reproduction, and response to stress, among other functions. [8].

Koistinen et al.'s study on unacclimatized top class skiers showed that training at moderate altitude for 12 days resulted in a significant decrease in serum total T3 levels and an increase in fT3 levels with no significant change in TSH, T4, fT4 and reverse T3 (rT3) [9].

Another study done by Deligiannis et. al. looking at the thyroid hormone response to swimming for 30 minutes at varying water temperatures showed that TSH and fT4 levels were significantly increased at 20°C as compared to 32°C but no significant effect was seen on T3 [10].

Pakerinen et. al. study on the effects of one week of very intense strength training on the thyroid hormones of male weight lifters showed a significant decrease in TSH, T3 and T4 with unchanged fT4, rT3 and thyroid binding globulin (TBG) [11]. Baylor et al revealed that over trained athletes show an impaired hormonal response to insulin-induced hypoglycemia with recovery after 4 weeks of rest indicating a hypothalamic dysfunction [12].

In a different study, untrained subjects experienced reductions in cortisol and rT3 and an increase in T3 after exercise. However, trained subjects had an increase in cortisol and rT3 and a decrease in T3 with exercise. Concentration of T4 was unchanged in both groups [10, 13]. José L. et al., examined the thyroid hormone levels of professional cyclists during a 3-week stage competition, they concluded that serum T4, FT4 and FT3 levels showed a significant increase by the last week of competition while concentrations of TSH and T3 remained unchanged [4].

2. Methodology

The subjects' (who attended a laboratory at 8:00 a.m.) heart rate, blood pressure, weight, height and body mass index (BMI) have been measured (table 1). The subjects' training protocol was Bruce test. The subjects have been bled five cc while fasting and before Bruce protocol. All subjects have been on the treadmill and have done Bruce protocol cardiovascular test. They have done the Bruce protocol on the treadmill according to the program. The laboratory technician has controlled the subjects' heart rate, the degree of slope and the speed of the treadmill according to Bruce protocol by computer. The subjects have done the Bruce protocol test till the limit of exhausting. The subjects' maximum heart rate mean reached 191.8 rates per min. The mean of train protocol's time on the treadmill for all subjects was calculated 16.45 ± 1.47 min. After the end of the test five cc was bled again from the elbow vein. Their maximal oxygen consumption (Vo_{2max}) was calculated. The subjects were asked to attend the laboratory till 24 hours later to bleed five cc, again. Totally bleeding was done three times. All blood samples were analyzed in the laboratory and the amount of TSH hormone concentration according to (n IU/mic L) and T3 according to (ng/ml) were determined. To determine the T3, TSH hormones concentrations, Elecsys Automatic ECLIA (a laboratorial method) was used.

3. Results

The result of TSH and T3 hormone concentration from three stages of bleeding are shown in table 2. The subjects' TSH hormone's concentration mean are 3.63 n IU/mic L before Bruce test and in the rest time. After the Bruce protocol, the mean has increased to 3.649 n IU /mic L. This increase has been calculated amounting to 0.533% n IU/mic L and was significant ($p = 0.048$), ($t = 2.282$).

The comparison of TSH hormones concentration means between the second stage 3.649 n IU/mic L and the third stage 2.139 n IU/mic L was calculated. It means 24 hours after the subjects' rest; it decreased to 41.38%4 n IU/mic L. This decrease is significant (p = 0.039), (t = 2.41).

The comparison of subjects' T3 hormone concentration mean before the Bruce test i.e. while resting was 1.477 n IU/micL and after the Bruce test was 1.459 n IU/mic L which means it is not significant. The decrease of serum T3 hormone concentration was 1.28% ng/mL at this stage (p = 0.214), (t = 1.336).

The comparison of serum T3 concentration at the first stage 1.477 ng/ml and 1.34 ng/ml at third stage were significant. At this stage the decrease of hormone's serum was 9.275% ng/ml (p = 0.022), (t = 2.77). The comparison of T3 hormone concentration's mean at the second stage 1.459 ng/ml and at the third stage 1.34 ng/ml was calculated. At this stage the decrease of serum T3 hormone concentration was calculated 8.156% that was significant (p=0.071), (t = 2.049). In table 2, t values, p values and also serum TSH and T3 hormone concentration, have been shown (Fig. 1).

Table 1. Physical characteristics of the subjects.

Variables	Mean	Standard Deviation
Weight(kg)	75.50	8.027
Height(cm)	176.60	7.026
Age(yr)	23.47	1.79
BMI(cm^2)	24.22	2.34
Systolic blood pressure (mm Hg)	117.00	3.00
Diastolic blood pressure (mm Hg)	77.00	4.83
Vo_2 max ml^{-1}. min^{-1}	60.44	5.21

Table 2. Alteration of Serum triiodothyronine (T3) and thyroid stimulating hormone (TSH) with P and t Values in Three Stages.

Variables	Mean	Standard deviation	t Values	p Values
T3(ng/ml)	1.477	0.228	1.336	0.214
T3(ng/ml)	1.459	0.225	2.77	0.022
T3(ng/ml)	1.340	0.162	2.049	0.071
TSH (n IU/micL)	3.630	1.688	2.282	0.048
TSH (n IU/micL)	3.649	2.137	2.080	0.067
TSH (n IU/micL)	2.139	0.97	2.41	0.039

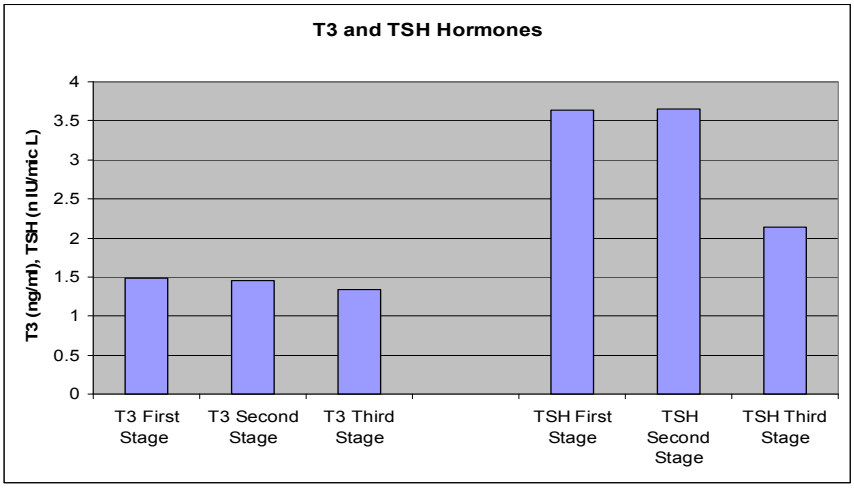

Fig. 2. Alteration of serum triiodothyronine (T3) and thyroid stimulating hormone (TSH) after Physical Activity.

4. Discussion and conclusion

The thyroid gland is a small organ with a powerful influence on the body. The thyroid secretes hormones that affect virtually every organ. Thyroid hormones are required for growth and development in children. In adults, the thyroid's governs our "basal metabolism", which turns calories into useable heat energy.

The purpose of this research is the study of TSH hormone alterations and T3 after exhausting aerobic activity by the use of Bruce protocol .The result of three stages bleeding with 12 male students is shown in table 2.

In the present research, the caused alterations in the research process have shown that different physical exercises can cause an increase and/or a decrease in the secretion of some glands and that this alteration has an enormous effect on athletes' performance. For example, in this research, Bruce protocol's exhausting exercise could increase the concentration of secreted hormone from thyroid gland or T3 serum amounting to %9.275 ng/ml. In other words, Bruce protocol aerobic exhausting physical excise could stimulate thyroid gland sufficiently, and increase T3 hormone's secretion.

On the other hand, the comparison of subjects' rest state with the one after the end of Bruce protocol has caused the decrease amounting to %1.218 ng/ml that shows excessive exhaustion has caused a delay in T3 hormone secretion; however, the athletes' T3 hormone secretion has no significant change. Also, the measurement of serum T3, after the Bruce protocol activity and its comparison with the subjects' 24 hours rest has shown a decrease amounting to %8.156 ng/ml.

In the case of T3 serum hormone, also Bruce protocol performance has caused TSH serum hormone to increase amounting to %0.523 n IU/mic L. It means that Bruce protocol has caused this hormone to secrete. The stimulation of this hormone takes its effect on thyroid gland and T3, T4 hormones have secreted and it has metabolism alterations.

The subjects' rest states, at the first stage and the third do not show any change. But in the second and the third stages of blood test, immediately after the end of Bruce protocol and 24 hours rest after that, the concentration of TSH has decreased amounting to 41.38% nIU/mic L that shows the concentration of TSH has increased after the physical activity but 24 hours rest has caused the concentration of TSH to return to its first stage. Therefore, the decrease of TSH observed in this study could be explained by a reduced hypothalamic central drive to induce thyroid gland activity.

Very few researches have studied TSH hormone's secretion and thyroid gland hormones but none of them has been followed. Yet, the present research does agree with Koistinen et al. [9]. This researcher has gained the significant change in T3 and TSH serum after training. And also, this research agrees with the Pakerin et al. [11]. This researcher has gained the main decrease in TSH, T3, T4 hormones; however, the subjects' activity time has been more in their research.

Baylor and Hackney have gained the significant alteration in TSH concentration in rowing even after one week. The results show that extreme exercise and exhausting aerobic activity can cause significant alterations in T3 and TSH hormones. These alterations can affect fats, proteins, carbohydrates metabolism and also temperature's regulating in ng/ml [1, 2]. It seems that after the TSH hormone's secretion, it takes time for TSH hormone to take its effect on thyroid gland and cause T3 secretion. It needs more investigation to eliminate this ambiguity.

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