

Research Journal of Pharmaceutical, Biological and Chemical Sciences

Altered Homeostasis of Thyroid Hormones In Critically Ill Patients.

T Vidhya Logini^{1*}, B Shanthi², and AJ Manjula Devi³.

Department Of Biochemistry, Sree Balaji Medical College and Hospital, Chrompet, Chennai 44, Tamil Nadu, India.

ABSTRACT

While interpreting the thyroid values thyroid disorders are mostly interpreted as either Hyperthyroidism or Hypothyroidism pertaining with references to the thyroid gland activity. But other altered homeostatic states like critical illness or inflammation can influence the thyroid values. In our study we focused on influence of critical illness on thyroid values.

Keywords: homeostasis, thyroid hormone, hyperthyroidism, hypothyroidism

**Corresponding author*

INTRODUCTION

The non-thyroidal illness syndrome also known as low T3 syndrome or euthyroid sick syndrome describes a condition characterized by abnormal thyroid function tests encountered in patients with acute or chronic systemic illnesses. Laboratory parameters in this syndrome - low serum levels of T3 with normal or low levels of T4 and TSH. The changes in serum thyroid hormonal levels in the critically ill patient seem to result from alterations in the peripheral metabolism of the thyroid hormones, in TSH regulation, in the binding of thyroid hormone to transport protein and in receptor binding and intracellular receptors.

AIM: To understand thyroid metabolism in altered homeostatic states [critically ill states]

To give suitable instructions towards interpretations of the thyroid results during these altered homeostatic states.

Materials and Method:

Sample size: 100 cases. [90 patients from ICU, 10 Patients from general ward with mild illness as control group].

Duration: 4 months [from sep 2014 – feb 2015]

Place of study: SBMCH, CHENNAI

Out patients of both gender admitted to the critical care unit of the SBMCH were recruited for the study. Institutions human ethical committee approval obtained. Informed consent obtained.

INCLUSION CRITERIA:

Patients who referred to the ICU and got clearly admitted to the ICU were studied.

EXCLUSION CRITERIA:

People with primary thyroid disorders

PROCEDURE

We have ADVIA centaur CP system. We did thyroid function test by Chemiluminescent immunoassay method.

Chemi-luminescence is a chemical reaction that emits energy in the form of light. When used in combination with immunoassay technology, the light produced by the reaction indicates the amount of analyte in a sample. Direct chemiluminescent reactions directly measures the light energy without the use of added steps or amplifying molecules.

The ADVIA centaur CP assays use Acridinium ester as the chemiluminescent label. Since Acridinium ester does not require the addition of a catalyst or substrate.

Dimethyl form of this ester increases its long life.

This ester is oxidized by the H₂O₂ and the light emission is maximized by changing the environment from acidic to basic followed by light emission in one second.

STATISTICS:

In our study the only parameter which showed low value is T3. So we focused the statistical analysis only for the parameter T3. The means of group I and group II are significantly different at $p < 0.05$

	Group I [T3]n=90		Group II [T3]n=10
T3[normal range]			
Mean	60.0228		86.5
STD deviation	19.483		5.9241
Variance	379.5869		35.0952
t-value		-4.2583	
Degrees of freedom		98	
Critical value		1.987	

DISCUSSION

There are many references which are showing low T3 in critically ill patients. Our study is very significant for the parameter T3. Authors Leslie J. De Groot, MD says that Starvation, and more precisely carbohydrate deprivation, appears to rapidly inhibit deiodination of T4 to T3 by type 1 iodothyronine deiodinase in the liver, thus inhibiting generation of T3 and preventing metabolism of reverse T3 (rT3) [1]. Consequently there is a drop in serum T3 and elevation of reverse T3. Since starvation induces a decrease in basal metabolic rate, [2] and this decrease in thyroid hormone represents an adaptive response by the body to spare calories and protein by inducing some degree of hypothyroidism. Patients who have only a drop in serum T3, representing the mildest form of the NTIS, do not show clinical signs of hypothyroidism. There are many factors which affect deiodinase enzymes like cytokines such as TNF, IFN- α , NF- κ B and IL-6), some drugs like amiodarone and high doses of propranolol and free (nonesterified) fatty acids. Also it is a selenium containing enzyme which becomes deficient during critical conditions. The reference quotes 'Giorgio Iervasi, MD; Alessandro Pingitore, MD, PhD; Patrizia Landi, BSc; Mauro Raciti, BSc; Andrea Ripoli, PhD; Maria Scarlattini, BSc; Antonio L'Abbate, MD; Luigi Donato, MD' did a study about low T3 syndrome and they correlated T3 with the heart disease. They noticed the typical pattern of altered thyroid hormone metabolism characterized by low T3 circulating levels [3, 4]. The principal pathophysiological mechanism underlying low circulating T3 is the reduced enzyme activity of 5' monodeiodinase responsible for converting T4 into T3 in peripheral tissues [5, 6].

CONCLUSION

In our study based on the statistical analysis it has been observed that, T3 levels are found to be well below the Reference mean, in critically ill states in patients without thyroid disorders. Hence request and the interpretation of the thyroid results during critically ill states needs to be strategized by the intensivist.

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