Study of Thyroid Function in Alcohol Dependence Syndrome

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ABSTRACT

Introduction: Alcohol, one of the most misused psychoactive substances impairs the functioning of many vital organs. It is known to have a direct toxic effect on thyroid cells with derangements in the secretion of TSH and feedback regulation of TRH. This study analyses the extent of thyroid dysfunction in cases of alcohol dependence syndrome.

Material and methods: The blood samples of 33 patients aged between 25 to 55 yrs admitted as Alcohol Dependant Syndromes in the psychiatry ward of Tertiary care centre were assessed for T3, T4 and TSH using Radio Immuno Assay (RIA) method.

Results: There were a total of 17 cases (i.e. 51.5% of cases) in which thyroid function tests were deranged (T3/T4 low and /or TSH raised). Lowered T3 levels was the most common abnormality seen (36.3% cases). Among the total of 33 cases, only one case had subclinical hypothyroidism and one had frank hypothyroidism. Therefore, although deranged thyroid function is common in alcoholics, subclinical and frank hypothyroidism is rare. All the liver function tests were within the normal limits except AST levels which was elevated with an increased AST/ALT Ratio of 1.6.

Conclusion: Thyroid function evaluation being a simple cheap and cost effective test,it is suggested that all alcoholics or alcohol dependence syndrome cases should be screened by thyroid function tests for hypothyroidism so that early diagnosis and treatment can reverse mood changes and depression, which are commonly seen in alcoholics.

Keywords: Alcohol, Thyroid Function Test, Thyroxine (T4), Triiodothyronine (T3), Thyroid Stimulating Hormone (TSH), Hypothyroidism

INTRODUCTION

Alcohol is one of the most commonly misused psychoactive substances consumed globally and is the world's third largest risk factor for disease and disability.[1]

Alcohol has been reported to have multiple effects on the functioning of the thyroid gland.[2,3] Alcohol abuse frequently produces modest reductions in serum thyroxine (T4) levels and more considerable reductions in triiodothyronine (T3) levels.[4] Studies have demonstrated a blunting of TSH release in response to thyrotropin releasing hormone (TRH), even after several weeks of sobriety, as well as decreased total and free triiodothyronine.[5] Alcohol has been reported to cause direct suppression of thyroid function by cellular toxicity, and indirect suppression by reducing thyrotropin-releasing hormone response.[3,4]

It is also seen that alcoholism causes a reduction of type II 5' deiodinase activity in liver, the enzyme that converts T4 to T3 and therefore resulting in increase in T4 and reduction in T3 in alcoholics. Further,Alcohol is also known to have a direct toxic effect on thyroid cells, which is used therapeutically in ethanol ablation therapy of thyroid nodules.[7] Alcohol induced direct toxicity may be one of the reasons for reduction of thyroid volume in chronic alcoholics.[8] The reduced thyroid size is accompanied by a reduction in T3 and fT3 concentrations with normal T4, fT4, and TSH values in most studies.[2]

Inspite of peripheral low values of thyroid hormones i.e. T3 and fT3, there is blunting of TSH seen in alcoholics. The mechanism of blunting of TSH secretion to TRH stimulation in alcoholics could be due to down-regulation of the TRH receptors in the pituitary due to chronically high TRH concentrations. The peripheral low thyroid hormones in different stages of alcohol consumption can chronically induce a slightly elevated TRH release.[9] The increased TRH can in turn cause feedback suppression of the TRH receptors, thereby blunting the TSH secretion.

Liver plays an important role in thyroid hormone metabolism, being involved in the conjugation and deiodination of thyroxine (T4) and triiodothyronine (T3), as well as the synthesis and secretion of the major thyroid hormone-binding proteins, thyroxine-binding globulin (TBG), thyroxine binding prealbumin, and albumin. Furthermore, the liver is an important target organ for thyroid hormone action, with a larger number of gene products expressed in the liver being responsive to T3.[2] Thus alcoholic liver damage decreases peripheral conversion of FT4 to FT3 in liver, and by automatic feedback stimulation TSH levels are raised.

This study aims to monitor the thyroid function in alcoholics. This study will help in detecting cases of frank or subclinical thyroid dysfunction in alcoholics. This will help in treating the thyroid dysfunction that occurs during chronic alcohol abuse that often goes unnoticed and may contribute to many mood changes, depression etc seen in alcoholics.

MATERIAL AND METHODS

This study was a cross sectional descriptive study and was conducted in the Department of Biochemistry, of a tertiary

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care centre. Samples were collected from all subjects admitted in Psychiatry ward as Alcohol Dependant Syndrome (ADS). The duration of study was 2 months. Sample size calculated was 33 with 95% confidence interval and error of margin 20%. Patients with history of ADS showing withdrawal symptoms were included in the study and those with other causes for liver dysfunction and history of hepatotoxic drug intake were excluded from the study. Written informed consent was obtained from all subjects.

Fasting blood sample was collected for the patients in gel vacutainer and serum was separated and stored at -20^{0}C. Serum sample was processed for TSH, T3 and T4 by Radio Immuno Assay (RIA). On the same sample, Liver Function tests was done which included Serum total bilirubin, Direct Bilirubin, ALT, AST and ALP.

The assessed parameters were compared with the normal range in healthy individuals and the deviations were studied. Total thyroxine estimation was done by radioimmunoassay by BRIA MAG 4, this is BRIT's radioimmunoassay (RIA) kit for total thyroxine (T4) level (Reference Range of T4 is 5.5-13.5 µg/mL), total triiodothyronine estimation also by radioimmunoassay by BRIA MAG 3 which is BRIT's radioimmunoassay (RIA) kit for total triiodothyronine (T3) (Reference Range of T3 is 0.7-2.0 ng/mL), Immunoradiometric assay (IRMA) for human thyroid stimulating hormone (hTSH) by IRMAK-9, IRMA kit for hTSH, is specifically designed to quantitate TSH in serum or plasma sample (Reference Range of TSH in Human is 0.17-5.5 µIU/mL). The subjects were divided into two groups based on the results of the thyroid function tests. Gp A had deranged thyroid function tests and Gp B had normal function tests.

STATISTICAL ANALYSIS

Microsoft office 2007 was used for the analysis. Descriptive statistics like mean and percentages were used for the analysis.

RESULTS

The study was conducted on 33 chronic alcoholics who were admitted to Psychiatric ward of a tertiary care centre. The age of the patients ranged from 25yrs to 55yrs with mean age 38.57yrs. All the patients were male in the study.

Table 1 shows the mean and SD with reference range of all the parameters tested. The mean for all the analytes in 33 patients of alcohol dependence syndrome were within the reference range except for AST (mean=53.8IU/L). The ratio of AST/ALT is approximately 1.6. Mean value for T3 in all 33 patients was 0.89 ng/mL in the lower limit of reference range.

There were a total of 17 cases (i.e. 51.5% of cases) in which thyroid function tests were deranged (T3/T4 low and /or TSH raised). These cases were regrouped as Group A. The rest of the cases (n=16) were regrouped as Group B. The Table 2 and Fig 1 displays the mean T3,T4 and TSH values in Gp A and B. The mean of T3 and T4 in Group A is lower than Group B as clearly depicted in Fig 1. (0.75ng/ml and 6.44 µg/ml respectively).

Analyte	Mean	SD
TSH	3.53 µIU/mL	2.33
T3	0.89 ng/mL	0.35
T4	7.09 µg/mL	1.88
Total Bilirubin	1.02 mg/dL	0.55
Direct Bilirubin	0.71 mg/dL	0.49
ALT	34.03 IU/L	43.65
AST	53.18 IU/L	78.06
ALP	78.73 IU/L	74.78

Table-1: Thyroid Function tests and Liver function tests in all subjects (n=33)

Analyte	Group A (n=17) Deranged thyroid function		Group B (n-16) Normal thyroid function	
	Mean	SD	Mean	SD
T3	0.75 ng/mL	0.41	1.05 ng/mL	0.18
T4	6.44 µg/mL	2.27	7.77 µg/mL	1.06
TSH	3.98 µIU/mL	3.48	3.22 µIU/mL	1.33

Table-2: Details of Thyroid function tests in Group A (n=17) and Group B (n=16)

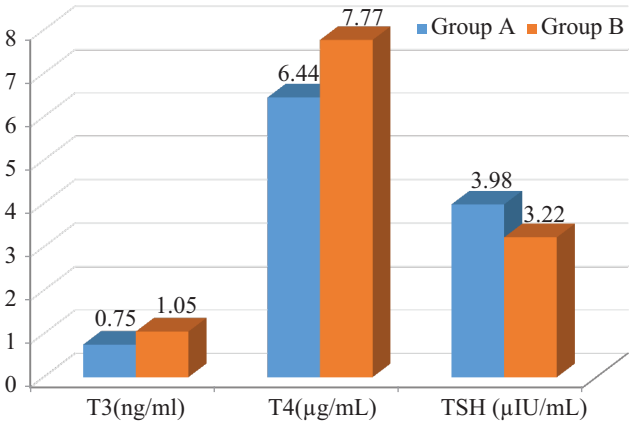

Figure-1: Thyroid Function Test in Group A and Group B

In Group A, 2 patients had both lowT3 and T4 but normal TSH; 10 Patients had low levels of T3, normal T4 and TSH. Thus a total of 12 patients (36.3%) had decreased T3 levels which was the most common derangement seen. Three patients (9.1%) had only low T4 levels with normal T3 and TSH. TSH levels were increased in only 2 patients who had normal T3 and T4. The TSH values in these patients were 13.77 µIU/mL and 6.07 µIU/mL. Thus, out of 33 cases only one case had subclinical hypothyroidism and one had frank hypothyroidism. The mean value of T3 in Group A is 0.75ng/mL and is in the lower reference range (0.7-2.2 ng/mL) of T3.

DISCUSSION

In our study almost 36% cases had decreased T3 levels. This has been seen in other studies also. Ioannis Liappas[3] et al in their study also found that majority of their patients i.e. 70% presented slightly altered peripheral thyroid hormone levels at the beginning of detoxification with reduced T3 levels and normal T4 and TSH levels. Other studies on

alcoholics also present modest reductions in serum T4 levels and more considerable reductions in T3 levels.[10] The reason for decreased T3 in chronic alcoholism is probably due to decreased production of T3 due to the reduced activity of type II 5' deiodinase, the enzyme that converts T4 into T3.[11,12] It has also been proposed that many alcohol abusers with alcoholism have an increased binding capacity for thyroid hormones, evidenced by a decreased T3 uptake value and an increased level of thyroxin-binding globulin.[13]

In our study only 2 cases of increased TSH have been detected. The TSH values in these patients were 13.77 µIU/mL and 6.07 µIU/mL. Therefore out of 33 cases only one case had subclinical hypothyroidism and one had frank hypothyroidism. This is in contrast to study by Ioannis Liappas[3] et al where all the alcohol abusers presented with normal TSH levels. Therefore although deranged thyroid function is common in alcoholics, subclinical and frank hypothyroidism is rare. In our study, 2/33 cases i.e. 6% of the cases of chronic alcoholism presented with hypothyroidism. Detection of such cases although rare is of clinical importance as treatment of hypothyroidism may help in reversing many mood changes, depression etc. seen in alcoholics.

All the liver function tests were within the normal limits except AST levels which was elevated with an increased AST/ALT Ratio of 1.6.

CONCLUSION

Thyroid function abnormalities are seen in alcoholics. The commonest abnormality is decreased T3 levels. Frank hypothyroidism, although rare is important to detect as treatment of such cases may help the alcoholics in reversing mood changes, depression etc. Thus Thyroid function evaluation being a simple cheap and cost effective test, it is suggested that all alcoholics or alcohol dependence syndrome cases should be screened by thyroid function tests for hypothyroidism.

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