

Thyroid Profile In Patients With Metabolic Syndrome

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Abstract

We conducted a cross sectional study of thyroid profile in 100 patients with Mets and 50 controls. The mean age of the patients was 52.4 ± 4.4 years and 48 patients were males. Most of the patients were from urban areas. Mean systolic and diastolic pressure were 142 ± 9.3 and 90.2 ± 4.9 mmhg which is on the higher side of the normal. Subclinical Hypothyroidism was seen in 21 patients and 4 controls while overt hypothyroidism was seen in 7 patients and 1 control. There was a significant negative correlation with and both total cholesterol and triglycerides and T3 levels. Also significant negative correlation was seen between T4 and total cholesterol and triglycerides. TSH was found to bear a significant positive correlation with TG and TC, also TSH was negatively correlated to HDL-C. A positive correlation was seen between TSH and blood sugar and a negative correlation was seen between thyroid hormones (T3 and T4) and blood sugars. Thus patients be early diagnosed and suggested to undertake weight reduction by non pharmacological means like diet modifications and exercise. Subclinical hypothyroidism should be picked up and treated at the earliest.

Key Words

Metabolic Syndrome, Thyroid Hormones, Hypothyroidism

Introduction

Metabolic syndrome (MetS) consists of a constellation of metabolic abnormalities which include central obesity, hyperglycemia plus insulin resistance, high triglycerides plus low HDL cholesterol and hypertension. Several cardiovascular risk factors like hypertension, atherogenic dyslipidemia, prothrombotic and proinflammatory conditions cluster with metabolic syndrome. (1) It was also referred to as insulin resistance syndrome till 1999, when WHO named it metabolic syndrome as there was insufficient evidence to show that all its components were caused by insulin resistance.

Thyroxine and Triiodothyronine play an important role in maintaining thermogenesis and metabolic homeostasis. The set point in thyroid axis is established by thyroid stimulation hormone (TSH). Thyroid hormones up-regulate metabolic pathways relevant to resting energy expenditure, hence obesity and thyroid functions are often correlated. It is still not clear whether these alterations in thyroid hormones are a cause or an effect of obesity. (2,3,4) MetS and hypothyroidism are well established forerunners of atherogenic cardiovascular disease. Considerable overlap occurs in the pathogenic mechanisms of atherogenic cardiovascular disease by MetS and hypothyroidism. (5) Various studies have been

done on relation between MetS and thyroid function but there is paucity of data from North India. In our study we assessed the association between MetS and the thyroid function

Material & Methods

The present study was conducted in the department of Medicine, Government Medical College Jammu from November 2013 to October 2014. Patients were enrolled from the out patient as well as inpatient departments. We recruited 100 patients who fulfilled National Cholesterol Education Program-Adult treatment Panel (NCEP-ATP) III (3 out of 5 criteria positive). (6) blood pressure was recorded with mercury sphygmomanometer after five minutes of rest. It was measured in the right arm and mean of three readings in supine, sitting and standing was taken as final. Plasma glucose was measured from venous blood sample from cubital vein after eight hours of fasting. Lipid profile was measured after eight hour of fasting. Waist circumference was measured to nearest 0.1 centimeter at the midpoint between lowest costal margin and upper margin of iliac crest at full expiration in the standing position. Thyroid profile was measured after eight hours of fasting using the Electro Cheiluminescent micro particle Immuno

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Assay. The normal values for T3 was taken as 0.58-1.5 ng/ml, for T4 4.87-11.7 µg/dl and for TSH it was 0.35-4.94 µIU/ml. fifty controls without MetS (0 out of 5 NCEP-ATP III criteria) were also included in the study. Patients with liver disorders, renal insufficiency, congestive heart failure, pregnancy were excluded from the study. Also acutely ill patients, patients on statins and other medications that alter thyroid function or lipid levels , were excluded from the study. The data was analysed for descriptive statistics. Pearson's correlation coefficient was used to find the association of metabolic variables with T4, T3 and TSH . A p value of <0.01 was considered significant for correlation.

Results

We enrolled 100 patients of MetS. The mean age was 52.4±4.4 years and 48 patients were males. Most of the patients were from urban areas. Mean WC was 101.2±5.51 centimeters. Mean systolic and diastolic pressure were 142±9.3 and 90.2±4.9 mmhg which is on the higher side of the normal.(Table 2) Subclinical Hypothyroidism was seen in 21 patients and 4 controls while overt hypothyroidism was seen in 7 patients and 1 control . (Table 2). While studying the biochemical profile we found that patients had blood sugars , total cholesterol and TGs on the higher side of normal. T3 had significant negative correlation with SBP, TGs, and TC.(Figure 1,2) T4 had significant negative correlation with SBP, TG and TC. TSH had significant correlation with SBP,TSH and TC. (3,4,5)

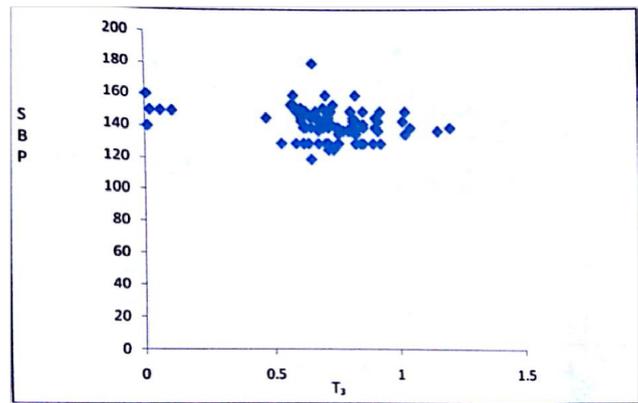
Discussion

Hypothyroidism has been associated with components of MetS and cardiovascular disease . Even in euthyroid state positive correlation between TSH levels and cardio metabolic variables has been reported .(7,8) some studies have found that the relationship between thyroid hormones and cardio metabolic variables may be intensified in patients with diabetes, obesity, or MetS. (9,10) Suggesting that the onset of these pathologies could affect thyroid function. It has been suggested that obese people with a normal thyroid may have a hyperactive hypothalamic-pituitary- thyroid axis, increasing the concentrations of TSH and thyroid hormones .(11) other studies have reported that the presence of MetS components in euthyroid subjects can vary between lowest and highest serum concentrations of TSH or T4. Thus the prevalence of MetS increases as the normal-TSH quartile . (7,8) The risk for insulin resistance increases in the lowest normal concentrations of free T4.Our study has shown that a high prevalence of SCH(21%) and overt hypothyroidism (7%) in patients with MetS as compared to control group which had 8% SCH and 2% overt hypothyroidism.

Another study from India has shown the prevalence of SCH and overt hypothyroidism to be 21.9% and 7.4% in MetS and 6.6% and 2% in controls respectively. (12) In our study there was a significant negative correlation and both total cholesterol and triglycerides and T3 levels . Also significant negative correlation was seen between T4 and total cholesterol and triglycerides. This could be explained by the fact that there is reduced removal of triglycerides from plasma in hypothyroidism due to decreased activity of TG lipase. Thyroid hormones can influence HDL metabolism by increasing cholesteryl ester transfer protein (CETP) activity which exchanges cholesteryl ester from HDL 2 to VLDL and TGs to opposite direction.

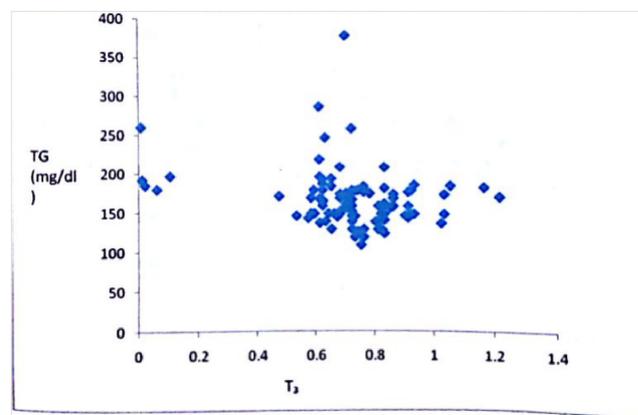
In our study TSH was found to bear a significant positive correlation with TG and TC .also TSH was negatively correlated to HDL-C . However the correlation was weak and not significant. similar results were seen in study by Roos et al. (7) There was significant

Fig 1. Correlation between T3 and SBP



$r = -0.234, p = .019$ (significant at .05)

Fig 2: correlation between T3 and TG

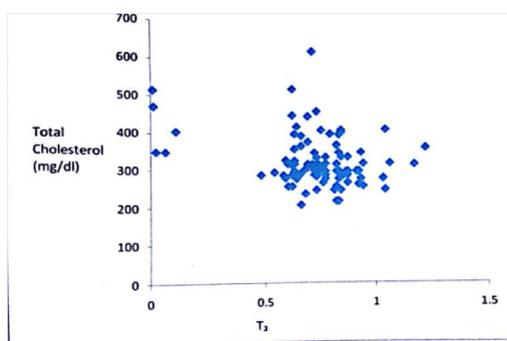


$r = -0.248, p = .013$

Table 1. Clinical Parameters of the Patients

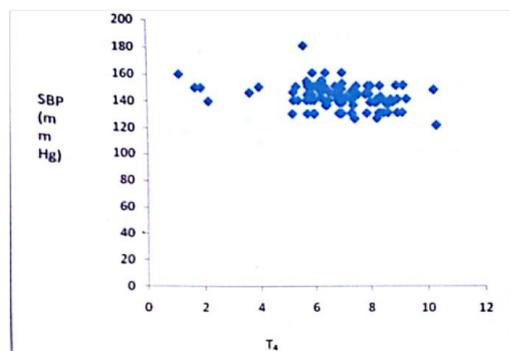
Parameters	n= 100
Males	48
Age (years)	52.4±4.4
Urban	56
Waist circumference(cms)	101.2±5.51
Systolic Blood pressure (mmhg) mean±SD	142±9.3
Diastolic Blood pressure (mmhg) mean±SD	90.2±4.9
Subclinical hypothyroidism	21
Overt hypothyroidism	7

Fig 3. Correlation between T3 and Cholesterol



$R = -.307, p = .002$ (significant at .01)

Fig 4. Correlation between T4 and SBP



$r = -.362, p = .000$

negative correlation between T3 and systolic and diastolic BP. Negative correlation was seen between T4 and systolic and diastolic BP. TSH had positive correlation with systolic and diastolic BP. Similar results were seen in previous studies.(13,14,15) Thyroid failure is strongly associated with arterial hypertension via sympathetic and adrenal activation and increased vascular stiffness.(16) Overt hypothyroidism is associated with diastolic hypertension which may contribute to increased

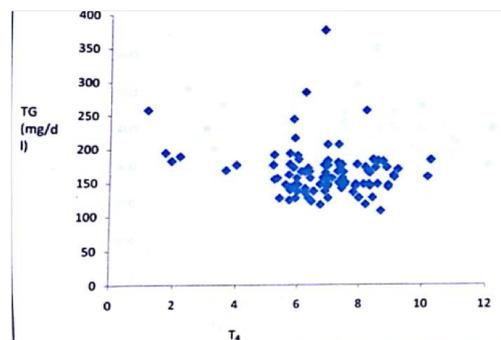
Table 2. Thyroid Status

Thyroid Status	Cases (100)	Controls (50)
Subclinical Hypothyroidism	21(21%)	4(8%)
Overt Hypothyroidism	7(7%)	1(2%)

Table 3. Biochemical parameters of the patients

Parameters	Value
Fasting Sugar(mg/dl) mean±SD	110.9±16.3
Triglycerides (mg/dl) mean±SD	168.3±36.2
HDL Cholesterol (mg/dl) mean±SD	42.2±2.86
Total cholesterol (mg/dl) mean±SD	325.5±66.6
T3 Levels ng/ml	0.67±0.22
T4 levels µg/dl	10.9±6.95
TSH µIU/ml	5.8±4.17

Fig 5. Correlation between T4 and TG



$r = -.205, p = .041$ (significant at .05)

atherosclerosis. (17) A positive correlation was seen between TSH and blood sugar and a negative correlation was seen between thyroid hormones (T3 and T4) and blood sugars though they were not significant. Similar results were seen in other studies. (18) TSH has been found to be positively associated with fasting and postarandial insulin concentrations and negatively with insulin sensitivity. Moreover low normal FT4 levels are associated with increased insulin resistance. Insulin resistance is increased in thyroid failure while a decrease in GLUT4 glucose transporter (leading to reduction of glucose uptake and promoting insulin resistance)is observed. A negative correlation was seen between waist circumference (WC) and T3 and T4 and a positive correlation was seen with TSH though not significant. This correlation could be explained on the basis of the

influence of thyroid hormone on lipid profile and also by the influence of thyroid hormones on adipocyte metabolism and the production of adipokines. Our study is limited by the fact that there was less number of patients which could have led to false negative results as far as some of the correlations are concerned. Also confounding factors like smoking, alcohol intake were not taken into consideration.

Conclusion

Thus we suggest that patients be early diagnosed and suggested to undertake weight reduction by non pharmacological means like diet modifications and exercise. Subclinical hypothyroidism should be picked up and treated at the earliest.

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