CORRELATION BETWEEN THYROID HORMONE VALUES AND CAROTID INTIMA MEDIA THICKNESS IN PATIENTS WITH SUBCLINICAL HYPOTHYROIDISM

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INTRODUCTION

Subclinical hypothyroidism (ScH) is a common condition affecting 4%-20% of the general population. ScH is defined as increased serum thyroid-stimulating hormone (TSH) concentrations and normal serum free thyroxine levels (fT4).[1] Measuring carotid intima media thickness (CIMT) with carotid ultrasonography represents a standard and valid approach to screen for early atherosclerosis and strongly correlated with not only regional, but also with generalized atherosclerosis.[2] Patients with primary hypothyroidism are at a three times greater risk for early atherosclerosis, as shown independently for other risk factors, such as atherogenic lipid profile, hypertension and impaired endothelial function. It is unclear whether ScH contribute to atherosclerosis.[3] The aim of the study was to investigate the influence of TSH and fT4 hormones on CIMT.

MATERIAL AND METHODS

At the Department of Endocrinology Diabetes and Metabolic Disorders, Skopje, R. Macedonia, 69 consecutive patients with newly diagnosed ScH were examined. The criteria for ScH were: normal fT4 (10.3-24.45 pmol/L) and elevated TSH (4.2<TSH<20.0 mU/L) serum. Thirty healthy, euthyroid subjects, defined as patients with reference values of fT4 and TSH (0.2-4.2 mU/L), were included in the study as a control group. None of the patients had a previous history of thyroid disease, arterial hypertension, or took any medication for thyroid disease, arterial blood pressure or lipid metabolism. Body mass index (BMI), TSH, fT4, thyroid peroxidase antibodies (TPOabs), total lipids, total cholesterol, HDL-C, LDL-C, triglycerides, blood pressure, mean and maximum carotid intima-media thickness (CIMT and max CIMT) were determined in all participants.

Statistical analysis

Statistical analyses were performed by SPSS 11.0. The t-test, $\chi 2$-test and Spearman rank correlation test were used. $p<0,05$ were considered statistically significant.

RESULTS

In this study, 99 patients were analyzed. They were 42.8 ± 15.2 years old, and 10 were men and 89 women.

Table 1. Personal and hormonal characteristics of the ScH and control group

	ScH group n= 67	control group n= 30	p value
Sex (m : f)	7 : 62 (10,1%)	3 : 27 (10%)	NS
Age (year)	42,4 ± 16,2	43,6 ± 12,8	NS
BMI (kg/m2)	27,8 ± 5,6	25,4 ± 5,1	NS
Menopauses	18 (29%)	8 (29,6%)	NS
Smoking	12 (17,4%)	5 (16,6%)	NS
fT4 pmol/l	**14,5 ± 2,8**	**15,7 ± 2,5**	**p= 0,04**
TSH mU/l	**7,9 ± 3,6**	**1,5 ± 0,8**	**p <0,0001**
TPOabs	**41/60 (68,3%)**	**3/24 (12,5%)**	**p < 0,0001***

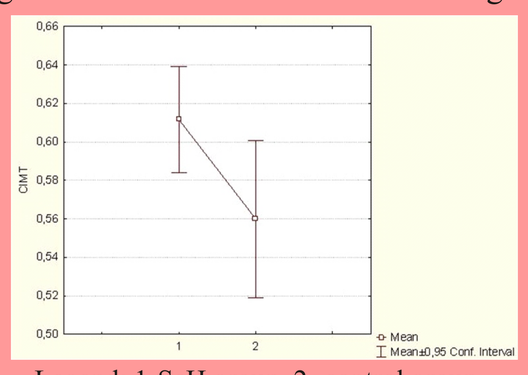
Results are presented as means ± STD deviation and percentages. NS: no significance. * Chi-square test, Yates correction factor

Carotid atherosclerosis in ScH and control group

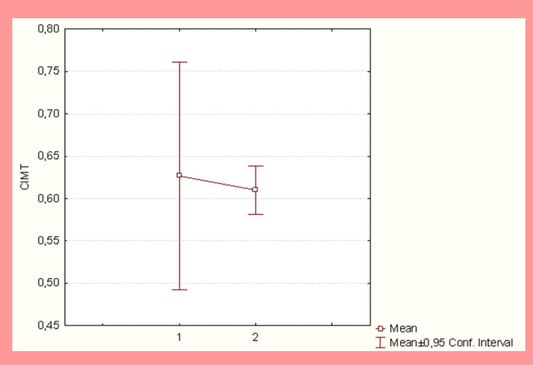
Table 2. Differences in examined variables between ScH and control group

	ScH group n= 67	control group n= 30	t-test p value
total lipids (mmol/l)	8,71 ± 1,9	8,14 ± 1,5	0,19
triglicerides (mmol/l)	**1,70 ± 1,1**	**1,18 ± 0,6**	**0,016**
total cholesterol (mmol/l)	5,46 ± 1,3	5,20 ± 0,9	0,34
HDL-C (mmol/l)	1,33 ± 0,37	1,46 ± 0,38	0,12
LDL-C (mmol/l)	3,42 ± 1,09	3,33 ± 0,79	0,67
systolic pressure (mmHg)	128 ± 20,7	121,8 ± 16,5	0,11
diastolic pressure (mmHg)	81,66 ± 12,3	78,6 ± 9,1	0,19
CIMT (mm)	**0,61 ± 0,1**	**0,56 ± 0,1**	**0,034**
max CIMT (mm)	0,65±0,1	0,64±0,1	0,65

Patients with ScH had statistically significant higher mean triglycerides and greater mean CIMT then the control group.

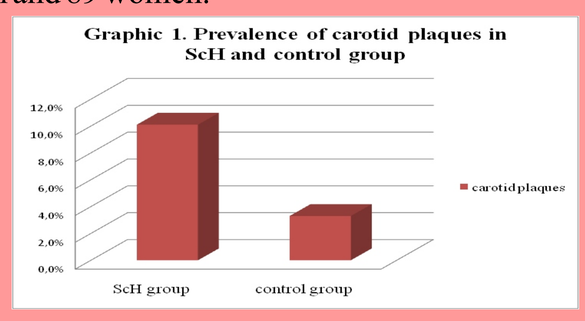


Legend: 1-ScH group, 2- control group
Figure 1. Mean CIMT values in ScH and control group



Legend: 1-men, 2- women
Figure 2. Mean CIMT values in men and women from ScH group

Mean and maximum values of CIMT for men and women in the ScH group were not statistically significant different.



Seven patients from ScH group and one from the control group had carotid plaques. Thus, ScH group had a greater prevalence of carotid plaques compared with the control group (10.1% vs. 3.3%) (Graphic 1). When age was considered, all patients from both groups with carotid plaques were women.

Correlation between TSH and examined variables in the ScH group

Table 3. Correlation between analyzed variables in ScH group

	BMI	TSH	fT4	age	CIMT	max CIMT	TPOabs
BMI	-	0,08	-0,17	**0,31****	0,21	0,18	-0,05
TSH	0,08	-	**-0,45****	0,15	**0,27***	**0,29***	0,18
fT4	-0,17	**-0,45****	-	**-0,31***	**-0,35****	**-0,33****	**-0,30***
Systolic	**0,31****	0,18	-0,23	**0,48****	**0,33***	**0,31***	0,11
Diastolic	**0,40****	0,16	-0,23	**0,40****	**0,44****	**0,39****	0,11
Total lipids	**0,40****	0,01	-0,09	**0,42****	**0,34****	**0,32****	-0,08
triglicerides	**0,44****	-0,07	-0,04	**0,30***	**0,34****	**0,35****	-0,01
Total chol.	**0,36****	-0,03	-0,06	**0,37****	**0,35****	**0,37****	-0,10
HDL-C	**-0,38****	-0,11	-0,02	0,10	-0,07	-0,10	0,09
LDL-C	**0,27****	-0,01	-0,04	**0,33****	0,18	0,23	-0,17
age	**0,31***	0,15	**-0,31***	-	**0,51****	**0,57****	0,16
CIMT	0,21	**0,27****	**-0,35****	**0,51****	-	**0,90****	0,22
max CIMT	0,18	**0,29****	**-0,33****	**0,57****	**0,90****	-	0,13
TPOabs	-0,05	0,18	**-0,30***	0,16	0,22	0,13	-

** statistical significance of the correlation coefficient at p<0,01
* statistical significance of the correlation coefficient at p<0,05

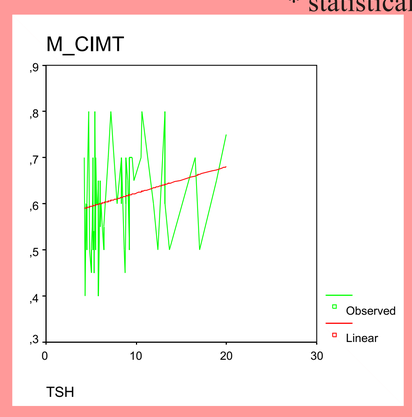


Figure 3. Correlation between TSH and mean CIMT

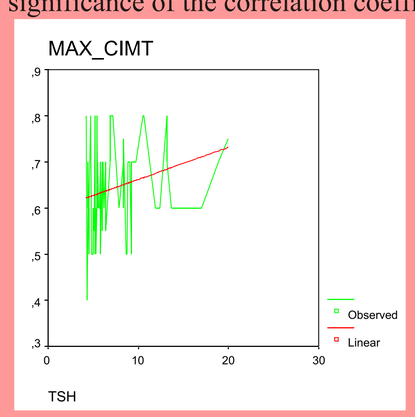


Figure 4. Correlation between TSH and max CIMT

There were significant positive correlation of moderate degree, between TSH and mean CIMT (r = 0,28, p <0 ,04) (Table 3, Figure 3) and max CIMT (r = 0,29, p <0,03) (Table 3, Figure 4). There were no significant correlation between TSH and other clinical variables (Table 3).

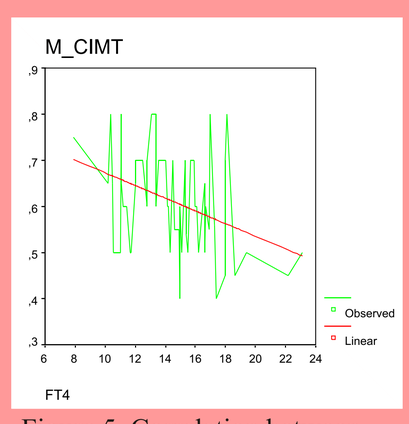


Figure 5. Correlation between fT4 and mean CIMT

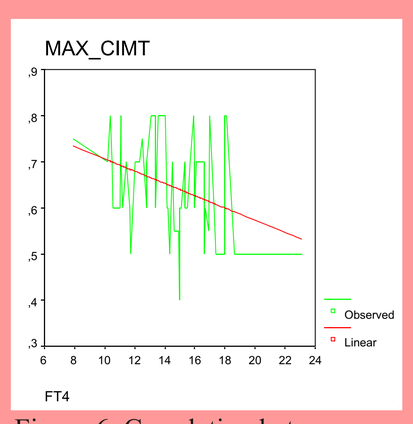


Figure 6. Correlation between fT4 and max CIMT

There were a significant negative correlation between fT4 and mean CIMT (r = -0,35, p<0,01) (Table 3, Figure 5) and max CIMT (r = -0,33, p <0,01) (Table 3, Figure 6).
In control group age positive correlated with CIMT (p<0,001 r=0,64), and HDL-C negative correlated with CIMT (p=0,04 r= -0,37).

DISCUSION

In this study there was no difference in mean values of cholesterol and arterial pressure between the groups, so we can say that ScH has a direct impact on the thickness of CIMT regardless of lipid status and arterial pressure. But should not neglect the differences between the groups in mean values of triglycerides.
It is know that CIMT reflects the cumulative effect of risk factors to which the patient is exposed and therefore may predict future cardiovascular risk.[4] In fact, it was demonstrated a direct correlation between CIMT and risk of myocardial infarction and stroke.[5] Together, ageing and ScH will faster favoring atherosclerosis. Because this study include mainly young people with a low risk factors for atherosclerosis, the study showed clear association between ScH and atherosclerosis. Future prospective studies, especially in young patients, are needed to confirm that ScH increases cardiovascular events.

CONCLUSION

Thyroid hormone values are correlated with CIMT in patients with ScH. So, ScH increases the risk to atherosclerosis with the possibility of a greater number of cardiovascular events.

1. Vanderpump MP et al. The incidence of thyroid disorders in the community: a twenty-year follow-up of the Whickham Survey. Clin Endocrinol (oxf). 1995; 43:55-68. 2. Monzani F et al. Effect of levothyroxine replacement on lipid profile and intima-media thickness in subclinical hypothyroidism: a double-blind, placebo-controled study.J Clin Endocrinol Metabol. 2004; 89: 2099-2106. 3. Willeit J et al. Distinct risk profiles of early and advanced atherosclerosis. Arterioscler, Tromb Vasc Biol. 2000; 20:529-37. 4. Parikh A, Daneman D. Is carotid ultrasound a useful tool in assessing cardiovascular disease in individuals with diabetes? Diabetes Technology and Therapeutics 2004; 6(1)65-69. 5. O'Leary DH et al. Carotid-artery intima and media thickness as a risk factor for myocardial infarction and stroke in older adults. N Engl J Med. 1999; 340: 14-22.