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Thyroid function in a large group of obese children: causes and consequences

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Introduction

Mild TSH elevations are frequently observed in obese patients, in the absence of any detectable thyroid disease.

Objectives

We tried to evaluate possible causes for the raised TSH levels and to verify possible biochemical and clinical consequences of this condition.

Methods

We evaluated 779 (325m/454f) obese children, chronological age 14.38±2.56 years (5.25 – 18.50), height SDS 0.27±1.04 (-3.49 – 4.35), BMI SDS 2.94±0.59 (1.6 - 4.62). After an overnight fast, they were admitted to the ward, for auxological evaluation, assessment of body composition by bioelectrical impedance analysis and energy expenditure by indirect calorimetry. A blood sample was obtained for the determination of thyroid function (fT4, TSH, TPOAbs, TGAbs), inflammation markers (total WBC and the subtypes, C-reactive protein), metabolic parameters (AST, ALT and yGT, total-, HDL- and LDL-cholesterol, triglycerides). An OGTT was performed for the assessment of glucose tolerance and for the calculation of the Disposition Index (ODI). The patients were then subdivided in two groups according to a TSH value above (group 1) or below (group 2) 4.5 mU/l. Mean TSH values was 5.7±1.0 in group 1 and 2.7±0.9 in group 2 (p<0.001). Children with thyroid antibodies were excluded from the study

Results

Auxological data were not different in the two groups (see table 1), as well as systolic and diastolic blood pressure, body composition, ODI, and fT4 (table 2).

Table 1. Auxological data in group 1 and group 2

	Number	Height SDS	Weight SDS	BMI SDS	WC/Height
Group 1	125	0.5±1.0	3.1±0.9	2.9±0.6	0.7±0.1
Group 2	654	0.2±1.0	3.0±0.8	2.9±0.6	0.7±0.1

Table 2. Clinical and biochemical data in group 1 and group 2

	FT4	Systolic BP	Diastolic BP	PCR	WBC
Group 1	11.7±1.9	125.8±13.5	79.2±8.0	0.6±1.0	8.3±1.7
Group 2	11.7±1.9	124.5±13.1	77.9±8.2	0.6±0.7	8.4±1.2

	FFM	FM	Calorimetry	ODI
Group 1	45.8±9.8	50.4±14.7	1897±434	0.8±1.3
Group 2	46.7±9.3	51.9±15.3	1904±375	0.7±0.8

Group 1, however, showed significantly higher values of AST, total cholesterol, azotemia and alkaline phosphatase, as reported in Table 3.

Table 3. Statistically significant data between the two groups

	AST	total cholesterol	azotemia	alkaline phosphatase
Group 1	24.8±12.2	170.3±28.7	28.9±5.3	168.6±89.7
Group 2	22.5±9.6	163.3±32.9	27.1±5.4	149.3±87
p	<0.05	<0.05	<0.001	<0.05

Correlations analysis

Multiple regression analysis showed that TSH serum levels was negatively affected by age (p<0.05) and positively by BMI SDS (p<0.001) and total lymphocytes count (p<0.01).

Because of the cardiovascular implications we also checked the determinants of cholesterol serum levels: AST (p<0.01) and TSH (p<0.05) were involved; however the model explained only 2% of the probability.

Conclusions

Fat excess and the consequent inflammatory status seem to be the main determinants of TSH elevation, probably through a negative influence of inflammatory cytokines on the TSH receptor. The raised TSH is a poor predictor of serum cholesterol levels.

References

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Pituitary

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