127 - BODY COMPOSITION OF PATIENTS WITH SUBCLINICAL THYROID DYSFUNCTIONS

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INTRODUCTION

The thyroid gland produces the hormones triiodothyronine (T3) and thyroxine (T4) through the hypothalamic (TRH; thyrotropin releasing hormone) - pituitary (TSH; thyroid stimulating hormone) - thyroid axis. These hormones regulate the rate of metabolism and affect the growth and rate of function of many other systems in the body (Zhang e Lazar, 2000). Subjects with thyroid disease (for example, hypothyroidism and hyperthyroidism, where serum thyroid hormones concentrations are respectively decreased and increased) present clinical signals and symptoms that negatively affect health and quality of life.

In relation to body composition, patients with hypothyroidism present weight gain due to lower metabolism and edema. On the other side, patients with hyperthyroidism present weight loss, due to lower fat mass and free-fat mass (Carneiro et al., 2003).

The new generation of sensitive thyroid-stimulating hormone immunoassays has changed the diagnosis of thyroid dysfunction. Subclinical hyperthyroidism (SCH) and subclinical hypothyroidism (SH) are new categories of thyroid dysfunction. SCH is characterized by a serum thyrotropin (TSH) level below the lower limit of the reference range, with normal free thyroxine (FT4) and tri-iodothyronine (T3) levels. By the other side, SH is characterized by a serum TSH level above the upper limit of the reference range with normal FT4 and T3 levels (Gharib et al., 2005). These alterations are also called by subclinical thyroid dysfunctions or minimal thyroid dysfunctions.

Although SCH and SH are conceptually characterized by biochemical alterations, many patients may present signals and symptoms frequently observed in the respectives clinicals forms of the diseases. The intensity and the frequency of these symptoms may vary according to the biological individuality, the time of disease, serum TSH concentrations, beside others (ROMALDINI et al., 2004). Up to the moment, it is still unclear if patients with SCH and SH present body composition alterations, similar to those found in the clinical for of the disease. In this scenario, the aim of this study was to evaluate and to describe the body composition of patients with subclinical thyroid dysfunctions – subclinical hyperthyroidism and subclinical hypothyroidism.

METHODS

A cross-sectional study was performed with 57 women with subclinical thyroid dysfunction, being 34 with subclinical hyperthyroidism (SCH) on TSH-suppressive therapy with levothyroxine (LT4) for differentiated thyroid carcinoma and 23 with subclinical hypothyroidism (SH). All patients were recruited from the Endocrine Clinic of the Clementino Fraga Filho Hospital, Federal University of Rio de Janeiro, Brazil. SCH was defined as TSH levels 0.4 Ul/ml and FT4 between 0.8 and 1.9 ng/dL, while SH was defined as TSH levels 0.4 Ul/ml and FT4 between 0.8 and 1.9 ng/dL. A control group comprised of 43 women without thyroid disease (TSH, T4L and T3 within the normal range) was also evaluated as for the same variables considered in the study.

The body composition was assessed by the anthropometric method, according to the procedures proposed by the International Society for Advancement in Kinanthropometry (ISAK) (Norton e Olds, 2005). The following measures were made: weight (kg), height (cm), girths (cm), skinfolds thickness (mm) and breadths (cm). The following parameters were calculated: Body Mass Index (BMI; kg/m2); Body fat percentage (% BF) (Jackson et al., 1980; Siri, 1956), the sum of seven skinfolds thickness (mm; 7SK): triceps, subscapular, iliac crest, media axillary, abdominal, front thigh and chest, Waist-hip ratio (WHR), Lean Mass (kg; obtained from the total weight and the fat mass) and Muscle mass (kg; obtained from the total weight and bone, residual and fat mass). All measures were made by the same skilled anthropometrist. Both groups gave their written consent and the protocol was approved by the local ethics committee.

Descriptive analyzes were shown as median and 25th and 75th percentiles (interquartile range). The comparisons between SCH patients, SH patients and controls were made by using the Kruskal-Wallis Test and the differences were obtained by the Mann-Whitney U-test with Bonferroni correction. All analyzes were performed using the software SPSS 13.0 for Windows and statistical significance was assigned whenever the p value was equal or less than 0.05.

RESULTS

SCH patients, SH patients and controls presented statistical different biochemical profile, as shown in Table 1. The groups were similar in respect to age, BMI and weight.

In relation to fat mass, body fat percentage and lean mass, neither statistical nor clinical differences were observed among SCH patients, SH patients and controls (Graphics 1, 2 and 3). SCH patients presented higher muscle mass when compared to controls (Graphic 4).

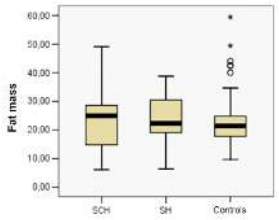
There were no differences among SCH patients, SH patients and controls as for the seven skinfolds considered in the study (Table 2). The thigh and the abdominal were the anatomic sites where the groups presented higher body fat accumulation.

It was observed that SCH patients presented lower thigh girth when compared to controls (p=0.05) (Table 2). No differences were observed for the other girths among the groups.

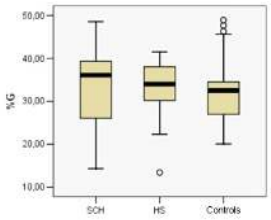
Table 1 – Biochemical and demographic characteristics of SCH patients, SH patients and controls

	SCH (n=36)	*HS (n=23)*	*EU (n=43)*	***p-value***
Age (years)	48.0 (43.0 – 51.0)	44.0 (40.5 – 49.5)	51.0 (40.0 – 56.0)	0.17
TSH (μUl/ml)	0.02 (0.1 – 0.4)	6.9 (5.4 – 8.8)	2.2 (1.6 – 2.7)	<0.01*
T4L (ng/dL)	1.7 (1.4 – 1.8)	1.1 (0.9 – 1.2)	1.1 (1.0 – 1.3)	<0.01*
Weight (kg)	69.1 (56.7 – 75.7)	65.9 (60.7 – 76.7)	68.9 (60.3 – 73.6)	0.93
BMI (kg/m^2)	27.4 (22.2 – 30.5)	27.3 (24.6 – 31.6)	27.1 (23.4 – 30.5)	0.80

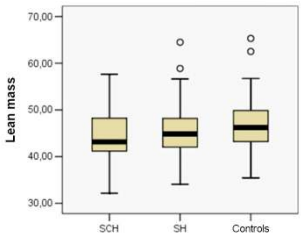
* The comparison between the groups was made with the Kruskal-Wallis Test; Identification of the differences: Mann-Whitney U-test with Bonferroni correction (p<0.01): SCH ≠ HS; SCH ≠ controls; HS ≠ controls.



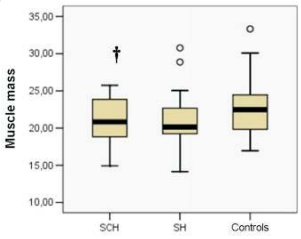
Graphic 1 – Fat mass dist ribution of SCH and SH patients and controls



Graphic 2 – Body fat percentage of SCH and SH patients and controls



Graphic 3 – Lean mass dist ribution of SCH and SH patients and controls



† SCH ? controls
Graphic 4 – Muscle mass dist ribution of SCH and SH patients and controls

Table 2 – Skinfold thickness and body girths of SCH and SH patients and controls

	SCH (n=36)	*SH (n= 23)*	*Controls (n=43)*	*p-value*
Skinfold thickness *(mm)*				
Thigh	35,6 (23,3 – 40,9)	33,9 (30,2 – 39,6)	30,1 (25,1 – 47,1)	0,74
Chest	22,6 (11,5 – 27,4)	16,2 (11,1 – 18,8)	17,1 (12,0 – 26,2)	0,17
Media axillary	20,0 (12,4 – 26,4)	20,1 (16,3 – 27,5)	16,5 (12,2 – 23,3)	0,22
Triceps	26,7 (18,7 – 30,8)	18,6 (15,4 – 25,5)	24,1 (17,3 – 28,2)	0,06
Subscapular	23,9 (16,6 – 34,1)	30,3 (23,5 – 34,9)	21,4 (15,0 – 32,1)	0,11
Iliac crest	30,9 (20,9 – 37,9)	28,0 (23,1 – 32,9)	27,3 (21,4 – 32,8)	0,63
Abdominal	31,9 (22,0 – 44,3)	35,5 (30,3 – 40,8)	28,2 (22,9 – 33,7)	0,09
Σ7DC	203,3 (128,6 – 231,9)	190,3 (159,4 – 222,7)	174,0 (133,0 – 194,5)	0,41
Girths (cm)				
Waist	82,1 (76,3 – 91,9)	87,2 (74,9 – 88,5)	83,7 (75,0 – 93,4)	0,94
Abdomen	94,0 (83,7 – 102,0)	90,5 (85,5 – 97,6)	92,9 (84,7 – 102,8)	0,98
Hip	105,5 (95,8 – 110,3)	102,4 (96,7 – 109,4)	102,4 (100,5 – 108,0)	0,86
Thigh	51,7 (47,9 – 56,0)	52,8 (51,3 – 57,8)	53,7 (51,0 – 57,0)	0,05*
Leg	35,5 (33,6 – 39,1)	35,7 (33,4 – 37,1)	36,5 (34,5 – 39,5)	0,42
WHR	0,81 (0,76 – 0,86)	0,78 (0,76 – 0,83)	0,83 (0,73 – 0,87)	0,84

* The comparison between the groups was made with the Kruskal-Wallis Test; Identification of the differences: Mann-Whitney U-test with Bonferroni correction ($p<0.01$): SCH ≠ controls

DISCUSSION

As thyroid hormones are involved in many physiological functions of the organism such as the regulation of the rest metabolic rate, energy production and muscle contraction (ARGOV et al., 1988; KAMINSKY et al., 1992). So, alterations in thyroid hormones production may influence body composition of the patients. Evidences show that in clinical hypothyroidism, a condition characterized by increased serum TSH concentrations and decreased serum T4 concentrations, patients present weight gain or difficulty in losing weight, even with physical activity practice and dietary (ATA, 2005). Moreover, in clinical hyperthyroidism, where the serum TSH concentrations are decreased and T4 increased, patients often show weight loss, resulting from a decrease of fat and lean mass (mostly muscle mass and bone mass) (RIIS et al., 2005; VESTERGAARD et al., 2003; WEETMAN, 2000). These changes on body composition are consolidated in the clinical form of the disease, but it is still not established whether patients with SCH and HS also exhibit these same characteristics.

In the present study, patients with subclinical thyroid dysfunctions were evaluated as for the body composition. It was observed that only SCH presented body composition alterations – lower thigh girth and lower muscle mass, when compared to euthyroid subjects, paired for age.

Considering that it was not observed neither clinical nor statistical differences concerning thigh skinfold, and that body girths comprehend both muscle and fat mass, we believe that the difference observed between SCH patients and controls have been given by the lower muscle mass presented by the patients.

Similar results were described by Brennan et al. (2006) when 24 patients with subclinical hyperthyroidism caused by toxic nodular goiter or Graves' disease were studied as for the proximal thigh muscle size and strength. The authors concluded that both cross-sectional area and muscle strength were reduced prior to the treatment compared to euthyroid control (n=48), but they improved after the 6-9 months of restoration of euthyroid status. In other study performed by the same group of investigators, 21 patients with subclinical hyperthyroidism presented a gain of approximately 2 kg in lean mass, besides the increase in bone mineral density and thigh muscle cross-sectional area after six months of normal thyroid function (GREENLUNG et al., 2008).

In relation to fat mass, as well as its distribution, it was not observed differences between patients and controls. This result means that the exposure to a slight increase or decrease of thyroid hormone is not associated to body fat alterations. We emphasize that the thigh is, naturally, a characteristic point of greatest accumulation of body fat in females by estrogen action (obesity gynoid). By the other side, the central points, that is, suprailiac and abdomen, are associated with an increased risk of developing cardiovascular diseases. In addition, waist circumference was found to be above the expected standard for the gender (0.88 cm) (SBC, 2005), which denotes a greater risk to health.

In conclusion, our results suggest that only SCH is associated with alterations on body composition, particularly in respect to thigh girth and muscle mass (similarly to what is seem in clinical hyperthyroidism). Regardless of the thyroid hormone profile, the patients evaluated had a higher risk of developing cardiovascular diseases due to the large accumulation of body fat, especially in the central region of the body. The practice of physical activity and healthy eating habits are strategies that can help reduce these risks and should therefore be encouraged in these patients. New studies are needed to enable a better understanding about the effects of a slight increase or decrease - but within the limits of reference, of thyroid hormones on body composition of patients with subclinical thyroid dysfunction.

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BODY COMPOSITION OF PATIENTS WITH SUBCLINICAL THYROID DYSFUNCTIONS

Subclinical hyperthyroidism (SCH) and subclinical hypothyroidism (SH), also called subclinical thyroid dysfunctions, are characterized by serum concentrations of thyroid hormones within the normal range, associated, respectively, with suppressed or increased serum TSH levels. It is not well-established if SCH or SH patients also present changes in body composition, similar to those observed in the clinical forms of the diseases. The aim of the study was to evaluate the body composition of SCH and SH patients. A cross-sectional study was performed with 34 women with subclinical hyperthyroidism (SCH) on TSH-suppressive therapy with levothyroxine (LT4) for differentiated thyroid carcinoma, 23 with subclinical hypothyroidism (SH) and 43 without thyroid disease (EU). The body composition was assessed by the anthropometric method and the following parameters were analyzed: Body Mass Index (BMI; kg/m2); Body fat percentage (% BF), the sum of seven skinfolds thickness, Lean Mass and Muscle mass. Descriptive analyzes were shown as median and 25th and 75th percentiles (interquartile range). The comparisons between SCH patients, SH patients and controls were made by using the Kruskal-Wallis Test and the differences were obtained by the Mann-Whitney U-test with Bonferroni correction (SPSS 13.0). Significance level: p0.05. Results: No differences were found among the groups in relation to total body fat, as well as its distribution. SCH patients presented lower thigh girth (SCH = 51.7 (47.9 – 56.0) cm vs. EU = 53.7 (51.0 – 57.0) cm; p=0.05) and muscle mass (SCH = 20.8 (18.5 – 23.9) kg vs. EU = 22.5 (19.8 – 24.5) kg; p =0.05) when compared to controls. Conclusion: Our results suggest that only SCH is associated with changes in body composition, similar to those observed in clinical hyperthyroidism.

KEY WORDS: body composition, subclinical hyperthyroidism, subclinical hypothyroidism

COMPOSITION CORPORELLE DES PATIENTS AVEC DYSFONCTIONS THYROÏDIENNES SUBCLINIQUES

L'hyperthyroïdie infraclinique (SCH) et l'hypothyroïdie infraclinique (SH), également appelé subclinique dysfonctionnement thyroïdien, sont caractérisés par des concentrations sériques des hormones thyroïdiennes dans la limite de référence, associé, respectivement, les valeurs de TSH (thyrotropine) a supprimé ou améliorés. Il n'est pas encore bien établi que les patients avec des changements expérience SCH ou SH dans la composition du corps semblables à ceux observés dans leurs manifestations cliniques. En ce sens, l'étude visait à évaluer la composition corporelle chez les patients avec SCH et HS. Méthodes: Les participants ont été une étude transversale, 34 femmes avec TSH SCH-induit un traitement suppressif par la lévothyroxine pour cancer différencié de la thyroïde, 23 avec SH et 43 sans maladie thyroïdienne (EU). La composition corporelle a été estimée par la méthode anthropométrique et analysé les paramètres suivants: indice de masse corporelle, le pourcentage de matières grasses, somme de sept plis cutanés et la masse grasse, maigre e musculaire. Les résultats ont été présentés sous forme de médianes et les percentiles 25 et 75. La comparaison entre les groupes a été réalisée en utilisant le test de Kruskal-Wallis et l'identification des différences a été réalisée en utilisant le test de Mann-Whitney avec correction de Bonferroni (SPSS 13.0). Signification: p 0,05. Résultats: Les groupes étaient similaires dans la graisse corporelle totale et sa distribution. Par rapport aux contrôles, les patients avec SCH avait circonférence bas de la cuisse (SCH = 51.7 (47.9 – 56.0) cm vs. EU = 53,7 (51.0 – 57.0) cm, p = 0.05) et la masse musculaire (SCH = 20.8 (18.5 – 23.9) kg vs. EU = 22,5 (de 19.8 – 24.5) kg, p = 0.05) comparativement au groupe témoin. Conclusion: Nos résultats suggèrent que seule la SCH est associée à des changements dans la composition du corps semblables à ceux observés dans l'hyperthyroïdie clinique.

MOTS-CLÉS: composition corporelle, hyperthyroïdie infraclinique, hypothyroïdie infraclinique

COMPOSICIÓN CORPORAL EN PACIENTES CON DISFUNCIÓN TIROIDEA SUBCLÍNICA

El hipertiroidismo subclínico (SCH) y el hipotiroidismo subclínico (HS), también llamada disfunción tiroidea subclínica, se caracteriza por concentraciones séricas de las hormonas tiroideas en el plazo de referencia, asociados, respectivamente, los valores de TSH (tirotropina) suprimida o mejorados. Todavía no está bien establecido si los pacientes con cambios experiencia SCH o SA en la composición corporal similares a los observados en sus manifestaciones clínicas. En este sentido, el objetivo del estudio fue evaluar la composición corporal en pacientes con SCH y HS. Métodos: Los participantes fueron un estudio transversal, 34 mujeres con TSH SCH-inducida por la terapia supresora con levotiroxina para el carcinoma diferenciado de tiroides, 23 con HS y 43 sin enfermedad tiroidea (EU). La composición corporal se estimó por el método antropométrico y analizado los siguientes parámetros: índice de masa corporal, porcentaje de grasa, la suma de siete pliegues cutáneos y las masas grasa, magra e muscular. Los resultados se presentaron como mediana y percentiles 25 y 75. La comparación entre grupos se realizó mediante la prueba de Kruskal-Wallis y la identificación de las diferencias se realizó mediante la prueba de Mann-Whitney con corrección de Bonferroni (SPSS 13.0). Significado: p 0,05. Resultados: Los grupos fueron similares en la grasa corporal total y su distribución. En comparación con los controles, los pacientes con SCH tuvieron una menor circunferencia del muslo (SCH = 51.7 (47.9 – 56.0) cm vs. EU = 53.7 (51.0 – 57.0) cm, p = 0.05) y la masa muscular (SCH = 20.8 (18.5 – 23.9) kg vs. EU = 22,5 (19.8 – 24.5) kg, p = 0.05) en comparación con el grupo control. Conclusión: Nuestros resultados sugieren que sólo el SCH se asocia con cambios en la composición corporal similares a los observados en el hipertiroidismo clínico.

PALABRAS CLAVE: composisión corporal, hipertiroidismo subclínico, hipotiroidismo subclínico

COMPOSIÇÃO CORPORAL DE PACIENTES COM DISFUNÇÕES TIREOIDIANAS SUBCLÍNICAS

O hipertireoidismo subclínico (SCH) e o hipotireoidismo subclínico (SH), também denominados disfunções tireoidianas subclínicas, são caracterizados por concentrações séricas dos hormônios tireoidianos dentro do limite de referência, associados, respectivamente, a valores de TSH (tireotrofina) suprimidos ou aumentados. Ainda não está bem estabelecido se pacientes com SCH ou SH apresentam alterações na composição corporal semelhantes àquelas observadas nas respectivas formas clínicas das doenças. Nesse sentido, o estudo teve como objetivo avaliar a composição corporal de pacientes com SCH e HS. Métodos: Participaram voluntariamente deste estudo seccional, 34 mulheres com SCH induzido por terapia supressiva de TSH com levotiroxina para carcinoma diferenciado de tireóide, 23 com SH e 43 sem doença tireoidiana (EU). A composição corporal foi estimada pelo método antropométrico considerando os parâmetros: índice de massa corporal (IMC; kg/m2); percentual de gordura (%G), somatório de sete dobras cutâneas e massas gorda, magra e muscular. Os resultados foram apresentados pela mediana e percentis 25 e 75. A comparação entre os grupos foi feita com o teste Kruskal-Wallis e a identificação das diferenças foi feita com o teste de Mann-Whitney com correção de Bonferroni (SPSS 13.0), (p0.05). Resultados: Os grupos foram semelhantes quanto à gordura corporal total, bem como a sua distribuição. Quando comparadas às controles, as pacientes com SCH apresentaram menores perímetro de coxa (SCH = 51.7 (47.9 – 56.0) cm vs. EU = 53.7 (51.0 – 57.0) cm; p=0.05) e massa muscular (SCH = 20.8 (18.5 – 23.9) kg vs. EU = 22.5 (19.8 – 24.5) kg; p =0.05) quando comparadas ao grupo controle. Conclusão: Os nossos resultados sugerem que somente o SCH está associado à alterações na composição corporal semelhantes à aquelas observadas no hipertireoidismo clínico.

PALAVRAS CHAVE: composição corporal, hipertireoidismo subclínico, hipotireoidismo subclínico