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Original article

Prevalence of malnutrition-inflammation complex syndrome and its correlation with thyroid hormones in chronic haemodialysis patients☆

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ABSTRACT

Introduction: Low levels of thyroid hormones, total triiodothyronine (T3) and free triiodothyronine (FT3) in haemodialysis patients are a marker of malnutrition and inflammation and are predictors of mortality. The aim of this study was to determine the prevalence of malnutrition-inflammation complex syndrome in haemodialysis and its relationship with the thyroid hormones thyrotropin, T3, FT3 and free thyroxine (FT4), as well as to evaluate the prevalence of low FT3 syndrome and its correlation with nutritional and inflammatory markers.

Materials and methods: Cross-sectional, analytical and comparative study that enrolled 128 haemodialysis patients: 50.8% females; mean age 45.05 ± 17.01 years; mean time on haemodialysis 45.4 ± 38.8 months; 29.7% diabetics; 79.7% with hypertension. Serum thyroidhormones thyrotropin, T3, FT3 and FT4 concentrations were measured and Malnutrition-Inflammation Score (MIS) was applied to diagnostic.

Results: Mean thyroid hormone values were: thyroid hormones thyrotropin 2.48 ± 1.8 mIU/ml (range: 0.015–9.5), T3 1.18 ± 0.39 ng/ml (range 0.67–2.64), FT3 5.21 ± 0.96 pmol/l (range: 3.47–9.75); FT4 1.35 ± 0.4 ng/ml (range: 0.52–2.57). Malnutrition-inflammation complex syndrome prevalence was 53.9%; 11.7% presented low FT3 levels. Serum T3 and FT3 concentrations inversely correlated with Malnutrition-Inflammation Score (MIS), while FT4 correlated positively with Malnutrition-Inflammation Score. In the linear regression analysis, low FT3 was associated with IL-6 ($\beta = 0.265$, $p = .031$), C-reactive protein (CRP) ($\beta = -0.313$, $p = .018$) and albumin ($\beta = 0.276$, $p = .002$).

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Conclusion: Low T3 and FT3 levels are correlated with malnutrition and inflammation parameters. Malnutrition-inflammation complex syndrome can affect serum concentrations of thyroid hormones.

Prevalencia del síndrome complejo de malnutrición e inflamación y su correlación con las hormonas tiroideas en pacientes en hemodiálisis crónica

Palabras clave:
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RESUMEN

Introducción: La reducción de las hormonas tiroideas, triyodotironina total (T3) y triyodotironina libre (T3L) en pacientes en hemodiálisis, es un marcador de malnutrición e inflamación y son predictores de mortalidad. El objetivo del estudio fue determinar la prevalencia del síndrome complejo de malnutrición e inflamación en hemodiálisis y su asociación con las hormonas tiroideas: tirotropina, T3, T3L y tiroxina libre (T4L); además de evaluar la incidencia del síndrome de T3L y su correlación con marcadores nutricionales e inflamatorios.

Materiales y métodos: Estudio transversal, analítico y comparativo, incluyó 128 pacientes en HD, 50,8% mujeres, edad 45,05 ± 17,01 años, 45,4 ± 38,8 meses en hemodiálisis, 29,7% diabéticos y 79,7% hipertensos. Se determinó en suero la concentración de tirotropina, T3, T3L y T4L, se aplicó la encuesta Malnutrition-Inflammation Score para diagnosticar malnutrición e inflamación.

Resultados: La media de valores de las hormonas tiroideas fueron: tirotropina 2,48 ± 1,8 mUI/mL (rango 0,015–9,5), T3 1,18 ± 0,39ng/mL (0,67-2,64), T3L 5,21 ± 0,96 pmol/l (3,47-9,75), T4L 1,35 ± 0,4ng/mL (0,52-2,57). La prevalencia de síndrome complejo de malnutrición e inflamación es 53,9%; un 11,7% mostró T3L baja. Las concentraciones séricas de T3 y T3L correlacionan negativamente con Malnutrition-Inflammation Score y T4L correlaciona positivamente con Malnutrition-Inflammation Score. El análisis de regresión lineal de T3L baja fue asociado con IL-6 (β=0,265 p = 0,031), proteína C reactiva (β=-0,313 p = 0,018) y albúmina (β=0,276 p = 0,002).

Conclusiones: Bajos niveles de T3 y T3L correlacionan con parámetros de inflamación y nutrición. El síndrome complejo de malnutrición e inflamación puede afectar la concentración sérica de hormonas tiroideas.

Introduction

Malnutrition is a frequent and serious problem in patients undergoing dialysis. The estimated prevalence is 18–75%.[1–3] The etiology is multifactorial and has been called "malnutrition-inflammation complex syndrome (MICS)"[4] and currently is also referred as "energy protein wasting syndrome".[5]

MICS is a condition in which there is a loss of protein reserves and energy resulting from inflammatory and non-inflammatory causes in patients with chronic kidney disease (CKD). Factors involved are: diet, oxidative stress, acidemia, blood loss by hemodyalizers and through feces, uremic medium and the effect of anabolic hormones.[5] There is a survey that is used to make the diagnosis of Malnutrition Inflammation Score (MIS),[6] that has been recently validated in Mexico.[7]

Previous studies have reported that in dialysis patients there is 50% decreased in serum levels of free triiodothyronine (FT3). Low FT3 syndrome is defined as low FT3 with normal thyroid stimulating hormone (TSH) and normal or slightly reduced free thyroxine (FT4) level. This has been correlated with parameters of malnutrition and inflammation.[8]

In CKD, there is an alteration of the metabolism, distribution, degradation and excretion of thyroid hormones[9,10] the most commonly observed is a decrease in total triiodothyronine (T3) concentration.[11]

The etiology of thyroid disorders in CKD is multifactorial and it is not entirely understood. There are a number of contributing variables: a decreased activity of deiodinase, reduction in the excretion of inorganic iodine, presence of uremic toxins, metabolic acidosis, malnutrition, use of heparin in hemodialysis (HD), advanced age, infection by hepatitis C virus and drugs (amiodarone, steroids, beta-blockers, lithium, rifampin, sunitinib, sorafenib, imatinib, among others).[9,12,13]

Some studies in CKD patients have found correlations between low concentrations of T3 with high concentrations of inflammatory markers (highly sensitive C reactive protein [hsCRP], interleukin 6 [IL-6]), malnourishment (decrease in