

Original article

Testosterone deficiency in dialysis patients: Differences according to the dialysis techniques[☆]

Secundino Cigarrán^a, Francisco Coronel^{b,*}, Enrique Florit^b, Jesús Calviño^c, Juan Villa^a, Lourdes Gonzalez Tabares^c, José Antonio Herrero^b, Juan Jesús Carrero^d

^a Servicio de Nefrología, Hospital da Costa, Burela, Lugo, Spain

^b Servicio de Nefrología, Hospital Clínico Universitario San Carlos, Madrid, Spain

^c Servicio de Nefrología, Hospital Universitario Lucus Augusti, Lugo, Spain

^d Division of Renal Medicine, Karolinska Institutet, Solna, Sweden

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ABSTRACT

Testosterone deficiency is a prevalent condition in male patients with chronic kidney disease. However, it is not known whether the type of renal replacement therapy has an impact on testosterone deficiency that accompanies loss of renal function.

Methods: The cross-sectional study enrolled 79 prevalent male patients on dialysis; 43 on haemodialysis (HD) and 36 on peritoneal dialysis (PD). The median age was 69 years and 31.6% were diabetics. Endogenous testosterone levels were measured by immunoluminescence assay (normal range 3–10.5 ng/ml), while nutritional/inflammatory markers, bone and mineral metabolism markers, anemia, type of dialysis technique and time on dialysis were also assessed. Body composition was evaluated by bioimpedance vector analysis and bioimpedance spectroscopy. Testosterone deficiency was defined as levels below 3 ng/ml.

Results: Mean testosterone levels were 8.81 ± 6.61 ng/ml. Testosterone deficiency affected 39.5% of HD patients and only 5.6% of PD patients. In the univariate analysis, testosterone levels were directly correlated with type of dialysis technique (HD) (Rho Spearman 0.366; $p < 0.001$) and time on dialysis (Rho -0.412 ; $p = 0.036$) and only with the HD technique in the multivariate analysis. No other significant correlations were found.

Conclusions: Circulating testosterone levels in men on dialysis were independently associated with HD technique. It can be concluded that a new factor—namely the dialysis technique—may be associated with falling testosterone levels and the associated loss of muscle mass and inflammation. Further studies are needed to establish whether the dialysis technique itself triggers testosterone elimination.

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* Corresponding author.

E-mail address: franciscoronel@yahoo.es (F. Coronel).

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Déficit de testosterona en los pacientes en diálisis: diferencias según la técnica de diálisis

RESUMEN

Palabras clave:

Testosterona
Enfermedad renal crónica
Hemodiálisis
Diálisis peritoneal

Los varones con enfermedad renal crónica cursan a menudo con deficiencia en testosterona. Se desconoce si el déficit de testosterona que acompaña a la pérdida de función renal se asocia con el tipo de tratamiento sustitutivo de la función renal.

Métodos: El estudio de corte transversal incluyó 79 varones prevalentes en diálisis, 43 en hemodiálisis (HD) y 36 en diálisis peritoneal (DP). Con una edad media de 69 años, el 31,6% eran diabéticos. Se evaluaron los niveles de testosterona endógena (inmunoluminiscencia: N 3–10.5 ng/ml), marcadores nutricionales/inflamatorios, marcadores de metabolismo óseo mineral, anemia, tipo de técnica y permanencia. La composición corporal fue estimada mediante bioimpedancia vectorial y espectroscópica. Se considera déficit de testosterona cuando los niveles son inferiores a 3 ng/ml.

Resultados: Los niveles de testosterona medios fueron $8,81 \pm 6,61$ ng/ml. El 39,5% de los pacientes en HD y el 5,6% de los de DP presentaban déficit de testosterona. Los niveles de testosterona se correlacionaron directamente con el tipo de técnica, HD (r Spearman 0,366; $p < 0,001$) y el tiempo de permanencia ($Rho -0,412$; $p = 0,036$) en el análisis univariante y solo con la técnica de HD en el multivariante. No se encontraron otras correlaciones significativas.

Conclusiones: Los niveles circulantes de testosterona en hombres en diálisis se asocian de manera independiente con la técnica de HD. Se puede concluir que, en la reducción de testosterona que acompaña de manera natural a la pérdida de masa muscular e inflamación, se asocia un nuevo factor que es la técnica dialítica. Se necesitan estudios para elucidar si la técnica per se favorece la eliminación de testosterona.

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Introduction

There are several mechanisms involved in the generation of testosterone deficit in males. In addition to a decrease in hormone production, there are other mechanisms that have to do with abnormalities of the hypothalamic-pituitary axis and also in relation with the storage and transport of the hormone. In the case of older patients with some type of hypogonadism, it is necessary to consider situations such as malnutrition and low serum protein concentration, since most of the circulating testosterone is bound to a protein and only a small proportion is circulating as a free form. Likewise, uremic toxicity could contribute to testosterone deficiency.

In chronic kidney disease (CKD) there is some degree of hypogonadism and androgen deficiency that is considered one common feature among renal patients. Progressive deterioration of renal function leads to gradual sexual dysfunction which does not appear to be corrected by dialysis. The deficit of testosterone correlates with the reduction of renal function. Testosterone is an anabolic hormone that plays an important role in muscle anabolism. Low testosterone level is associated with endothelial dysfunction and the possibility of cardiovascular events.¹ Low testosterone in chronic renal male patients may be involved not only in reduction of libido and erectile dysfunction² but also in cognitive impairment,³ anemia,⁴ cardiovascular disease⁵ and increased mortality.⁶

Aging aggravates testosterone deficiency that contributes to the development of atherosclerosis which is accentuated by renal failure. Low testosterone levels is thought to be present in 26–66% of patients with different stages of CKD.² It is not known whether testosterone deficiency associated with renal failure correlates with muscle loss in men with advanced CKD. Previous studies have evaluated the testosterone deficiency in chronic hemodialysis (HD) patients and its relation with age, anemia, frequency of cardiovascular events and mortality; however in peritoneal dialysis (PD) patients there are not many studies evaluating serum testosterone levels and the potential impact on body composition, muscle strength and nutrition in general.

The aim of the present study is to evaluate testosterone levels in patients on PD and HD to assess the effect of the dialysis modality.

Patients and methods

This is an observational study in a cohort of 79 prevalent male dialysis patients, stable for more than 6 months. A total of 43 patients were on HD for a period of 80.4 ± 15 months and 36 patients were on PD for 32.6 ± 27.7 months ($p < 0.001$). Patients on HD were 68.84 ± 13.22 years old and received HD for 12 hours per week, none was on an on-line technique. Patients on PD were 60.5 ± 15.6 years old and there were receiving with continuous ambulatory PD ($n = 13$ (36.1%)) or with an

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