Serum Reverse Triiodothyronine (3,3', 5-L-Triiodothyronine) in End-Stage Renal Failure

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We read with interest the recent article of Kosowicz et al. [3] regarding serum reverse triiodothyronine (reverse T3) levels in patients with end-stage renal failure on conservative treatment. 9 of their 40 patients presented with the classical 'low triiodothyronine (T3) syndrome': low T3, high reverse T3, low or normal thyroxine (T4), and normal TSH serum concentrations. Similar findings have been described previously for other nonthyroidal illnesses [1].

We want to point out that the situation is different in patients with end-stage renal failure on regular hemodialysis treatment. Here, in fact, serum reverse T3 levels are low normal or below the normal range. In figure 1 the serum reverse T3 levels of patients with end-stage renal failure on conservative treatment (plasma creatinine above 7 mg/dl; for details of patients and methods of hormone determination see Weissel et al. [6]) are compared with those obtained in patients with end-stage renal failure on chronic hemodialysis treatment. The mean value of the latter group of patients is significantly decreased (Student's t test) in comparison to the value of patients on conservative treatment. 7 of the 10 patients of this group had reverse T3 serum levels below the normal range of our laboratory. Table I shows the mean values and standard deviations of total T4, total T3, and basal TSH as well as maximal TSH increments after TRH. In both groups total T4 and T3 levels were similar: T3 being below our normal range, T4 being normal or low normal. Neither basal nor TRH-stimulated TSH

40-

36-

32-

28-

24-

20-

group I

p < 0.05

group II

Fig.1. Serum reverse T3 levels in patients with end-stage renal failure on conservative treatment (group I) and in patients on chronic hemodialysis treatment (group II). Statistical comparison of the mean values of the two groups by Student's t test.

Table I. Serum concentrations of thyroid hormones in patients with end-stage failure (mean $\pm$ SD)

Total T4, µg/dl)
Total T3, ng/dl
Basal TSH, µU/ml Δmax TSH, µU/ml

Patients on conservative treatment (n = 7) Patients on hemodialysis Treatment (n = 10) Normal range

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serum levels were elevated, corresponding well with the clinical impression of euthyroidism in all patients.

Our results support the findings of the classical 'low T_β syndrome' in some patients (2 of 7; fig. 1) with end-stage renal failure on conservative treatment as reported by Kosowicz et al. [3]. In spite of normal TSH values and clinical euthyroidism 2 patients of this group had, however, reverse T3 levels below our normal range. In patients on regular hemodialysis treatment, serum reverse T3 levels are constantly low or low normal. The observed low T3 and low reverse T3 serum levels in these patients indicate a decrease in the overall deiodinative pathway of T4 as we have suggested previously [5].

On the basis of the reverse T3 and TSH levels found in their chronic uremic patients, Kosowicz et al. [3] suggest that hypothyroidism is excluded, since their control group of hypothyroid patients (without concomitant nonthyroidal illness) had low reverse T3 and high TSH levels. In fact, reverse T3 may be a useful parameter for the diagnosis of hypothyroidism in other illness than chronic uremia as it was proposed by Chopra et al. [2]. Our data show that low reverse T3 serum levels cannot be taken as evidence for hypothyroidism in patients with end-stage renal failure on chronic hemodialysis treatment, since the majority of our patients had reverse T3 levels distinctly below normal, in spite of clinical euthyroidism. Moreover, it has recently been pointed out [4] that even a normal TSH serum concentration may not be a reliable index of the euthyroid state in nonthyroidal illnesses. Therefore, we believe that the diagnosis of mild hypothyroidism in chronic renal failure remains an unsolved problem.

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