β_2 -ADRENOCEPTOR AGONISTS AND THYROID HORMONES

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The potential influence of the selective β_2 -adrenoceptor agonist terbutaline on the serum concentration of the thyroid hormones in humans was studied in 11 healthy euthyroid subjects. Five served as a control group without medication while six received 5 mg terbutaline three times daily for 2 weeks. No significant differences were found between the two groups by measuring the serum concentrations of thyroxine, triiodothyronine, reverse triiodothyronine and resin-triiodothyronine uptake. The use of a β_2 -adrenergic receptor stimulating drug is relatively contraindicated in untreated thyrotoxicosis. This recommendation is based upon a summation of clinical adverse reactions and not due to an effect on the serum concentrations of thyroid hormones.

Introduction

β_2 -adrenoceptor agonists profoundly influence several metabolic pathways resulting in altered serum concentrations of glucose, insulin, fatty acids, lactate, β -hydroxybutyrate and many electrolytes including potassium and phosphate (Phillips *et al.*, 1980). *In vitro* and animal experiments have provided evidence for a sympathetic regulation of the secretion of thyroid hormones although species- and age-differences make it difficult to extrapolate these results to the clinical setting (Melander *et al.*, 1975). We therefore decided to study the influence of the selective β_2 -adrenoceptor agonist terbutaline on the serum concentration of the thyroid hormones in humans.

Methods

Eleven healthy euthyroid subjects, three females and eight males, aged 23 to 40 years were randomly divided into two groups. Five subjects served as a control group without medication while six received 5 mg terbutaline three times daily for 2 weeks. None received any drug known to influence the serum concentration of thyroid hormones and there were no drop-outs. The serum concentrations of thyroxine, triiodothyronine, reverse triiodothyronine and the resin-triiodothyronine uptake were measured in the two groups before, several times during and two days after the terbutaline administration. The hormone concentrations were measured by radioimmunoassays by previously published methods (Johansen *et al.*, 1979). Normal limits for total T_4 concentration are 56–129 nmol/l, for T_3 1.6–2.8 nmol/l, for r T_3 0.28–0.71 nmol/l, and for the resin-triiodothyronine

uptake 0.80–1.25 units. The results have been compared by use of Mann-Whitney's non-parametric test. No adverse reactions were recorded during the study except a slight temporary muscular tremor in the terbutaline group.

Results

Figure 1 shows the results of the measured serum concentrations of thyroxine and triiodothyronine. No significant differences were observed between the two groups or among the individual values before, during and after administrations of terbutaline. The concentration of reverse triiodothyronine and the values of the resin-triiodothyronine uptake were also unchanged.

Discussion

Although the clinical picture of thyrotoxicosis resembles that of excessive adrenal medullary activity, there is no evidence of adrenal hyperactivity in hyperthyroidism. The serum concentration of adrenaline is unchanged in hyperthyroidism while the concentration of noradrenaline is reduced (Christensen, 1973). The symptomatic effect of the β -adrenoceptor blockers in thyrotoxicosis is thus not explained by a counteracting of an increased serum concentration of catecholamines but might be due to the blocking effect on a qualitatively altered adrenergic receptor (Williams & Lefkowitz, 1977). Propranolol has no demonstrable effect on the secretion of thyroid

Figure 1 Serum concentrations of thyroxine (T_4) and triiodothyronine (T_3) in two groups of healthy euthyroid subjects. ---] indicates the mean and range of the control group without medication ($n = 5$), while [— indicates the mean and range of the group receiving 15 mg of terbutaline daily ($n = 6$).

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