SUMMARY

Context: A shortening of the atrial refractory period has been considered as the main mechanism for the increased risk of atrial fibrillation in hyperthyroidism. However, other important factors may be involved.

Objective: The objective of the study was to determine the activity of abnormal supraventricular electrical depolarizations in response to elevated thyroid hormones in patients without structural heart disease.

Patients & Design: Twenty-eight patients (25 females & 3 males; mean age: 43 ± 11 years) with newly diagnosed and untreated hyperthyroidism were enrolled in a prospective trial after exclusion of heart disease. Patients were followed up for 16 ± 6 months and studied at baseline and 6 months after normalization of serum TSH levels.

Main Outcome measures: The incidence of abnormal premature supraventricular depolarizations (SVPD) and the number of episodes of supraventricular tachycardia was defined as primary outcome measurements before the start of the study. In addition, heart rate oscillations (turbulence) after premature depolarizations and heart rate variability were compared at baseline and follow-up.

Results: SVPDs decreased from 59 ± 29 to 21 ± 8 per 24 hours (P=0.003), very early SVPDs (so called P on T) decreased from 36 ± 24 to 3 ± 1 per 24 hours (P<0.0001), respectively, and nonsustained supraventricular tachycardias decreased from 22 ± 11 to 0.5 ± 0.2 per 24 hours (P=0.01) after normalization of serum thyrotropin levels. The hyperthyroid phase was characterized by an increased heart rate (93 ± 14 vs. 79 ± 8 beats/min; P<0.0001) and a decreased turbulence slope (3.6 vs. 9.2; P=0.003), consistent with decreased vagal tone. This was confirmed by a significant decrease of heart rate variability.

Conclusions: Hyperthyroidism is associated with an increased supraventricular ectopic activity in patients with normal hearts. The activation of these arrhythmogenic foci by elevated thyroid hormones may be an important causal link between hyperthyroidism and atrial fibrillation.

COMMENT

Hyperthyroidism is associated with an age-dependent increased risk of arrhythmogenic events, mainly atrial fibrillation. The present study demonstrates that hyperthyroidism is associated with an increased activity of focal arrhythmogenic centers, leading to increased premature supraventricular depolarisation and episodes of nonsustained supraventricular tachycardia. Furthermore, the study confirmed a decreased vagal tone in hyperthyroid patients, with induction of greater heart rate variability.
Taken together, these factors constitute the physio-pathologic link between hyperthyroidism and an increased risk of atrial fibrillation. This link is even strengthened further by the fact that in the present study, hyperthyroid patients with structural heart disease were excluded. As a consequence, many elderly hyperthyroid patients were excluded from the study.

Finally, it is reassuring to note that restoration of euthyroidism by treatment was accompanied by a substantial improvement in arrhythmogenic events.

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