

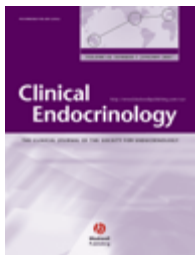
Effects of evening *vs* morning thyroxine ingestion on serum thyroid hormone profiles in hypothyroid patients

1. Nienke Bolk¹,
2. Theo J. Visser¹,
3. Andries Kalsbeek³,
4. Ron T. Van Domburg²,
5. Arie Berghout⁴

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Summary

Objective Standard drug information resources recommend that l-thyroxine be taken half an hour before breakfast on an empty stomach, to prevent interference of its intestinal uptake by food or medication. We observed cases in which TSH levels improved markedly after changing the administration time of l-thyroxine to the late evening. We therefore conducted a pilot-study to investigate whether l-thyroxine

administration at bedtime improves TSH and thyroid hormones, and whether the circadian rhythm of TSH remains intact.

Design Patients were studied on two occasions: on a stable regimen of morning thyroxine administration and two months after switching to night-time thyroxine using the same dose. On each occasion patients were admitted for 24 h and serial blood samples were obtained.

Patients We investigated 12 women treated with l-thyroxine because of primary hypothyroidism, who used no medication known to interfere with l-thyroxine uptake.

Measurements Patients were admitted to hospital and blood samples were obtained at hourly intervals for 24 h via an indwelling catheter. Following this first hospital admission, all women were asked to switch the administration time from morning to bedtime or vice versa. After 2 months they were readmitted for a 24-h period of hourly blood sampling. Blood samples were analysed for serum TSH (immunometric assay), FT4 and T3 (competitive immunoassay), T4 and rT3 (radioimmunoassay), serum TBG (immunometric assay) and total protein and albumin (colourimetric methods).

Results A significant difference in TSH and thyroid hormones was found after switching to bedtime administration of l-thyroxine. Twenty-four-hour average serum values amounted to (mean \pm SD, morning vs bedtime ingestion): TSH, 5.1 ± 0.9 vs 1.2 ± 0.3 mU/l ($P < 0.01$); FT4, 16.7 ± 1.0 vs 19.3 ± 0.7 pmol/l ($P < 0.01$); T3, 1.5 ± 0.05 vs 1.6 ± 0.1 nmol/l ($P < 0.01$). There was no significant change in T4, rT3, albumin and TBG serum levels, nor in the T3/rT3 ratio. The relative amplitude and time of the nocturnal TSH surge remained intact.

Conclusions l-thyroxine taken at bedtime by patients with primary hypothyroidism is associated with higher thyroid hormone concentrations and lower TSH concentrations compared to the same l-thyroxine dose taken in the morning. At the same time, the circadian TSH rhythm stays intact. Our findings are best explained by a better gastrointestinal uptake of l-thyroxine during the night.