

PP-T-03

UNDERSTANDING THE COMPLEX RELATIONSHIP BETWEEN TSH AND FREE THYROXINE

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OBJECTIVES

Guidelines suggest screening for thyroid disease using TSH first before FT4 due to their inverse log-linear relationship. The signal favours TSH over FT4 in a ratio of >100:2. We reassessed this FT4 to TSH relationship following the third-generation TSH assay from Roche.

METHODOLOGY

Consecutive paired TSH/FT4 from ambulatory non-hospitalized subjects assayed on Cobas e801 (Roche) between October 2020 to July 2022 were retrieved from our Laboratory Information System. For duplicate/multiple values from the same individual, the earliest values were retained. Reference intervals for the Roche assays were TSH 0.4-4.0 mIU/L and FT4 10-20 pmol/L. Descriptive statistics, linear and nonparametric (kernel) regression and cross-validation of the results (n = 7484) were performed using the statistical software packages in R 4.2.0.

RESULTS

Linear regression of logTSH against FT4 gave an $r = -0.26$. Nonparametric regression revealed two negative sigmoid curves merging into the euthyroxinemic region. Three different segments were determined: hypothyroxinemic (FT4<10): $\log TSH = 1.75 - 0.15 FT4$ (n = 144; $r = -0.34$, $P < 0.0001$), euthyroxinemic (FT4 10-20): $\log TSH = 0.51 - 0.02 FT4$ (n = 6886, $r = -0.10$, $p < 0.0001$), and hyperthyroxinemic (FT4>20): $\log TSH = 1.89 - 0.09 FT4$ (n = 454, $r = -0.45$, $P < 0.0001$).

CONCLUSION

The relationship between FT4 and TSH is complex. The widely accepted view of a constant gradient of logTSH against FT4 over the whole range of thyroid test values is inaccurate. While the TSH-first strategy is applicable for thyroid dysfunction, two tests may be preferred for euthyroxinemic states in a hospital-based practice.

PP-T-04

CURRENT STATUS AND CHALLENGES IN THE MANAGEMENT OF POST-ABLATIVE HYPOTHYROIDISM DUE TO GRAVES' DISEASE AMONG THAI PATIENTS

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OBJECTIVES

Up to 40% of patients on levothyroxine (LT4) replacement have out-of-range TSH. This study aimed to evaluate TSH and daily LT4 dosage according to body mass index (BMI) in Thai patients with post-ablative hypothyroidism.

METHODOLOGY

We reviewed the medical records of Thai patients treated with radioactive iodine (RAI) for Graves' disease from 2016 to 2020 at Theptarin Hospital. Patients who received LT4 for at least 6 months were included. Serum TSH, FT4 and self-reported compliance were retrieved at the last visit. Daily LT4 dose was calculated based on actual body weight (ABW) compared with estimated lean body mass (LBM) by Hume formula.

RESULTS

A total of 271 patients (female 81.2%, mean age 36.7 ± 7.6 years, LT4 treatment duration 27.1 ± 14.6 months, LT4 1.4 ± 0.5 $\mu\text{g}/\text{kg}$ ABW/day, LT4 2.0 ± 0.7 $\mu\text{g}/\text{kg}$ LBM/day) were analyzed. Only 55.5% of patients achieved within-range TSH on last follow-up. TSH values were above reference range (>4.2 mIU/L) in 15.1% and below (<0.3 mIU/L) in 29.9%. Only 3.3% of all patients frequently missed dose of LT4 more than 15%. Within-range TSH was seen in 46.2% of obese patients (BMI ≥ 30 kg/m^2). There were no differences between daily LT4 doses based on ABW and LBM between within-range and out-of-range TSH groups. Obese patients required a lower daily LT4 dose relative to ABW and LBM to attain euthyroidism (ABW 1.1 ± 0.4 $\mu\text{g}/\text{kg}/\text{day}$ and LBM 1.8 ± 0.6 $\mu\text{g}/\text{kg}/\text{day}$).

CONCLUSION

Almost 50% of patients with hypothyroidism had out-of-range TSH values. In obese patients, both ABW and LBM could be used to guide appropriate LT4 replacement dose.