



ENHANCING THYROID DOSAGE ACCURACY POST-TOTAL THYROIDECTOMY: KEY INFLUENCING FACTORS

General Surgery

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ABSTRACT

Aims and Objectives: To assess optimal thyroxine dosage after total thyroidectomy. **Methods:** This was a hospital-based longitudinal cohort study conducted in the Department of General Surgery, Narayana medical college and hospital, nellore, Andhra Pradesh, India. The study period ranged from 1 October 2023 to 30 September 2024. The relationship between the optimal thyroxine replacement dose and factors such as body weight, BSA, LBM, age, and sex in patients who have undergone total thyroidectomies was assessed and evaluated in this study. **Results:** Of 100 patients who underwent total thyroidectomies, 13 were male and 87 were female. Significant correlations were found with BMI, body weight, Lean Body Mass and Body Surface Area. LBM and BSA had the strongest statistical correlations with the final thyroxine dose. No significant association was observed between age and the final thyroxine dose. **Conclusion:** Calculations based on BSA or LBM provide a more accurate dosage schedule for T4 in post-thyroidectomy patients compared to those based on body weight. This study offers preliminary insights into the calculation of thyroxine replacement therapy. Further randomized controlled trials are needed to confirm our findings.

KEYWORDS

INTRODUCTION

Achieving a clinical and biochemical euthyroid state promptly after a total thyroidectomy is crucial. Traditionally, thyroxine replacement has been based on body weight at a dose of 1.6 µg/kg/day, but this method may not be precise for post-thyroidectomy patients. Research suggests that lean body mass (LBM) and body surface area (BSA) are more accurate predictors of thyroxine needs than actual body weight. There is no consensus on whether age and sex are the best predictors for thyroxine requirements. Additionally, there is limited data on the optimal thyroxine dosage for the Indian population.

Aims and Objectives

To assess the relationship between the optimal thyroxine replacement dose and factors such as body weight, BSA, LBM, age, and sex in patients who have undergone total thyroidectomies for benign multinodular goiters at our institute.

MATERIALS AND METHODS

This was a hospital-based longitudinal cohort study conducted in the Department of General Surgery, Narayana medical college and hospital, nellore, Andhra Pradesh, India. The study period ranged from 1 October 2023 to 30 September 2024. To assess the relationship between the optimal thyroxine replacement dose and factors such as body weight, BSA, LBM, age, and sex in patients who have undergone total thyroidectomies for benign multinodular goiters at our institute.

Inclusion Criteria

Patients who underwent total thyroidectomies for various benign thyroid conditions in the 15-70 age group, both sexes were included.

Exclusion Criteria

Malignancy; acute infections; adrenal disorders; pituitary abnormalities and those taking medications like iron, calcium, antacids and PPIs were excluded in the study.

All patients received a discharge dose of 75 µg of thyroxine and were monitored every two months. During follow-up, clinical examinations and thyroid function tests were conducted, with dosage adjustments made as needed. Patients who maintained a stable biochemical euthyroid status for two consecutive visits were included in the study. Euthyroid status was defined as a TSH level between 0.4 and 4 IU/ml with a normal free T4 level. Data on age, sex, actual body weight, lean body weight, body mass index, and biochemical markers (T3, T4, and TSH) were recorded upon inclusion in the study. Lean body mass

(LBM) was calculated using the Hume formula: for males, $(0.328 \times \text{weight in kg}) + (0.339 \times \text{height in cm}) - 29.533$; for females, $(0.295 \times \text{weight in kg}) + (0.418 \times \text{height in cm}) - 43.293$. Body surface area (BSA) was determined using the DuBois formula: $\text{BSA (m}^2\text{)} = 0.202 \times \text{height (m)} \times \text{weight (kg)}$.

Statistical Analysis

The data were coded and entered in Microsoft Excel. Mean, standard deviation, median and interquartile ranges were used to express quantitative variables. The association between quantitative variables was analyzed using correlation regression and multiple regressions. Data were presented as mean $\pm$ SD. P values <0.05 were considered statistically significant.

RESULTS

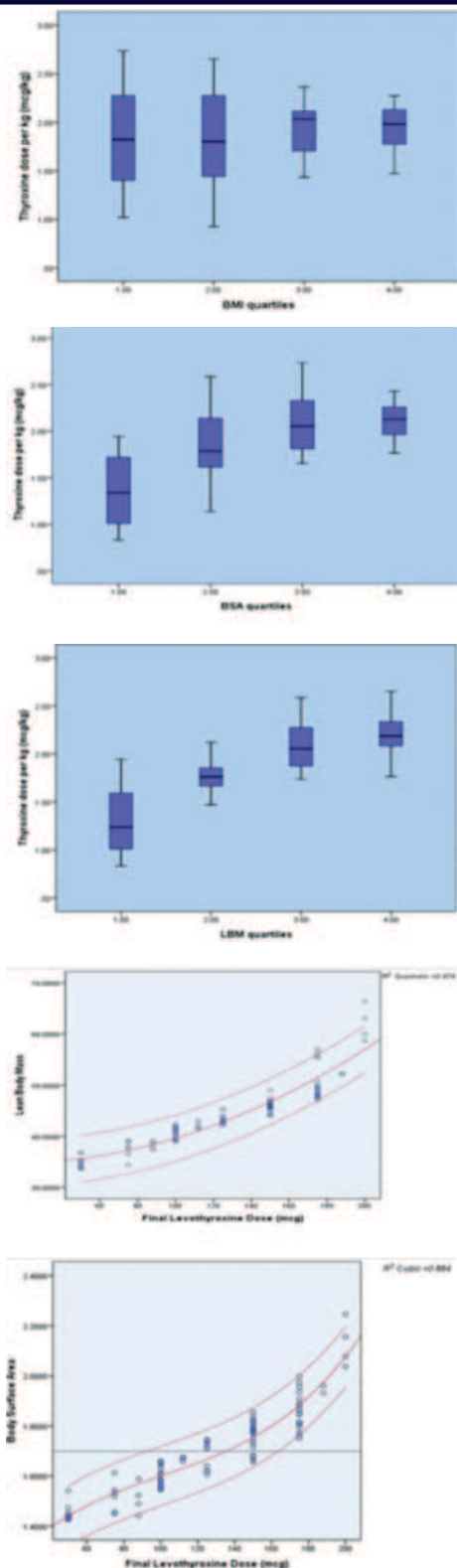
This study evaluated and analyzed a total of 100 patients who underwent total thyroidectomies for benign thyroid conditions. The cohort consisted of 13 men and 87 women, with a male-to-female ratio of 1:6.7. The average age of the patients in the study group was 42.27 ± 11.67 years.

Age Distribution

Age distribution	No. of patients
<30	14
31-40	35
41-50	30
51-60	13
>61	8

Histological variants	Case distribution
Nodular colloid goitre	41
Hashimoto's thyroiditis	33
Lymphocytic thyroiditis	17
Follicular adenoma	9
total	100

parameter	Mean $\pm$ SD	Correlation	P value
age	42.4 $\pm$ 11.67	0.117	0.248
weight	66.42 $\pm$ 12.61	0.833	<0.01
BMI	25.48 $\pm$ 4.27	0.523	<0.01
BSA	1.698 $\pm$ 0.172	0.923	<0.01
LBM	44.15 $\pm$ 6.44	0.921	<0.01



- The mean thyroxine dose per (kg) of body weight was 1.87µg/kg (standard error of mean 0.61).
- The mean thyroxine dose per LBM was 2.79µg/kg (standard error of mean 0.9).
- The mean thyroxine dose per BSA was 72.87µg/m² (standard error of mean 21.5).
- The mean thyroxine dose per body mass index (BMI) was 4.96µg/kg (standard error of mean 1.63).

The thyroxine replacement dose was correlated with several factors: Significant correlations were found with BMI (0.523, $P < 0.01$), body

weight (0.833, $P < 0.01$), LBM (0.921, $P < 0.01$), and BSA (0.923, $P < 0.01$). LBM and BSA had the strongest statistical correlations with the final thyroxine dose. No significant association was observed between age and the final thyroxine dose.

DISCUSSION

LBM and BSA have a strong correlation with thyroxine requirements, displaying linear relationships with the needed dose. Actual body weight also shows a correlation with thyroxine requirements, but this correlation is weaker. The common practice of prescribing a thyroxine dose of 1.6 µg/kg after thyroidectomy originates from treatment protocols for primary hypothyroidism. In the present study, the thyroxine dose based on body weight was 1.87 (± 0.61) µg/kg, which is higher than the commonly recommended dose of 1.6 µg/kg. This dosage also exceeds the typical reported dosage from Western studies, which ranges from 1.5 to 1.6 µg/kg in patients who have undergone total thyroidectomy. Since adipose tissue is metabolically less active, the thyroxine requirement for fat cells is minimal compared to highly metabolically active tissues such as muscles, the brain, and the kidneys. Therefore, it is suggested that the total thyroxine requirement is more closely related to lean body mass rather than overall body weight.

CONCLUSION

Calculations based on BSA or LBM provide a more accurate dosage schedule for T₄ in post-thyroidectomy patients compared to those based on body weight. Our study offers preliminary insights into the calculation of thyroxine replacement therapy. Further randomized controlled trials are needed to confirm our findings.

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