

## A Prospective Study to Calculate a Formula for Thyroxine Replacement Dose after Total Thyroidectomy in Benign Disorders in Indian Population

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### Abstract:

**Background:** Thyroxine replacement after total thyroidectomy poses a potential challenge to clinician and patient and a search for a ready reckoner formula for calculating the same is the need of the hour. The goal of this study was to calculate a definitive formulae to replace thyroxine to get a clinical oriented solution for Post-operative hypothyroidism in Indian population.

**Aim:** To calculate a formula for thyroxine replacement dose after total thyroidectomy in benign disorders in Indian population

### Methods/Design Of The Study:

- Design of the study :- Prospective study
- Material / Selection of Subjects :- The study population consists of 100 consecutive patients admitted in the surgical ward who underwent Total thyroidectomy for benign thyroid disorders

**Results:** A generalized formula of Total required dose after Total thyroidectomy : ( Body weight – Age + 100 ) micrograms has been arrived , considering Age of the patient and Body weight of Indian patient .

**Keywords:** Total Thyroidectomy, Thyroxine replacement dosage

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### I. Background

Thyroxine replacement after total thyroidectomy poses a potential challenge to clinician and patient and a search for a ready reckoner formula for calculating the same is the need of the hour. This may alleviate the post-operative symptoms of hypothyroidism, may prevent more frequent thyroid function tests for titrating the dosage for attaining thyro-normalcy , may help in optimal TSH suppression to prevent recurrence and also may help in improving the quality of life of postoperative patients. The goal of this study was to calculate a definitive formulae to replace thyroxine to get a clinical oriented solution for Post-operative hypothyroidism in Indian population.

### II. Methods/Design Of The Study

- Design of the study :- Prospective study
- Material / Selection of Subjects:- The study population consists of 100 consecutive patients admitted in the surgical ward who underwent Total thyroidectomy for benign Thyroid disorders . Ethical clearance obtained from the Institutional Ethical committee.
- Inclusion criteria: Patients who undergo Total thyroidectomy for benign conditions. Patients aged above 20 years.
- Exclusion Criteria: Patients below 20 years, Malignant goitres.
- Study Procedure: Patients who undergo total thyroidectomy for benign multinodular goiter were enrolled in the study. Preoperative and post-operative Bi-monthly T3,T4,TSH monitoring and dose adjustment for thyronormalcy , were done and documented. Finally a formulae was derived in relation age and body weight of the patient.

### III. Results

Proper titration of the dose of L-Thyroxine was done in all 100 consecutive patients who underwent total thyroidectomy for Multi-nodular goiter and the same was assessed to know the relationship between the dose needed for thyronormalcy in relation with age, body weight and initial TSH dose. TSH target was planned between detectable and 0.1 mU/L. Initially all patients were started on 100 µg thyroxine, later dose titrated

bimonthly till thyronormalcy. 45 % patients attained thyronormalcy with 125 µg . Obese patients and young patients were in need of more dosage of thyroxine. Perfect relations were observed between thyroxine supplementation dose with age and body weight. So the difference in body weight and age was calculated for all patients and a constant factor (K factor) was also calculated to attain the dose of thyronormalcy. It was seen averagely that constant factor (K factor) was found to be  $100 \pm 10$ . Finally a base equation was calculated on the observed facts that “ Required thyroxine dose = Body weight – Age + 100 µg “.

#### IV. Discussion

A perfect study of pharmacokinetics and pharmacodynamics of thyroxine is a pre-study must before calculating the thyroxine formulae. After oral administration of T4 form of thyroxine, 80 % gets absorbed , reaching the peak concentration in serum after 3 hours, with an half life of 7 days. But T3 supplementation orally results in 90 % absorption with serum peak concentration at 2 hours, with fluctuant serum levels and a shorter half life of 19 hours. Zeina et al<sup>1</sup> presented evidence that levothyroxine (L-T4) is the best preparation of choice and TSH target should be between detectable and 0.1 mU/L. Schaffler<sup>3</sup> proved in his study that food retards the absorption of thyroxine. So based on all these facts, we planned T4 form of Levo thyroxine supplementation as once daily dosage in the empty stomach. Zienna<sup>1</sup> proved in his study that TSH suppression is necessary post-operatively , which is otherwise trophic to growth of both normal thyroid cells and malignant thyroid cells. So proper TSH suppression is a must to prevent the recurrence in both benign and malignant goiters after thyroidectomy. Also improper calculation of thyroxine dosage results in fatigability, weight gain, lethargy and Brain fog. So a proper base for calculating thyroxine dosage is a must to improve the quality of life in post-thyroidectomy patients, also to prevent the ugly scarring of surgeon’s name and fame. Judy Jin et al<sup>2</sup> calculated as 1.5 and 1.3 µg/kg based on actual weight as the best estimation for levothyroxine replacement therapy after thyroidectomy and he concluded that a regression model incorporating other patient factors did not produce a more reliable dosing regimen. But we noticed that younger patients and obese patients required more thyroxine dose to attain thyronormalcy. So we included patient factors such as age and body weight into consideration. Many studies have focused on TSH suppression and thyroxine replacement in malignant goiters, but not on benign goiters. But literature survey significantly documents the recurrence of benign multinodular goitre after total thyroidectomy. Mohammed Rabea Abdella<sup>5</sup> et al documented that multinodular goiter is the only significant independent predictor of the recurrence after total thyroidectomy and lack of substitution therapy as one of the promoting factors. Gibelin H et al<sup>4</sup> has studied that higher rate of morbidity were demonstrated after surgery for recurrent goitre . So, we tried to bring out a perfect formulae for thyroxine replacement in thyroidectomy patients in Indian population considering all these facts. As increased body weight and decreased age were seen to be correlating with increased thyroxine requirement, we calculated Body weight – Age and tried to correlate with dose required for thyronormalcy. We tried to calculate a constant factor (K factor) which was averagely found to be  $100 \pm 10$ . So we finally arrived at a base equation for calculating thyroxine dose after thyroidectomy for benign conditions in Indian population as “ **Required thyroxine dose = Body weight – Age + 100µg** “.

#### V. Conclusion

To increase the quality of life of post thyroidectomy patients and to prevent recurrence, and to prevent symptoms of hypothyroidism, a base formula to calculate thyroxine supplementation dose after thyroidectomy for benign conditions in Indian population , has been formulated.

#### References

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