Post Ablative Hypothyroidism in Hyperthyroid Patients: Single Institute Based Observational Study

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ABSTRACT

Objective: To determine the incidence of hypothyroidism after radioactive iodine (131I) ablation of hyperthyroid patients attending the thyroid division of Institute of Nuclear Medicine & Allied Sciences (INMAS), Mitford.

Method: This retrospective observational study was conducted among hyperthyroid patients of INMAS, Mitford, who received radioiodine therapy between the period of 2019 to 2023. A total of 63 subjects of both sexes were included in this study. Patients who received a second dose of radioiodine as therapy and lost to follow-up were excluded. Patient data were collected from the medical records.

Result: The incidence of post-ablative hypothyroidism within six months was 55.45%. Among them, 1.59% became hypothyroid at one month, and 26.98% became hypothyroid at three and six months respectively.

Conclusion: This study showed a high incidence of hypothyroidism within six months of radio-iodine therapy (RAI therapy).

Key words: Hyperthyroidism, thyrotoxicosis, hypothyroidism, radioiodine ablation, anti-thyroid drug.

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INTRODUCTION

Hyperthyroidism is an endocrine disorder characterized by increased thyroid hormone in the blood due to overproduction from the thyroid gland. Thyrotoxicosis is the clinical syndrome of excess thyroid hormone. The incidence of hyperthyroidism is about 25% lower in men than women. People can be affected at any age, but it peaks from 30 to 60 years of age. This condition can affect many systems, and a cardiovascular complication might be fatal. 60–80% of hyperthyroidism is caused by Graves' disease (GD), followed by toxic multinodular goiter (TMNG) and toxic adenoma. Available treatment options are anti-thyroid drugs (ATD), radioiodine ablation therapy (RAIT), and surgery (thyroidectomy) (1, 2).

Each treatment modality has advantages and disadvantages. Hypothyroidism is the most common outcome of all the treatment modalities. ATDs have a lower risk of hypothyroidism compared to RAI or surgery, but their recurrence rate is about 50%–70% in the case of GD. Hypothyroidism is the most desirable side effect of RAI therapy, although attainment of both euthyroid and hypothyroid states are considered successful treatment outcomes for hyperthyroidism in most countries. RAI therapy is considered one of the safest and most cost-effective modalities for hyperthyroidism in the world today (2, 3).

Though there are standard practice guidelines for the treatment of thyroid patients, RAI administration practice varies in different NM institutes, leading to diverse outcomes of the therapy, especially in cases of hypothyroidism. The aim of this study was to determine the incidence of hypothyroidism within six months of RAI therapy at a single institute.

PATIENTS AND METHODS

A total of 63 patients who underwent RAI therapy for hyperthyroidism between 2019 to 2023 at INMAS, Mitford were enrolled in this study. Data were collected from medical records. Patients who came for follow up at 1st, 3rd and 6th months after RAI therapy were included in this study. On the other hand, patients who needed repeated dose of therapy or underwent surgery (partial thyroidectomy) or did not complete all scheduled follow up within six months of therapy were excluded.

At the end of six months, out of 34 females, 18 (52.94%) converted to hypothyroidism, while out of 29 males, 17 (58.62%) converted to hypothyroidism. The conversion of hypothyroidism was more common in males in this study but was not statistically significant (P value = 0.65).

In this study, five (14.28%) patients in the age group <30 years attained hypothyroidism, 22 (62.85%) attained in 30–50 years, and eight (22.85%) attained in >50 years. The correlation between age group and hypothyroidism was not statistically significant (P value 0.55).

Maximum rates (n = 31) of hypothyroidism were seen in GD patients, but they were not statistically significant (P = 0.78). Before going to RAI ablation, goiter was present in 36 (57.14%) patients, and mild ophthalmopathy was present in 24 (38.10%) patients. Conversion to hypothyroidism was more common in the presence of goiter and less common in the presence of ophthalmopathy, but not significant (P values of 0.62 and 0.39, respectively).

Among 54 patients who took ATDS, 29 (53.70%) patients attained hypothyroidism, and out of nine patients who did not take ATDS, six (66.67%) attained hypothyroidism. There was no statistically significant correlation between ATDs prior to RAI therapy and hypothyroidism (P = 0.64).

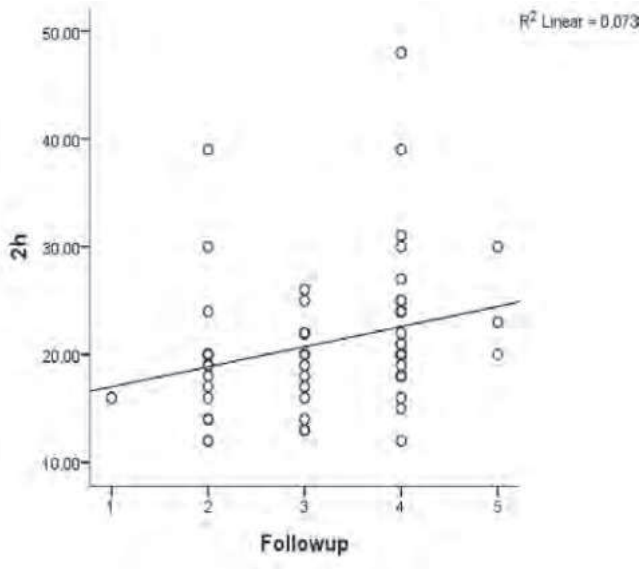

Figure 1: Plot showing negative linear correlation between thyroid uptake and post therapy hypothyroidism. Here, 1- Hypothyroid within 1 month of therapy, 2- Hypothyroid within 3 months of therapy, 3- Hypothyroid within 6 months of therapy, 4-Hypothyroidism not attained and 5- euthyroid state after 6 months of therapy.

Baseline hormone levels had no relation to the attainment of hypothyroidism (the P value for FT4 was 0.12 and for TSH was 0.71). Our study showed a weak negative correlation between RAI uptake and developing hypothyroidism, which is statistically significant (P value -0.007) (Figure 1).

DISCUSSION

RAI therapy has been used for treating primary hyperthyroidism since the 1940s, and now it is one of the most popular modalities for treating GD. RAI destroys the thyroid volume, rendering patients either transient euthyroid or hypothyroid without further therapy or persistent hyperthyroidism that needs repeated doses. Euthyroidism and hypothyroidism are the most expected outcomes of the therapy. In the majority of cases, a single dose leads to lifelong hypothyroidism that needs levothyroxine replacement (1,5).

We found a high incidence (55.45%) of hypothyroidism within six months of therapy, and levothyroxine was started for 1.59% at the 1st month, 26.98% at the 3rd month, and 26.9% at the 6th month. A study conducted in India showed 63.4% of patients became hypothyroid within six months of therapy. Demir et al. found that 78% of patients became hypothyroid within ten months of RAI therapy. All these studies suggest RAI therapy is a safe and effective treatment for hyperthyroidism. Our findings were similar to these studies (4, 7).

Our study showed a negative relationship between RAI uptake and the development of hypothyroidism. Stachura found RAI therapy failure was more common in patients with high radioiodine uptake than in patients with low or moderate radioiodine uptake, which is similar to our study. Several authors suggested that the reason for more treatment failure might be due to the progressive destruction of thyroid tissue with the subsequent release of huge amounts of free hormone (3, 5).

Females are more likely to develop hyperthyroidism. In our data, the majority of patients (53.97%) are female. No statistically significant relationship was found between sex and post-therapy hypothyroidism, which is consistent with most of the studies. Ghadhan et al. reported that gender was not significantly associated with post-therapy hypothyroidism, while Mohamed et al. showed females are less likely to become hypothyroid compared to males. The effect of age on the outcome of RAI therapy is contradictory.

Stachura found younger age is a negative predictor of treatment success, whereas some other studies demonstrated that age did not affect the outcome of RAI therapy (1, 2). Our results also found no statistical relationship between age and treatment outcome.

In order to assess thyroid gland size, we measured the anterior-posterior diameter of thyroid lobes with high resolution ultrasound, but no sonological quantification of thyroid volume was done. We observed no relationship of goiter with treatment response. This finding is similar to Banzal et al. and contradictory to Nair and Nwatsock et al. Besides, baseline ophthalmopathy did not affect the rate of post-therapy hypothyroidism in this study. We also could not find any relationship between post-ablative hypothyroidism and the use of pretreatment ATDs. The results in this aspect are conflicting as ATD was found to be a factor in increasing treatment failure and decreasing the rate of hypothyroidism in a meta-analysis of 14 studies (7, 8, 9).

There are a few limitations to our study. A short follow-up period and heterogeneous patient profile are the first limitations of this work. The second limitation is that it is a single-center study, which may affect the general applicability of the findings. However, this study was conducted in a tertiary center where patients are referred from different parts of the country. We had collected data for six months only, but hypothyroidism may develop even years after therapy. These patients need to be followed up closely to look for relapses in the future.

CONCLUSION

Treatment with RAI therapy has been one of the most important therapeutic modalities for hyperthyroidism for many years. This study showed this modality is very efficient in treating hyperthyroidism, and majority of patients became hypothyroid within a short period of time after therapy. A significant model could not be developed for predicting hypothyroidism using factors such as ATD use, RAI dose, serum TSH, and scintigraphic findings. However, the risk of treatment failure was higher among patients with high iodine uptake. Long-term follow-up is needed to monitor post-ablative hypothyroidism and the recurrence of the disease.

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