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Post Hemi Thyroidectomy Hypothyroidism: Risk Factors and Course

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Abstract

Background: Risk factors for post hemithyroidectomy (HT) biochemical hypothyroidism (BH) and its course are not well understood. The aim of the study was to look at the incidence, risk factors and the course of BH after HT

Material and Methods: Longitudinal observational study at a tertiary care referral centre. Patients undergoing HT (Jan to Dec 2009), having a follow up for 2 years, with no history of head and neck radiation and euthyroid pre op status were included. Serum TSH, FT4, TPO Ab, Anti Tg Ab, FNAC and USG thyroid are performed pre operatively. Post operatively the residual thyroid volume was assessed using USG at 1 week. TSH was performed at one, three, six, twelve months after surgery.

Statistical analysis: SPSS vs. 12 used and appropriate statistical tests applied

Results: Patients (n=92) satisfied the inclusion criteria (14 males and 78 females). The mean age, duration of the goiter, TPO Ab and serum Anti Tg Ab levels were 38.58 ± 9.98 years, 35.08 ± 49.39 months, 43.87 ± 85.7 IU/mL and 2.65 ± 2.28 IU/mL respectively. BH was observed in 43.48% (n=40). Patients who had BH after HT were older, had significantly lower residual thyroid volume and smaller sized involved lobe. Patients with thyroiditis had a relative risk of 1.97 for post operative BH. At one year 23.33% (n=21) had BH.

Conclusions: Post hemithyroidectomy BH is common in older patients with lesser amount of residual thyroid volume. 50% of these recover spontaneously within the first year after surgery necessitating monitoring of thyroxine replacement.

Key Words: Hemithyroidectomy, hypothyroidism, thyroid volume, thyroiditis

Introduction

With the routine use of ultrasound in the assessment of head and neck diseases the incidence of asymptomatic thyroid nodules is on the rise. Due to various reasons like size of the nodule, ultrasound characteristics of the nodules, suspicious fine needle aspiration cytology, old age many of these patients undergo surgery. The two common surgeries performed for benign thyroid nodules are

either hemithyroidectomy (HT) or total thyroidectomy (TT) [1,2]. After TT all patients are started on thyroxine replacement therapy however after HT many of them may not need thyroxine. After HT thyroxine replacement may be temporary in a few or permanent in the remaining. It is necessary to pick up patients who develop biochemical hypothyroidism (BH) after HT so as to prevent frank hypothyroidism. Unrecognized BH leads to increased cardiovascular and neuropsychiatric diseases [5].

The incidence of hypothyroidism after HT is reported to be 9-43% [3,4]. This wide variation depends on many factors including the extent of surgical excision during the HT, cut off value of TSH used and duration of follow up [4]. Most of the surgical centres therefore recall their patients who undergo HT periodically based on the institutional protocols so as to diagnose cases of BH. This however adds to the hospital burden and also causes inconvenience to the patients. If only high risk patients are called for follow up the hospital visits can be decreased in some of the cases of HT. Previous studies have looked into this aspect and put forward many factors which can predict BH like pre operative TSH levels, autoimmune thyroiditis in the excised lobe and presence of anti thyroid antibodies [6]. Some of the patients who develop early post operative BH recover after few months of thyroxine therapy and there after no longer need any supplementation. Ours being a centre in an iodine deficient area [7], with pockets of high prevalence of thyroiditis and goiter [7] we conducted this study on patients who underwent HT. The aim of the study was to look at the incidence, risk factors and the course of early onset of BH after HT.

Material and Methods

Ours is a longitudinal observational study. The study was approved by the institutional ethics committee. The study was conducted in the department of endocrine surgery at Narayana Medical College and Hospital, Nellore, during the period Jan 2009-Dec 2009. All patients undergoing HT during this period were part of the study. HT is offered to patients who have FNAC proven benign nodule in the thyroid but limited to one lobe. Pre operative evaluation of patients who undergo HT included serum thyroid stimulating hormone (TSH), serum free thyroxine (FT4), serum thyroperoxidase antibodies (TPO Ab), serum Anti thyroglobulin antibodies (Anti Tg Ab), fine needle aspiration cytology (FNAC), and ultrasound thyroid (USG). Hemi thyroidectomy is defined as lobectomy, isthmusectomy and pyramidal lobe excision. Thyroid USG is performed one week after surgery to assess residual thyroid volume. Thyroid volume was assessed as described by Shabana W et al [6]. The volume of the remnant thyroid lobe was calculated based on the use of an ellipsoid model. Within the ellipsoid model height, width and depth of the lobe is measured and multiplied. The obtained result is further multiplied by a correction factor which is $\pi/6$ or 0.524 [5]. The final histopathological diagnosis was also included in the analysis. Those who had malignancy in the histopathology and those who needed completion thyroidectomy were excluded from the study. Patients who had euthyroid preoperative status as reflected by normal TSH levels before surgery with no previous history of radiation therapy to the cervical region were included. None of these patients had empirical use of thyroid hormone therapy after surgery. Follow up records up to 2 years after surgery were included in the study. Patients undergo TSH at 1 month, 3 month, 6 month and there after yearly after HT. BH is defined as serum TSH more than 5.5mIU/L.

Statistical analysis

SPSS 12 software was used. Data is expressed as means and standard deviation for continuous variables and as percentages for categorical variables. Comparisons of means were done by independent sample T Test and proportions by Fisher's exact test. P value of <0.05 was considered statistically significant.

Results

A total of 253 patients underwent thyroid surgery during the study period. Records of 92 patients

who underwent HT and satisfied the inclusion criteria were analysed. There were 14 males (15.2%) and 78 females (84.8%). The pre operative FNAC was colloid goiter in 39.1% (n=36), nodular goiter in 34.8% (n=32), follicular neoplasm in 18.5% (n=17) and nodular goiter with Hashimotos thyroiditis in 7.6% (n=7). The mean age was 38.58 ± 9.98 years. Mean duration of the goiter was 35.08 ± 49.39 months. The mean TPO Ab and serum Anti Tg Ab levels were 43.87 ± 85.7 IU/mL and 2.65 ± 2.28 IU/mL respectively. Biochemical hypothyroidism in was observed in 43.48% (n=40). Incidence of hypothyroidism was 42.86% (n=6) among the males and 43.59% (n=34) among females which was not statistically significant. Further comparison of the demographic, biochemical, radiologic and pathological data of the patients who developed BH and those who did not is shown in **Table 1**. Patients who had hypothyroidism after HT were older, had significantly lower residual thyroid volume and smaller sized involved lobe (**Table1**). A significant correlation between post operative hypothyroidism and the residual thyroid volume, age and resected lobe size was noticed. (Pearson's correlation coefficient -.703, .221, -.202 respectively, and $p = 0.001, 0.01$ and 0.02 respectively). The histopathology revealed thyroiditis in two cases and both of them developed hypothyroidism after HT which persisted even at 24 months of follow up. Patients with thyroiditis had a relative risk of 1.97 (95% CI, 1.13-3.45, $p=0.02$) for post operative BH. Multivariate analysis using logistic regression to identify the independent factors for post operative BH revealed that the volume of the unresected lobe was the independent predictor. The patients who developed BH at one month after surgery were followed up. At 3rd and 6th month 34.78% (n=32) and 28.89% (n=26) remained hypothyroid. Patients who remained hypothyroid at one year 23.33% (n=21) remained so even at the 2nd year after HT (**Figure 1**).

Table 1: Comparison of the demographic, biochemical, radiological and histopathological findings in the patients who did and did not develop post hemithyroidectomy hypothyroidism

	Post operative Hypothyroidism present (n=40)	Post operative Hypothyroidism: Absent (n=52)	P=
Age (in years)	41.35± 10.97	36.44 ± 8.66	0.02
Duration of the goiter	32.9 ± 39.04	36.76 ± 56.39	0.7
Sex: Males (n=14)	42.86%	57.14%	NS
Females (n=34)	43.56%	56.44%	
Pre operative Serum TSH (mIU/L)	2.60±1.24	2.16±1.5	0.14
Serum TPO Ab (<09IU/mL)	62.25±94.92	28.56±74.79	0.06
Serum Anti Tg Ab (<04IU/mL)	2.2±1.13	3.07±2.95	0.09
Volume of uninvolved lobe (cm ³)	1.36±0.28	3.02±0.71	0.01
USG size of uninvolved lobe (cm)	2.2±0.65	3.24±0.53	0.01
USG size of involved lobe (cm)	4.82±1.25	5.4±1.31	0.03
Final histopathology showing thyroiditis (n=2)	100%	Nil	-

NS: Not significant

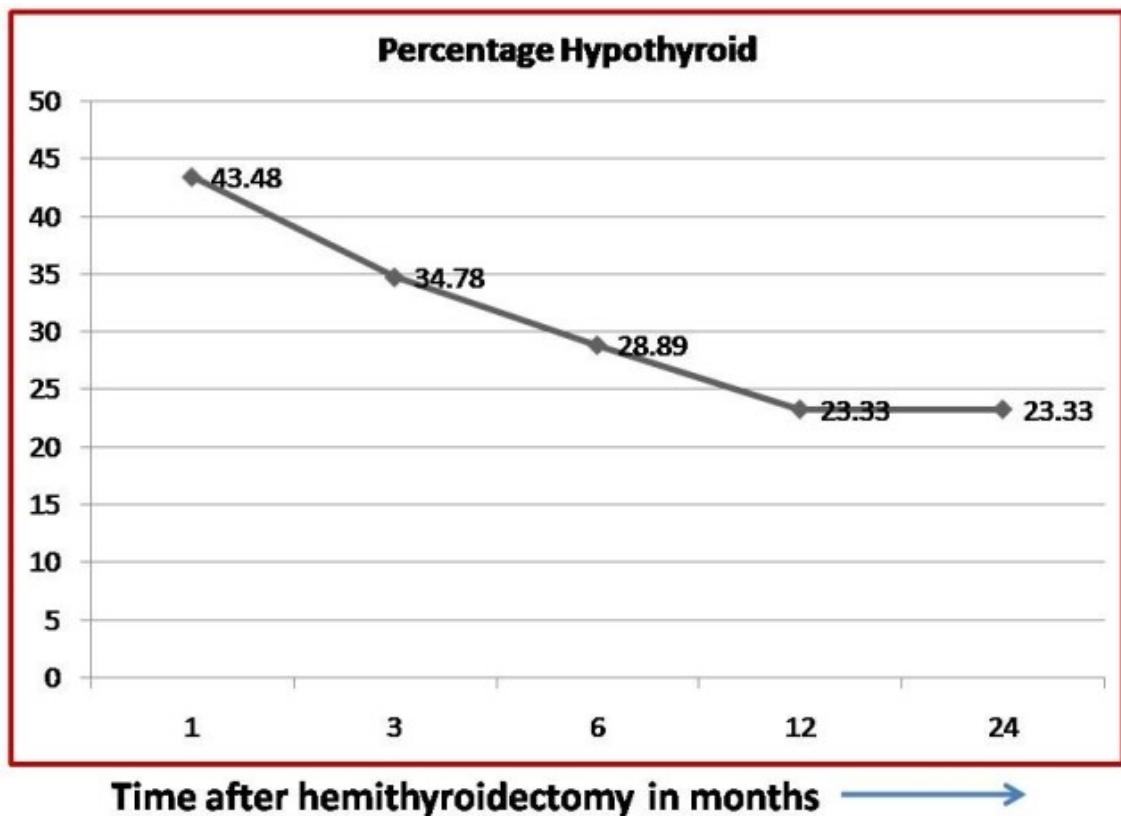


Figure 1 depicts the percentage of patients who were hypothyroid at the different follow up intervals

Discussion

In India, after HT patients are discharged without any definite follow up protocol. Even if followed up TSH estimation is not performed in many of the general surgical/ Otolaryngology units since the occurrence of biochemical hypothyroidism (BH) is not thought of. In some patients after the initial TSH estimation and diagnosis of BH, follow up estimations are not done. This leads to over treatment and development of subclinical hyperthyroidism in a group of post HT hypothyroid subjects who otherwise would have had spontaneous recovery. Many studies have reported varying incidences of post hemithyroidectomy BH (9-43%) [4], however this would be influenced by many factors like age of the patient, presence of thyroiditis and extend of surgery since the definition of HT is not uniform. We had post hemithyroidectomy BH in 43.48% of our patients. This high incidence could be because in all cases the extent of surgery is uniform (Affected lobe, pyramidal lobe and isthmus up to the junction of isthmus and the opposite normal lobe) and performed by single surgeon. Moon et al had BH in 36.6% and Miller et al observed this in 27% after HT. Both these authors had performed unilateral lobectomy along with isthmusectomy in all their cases [9]. Meticulous dissection with deliberate excision of pyramidal lobe and resection of the isthmus flush with the unaffected lobe results in lesser residual thyroid volume which may result in the BH after surgery.

The duration of the goiter was similar in both the groups (**Table 1**). Hence there is no association between long standing goiters and post hemithyroidectomy BH. The incidence of BH after surgery was similar in males and females. Pre operative TSH has been suggested as a predictor for post HT hypothyroidism [9-12]. These studies have suggested that a pre operative TSH levels >3 mIU/L should alert the surgeon for possible post hemithyroidectomy BH. Similarly high pre operative TSH was observed in more than 75% of the patients who became hypothyroid after HT [12]. No such association between the pre operative TSH and post op BH was detected in our series. Similarly we

did not observe a significant difference in the TPO antibodies and Anti Tg Ab levels in the two groups. This is probably due to the fact that there is high incidence of thyroiditis in our area. Increasing age has been a predictor for hypothyroidism and this was seen in our patients too wherein the patients who developed hypothyroidism after HT were found to be older. Similar observations were made by other authors [12,13].

The normal thyroid gland weighs about 25 grams. This tissue produces the required amounts of thyroid hormones for the functioning of the various systems of our body. After HT what really matters is how much of thyroid tissue is left behind in the body and whether the remaining thyroid tissue is normal to produce the necessary hormones under the stimulation of the TSH. This study highlights this aspect especially in an iodine deficient region in South India with high goiter prevalence [7]. We have observed that the volume of the remnant thyroid gland after the HT is the important predictor of possible development of post hemithyroidectomy BH. Moon et al made similar observation from an iodine sufficient area of South Korea [9] however they estimated the remnant gland volume from the pre operative thyroid USG. This may not be an accurate estimation of the remnant gland volume because the remnant depends on how much of the isthmus and pyramidal lobe has been removed. Hence we have taken the post operative USG for the estimation of remnant thyroid volume. Since Moon et al from South Korea had observed the post hemithyroidectomy BH (36.6%) in iodine sufficient patients unlike our series (BH incidence 43.48%) which is in iodine deficient patients the iodination status may not be a significant factor.

We have also observed that the size of the excised lobe was smaller in the patients who developed post hemithyroidectomy BH. However this is in contrast to the observation made by Wan Chu et al [4] and they found that the patients who had excised gland weight >21 gms were more susceptible to development of BH [4]. They postulated that weight of the excised gland reflects the volume of the opposite lobe and that they are directly proportional.

There are other studies which have shown that BH can occur even after 12 months of surgery, the incidence being 3.8% [4]. We have not included the cases which developed late hypothyroidism (more than 3 months after surgery). This is because as the age advances the incidence of hypothyroidism either biochemical or clinical will increase as in the general population wherein no thyroid surgery has been performed. The annual incidence of hypothyroidism was reported as 3.5 per 1000 during a 20 year follow up in the Wickham cohort [14].

Even though the initial BH was seen in 43.48% (n=40); at the end of 12 months only 23.33% (n=21) remained BH necessitating thyroxine therapy. This probably could have been due to the compensatory hypertrophy of the residual thyroid tissue.

To conclude post hemithyroidectomy BH is common. It can be usually diagnosed one month after surgery at the first follow up. Older patients with lesser amount of residual thyroid volume are susceptible to BH. About 50% of these cases of early BH recover spontaneously within the first year after surgery and hence regular monitoring of thyroxine replacement is necessary.

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