

Original Research Article

Hypothyroidism following hemithyroidectomy: a study in a tertiary care hospital, Chittagong, Bangladesh

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ABSTRACT

Background: Hypothyroidism results from insufficient production and secretion of thyroid hormones. This may be due to disturbance within the thyroid gland itself (primary hypothyroidism) or within the hypothalamic-pituitary-thyroid axis (secondary hypothyroidism). The objective of this study is to determine the incidence, risk factors and management of hypothyroidism occurring after hemithyroidectomy for benign non-toxic thyroid disease.

Methods: We conducted a prospective cross sectional study of 50 euthyroid patients with benign non-toxic thyroid disease who had undergone hemithyroidectomy from January 2012 to December 2012 admitted in the department of otolaryngology and Head Neck Surgery, Chittagong Medical College Hospital. All patients were evaluated for age, sex, pre-operative and post-operative TSH levels, histopathology and follow up. Time of diagnosis and therapeutic dose of thyroid hormone were determined for patients with hypothyroidism.

Results: As per this study, the incidence of permanent nerve damage was zero whereas the incidence of temporary neuropraxia was found to be around 0.5%. The incidence of temporary and permanent hypocalcemia was found to be around 0.7% and 0.2% respectively. These complications were found more in obese patients and those with malignancies.

Conclusions: Taking account of the very low incidence of nerve and parathyroid injury in this series, the authors suggest that meticulous capsular dissection is superior to dissection of the entire nerve in avoiding transient nerve damage as well as temporary hypocalcemia. However it is stated that a deliberate search for the nerve is definitely indicated in cases where there is likely to be distorted anatomy, as in infiltrating malignancies and recurrent thyroidectomies.

Keywords: Hypothyroidism, Hemithyroidectomy, Euthyroid, Incidence

INTRODUCTION

Insufficient production and secretion of thyroid hormones causes hypothyroidism. This might be due to disturbance within the thyroid gland itself (primary hypothyroidism) or within the hypothalamic-pituitary-thyroid axis (secondary hypothyroidism).¹ The operation of hemithyroidectomy (total thyroid lobectomy and isthmusectomy with preservation of the contralateral

lobe) indicates for patients with a unilateral thyroid mass that is causing compressive symptoms, cosmetic concern or to exclude thyroid malignancies.² Hypothyroidism may occur after lobectomy if the remaining thyroid lobe does not produce sufficient thyroid hormone to maintain a euthyroid state. Many studies have evaluated thyroid function after hemithyroidectomy for benign thyroid disease. The reported incidence of hypothyroidism after hemithyroidectomy has been found to vary from 5.0% to

49%, with most studies reporting a range of 15-30%.²⁻⁴ This disparity in results is partially due to differences in their definition of hypothyroidism and to differences in length of follow-up. Patients may have subclinical and clinical hypothyroidism. Serum TSH levels should be routinely checked after hemithyroidectomy to detect hypothyroidism. Most of the patients who are found to have an elevated TSH level after hemithyroidectomy will require thyroid hormone replacement therapy. However, some patients may become euthyroid without intervention.⁵ In the past, it was common practice for physicians to place most post-hemithyroidectomy patients on prophylactic thyroid suppression therapy with low-dose levothyroxine. The rationale for the strategy was based on the assumption that the addition of low dose levothyroxine would prevent recurrence of disease in the remaining thyroid tissue by inhibiting endogenous secretion of thyroid-stimulating hormone (TSH). A consequence of this practice was that the administration of levothyroxine prevented physicians from recognizing those patients who would have otherwise become hypothyroid after hemithyroidectomy. In more recent years, physicians usually stopped administering thyroid suppression therapy during the immediate post-operative period. Instead, the new strategy was to follow these patients clinically for signs of recurrence.⁶ Hypothyroidism as a sequel of hemithyroidectomy may remain unnoticed most of the time.⁷ Mild hypothyroidism after hemithyroidectomy may subside after a few months as the remnants of thyroid tissue is stimulated by the rising TSH. Furthermore, post-operative hypothyroidism in patients who had chronic hypothyroidism and do not receive hormone replacement therapy early after operation can be severe. It's still unclear the incidence and risk factors for development of hypothyroidism after hemithyroidectomy.⁸ We conducted a study to identify certain risk factors that may place a patient at a higher risk for developing hypothyroidism after hemithyroidectomy. These potential risk factors includes age, sex, tissue pathology characteristics, the size of thyroid remnant, a history of neck irradiation, and co existing thyroid autoimmune disease.⁹ Post-operative thyroid replacement therapy is initiated usually levothyroxine at 1.8 µgm/kg/day. The dose of levothyroxine is adjusted on the basis of the result of serum thyroid stimulating hormone (TSH) and thyroxine (T4) levels performed 4 to 6 weeks after the thyroid replacement therapy.¹⁰

Objectives

General objective

To find out the incidence of hypothyroidism after hemithyroidectomy in Bangladesh.

Specific objectives

To identify risk factors of hypothyroidism in Bangladesh.

METHODS

We carried out a prospective cross sectional study among 50 euthyroid patients with benign non-toxic thyroid disease who had undergone hemithyroidectomy from January 2012 to December 2012 admitted in the department of otolaryngology and Head Neck Surgery, Chittagong Medical College Hospital. Subject selected by adopting purposive sampling techniques with maintaining some inclusion criteria. Before starting the study, we got approval from the Department of Otolaryngology and Head Neck Surgery, Chittagong Medical College Hospital. We also took written informed consent from the study participants. We performed statistical software SPSS for analyzing data. Chi-square test used for getting comparison and p value.

Inclusion criteria

All patients who underwent hemithyroidectomy in Chittagong Medical College Hospital during the study period aged between 11 to 60 years.

Exclusion criteria

Age range not in 11-60 years, critically ill patients, if patients were not interested to include the study.

RESULTS

From 2012 January to 2012 December total 50 patients underwent hemithyroidectomy in Chittagong Medical College Hospital. The main indication for surgery was exclusion of malignancy, cosmetic consideration and relief of compressive symptoms. Of them 42 (84%) were female, 8 (16%) were male and female (Figure 1) male ratio was 5.25:1. The age of the patient ranged from 18 years to 60 years (mean age 36 years) with a maximum age of patient in 3rd and 4th decade. Only 4 patients (3 females and 1 male) aged below 20 years. Hypothyroidism following hemithyroidectomy developed 22% and remaining 78% were euthyroid (Table 1). Among hypothyroid patient 9 (81.81%) were female and 2 (18.18%) were male. Maximum incidence of hypothyroidism following hemithyroidectomy in 3rd and 4th decade. Compared with those who were euthyroid, there were no significance difference in age, family history of goitre, side of surgery, but post-operative TSH level between two means were significant ($p < 0.01$). The pathological diagnosis after surgery were nodular goitre 5 (45.45%), multinodular goitre 3 (27.27%), hashimotothyroiditis 3 (27.27%) and follicular adenoma 1 (9.09%) (Table 5). The potential risk factors for hypothyroidism in this study were female (82%) and less than 45 years, preoperative mean TSH level 3.14 µIU/l, multinodular goitre (27%), hashimoto thyroiditis (18%) (Table 6). In our study the follow-up schedule was at 6 weeks, 3 months and 6 months after surgery, then yearly thereafter. Among hypothyroid patients 5 (45.45%) were subclinical and 6 (54.54%) were clinical and 9 patients required postoperative levothyroxine therapy.

Table 1: Incidence of hypothyroidism after hemithyroidectomy (n=50).

Diseases	Frequency (%)
Hypothyroid	11 (22)
Euthyroid	39 (78)

Table 2: Incidence of hypothyroidism after hemithyroidectomy according to sex (n=50).

Sex	Total number of patients	Number of patients with hypothyroidism	Percentage (%)
Male	08	02	18.18
Female	42	09	81.81

Table 3: Incidence of hypothyroidism after hemithyroidectomy (age sex relation) (n=50).

Age group	Male	Female	Total number of patients
11-20	0	1	1
21-30	1	1	2
31-40	0	4	4
41-50	1	1	2
51-60	0	2	2

Table 4: Post-operative TSH, age, sex, family history of thyroid disease, side of operation (n=50).

		Post-operative euthyroid (n=39)	Post-operative hypothyroid (n=11)	P value
Post-operative TSH (Mean)		3.06 µIU/l	13.06 µIU/l	<0.01
Age (mean)		35.69	36.27	0.08
		N (%)	N (%)	
Sex	Female	33 (84.61)	9 (81.81)	
	Male	6 (15.38)	2 (18.18)	
Family history of thyroid disease	Yes	5 (12.82)	2 (18.18)	0.14
	No	29 (74.36)	7 (63.64)	
	Unknown	5 (12.82)	2 (18.18)	
Side of operation	Right	22 (56.41)	7 (63.63)	0.08
	Left	17 (43.58)	4 (36.36)	

Table 5: Pathology of resected tissue (n=50).

Histopathology	Post-operative euthyroid (n=39)	Post-operative hypothyroid (n=11)
	N (%)	N (%)
Nodular goitre (adenomatous, goitre, hyperplastic)	23 (58.97)	5 (45.45)
Follicular adenoma	3 (7.69)	1 (9.09)
Multinodular goitre	12 (30.76)	3 (27.27)
Hashimoto thyroiditis	1 (2.56)	2 (18.18)

Table 6: Potential risk factors for hypothyroidism.

Risk Factors	Hypothyroid (n=11)	Euthyroid (n=39)
1. Sex		
	Female	9 (81.81%)
	Male	33 (84.61%)
2. Age (in years)		
	≤45	8 (72.72%)
	>45	3 (7.69%)
3. Pre-operative TSH (Mean)	3.06 µIU/l	2.008 µIU/l
4. Lymphocytic infiltration	1 (9.09%)	1 (2.56%)

Continued.

Risk factors		Hypothyroid (n=11)	Euthyroid (n=39)
5. Histologic type	Nodular goitre	5	23
	Follicular adenoma	1	3
	Multinodular goitre	3	12
	Hashimoto thyroiditis	2	1

Table 7: Preoperative and postoperative TSH level in hypothyroid patient (n=11).

Sl. no	Sex	Age (in years)	Preoperative TSH level μ IU/l	Postoperative TSH level μ IU/l 6 weeks after surgery
1	Female	60	4.29	13.54
2	Female	31	3.31	18.69
3	Female	35	2.91	5.22
4	Female	23	3.90	11.14
5	Female	32	3.41	7.21
6	Female	55	2.87	14.17
7	Female	19	1.47	5.52
8	Female	42	1.97	21.5
9	Female	34	2.66	7.89
10	Male	23	3.50	7.06
11	Male	45	4.30	18.99

Table 8: Classification of hypothyroidism (n=50).

Sub-clinical hypothyroid (TSH level > 4.5 μ IU/l)		Clinical hypothyroid abnormal serum TSH & free T4 concentrations or development of hypothyroidism symptoms	
Number of patient	Percentage (%)	Number of patient	Percentage (%)
5	45.45	6	54.54

DISCUSSION

The operation of hemithyroidectomy is a relatively commonly performed procedure. It is indicated for patients with a unilateral mass to exclude carcinoma, to relieve compressive symptoms or for cosmetic considerations. Hypothyroidism, both clinical and subclinical, is a potential consequence of hemithyroidectomy and is associated with a number of adverse clinical outcomes. The routine use of thyroxine for all patients after surgery is no longer adopted because of questions over its efficacy and possible side effects. Therefore, it is important to identify those patients who are at risk of developing hypothyroidism in the early postoperative period so that they can be more vigilantly monitored using thyroid function tests. There is no universally accepted definition of normal thyroid function, based upon thyroid function assays. For this study, we have adopted a TSH level of 4.5 μ IU/l as the upper limit of normal.^{11,12} Our results demonstrate an incidence of hypothyroidism following hemithyroidectomy of 22% (clinical hypothyroidism was seen in 55% and subclinical hypothyroidism in 45%). All patients are follow up after 6 weeks of surgery and routinely measure Serum TSH level. Risk factors for hypothyroidism following hemithyroidectomy include the female (82%), less than

45 years, preoperative mean TSH level 3.14 μ IU/l, multinodular goitre (27%), Hashimoto thyroiditis (18%). Thyroid function after hemi-thyroidectomy is clearly dependent upon the functional capacity of the thyroid remnant. It would be intuitive to assume that patients with ongoing thyroid disease would be at increased risk of developing subsequent hypothyroidism.¹⁵ Our study demonstrates that a relatively raised (greater than the mean TSH but still within normal limits) preoperative TSH is also associated with an increased risk of developing hypothyroidism. A raised TSH can be interpreted as a reflection of deteriorating thyroid reserve and subsequently an increased risk of developing post-operative hypothyroidism.¹⁵ Our results also support the hypothesis that lymphocytic Infiltration/ Hashimoto thyroiditis is a significant risk factor for the development of hypothyroidism.^{17,18} The presence of lymphocytes in thyroid tissue would indicate active or ongoing disease and therefore the possibility of a progressive decline in thyroid function.¹⁹ Multi-nodular goitre has been associated with an increased incidence of post-operative hypothyroidism.¹⁹ This will also be observed in our study. Multi-nodular goitre is suggestive of an active disease process, it would have to be assumed that it may alter the function of remaining thyroid tissue.¹⁵ In our country maximum incidence of thyroid disease occur in female.

In our study majority of patients are also female and below 45 years of age. Several studies have evaluated thyroid function after hemithyroidectomy for benign thyroid disease. The reported incidence of hypothyroidism after hemithyroidectomy has been found to vary from 5.0% to 49%, with most studies reporting a range of 15-30%.²⁻⁴ Our figures are approximately midway and agree favorably with other studies. This disparity in results is partially due to differences in their definition of hypothyroidism and to differences in length of follow-up. Hypothyroidism, both clinical and subclinical, is a potential consequence of hemithyroidectomy and has been associated with a number of adverse clinical outcomes. However, hypothyroidism after hemithyroidectomy is an under recognized complication, with patients most often monitored only for a short time postoperatively.¹⁵ There is no widely accepted guideline for the monitoring of thyroid function after hemithyroidectomy, leaving hypothyroidism as the most common resulting complication. Follow-up guidelines vary widely and generally consist of a single postoperative measurement of TSH. Some patients may not be examined at all until the development of overt hypothyroidism. If thyroid dysfunction is detected, the decision to start thyroid hormone replacement therapy is usually based on the preference of the treating physician, patient symptoms, and the degree and duration of TSH elevation, rather than on evidence obtained from clinical trials. Therefore, it is important to identify those patients who are at risk of developing hypothyroidism soon after surgery so that they can be more attentively monitored using thyroid function tests.¹⁵ Several recommendation protocol for follow-up after hemithyroidectomy is given below- Postoperative TSH measurement 8 to 12 weeks after surgery, followed by the measurement of TSH levels at 6 months and 12 months after surgery. If the TSH level is normal at 12 months, biannual to annual determination of TSH levels was encouraged unless symptoms of hypothyroidism manifest.¹⁹

Postoperative TSH level should be checked 4 weeks after surgery and again 3 months. At 3 months after operation, the decision regarding prescription of levothyroxine to patients with subclinical hypothyroidism (more than 10 μ IU/ml). After 3 months after operation, the measurement of TSH levels was recommended at 6 and 12 months after surgery. If the TSH level is normal at 12 months, biannual to annual determination of TSH levels could be checked unless symptoms of hypothyroidism manifest.²⁰ To obtain a postoperative TSH measurement for all patients at 6 weeks after surgery, followed by the measurement of TSH levels at 6 and 12 months after surgery was advised. TSH level at 3 months was no longer recommended because most patients displayed marked increase in their TSH level immediately after surgery, that subsequently normalized over time.²¹ Our guide line was measurement of serum TSH level 6 weeks after surgery and again after 3 months. At 3 months after operation, the decision regarding prescription of levothyroxine to patients with subclinical hypothyroidism

(more than 10 μ IU/ml). Then measurement of TSH levels was recommended at 6 and 12 months after surgery. If the TSH level is normal at 12 months, biannual to annual determination of TSH levels could be checked unless symptoms of hypothyroidism manifest.

Limitations of the study

This study needs longer follow up periods to confirm this, but follow up periods of our study were only 6 months. In our study all patients were not completed the follow up with their surgeons. All patients were not operated by single surgeon. Weight of excised gland might reflect the volume of the contra lateral or opposite lobe that was reported to be associated with hypothyroidism. Preoperative measurement of thyroid auto-antibodies which were further variable to predict post-operative hypothyroidism were not performed in our study. In our study all bio-chemical values were not performed in single laboratory which reflected different reference values.

CONCLUSION

The incidence of hypothyroidism after hemithyroidectomy is not negligible and should not be overlooked. Approximately 15-30% of patients who undergo hemithyroidectomy may have this complication, and some may need thyroid hormone replacement therapy. Risk factors such as elevated preoperative TSH levels, elevated concentrations of thyroid autoimmune antibodies, degree of thyroiditis, age, and residual thyroid volume are associated with an increased risk of hypothyroidism after hemithyroidectomy.

Recommendation

Patients at increased risk for postoperative hypothyroidism should be made aware of their risk factors and undergo more intensive follow-up. Need more research with large sample size to address this issue in Bangladesh as well as in the globe.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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