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INCIDENCE OF DEVELOPMENT OF HYPOTHYROIDISM FOLLOWING HEMITHYROIDECTOMY

Surgery

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ABSTRACT

OBJECTIVE: To investigate the incidence, time to onset, and risk factors for the development of hypothyroidism after hemithyroidectomy.

BACKGROUND: The incidence and risk factors for hypothyroidism in patients undergoing partial thyroid surgery remains unclear. Hypothyroidism is an under-appreciated sequel of hemithyroidectomy. The early recognition of this postoperative complication m ay prevent symptom s of hypothyroidism and recurrent thyroid disease.

METHODS: We conducted a prospective observational study of patients undergoing hemithyroidectomy from July 2010 to July 2011 at department of General Surgery, CSM Medical University, Lucknow. Patients were analyzed for age, sex, family history of thyroid disease, pre and postoperative thyroid stimulating hormone (TSH), histological diagnosis, size of residual thyroid gland, histological evidence of thyroiditis, and time period to develop hypothyroidism.

RESULTS: Hypothyroidism was diagnosed in 22.7% of 26 patients. The mean time to diagnosis was within 4.5 months. Patients with postoperative hypothyroidism had a higher incidence of a high-norm al preoperative TSH level. Age, gender, family history of thyroid disease, thyroid pathology, and weight of resected tissue were not significant risk factors for hypothyroidism.

CONCLUSIONS: An incidence of 22.7% is higher than anticipated and all patients should have postoperative thyroid function assessment. However, a high-norm al preoperative TSH levels is indications for close monitoring.

KEYWORDS

Hypothyroidism, Hemithyroidectomy, Thyroid Function Test, General Surgery.

INTRODUCTION

Thyroid hormone is vital for life and lack of it results in a slowing of body's chem ical process and metabolism. It can also lead to serious potential life threatening com plications. It can be caused by variety of diseases and conditions e.g. viral thyroiditis, Hashimoto's or autoimmune, disorders of pituitary gland or due to treatment of thyroid disorders e.g. thyroid surgery or radiation or medication. The incidence and risk factors for the developm ent of hypothyroidism after hemithyroidectomy is unclear. Hypothyroidism is an under-appreciated sequelae of hemithyroidectomy. Making a diagnosis of hypothyroidism after hemithyroidectomy requires a thorough medical history, physical examination and blood tests. Routine thyroid function tests obtained as early as one month after surgery may identify the patient with subclinical as well as clinical or overt hypothyroidism. The early recognition of this postoperative complication prevents symptoms of hypothyroidism or recurrent thyroid discase. We plan to conduct a study to identify the incidence and certain risk factors that m ay place a patient at risk of developing hypothyroidism after hemithyroidectomy. These potential risk factors include age, sex, tissue pathology, characteristic size of remnant and history of neck radiation. Our study also examined the incidence, natural history and factors contributing to hypothyroidism after hemithyroidectomy.

MATERIAL AND METHOD

The present study was a Prospective observational study. All patients undergoing hemithyroidectomy admitted in Department of Surgery (General), CSMMU, Lucknow. A total of 28 patients having age >18 years, undergoing hemithyroidectomy under the supervision of two attending surgeons, euthyroid preoperative status as reflected in norm al thyrotropin level before surgery were included in the study. Patients having age >90 years or having preoperative malignancy, hypothyroidism or hyperthyroidism or history of use of medication known to alter thyroid hormone or serum TSH or who could not be followed up were excluded from the study. Apart from routine haematological and biochemical investigations, the following specific investigations will be carried out:

1. Serum TSH
2. Serum T3
3. Serum T4

Assessment of thyroid function with a serum thyrotropin test at 12", 18th and 24th week after surgery was done. Thyrotropin values higher than 6 m IU/lit were selected to include the patients who were clearly hypothyroid based on serological test results and clinical symptoms. Also, an elevated thyrotropin level (>4-5 m IU/L) can indicate the early development of subclinical hypothyroidism and were subjected to a careful follow-up.

RESULTS

Age of patients ranged from 16 to 55 years. Maxim um number of subjects were aged between 31-40 years (35.7%) followed by those aged between 21 to 30 years (28.6%). A total of 06 (21.4%) subjects were aged <20 years while 04 (14.3%) subjects were aged >40 years. Mean age of the patients was 31.64±10.16 years. More than four-fifth (85.7%) subjects were females. There were only 04 (14.3%) males. M ale to fem ale ratio of the study subjects was 0.17:1. In maximum number of patients (71.43%) the diagnosis was colloid goiter, there were 05 (17.9%) in whom the diagnosis was follicular neoplasm in 03 (10.7%) the diagnosis was adenomatous goiter.

It was observed that exactly half (50%) subjects had involvement of right side while an equal number had involvement of left side and they underwent right and left hemithyroidectomy respectively subsequently. More than two third (67.9%) had >4 cc of uninvolved thyroid whereas slightly less than one third (32.1%) had <4 cc of uninvolved thyroid. Pre-operatively (at baseline) the mean T3 levels was 1.72+0.91 (range 0.43-4.23 ng/dl). Mean T4 level at baseline was 58,57±43.80 (range -17.40-134.00 ng/dl) and mean TSH level was 2.48+1.63 uIU/m l. None of the patients had hypothyroidism at this stage. All the patients were followed up at 12 weeks, 18 weeks and 24 weeks intervals respectively. Comparison of mean T3, T4 and TSH from baseline has been shown in Table 1 below:

Table 1: Comparison of Mean thyroid function test parameters from baseline and different follow up

S.No.	Function	Before procedure		12 weeks after procedure		18 weeks after procedure		24 weeks after procedure	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD
1	T3	1.72	0.91	1.77	0.93	1.81	0.95	1.85	0.68
2	T4	58.57	43.80	61.52	42.25	58.39	42.74	67.44	33.50
3	TSH	2.48	1.63	2.57	1.71	2.82	2.33	2.62	2.02

OVERALLASSESSMENT

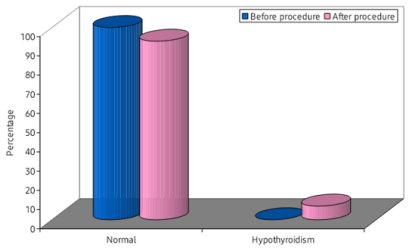
Overall assessment of change in thyroid status of patients have been shown in Table 2 below.

S. No.	Thyroid Status	Before procedure (n=28)		Overall up to 6 Months (n=22)*	
		No.	%	No.	%
1	Normal	28	100	17	77.30

2	Hypothyroidism	00	00	05	22.70

χ^2=5.807; p=0.016

*One patient having thyroid status as hypothyroid at 12 weeks and normal at 24 weeks has been taken as hypothyroid in final assessment.



A significant change in thyroid status was observed during the study period. Overall, among 22 patients in whom outcome upto 6 months were known, there were 5 (22.7%) patients in whom hypothyroidism was observed at any stage. Thus overall prevalence hypothyroidism following hemithyroidectomy in present study was 22.7%.

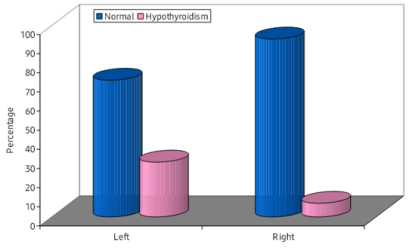
No association between age and hypothyroidism was observed. Out of 14 patients aged <30 years, 3 (21.4%) developed hypothyroidism whereas out of 14 patients aged >30 years, only 2 (13.3%) developed hypothyroidism. Though the proportion of subjects developing hypothyroidism was lower in age group >30 years as compared to those aged 30 years yet the association was not significant statistically (p=0.622).

Hypothyroidism did not develop in any of the m ales (0%). Among females, the incidence of hypothyroidism was 20.8%. Despite this proportional difference between two genders, the difference was not significant statistically (p=0.314).

Table 3: Association between Side and Thyroid status:

S. No.	Side/ Procedure	Normal		Hypothyroid	
		No.	%	No.	%
1	Left/ Left hemithyroidectomy	10	71.40	04	28.60
2	Right/ Right hemithyroidectomy	13	92.90	01	7.10

χ^2=2.191; p=0.163 (Fisher exact test)



All events of hypothyroidism except one took place among those patients in whom left hemithyroidectomy was done. In 1 patient, hypothyroidism developed among subjects undergoing right hemithyroidectomy. On testing the data statistically, no significant association between side and event of hypothyroidism was observed (p=0.163).

Table 3: Association between FNAC findings and Thyroid status

S. No.	Diagnosis	Normal (n=23)		Hypothyroid (n=15)	
		No.	%	No.	%
1	Adenomatous Goiter	02	66.7	01	33.3
2	Colloid Goiter	18	90.0	02	10.0
3	Follicular Neoplasm	03	60.0	02	40.0

χ^2=3.002; p=0.223

The incidence was maximum among those with follicular neoplasm (40%). There were 1 (33.3%) cases of adenomatous goiter and 2 (10.0 %) of colloid goiter who developed hypothyroidism. On testing the significance of difference among different diagnosis, the association between diagnosis and outcome was not significant statistically (p=0.223).

SIZE OF RESIDUAL THYROID GLAND

Table 4: Association between Residual Thyroid size and Thyroid status

S. No.	Residual Thyroid Gland Size	Normal (n=23)		Hypothyroid (n=5)	
		No.	%	No.	%
1	≤4 cc	6	66.7	3	33.3
2	>4 cc	17	89.5	2	10.5

χ^2=2.166; p=0.172 (Fisher exact test)

The incidence of hypothyroidism among those having residual thyroid size <4 cc was 33.3% whereas among those having residual thyroid size >4 cc, the incidence was 10.5%. However, on com paring the data statistically, this difference was not found to be significant (p=0.172).

Histopathology was done in 4 cases who developed hypothyroidism. The findings have been shown as under:
Adenomatous goiter - 01 case
Colloid cystic nodule - 03 cases

DISCUSSION

Hypothyroidism has been mentioned as rare but potential sequelae of hemithyroidectomy in many previous studies. But, the incidence of hypothyroidism and the timing of follow-up investigations after hemithyroidectomy remain uncertain. From a practical standpoint, all patients, who have undergone hemithyroidectomy, have not been followed up in regular schedule. And so, we have felt the necessity of selection of patients at risk of developing the hypothyroidism.

How can we predict hypothyroidism after hemithyroidectomy?

We have speculated that if there were reliable predictors to identify Patients predisposed to the development of postsurgical hypothy roidism, follow-up schedule could be simplified and patients at risk of hypothyroidism would be selected for regular follow-up.

In our study, 22.7% (5/22) had postsurgical hypothyroidism in agreement with previous reports in the literature. It is necessary to wait for at least four to five half-lives before measuring a serum TSH level postoperatively to get an accurate assessment of the thyroid hormone being produced by the residual thyroid lobe because serum TSH has a half-life of about 7 days. To monitor thyroid function after hemithyroidectomy, previous studies recommended assessing serum TSH at the first 12 weeks and again at 4.5 and 6 months post operatively because postsurgical hypothyroidism was usually detected within the first 3 months. Also in this study, most of postoperative hypothyroidism (60%) was detected at 3 months after hemithyr oidectomy. But about 40% (2/5) of postoperative hypothyroidism were detected at 4.5 months after surgery. Therefore, our findings suggest that regular serum TSH follow-up should be continued for at least 6 months after surgery. Our limitation of this prospective study is that we could not have accurate data on late hypothyroidism beyond the first 12 months because, in our practice, no more thyroid function test was recommended without the evidence of hypothyroidism until the postoperative 6 months.

Subjective symptom s associated with hypothyroidism were: fatigability, generalized edema, weight gain and muscle pain. But clinical diagnosis of hypothyroidism is frequently confused with the variety of medical causes that present with similar symptoms and life style. Therefore, the diagnosis of postsurgical hypothyroidism based solely on symptomatic criteria may be unreliable. In our study, 40% of hypothyroid group complained of multiple symptoms associated with hypothyroidism. Most symptom s associated with hypothyroidism were mild and spontaneously resolved with return to a norm al serum TSH level without medication. However, in three patients, long-term thyroxine replacement was needed after surgery due to the persistent elevation of serum TSH and symptomatic com plaints. In our study, there was no relationship found between most of various parameters and subsequent risk of hypothyroidism.

M cHenry and Slusarczyk et al. reported similar findings, with an elevated preoperative thyrotropin level found to be significantly related to the risk of postoperative hypothyroidism. A preoperative

thyrotropin level in the upper-norm al reference range (3.0-3.5 m IU/L) should alert the surgeon to the elevated risk of hypothyroidism developing in the patient in the postoperative period. An elevated thyrotropin level will develop in the vast majority of patients who become hypothyroid (75%) within the first 3 to 6 months after they undergo hemithyroidectomy. One limitation of this prospective study is the inability to accurately define a time frame for the development of late hypothyroidism owing to the variability in obtaining the results of postoperative thyroid function studies and lack of prolong follow up. While the majority of the hypothyroidism developed in our patients in the first 3 to 6 months, it certainly is possible that a portion of the population will develop late hypothyroidism in the ensuing years. In our practice, m any of these patients continue long-term follow-up with their primary care physician or endocrinologist; therefore, we may not have accurate data on late hypothyroidism beyond the first 24 months.

However, preoperative TSH value, degree of lymphocytic infiltration, and presence of thyroiditis were strongly associated with hypoth yroidism.

Curiously, in the present series, hypothyroidism was significantly related to the side of the surgery. More patients who had left hemithyroidectomy became hypothyroid. The similar finding has been also found by *Carlucci Jr et al*, in a study titled "Thyroid Function after Unilateral Total Lobectomy". But it is somewhat difficult to understand. One possible explanation could be the difference in size of the thyroid lobes, suggested by the large series of thyroid ultrasound examinations.

After partial thyroidectomy, the pituitary-thyroid axis undergoes adaptation. There was a general increase in serum TSH at 1 month postoperatively after hemithyroidectomy. Given that the majority of patients who will develop subclinical hypothyroidism will not do so within the first 3 months of surgery without treatment, we believe that a postoperative TSH level should be checked 4 weeks after surgery and again at 3 months. At 3 months after operation, we made the decision regarding prescription of levothyroxine to patients with our current subclinical hypothyroidism (more than 6 IU/m l). After 3 months, our current recommendation is the measurement of thyrotropin levels at 4.5, 6 and 12 months after surgery. If the thyrotropin level is norm al at 12 months, we recommend biannual to annual determination of thyrotropin levels unless symptom s of hypothyroidism manifest.

CONCLUSION

On the basis of observations made during the course of study and their analysis the following conclusions have been drawn from the present study:

1. Overall prevalence of hypothyroidism following hemithy roide ctomy in present study was 22.7%.
2. Majority of subjects undergoing hemithyroidectomy were females. Only 5 (17.9%) subjects were males.
3. Onset of post-surgical hypothyroidism was observed from 12 weeks itself.
4. In 2 out of 5 cases diagnosed as hypothyroid, the status could be reverted to normal without oral thyroxine.
5. No association of age, gender, size of residual thyroid, FNAC finding or side operate could be observed with occurrence of hypothyroidism statistically.
6. No new case was detected at 24 weeks interval. All the cases were detected by 18 weeks. Thus 18 weeks) seem s to be an optimum time interval by which hypothyroidism sets in.

CONFLICT OF INTEREST: None

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