



COMPARISON OF POST OPERATIVE HYPOCALCEMIA FOLLOWING TOTAL THYROIDECTOMY BETWEEN VITAMIN D DEFICIENT AND NON-VITAMIN D DEFICIENT PATIENTS

General Surgery

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ABSTRACT

To compare post-operative hypocalcemia in vitamin D deficiency and non-vitamin D deficiency patients who were undergoing total thyroidectomy. **Methodology:** Patients who are candidates for total thyroidectomy with diagnosis of thyroid malignancies, benign disorders like Grave's disease, multinodular goiter. **Results:** In the postoperative period, forty three (41.66%) patients developed hypocalcemia, 1 patients developed hoarseness of voice and hematoma in 1 patient. Vitamin D deficiency was noted in 45 patients. **Conclusion:** Biochemical hypocalcemia was present among 24.4% patients. There good sensitivity and reasonable specificity in of Vitamin D in predicting Biochemical hypocalcemia.

KEYWORDS

Hypocalcemia, Total Thyroidectomy.

INTRODUCTION

Total thyroidectomy is the treatment for thyroid disorders such as cancer, non-cancerous enlargement of thyroid (goitre) and for overactive thyroid gland (hyperthyroidism). Aesthetic concerns because of the goitre may be an indication for total thyroidectomy¹.

Proponents of limited resection in benign thyroid disease base their arguments on the fact that total thyroidectomy is often associated with a higher complication rate, particularly of recurrent laryngeal nerve injury, hypoparathyroidism, than lesser than total thyroid resections. The factors that increase the complexity of surgery such as Graves disease, large goitres, thyroid cancer, malignant adenopathy in the central neck compartment and previous neck operations have been shown to increase the risk of hypoparathyroidism; causing hypocalcemia².

Hypocalcemia after total thyroidectomy can be either symptomatic or biochemical. Hypocalcemia manifests usually with circumoral or digital numbness and paraesthesia, carpopedal spasm, Chvostek sign, Trousseau's sign, laryngeal spasm, cardiac arrhythmias. 50% cases of transient hypocalcemia has been reported, but permanent hypoparathyroidism occurs only in < 2% of the time and most of the cases present dramatically 2-5 days after the surgery but, very rarely, the onset may be delayed for 2-3 weeks or if a patient with marked hypocalcemia is asymptomatic.³

Many factors are postulated to increase the risk of hypocalcemia, including old age, extent of surgery, thyroid cancers, surgical techniques, concomitant neck dissection, ethnicity, large surgical volumes. Vitamin D plays a critical role in calcium homeostasis. PTH is one of the major regulators of renal 1 α -hydroxylase (CYP27B1) activity and thereby increases the level of active metabolites of vitamin D (1,25-dihydroxyvitamin D; calcitriol) in the circulation; its absence, as in hypoparathyroidism, results in low serum calcium and ultimately manifests itself as symptomatic hypocalcemia^{4,5}.

Aim was to compare post-operative serum corrected calcium levels following total thyroidectomy between vitamin D deficient and non-vitamin D deficient groups.

METHODOLOGY

This study was carried out in Sir Ganga Ram Hospital, New Delhi. Prospective observational study. Patients were observed up to 3 postoperative days.

Inclusion Criteria:

1. Age > 18 yrs undergoing total thyroidectomy for benign and malignant thyroid disorders and were not aware of their vitamin D status.
2. Patients with pre-operative normal calcium levels.

Exclusion Criteria:

1. Patients who were undergoing completion thyroidectomy and patients having past history of parathyroidectomy.
2. pre-existing hypocalcemia.
3. Patients on medications known to affect serum calcium metabolism

Blood sample of 2 ml was taken prior to surgery in yellow colored plain vial (BD vacutainer) in the nuclear medicine department of our hospital using Radio immune assay (R.I.A) by ABBOTT ARCHITECT i analyzer. The participant and the observer were remained blinded to the results. The level of non-vitamin D deficiency in our laboratory was >20 ng/ml and vitamin D deficiency was $\leq$ 20 ng/ml.

Surgical Technique:

Kocher's incision was made over the lower neck. Subplatysmal flaps was be elevated superiorly and inferiorly and the strap muscles (sternohyoid and sternothyroid) was identified and retracted. Once cervical linea alba seen, it was bluntly dissected exposing thyroid gland. Middle thyroid vessels were then divided and thyroid lobe was medially retracted. The superior pedicles on both sides were then divided and ligated close to the gland. After identifying the parathyroid glands, they were carefully dissected from the thyroid and left in the thyroid bed. After identifying the recurrent laryngeal nerve, the inferior vascular pedicles of the thyroid lobe was divided close to the gland and finally the thyroid gland was removed. Obtaining haemostasis in the thyroid bed was imperative, suction drain might be placed and incision closed in layers.

Method Of Outcome Of Interest:

The serum albumin was preoperatively measured and taken for calculating each of serum corrected calcium levels on first 3 postoperative days. Normal level of serum corrected calcium [Measured total serum calcium + 0.8 (4.0 – serum albumin)] in adult was 8.5 to 10.5 mg/dl. The serum corrected calcium level less than 8.0 mg/dl was considered as biochemical hypocalcemia. Among the three post-operative serum corrected calcium levels whichever was the least was taken for the study.

We compared the results of serum corrected calcium levels in both vitamin D deficient and non- vitamin D deficient groups and tried to find out any relation between the preoperative vitamin D levels with postoperative hypocalcemia. A standard postoperative recovery protocol was followed for the discharge. The signs and symptoms of hypocalcemia ranging from peri-oral tingling and numbness to carpopedal spasms and tetany was documented. Postoperatively patients were monitored daily for corrected serum calcium level and symptoms of hypocalcemia for 3 consecutive days starting from postoperative day1. The symptomatic patients were managed according to the standard protocol.



Few Total Thyroidectomy Specimens Of Multinodular Goitre

RESULTS

A total of 90 patients were included. More than one fourth of patients were between 51-60 years (28.9%) followed by 31-40 & 41-50 (21.1%), >60 (15.6%) and <30 (13.3%). Mean age of patients was 46.27 ± 14.04 years. More than half of patients were females (68.9%). Papillary carcinoma thyroid was the most common FNAC finding (27.8%). Follicular Neoplasm was the second most common FNAC finding (6.7%). Hurthel cell Neoplasm and Multi nodular goiter was least common FNAC finding each constituted 1.1%. Multinodular goitre was the most common diagnosis (47.8%). Papillary carcinoma thyroid was the second most common diagnosis (31.1%). GRAVES and Solitary nodule was least common diagnosis each constituted 1.1%. Total thyroidectomy was done among majority of patients (97.8%) followed by Total thyroidectomy + parathyroid gland excision (2.2%). Nodular goiter was the most common HPE finding (32.2%) and Papillary carcinoma thyroid was the second most common HPE finding. GRAVES L Thyroiditis was the least common HPE finding (1.1%) Hypocalcemia was among more than one third of patients (47.8%) followed by Hematoma evacuated & Hoarseness (1.1%). The onset of symptom was in 17.8% at post-operative day 1. Vitamin D deficiency was found among half of patients (50%). The mean vitamin D level was 20.43 ± 10.79 .

The mean duration of oral calcium given was 2.85 ± 2.88 months. Biochemical hypocalcemia was present among 24.4% patients. Mild biochemical hypocalcemia was among majority of patients (72.2%) followed by moderate (22.7%) and severe (4.5%). There was no significant difference in mean post-operative corrected calcium level between with and without vitamin D deficient patients. Biochemical hypocalcemia was higher among Vitamin D deficient patients (33.3%) than without Vitamin D deficient (15.6%).

Table-1

Time periods	Vitamin D deficient	Without Vitamin D deficient	p-value
Post-operative	8.18 ± 0.66	8.52 ± 0.80	0.03*
Post-operative corrected	8.30 ± 0.72	8.67 ± 0.83	0.02*
day 1	8.17 ± 0.66	8.52 ± 0.80	0.03*
day 2	7.87 ± 0.80	8.42 ± 0.90	0.01*
day 3	7.99 ± 0.93	8.45 ± 0.57	0.03*

Table-2

Vitamin D level	Biochemical hypocalcemia				Total	
	Present		Absent		No.	%
	No.	%	No.	%		
<18.5	16	17.8	26	28.9	42	46.7
≥ 18.5	6	6.7	42	46.7	48	53.3
Total	22	24.4	68	75.6	90	100.
Predictive values, % (95%CI)						
AUC	0.69 (0.56-0.82)					
Sensitivity	72.7 (54.1-91.3)					
Specificity	61.8 (50.2-73.3)					
PPV	38.1 (23.4-52.4)					
NPV	87.5 (78.1-96.9)					

DISCUSSION

As in this study, Carvalho et al⁶ (2019) also found that most patients were women and the age range was from 7 to 85 years.

In the current study, FNAC was done in all patients, where 61.1 % patients got negative result, 27.8% patients had papillary carcinoma thyroid being the most common FNAC finding (27.8%) followed by Follicular Neoplasm (6.7%). Hurthel cell Neoplasm and Multi nodular goiter was least common FNAC finding each constituted 1.1%.

In this study, multinodular goitre was the most common diagnosis (47.8%). Carcinoma thyroid is the second most diagnosis among which Papillary carcinoma thyroid was the only cancer diagnosed in our study (31.1%). GRAVES and Solitary nodule were least common diagnosis each constituted 1.1%. Total thyroidectomy was done among majority of patients (97.8%). Nodular goiter was the most common HPE finding (32.2%) and papillary carcinoma thyroid was the second most common HPE finding. GRAVES L Thyroiditis was the least common HPE finding (1.1%).

Vitamin D deficiency was found among half of patients (50%) in the present study. The mean vitamin D level was 20.43 ± 10.79 . A lower incidence of Vitamin D deficiency was reported than by Carvalho et al (2019) in which a total of 390 patients (29%) had vitamin D insufficiency, while 714 patients (53%) had sufficient vitamin D. In the study by Wang et al (2017), the mean vitamin D level of the entire cohort was 16.8 ± 6.89 ng/mL. Of the patients, 23 (12.4%) had serum 25OHD levels of <10 ng/mL, 114 (61.3%) had serum 25 OHD levels of 10–20 ng/mL, and 49 (26.3%) had serum 25OHD levels of >20 ng/mL. There was no significant ($p > 0.05$) difference in albumin level between with and without Vitamin D deficient.

This study showed that post-operative serum calcium level was significantly ($p < 0.05$) lower in all the post-operative periods in Vitamin D deficient patients than without Vitamin D deficient patients. Biochemical hypocalcemia was present among 24.4% patients in this study. The Post-operative corrected calcium level was 8.30 ± 0.72 . Carvalho et al⁶ (2019) postoperative hypocalcemia reported higher than this study in which postoperative hypocalcemia was diagnosed in 357 patients (31.5%). Mild biochemical hypocalcemia was among majority of patients (72.2%) followed by moderate (22.7%) and severe (4.5%).

There was no significant difference in mean post-operative corrected calcium level between with and without vitamin D deficient patients.

In the present study, biochemical hypocalcemia was higher among Vitamin D deficient patients (33.3%) than without Vitamin D deficient (15.6%). The association of post-operative corrected biochemical hypocalcemia with Vitamin D level was nearly significant ($p = 0.05$).

Vitamin D level <18.5 correctly predicted post-operative corrected biochemical hypocalcemia among 17.8% patients with sensitivity and specificity of 72.7% (95%CI=54.1-91.3) and 61.8% (95%CI=50.2-73.3) respectively. Vibhatavata et al⁷ (2020) found that preoperative vitamin D level <19.6 ng/mL could predict significant and symptomatic hypocalcemia in postoperative hypoparathyroidism with sensitivity of 90% and 82% and specificity of 70% and 69%, respectively.

CONCLUSION

Overall, biochemical hypocalcemia was present among 24.4% patients. There is good sensitivity and reasonable specificity of Vitamin D in predicting Biochemical hypocalcemia. However, postoperative calcium and calcitriol replacement should be performed only when the patient develops symptoms of hypocalcemia or when calcium or PTH levels are below normal.

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