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Original Research Article

A study of monitoring of early postoperative serum calcium levels in total thyroidectomy and its role in predicting temporary or permanent hypocalcemia: a prospective observational study

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ABSTRACT

Background: This aim of study was to evaluate the ability of consecutive measurements of serum calcium levels to predict clinically relevant post-thyroidectomy hypocalcaemia and to assess risk factors for post-thyroidectomy hypocalcaemia.
Methods: The study design was a prospective observational study, total 65 patients who undergoing completion or total thyroidectomy. Serum calcium level was measured at the time of first follow up (nearly 20th postoperative day) and patient was examined for signs of hypocalcemia.
Results: In this study, 65 patients of all age group included from 19 years to 78 years. The mean (±SD) age of the patients was 47.65±12.35 years with range from 19 to 78 years. The mean difference of calcium values after 6 hours, 12 hours, 24 hours and 48 hours post-operative period were statistically significant ($p<0.001$) between patients with hypocalcaemia and patient with normokalaemia in unpaired t-test.
Conclusions: There was no significant increase in morbidity (including postoperative hypocalcaemia) in completion thyroidectomy compared to primary total thyroidectomy.

Keywords: Hypocalcemia, Post-thyroidectomy, Serum calcium levels

INTRODUCTION

Total thyroidectomy is the procedure of choice in patients with thyroid cancer, Graves's disease, and toxic multinodular goiter. In recent years, total thyroidectomy has emerged as a surgical option to treat patients with multinodular goiter, especially in endemic iodine deficient regions. Completion thyroidectomy is usually done when a diagnostic thyroid lobectomy or lobectomy is performed for what was thought to be a benign disease such as symptomatic multinodular goiter reveals a differentiated thyroid carcinoma on histopathological examination.[1] In most cases, post-thyroidectomy hypocalcemia is temporary, but may take several months to resolve. A small percentage of cases (0-12%) persist beyond this stage and are considered permanent, although the cut-off time between a temporary and permanent hypocalcemia varies between 6 months to 1 year.[2] However, when it is permanent, the patient is committed to lifelong symptomatic treatment with calcium, and/or Vitamin D. To avoid this complication, the surgeon must make every effort to preserve one or more viable parathyroid glands, particularly while performing total thyroidectomy or subtotal thyroidectomy.[3]

Several studies have been conducted evaluating the role of serial calcium level measurement post thyroidectomy in predicting the occurrence of postoperative

hypocalcemia. Most of these studies were from western population and very few studies were conducted on Indian patients.

This study purpose was to prospectively evaluating the ability of consecutive measurements of serum calcium levels to predict clinically relevant post-thyroidectomy hypocalcemia and to assess risk factors for post-thyroidectomy hypocalcemia.

METHODS

Study design was prospective observational study. Sample size was total 65 patients were included in this study. Study population was patients undergoing completion or total thyroidectomy. Study center was Department of General surgery, Chalmeda Anand Rao Institute of Medical Sciences, Karimnagar. Duration of study was from September 2016 to May 2018

Inclusion criteria

All patients undergoing total thyroidectomy for multinodular goiter, Hashimoto's thyroiditis (without previous history of thyrotoxicosis) and papillary, follicular and medullary thyroid carcinoma (primary hyperparathyroidism excluded before surgery by doing serum PTH and serum calcium) and patients undergoing completion thyroidectomy for malignancy of thyroid diagnosed on histopathological examination after lobectomy or hemithyroidectomy were included.

Exclusion criteria

Patients having preoperative hypocalcemia, patients undergoing hemithyroidectomy and chronic renal failure patients were excluded.

An informed consent was obtained from the patient preoperatively. Preoperative serum calcium level was measured on the evening of day before surgery. Postoperatively serum calcium levels were measured at 6, 12, 24 and 48 hours after surgery, at the time of discharge.

Serum calcium level was measured at the time of first follow up (nearly 20th postoperative day) and patient was examined for signs of hypocalcemia. Patients were started on calcium supplementation and vitamin D, only when they developed symptoms or signs of hypocalcemia. Analysis was made to find out, whether the slope of the curve has significant relationship to the development of temporary hypocalcemia.

Statistical analysis

The data collected regarding all the selected cases were recorded in a Master Chart in Excel sheet. Data analysis was done with the help of computer using SPSS statistical package- Version 22.

Chi square test and Fischer's exact test were conducted to assess the association between qualitative variables. Student's paired' test was used to assess the association between quantitative variables in pre and post op periods. $p<0.05$ were considered significant.

RESULTS

During the study period from September 2016 to May 2018, 65 normocalcemic (>8.6 mg/dl) patients who underwent completion or total thyroidectomy were included in the study. In this study, 65 patients of all age group included from 19 years to78 years. The mean (±SD) age of the patients was 47.65±12.35 years with range from 19 to 78 years (Table 1). The Table 2 shows that among the total subjects, males were 15 (23.1%) and females were 50 (76.9%).

Table 1: Age distribution.

Age group (years)	No of cases	Percentage (%)
Up to 30	5	7.7
31-40	17	26.2
41-50	20	30.8
51-60	16	24.6
Above 60	7	10.8
Total	65	100.0
Range (years)	19-76	
Mean (years)	47.65	
SD (years)	12.35	

Table 2: Sex distribution.

Sex	No. of cases	Percentage (%)
Male	15	23.1
Female	50	76.9
Total	65	100.0

Table 3: Surgery done.

Surgery	No of cases	Percentage (%)
Completion thyroidectomy	5	7.7
Completion thyroidectomy and modified neck dissection	3	4.6
Total thyroidectomy	46	70.8
Total thyroidectomy and central compartment node dissection	4	6.2
Total thyroidectomy and central compartment node dissection and modified neck dissection	4	6.2
Total thyroidectomy and modified neck dissection	3	4.6
Total	65	100.0

Total thyroidectomy was done for 70.8% of the patients; total thyroidectomy and lymph nodal dissection in 16.9% and completion thyroidectomy done in 7.7%; completion thyroidectomy and nodal dissection was done for 4.6%. (Table 3).

Table 4: Calcium values for cases with and without signs.

Calcium value at	Cases with sign (n=16)		Without signs (n=49)		P value
	Mean	SD	Mean	SD	
6 hours	7.72	0.57	8.18	0.64	0.01 (significant)
12 hours	7.33	0.48	8.25	0.47	<0.001 (significant)
24 hours	7.04	0.69	8.29	0.42	<0.001 (significant)
48 hours	6.78	0.45	8.18	0.40	<0.001 (significant)
At discharge	7.32	0.96	8.33	0.32	<0.001 (significant)
At follow-up	7.84	0.72	8.59	0.26	

Table 4 shows the comparison of calcium values after 6 hours, 12 hours, 24 hours and 48 hours post-operative period between patients with hypocalcemia and patients with normocalcemic, the mean (±SD) calcium values after 6 hours, 12 hours, 24 hours and 48 hours post-operative period were 7.72±0.57, 7.33±0.48, 7.04±0.69 mg/dl and 6.78±0.45 mg/dl respectively. The mean difference of calcium values after 6 hours, 12 hours, 24 hours and 48 hours post-operative period were statistically significant ($p<0.001$) between patients with hypocalcemia and patient with normocalcemia in unpaired t-test.

DISCUSSION

In the present study, it was found that the incidence of post-operative hypocalcemia was more in the group of people with age >50 yrs than those in ≤50 yrs age group, but the relation was not statistically significant since p value is 0.42. The results of the present study are comparable to the study done by Basim et al, study shows that the majority of patients above 50 years were at risk of developing postoperative hypocalcemia but the observation was not statistically significant, but contrasting with the study done by Bhattacharyya et al in 2002 which reported that aging was associated with a decrease in defense mechanisms against hypocalcemia.[4] Being older than 50 years was associated with an increased risk of postoperative hypocalcemia in patients who underwent total thyroidectomy.[5]

According to this study 98.0% of female patients developed post-operative hypocalcemia and 86.7% of male patients developed post-operative hypocalcemia. Though the incidence of temporary hypocalcemia was more among female population the difference was not found to be significant with a p value of 0.07.

Li et al conducted a meta-analysis comparing the complication rates between completion thyroidectomy and primary total surgery for differentiated thyroid cancer. Seven studies with a total of 1,208 patients were included. There were no statistically significant differences regarding the presence of temporary recurrent laryngeal nerve (RLN) palsy, permanent RLN palsy, temporary hypocalcemia, permanent hypocalcemia, hematoma and wound infection.[6]

In this study, it showed that there was no significant increase in the incidence of post-operative temporary hypocalcemia compared to total thyroidectomy. Authors could not establish any relation between preoperative hypocalcemia and its relation with incidence of post-operative temporary hypocalcemia since only normocalcemic patients were included in this study.

Baktash et al conducted a study on risk factors for hypocalcemia after completion thyroidectomy in thyroid cancer. They found that rate of hypocalcemia and hypoparathyroidism were comparable to primary total thyroidectomy and a low pre-operative calcium level was a significant risk factor for post-operative hypocalcemia after completion thyroidectomy.[7]

In this study, serum calcium was measured at 6, 12, 24 and 48 hours. The difference in calcium levels was statistically significant ($p<0.001$) between patient with hypocalcemia and normocalcemia. Serum calcium level significantly decreased after total thyroidectomy and most critical time was first 24 to 48 hours of post-thyroidectomy period, as observed in study conducted by Islam et al, where the difference in calcium levels was statistically significant ($p<0.05$) between patient with hypocalcemia and normocalcemia.[8]

Serum calcium level significantly decreased after total thyroidectomy and most critical time was first 24 hours of post-thyroidectomy period. If symptoms and signs of hypocalcemia did not develop in this period, patient is safe and can be discharged from hospital.

CONCLUSION

Serial measurements of serum calcium levels is a cheap and effective way to diagnose early post-operative hypocalcemia and close monitoring and treatment is needed in such patients. Development of hypocalcemia was not related to age (<50 years (or) >50 years).

Although there was a high incidence of postoperative hypocalcemia in above 50 years of age group, the finding was not significant. There was no significant increase in morbidity (including postoperative hypocalcemia) in completion thyroidectomy compared to primary total thyroidectomy. So, completion thyroidectomy, when indicated, can be done with acceptable morbidity compared to total thyroidectomy.

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

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