SAS Journal of Surgery ISSN 2454-5104
SAS J. Surg., Volume-2; Issue-5 (Sep-Oct, 2016); p-199-203
Available online at http://sassociety.com/sasjs/

Original Research Article

Measurement of serum calcium levels as predictor of post op hypocalcemia after total thyroidectomy

Srinivas N.M[1], Vikas. N. Raj[2]
[1]Assistant professor, [2]Post Graduate, Department of general surgery, Bangalore Medical College and Research Institute, Bangalore, Karnataka, India

***Corresponding author**
Vikas. N. Raj
Email: vikasnagaraj@hotmail.com

Abstract: Postoperative hypocalcemia is the most frequent and common complication following total thyroidectomy. It is necessary to diagnose and treat hypocalcemia immediately after total thyroidectomy in order minimizing the post op complications. The aim of study is to measurement of serum calcium levels as predictor of post op hypocalcemia after total thyroidectomy. This prospective study was carried out in the Department of general surgery, Bangalore medical college and research institute, Bangalore, during the period of September 2014 to August 2015. Total of 50 patients included in the study aged between 18 and 70 with irrespective of sex who are undergoing total thyroidectomy surgery for various thyroid disease. Serum calcium levels is measured in all 50 patients preoperatively, immediate post-op, after 24hrs and 48hrs of post-op. Out of 50 patients, 18(36%) developed hypocalcemia. Out of which 15 (83.33%) patients were female and 3(16.66%) were male. Hypocalcemia was predominantly present in female patients who undergoing surgery for malignant thyroid disease. Hypocalcemia was found to occur between 24 and 48hrs of surgery. In our study showed that serum calcium level monitoring helped to predict hypocalcemia and to prevent complication related to post operative hypocalcemia and reduce the hospital stay and financial burden on the patients. In our study we also showed that post operative hypocalcemia most common in female and malignant thyroid disease patients. If patients do not show low serum calcium level or hypocalcemic features within 24 to 48hrs, patient is considered safe and can be discharged with follow up after a week.
Keywords: serum calcium, hypocalcemia, total thyroidectomy, hypoparathyroidism, chronic kidney disease

INTRODUCTION

Total thyroidectomy is generally done for patients with thyroid malignancy or toxic multinodular goiter. Less commonly, it is done for chronic thyroiditis[1]. Total thyroidectomy is associated with specific complications like hemorrhage/hematoma, recurrent laryngeal nerve injury and hypocalcemia[2]. Complications are more often due to some factors, such as gender of the patients, large or intrathoracic goiter and extensive malignancy[3].

Post-thyroidectomy hypocalcemia develops as a result of hypoparathyroidism secondary to parathyroid injury leading to devascularization or inadvertent removal of parathyroid gland during total thyroidectomy[4]. Other postulated explanations include haemodilution, secondary to surgical stress, urinary calcium excretion, calcitonin release and hungry bone syndrome[5]. Disease of thyroid gland is a contributor factor of developing post thyroidectomy hypocalcaemia. Cancer, Hashimoto's thyroiditis, and Grave's disease are high risk disease process that causes more post-thyroidectomy hypocalcemia[6]. Females are major victims of thyroid diseases[7] and hypocalcemia is more common in female after total thyroidectomy[8]. The incidence of hypocalcemia ranges from 1.6% to 50%[9].

Patients with severe hypocalcemia may present with numbness of the extremities, circumoral paresthesias, and/or carpopedal spasm, seizure, laryngospasm and arrhythmias[10]. Hypocalcemia following thyroid surgery is the major factor that determines length of hospital stay[11]. To reduce complications and early discharge, we should be able to identify the patients who will develop symptoms of hypocalcemia[12].

After total thyroidectomy Postoperative hypocalcemia may have a delayed onset[13]. The most common definition of hypocalcemia - serum calcium level is below 2 mmol/L after total thyroidectomy[14]. The lowest serum calcium levels are usually reached at 24 to 48 hours after total thyroidectomy. Hypocalcemia may be delayed[15]. Early postoperative hypocalcemia following thyroid surgery may be due to perioperative hemodilution[16]. The common practice to assess serum calcium concentration daily until a rising trend is

obtained[16]. Close monitoring of serum calcium level has been recommended, for postoperative hypocalcemia[17].

This study prospectively evaluated the ability of consecutive measurements of serum calcium levels to predict clinically relevant post-thyroidectomy hypocalcemia and also, to assess risk factors for post-thyroidectomy hypocalcaemia. The aim of the present study was to determine the patients who are likely to remain normocalcemic so that they can safely discharged earlier.

MATERIALS AND METHODS

A prospective study conducted in department of general surgery, Bangalore medical college and research institute, Bangalore, during the period of. Total of 50 patients included in the study aged between 18 and 70 with irrespective of sex who are undergoing total thyroidectomy surgery for various thyroid disease. After taking written informed consent, a careful history and examination. The details information was recorded by the investigator in a predesigned questionnaire. With all aseptic precaution preoperatively 3ml blood was taken for serum calcium level measurement. Then immediate post-op (20 minutes after total thyroidectomy), after 24 hours & 48 hours of total thyroidectomy, 3 ml blood was taken for serum calcium level measurement.

Statistical analysis was done by unpaired Student t-test using window based computer software devised with Statistical Packages for Social Sciences

Exclusion criteria

- Known case of hypoparathyroidism
- Known case of chronic kidney disease

RESULTS

This study included 50 patients. The mean (±SD) age of the patients was 39.15±13.18 years with range from 18 to 70 years. The table-1 shows the total subjects male was 5 and female was 45. Females are predominant. The fig 1 shows the sex distribution of the hypocalcemic patients. Male was found 3(16.6%) and female was 15(83.33%). Female were predominant. The table 2 shows that hypocalcemia was found in 18(36%) and normocalcemia was found in 32(64%) of the study patients. The table 3 shows that among 18 hypocalcaemic patients asymptomatic hypocalcemia was found in 10 patients and symptomatic hypocalcemia was found in 8 patients.

Table 1: Sex distribution of the study patients

Sex	No of patients	Percentage
Male	5	10%
Female	45	90%
Total	50	100%

Table 2: Distribution of postoperative hypocalcemic and normocalcemic patients

	Number of patients	Percentage
Hypocalcemia	18	36%
Normocalcemia	32	64%
Total	50	100%

Table 3: Distribution of symptomatic hypocalcemic and asymptomatic hypocalcemic patients

	Number of patients	Percentage
Asymptomatic hypocalcemia	10	55.55%
Symptomatic hypocalcemia	8	44.44%
Total	18	100%

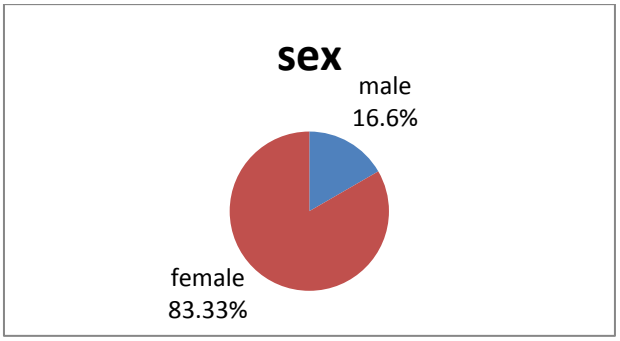

Fig 1: Sex distribution of the hypocalcemic patients

Table 4 shows the hypocalcemia developing time of the hypocalcemic patients. Hypocalcemia was found in 1case immediate post op, 14 developed after 24 hours of total thyroidectomy and 3 developed after 48 hours of total thyroidectomy.

Table 5 shows the hypocalcemia developed in different diseases of the study patients. Hypocalcemia developed 44.0% in papillary carcinoma patients, 38% in multinodular goitre patients, 11% in follicular carcinoma patients and 5% in Hashimoto's thyroiditis patients.

Table 6 shows the serum calcium level (mmol/L) of the all study patients. The mean(±SD) of preoperative calcium level was 2.2±0.2 mmol/L with range from 2.0 to 2.6mmol/L. The mean(±SD) of immediate post op calcium level was 2.0±0.3 mmol/L with range from 1.6 to 2.5mmol/L. The mean of serum calcium level (±SD) after 24 hours of total thyroidectomy was 2.0±0.3 mmol/L with range from 1.5 to 2.5 mmol/L. The mean of serum calcium level (±SD) after 48 hours of total thyroidectomy calcium level was 2.0±0.2 mmol/L with range with 1.5 to 2.6mmol/L.

Table 4: Distribution of postoperative hypocalcemia developing time

Developing time of hypocalcemia	Number of patients	Percentage
Immediate post op	1	5.5%
After 24 hours of total thyroidectomy	14	77.77%
After 48 hours of total thyroidectomy	3	16.66%
Total	18	100%

Table 5: Distribution of hypocalcemia in different diseases

Diseases	Number of patients	Percentage
Papillary carcinoma	8	44.44%
Multinodular goitre	7	38.88%
Follicular carcinoma	2	11.11%
Hashimoto's Thyroiditis	1	5.55%
Total	18	100%

Table 6: Pre- and postoperative serum calcium (Ca++) level of the study subjects at different time interval

Serum calcium (Ca ++) level (mmol/L) of all patients	**Mean ±SD Min -Max**
Preoperative calcium	2.2 ±0.2 (2.0 -2.6)
Immediate post op(20 minutes after total thyroidectomy) calcium	2.0 ±0.2 (1.6-2.5)
After 24 hours (of total thyroidectomy) Calcium	2.0 ±0.3 (1.5-2.5)
After 48 hours (of total thyroidectomy) Calcium	2.0 ±0.2 (1.5-2.6)

DISCUSSION

Postoperative hypocalcemia following total thyroidectomy is a common and major problem. It often increases the duration of the hospital stay and the need for various biochemical tests; when severe, it can lead to serious complications. To focus our study on clinically significant hypocalcemia, we considered as hypocalcemic patients only with a serum calcium level under 2.0 mmol/L or 8.6mg/dl. Postoperative hypocalcemia after total thyroidectomy has been reported to range from 1.6% to 50%.

Approaches to prediction of hypocalcemia are based on serum calcium values at different times after surgery have proven useful[18]. The purpose of this study was to evaluate the ability of consecutive serum calcium level measurements in predicting hypocalcemia at the earliest time after total thyroidectomy.

In this study, a total 50 cases were evaluated. The mean age of the patients was a 39.15 ±13.18 year ranging from 18 to 70 years. In study conducted by Qari FA[19] reported that mean age (mean ± SD) was 39.35 ± 13.97 which is consistent with the study conducted in our institute. In our study, 5 were male and 45 were female. Female's patients most commonly present of thyroid diseases. So, our observation is consistent with the others.

Post op Hypocalcemia is more common in female after total thyroidectomy[8]. In our study, hypocalcemic patients were 18 of which 16.66% were male and 83.33% were female. Females are more prone to develop hypocalcemia. So, study conducted in our institute is in par with other studies.

The incidence of hypocalcemia was 36% after total thyroidectomy. Post-operative hypocalcemia after

total thyroidectomy has been reported to range from 1.6% to 50%[9]. Incidence of post op hypocalcemia in this study was within the international norms. In this study, total hypocalcemic patients were 18. Asymptomatic hypocalcemia was found in 55% patients and symptomatic hypocalcemia was in 45% patients. In a study with 100 study populations, the percentage of symptomatic hypocalcemia was 9%[15] and in the study of Gac EP *et al*[20] with 448 study population, the symptomatic hypocalcemia was 15%.

A Disease of thyroid gland is a contributor factor of developing post-thyroidectomy hypocalcemia. Cancer, Hashimoto's thyroiditis, and Grave's disease are at high risk of developing post thyroidectomy hypocalcemia. Higher incidence of hypocalcaemia with malignant 25% and toxic goitre 11.4% than that in simple nodular goitre 3.6%, the high incidence of hypocalcemia in thyrotoxicosis was also noted by Wingert DJ et al[6]. In our study, hypocalcaemia developed in 44.0% papillary carcinoma patients, 38.0% in multinodular goitre patients, 11.0% in follicular carcinoma patients and 5.0% in Hashimoto's thyroiditis patients. Here, malignancy is main contributor factor of developing hypocalcemia. So, it is consistent with the other study.

Postoperative hypocalcemia following total thyroidectomy may have a delayed onset[13]. The lowest calcium levels are usually recognized 24 to 48 hours after thyroidectomy though hypocalcemia may be delayed[15]. It is usually evident in the first 24 hours[21]. In our study, total hypocalcemic patients were 18. Hypocalcaemia was developed in 1 immediate post op, 14 developed after 24 hours of total thyroidectomy and 3 developed after 48 hours of total thyroidectomy. So, the hypocalcemia developing time is consistent with the others.

CONCLUSION

In our study showed that serum calcium level monitoring helped to predict hypocalcemia and to prevent complication related to post operative hypocalcemia and reduce the hospital stay and financial burden on the patients. In our study we also showed that post operative hypocalcemia most common in female and malignant thyroid disease patients. If patients do not show low serum calcium level or hypocalcemic features within 24 to 48hrs, patient is considered safe and can be discharged with follow up after a week.

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