

Original Research Article

Post-operative hypocalcemia in patients undergoing thyroid surgeries in tertiary care hospital: an observational study

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Received: 27 May 2021

Revised: 24 June 2021

Accepted: 30 June 2021

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ABSTRACT

Background: Post-operative hypocalcaemia is one of the most common complications of thyroid and parathyroid surgery. Temporary hypocalcaemia has been reported to occur in 1.6-50% of the patients undergoing bilateral thyroid resection. Permanent hypoparathyroidism results in 0-13% of patients after bilateral thyroid surgery.

Method: We have analyzed the data of 34 patients undergoing total thyroid surgery (with or without neck dissection) and completion thyroidectomy at the department of ENT and HNS, SMHS hospital over a period of 1.5 years between May 2019 to November 2020.

Results: Hypocalcemia was found in a total of 15 patients out of 34 patients in the post-op period. Among the total patients who developed hypocalcemia 5 (14.7%) were males and 10 (29.4%) were females. Among the patients who developed post-op hypocalcemia 14 patients developed transient hypocalcemia ($p > 0.01$) which is not statistically significant and 1 patient developed permanent hypocalcemia ($p > 0.01$) which also has no statistical significance.

Conclusions: The study suggests that female gender is a strong risk factor for developing post-operative hypocalcemia, other factors that play a role include difference in serum calcium levels in the perioperative period and type of surgery.

Keywords: Post-operative hypocalcemia, Total thyroidectomy, Completion thyroidectomy, Neck dissection

INTRODUCTION

Post-operative hypocalcaemia is one of the most common complications of thyroid and parathyroid surgery. Temporary hypocalcaemia has been reported to occur in 1.6-50% of the patients undergoing bilateral thyroid resection and in 0-35% of patients after parathyroidectomy. Permanent hypoparathyroidism results in 0-13% of patients after bilateral thyroid surgery and in 0-2.2% of patients after successful parathyroidectomy.¹ Various factors account for these differences in the literature, such as the definition of hypocalcaemia, the type of disease, and the surgical technique. Moreover, hypocalcaemia following thyroid resection is somewhat different in origin versus that

occurring after parathyroid surgery. Post-thyroidectomy hypocalcaemia is multifactorial in origin. Among potential factors causing this decrease in serum calcium, there are postoperative hemo-dilution and calcitonin release.^{2,3} The so-called 'hungry bone syndrome' is also implicated in patients with hyperthyroidism or hyperparathyroidism and osteodystrophy.⁴ A moderate, asymptomatic hypocalcaemia is usually observed within 12 hours following unilateral or bilateral thyroidectomy, is associated with serum phosphorus decrease, and recovers spontaneously within 24 hours in most patients.^{2,5} Peri-operative hemo-dilution may be responsible for this decrease and explains its occurrence with other extra cervical operations.² This hypocalcaemia is self-limited, usually asymptomatic, and does not

require supplementation. Elevation of serum calcitonin (calcitonin leak), secondary to manipulation of the thyroid, was suspected to participate in this calcium decrease, but this was not confirmed in further studies.²⁻⁶ Pre-operative hyperthyroid status is associated with decreased gastrointestinal calcium absorption and increased osteoclast activity, with increased bone resorption to maintain serum calcium levels.⁷ The postoperative reversal of osteodystrophy and the accretion of calcium in bones may also contribute to the decreased serum calcium. The serum calcium generally reaches its nadir within 48 hours of surgery. The risk of hypocalcaemia is not alleviated by the correction of hyperthyroidism within a few weeks before thyroidectomy. It is correlated more closely with the pre-treatment serum levels of free thyroxine and with markers of bone turnover rate, such as serum alkaline phosphatase levels.^{2,6} Similarly, hyperparathyroidism is associated with osteoclast activation and increased bone resorption. After thyroidectomy or parathyroidectomy, active calcium uptake by bone may result in postoperative hypocalcaemia. These possible mechanisms of postoperative hypocalcaemia underscore the need for adequate patient preparation before surgery for hyperthyroidism. Prophylactic supplementation should be considered to avoid severe hypocalcaemia in patients with significant osteodystrophy.¹⁶ Nonetheless, it is clear that impaired parathyroid function is the major contributing factor for clinically relevant hypocalcaemia. Proper surgical technique is of the utmost importance in preserving viable parathyroid glands and several factors have been associated with impaired post-operative function.

METHODS

We have analysed the data of 34 patients undergoing total thyroid surgery (with or without neck dissection) and completion thyroidectomy at the department of ENT and HNS, SMHS hospital over a period of 1.5 years between May 2019 to November 2020. Patients of all age groups undergoing total thyroid surgery (with or without neck dissection) and completion thyroidectomy for benign or malignant disease were included in the study. We have excluded patients undergoing lobectomy and hemithyroidectomy during the same period. The data collected was analysed for age distribution, sex distribution, type of surgery and the various indications for undergoing thyroid surgery. We have considered the presence of early hypocalcemia for calcium serum levels lower than 8.0 mg/dl measured 24 hours after surgery.

Serum calcium levels of the patients selected for the study was done in the preoperative period. In the post-operative period serum calcium was done at 6 hrs into the post-operative period, 1st post-operative day, 2nd post-operative day, 3rd post-operative day, 4th post-operative day and at every follow up up to a period of 6 months. All the patients who underwent total thyroidectomy (with or without neck dissection) and completion

thyroidectomy were put on supplemental oral calcium starting with a dose of 3 gm (500 mg tablet given as 2 tablet TID) per day in the post-operative period and the dose was later adjusted as per the serum calcium levels. Based on the serum calcium levels patients were divided into 3 groups: 1) those who did not develop hypocalcemia at any time in the post-operative period until the final follow up at 6 months, 2) those who developed hypocalcemia in the post-operative period but attained normal serum calcium levels by the time of final follow up at 6 months without requiring supplemental oral calcium (labelled as transient hypocalcemia), 3) those who developed hypocalcemia in the post-operative period and failed to attain normal serum calcium levels by the time of final follow up at 6 months and required supplemental oral calcium to maintain normal serum calcium levels (labelled as permanent hypocalcemia).

There were no ethical issues with the study and as such did not require ethical clearance.

Statistical data analysis performed using SPSS software.

RESULTS

We analysed data of a total number 34 patients that underwent thyroid surgery in the study period. Out of the total patients there were 22 women (64.7%) and 12 men (35.3%). Patients' demographic details are given in Table 2 and 3, operative details are given in Table 1, histological findings are given in Table 4 and postoperative events are reported in Table 5, 6 and 7. We divided patients into age groups: 2 (14.7%) patients younger than 20 years, 8 patients (20.8%) aged between 20 and 35 years, 19 patients (26.0%) aged between 36 and 50 years and 5 patients (38.5%) older than 50 years.

Based on the surgeries planned we divided the patients into 3 groups-13 patients (38.2%) underwent total thyroidectomy without neck dissection, 16 patients (47.1%) underwent total thyroidectomy with neck dissection, 5 patients (14.7%) underwent completion thyroidectomy.

Based on final histopathological reports found following results-24 patients (70.6%) were diagnosed with papillary carcinoma, 6 patients (17.6%) with follicular carcinoma, 2 patients (5.9%) with medullary carcinoma and 2 patients (5.9%) with multinodular goitre.

Serum calcium levels lower than 8 mg/dl were found in a total of 15 patients out of 34 patients in the post-operative period. Among total patients who developed hypocalcemia 5 (14.7%) were males and 10 (29.4%) were females. Among patients who developed post-operative hypocalcemia 14 patients developed transient hypocalcemia ($p > 0.01$) which is not statistically significant and 1 patient developed permanent hypocalcemia ($p > 0.01$) which also has no statistical significance.

Table 1: Operative details.

Variables	No.	Percentage (%)
Total thyroidectomy without neck dissection	13	38.2
Total thyroidectomy with neck dissection	16	47.1
Completion thyroidectomy	5	14.7
Total cases	34	

Table 2: Gender.

Variables	Males	Females
Total thyroidectomy without neck dissection	5	8
Total thyroidectomy with neck dissection	5	11
Completion thyroidectomy	2	3
Total	12	22

Table 3: Age details.

Age group (in years)	Total thyroidectomy without neck dissection	Total thyroidectomy with neck dissection	Completion thyroidectomy	Total patients
<20	1	1	0	2
20-35	3	2	3	8
36-50	7	10	2	19
>50	2	3	0	5

Table 4: Histological findings.

Variables	Papillary carcinoma	Medullary carcinoma	Follicular carcinoma	Multi nodular goitre
Total thyroidectomy Without neck dissection	7	1	3	2
Total thyroidectomy With neck dissection	14	1	1	0
Completion thyroidectomy	3	0	2	0
Total patients	24	2	6	2

Table 5: Postoperative events.

Variables	No. of patients	Percentage (%)
Patients without hypocalcemia	19	55.9
Transient hypocalcemia	14	41.2
Permanent hypocalcemia	1	2.9

Table 6: Postoperative events.

Age group (in years)	Patients without hypocalcemia	Transient hypocalcemia	Permanent hypocalcemia	Total patients
<20	1	1	0	2
20-35	4	4	0	8
36-50	11	8	0	19
>50	3	1	1	5

Table 7: Postoperative events.

Variables	Males	Females
Patient without hypocalcemia	7	12
Transient hypocalcemia	5	9
Permanent hypocalcemia	0	1
Total	12	22

DISCUSSION

Hypocalcemia is a frequent complication after thyroid surgery and usually develops within first 24 hours after the surgery. Post-op hypocalcemia can be symptomatic or

asymptomatic. Post-operative hypocalcemia is accepted to be multifactorial; factors like surgical technique, parathyroid iatrogenic damage (injury, edema, infarction, ischemia), extent of thyroidectomy, hyperthyroidism, malignancy, patient gender, perioperative serum calcium drop, presence of thyroiditis, diabetes, number of identified parathyroid gland during surgery can be considered as etiological factors.⁸⁻¹⁰

There are some studies that have found transient hypocalcemia to be associated with advanced age, whereas others reported an association with younger age. A systematic review performed by Edafe et al. Observed

no significant difference in mean age between patients who had transient hypocalcemia and those who did not.¹⁰ In our study we divided the patients who developed hypocalcemia into 4 age groups and did not find much difference between different age groups.

In several studies women were found to have significant higher rates of hypocalcemia.¹⁰⁻¹³ Whereas other studies showed that gender has no significant effect on the incidence of hypocalcemia.^{11,13-16} In our study out of the total patients who developed hypocalcemia 64.3% were females and 35.7% were males.

In study also found patients who had a greater difference between preoperative and postoperative serum calcium levels were prone to develop post-op hypocalcemia while patients in whom difference between preoperative and postoperative serum calcium level is small are less likely to develop postoperative hypocalcemia.

The findings of study are limited due to a small sample size.

CONCLUSION

The study suggests that female gender is a strong risk factor for developing post-op hypocalcemia, other factors that play a role include difference in serum calcium levels in the peri operative period and type of surgery.

All the risk factors detected in our study appear to be very common and not editable before nor during or after surgical procedure. This is the reason why in our department we are used to suggest prophylaxis against symptomatic hypocalcemia (carbonate calcium 1 gm twice a day for seven days) to every patient who underwent thyroid surgery. In our experience, therefore, prophylaxis with calcium during hospitalization and after patient discharge was found to be beneficial both in terms of clinical outcome and in terms of health costs. Since when we started this prophylaxis, we noticed a decreased length of stay and minimization of re-entry.

Funding: No funding sources

Conflict of interest: None declared

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

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Cite this article as: Hafiz A, Maqbool T, Showkat SA, Mehta KS. Post-operative hypocalcemia in patients undergoing thyroid surgeries in tertiary care hospital: an observational study. Int J Otorhinolaryngol Head Neck Surg 2021;7:1293-6.