

Spectrum of Hypocalcaemia after Thyroid Surgery in Dhaka Medical College Hospital

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Abstract

Hypocalcaemia is not a uncommon complication after thyroid gland surgery. The extent of surgery and expertise are the vital factors to determine the spectrum of hypocalcaemia. This study was done to observe the spectrum of hypocalcaemia after different extent of thyroid gland surgery. A total of 70 consecutive patients were enrolled in the study by purposive sampling who received treatment for thyroid disorder in department of ENT and Head Neck Surgery, Dhaka Medical College Hospital, Dhaka, Bangladesh. They underwent different extent of thyroid surgery from January, 2017 to June, 2017. A prospective study was conducted for this 6 months period. A pre-structured, interview and observation based, peer reviewed data collection sheet was prepared. Data regarding sociodemographic, clinical, surgical and outcome profile were recorded. Data were compiled, edited and analyzed with SPSS version 23. Data were presented as mean and standard deviation, frequency percentage and median with range. The mean age of the respondents was 46.79±6.79 years (age range: 36-73 years.). Male to female ratio was 1:2.3. All the patients underwent total, near total, subtotal and

completion thyroidectomy. 35(50%) and 28 (40%) patients underwent surgery due to papillary thyroid carcinoma and multinodular goiter respectively. Total of 30 patients developed hypocalcaemia. Among them, 22(73.33%) developed asymptomatic or mild hypocalcaemia which subsequently developed symptomatic hypocalcaemia (26.67%). Out of these 30 patients, 15(50%) and 10 (33.33%) patients developed hypocalcaemia intraoperative (20 minutes after surgery) and after 24 hours after surgery respectively. Serum calcium level significantly decreases after total thyroidectomy and most critical time is the first 24 hours of post thyroidectomy period.

Keywords: Hypocalcaemia, thyroid disorder, thyroidectomy.

INTRODUCTION

Hypocalcaemia following thyroid surgery is a common complication which may be transient or permanent.¹ It may be termed as 'Post thyroidectomy hypocalcaemia'. Despite careful surgery, 25% patients usually experience this complication.² Among them 30% usually experience arrhythmia, transient hypocalcaemia on first postoperative day.³ The permanent hypocalcaemia are recognized as the post thyroidectomy hypocalcaemia which requires calcium supplementation even after one year of surgery.⁴

This complication may occur due to several factors including injury, devascularization of the parathyroid glands and accidental resection of parenchyma along with incidental parathyroidectomy.⁵ The arrhythmia and several other factors like patient's age (higher incidence among younger age) and gender (women being more prone to calcium and vitamin D deficiency than men) are also attributable factors. These patients may present with numbness of distal extremities, circumoral paresthesias and/or carpopedal spasm, seizure, laryngospasm and arrhythmia.^{6,7,8} Hospital stay may also be prolonged due to hypocalcaemia.⁹

According to the definition of hypocalcaemia serum calcium level must be below 2 mmol/L in case of post thyroidectomy hypocalcaemia.¹⁰ Perioperative hemodilution may be responsible for early post thyroidectomy hypocalcaemia.¹¹

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This study evaluated the frequency of development of hypocalcaemia after thyroid surgery.

MATERIALS AND METHODS

This study was conducted in the department of Otolaryngology & Head Neck Surgery, Dhaka Medical College Hospital, Dhaka from January 2017 to July 2017. It was a prospective study. The sample size was 70. Initially, patients admitted for thyroid surgery were enrolled in the study by purposive sampling. Thereafter, those who fulfilled the inclusion criteria were included in the study. Here only total, near total, subtotal or completion thyroidectomy cases were included. On the other hand, lobectomy, hemithyroidectomy and patients who failed to attend follow up on regular basis, were excluded from the study.

Patients were stratified into the ‘hypocalcemic’ and ‘normocalcaemic’ groups depending on whether they had postoperative calcium level less than 2.00 mmol/L.¹⁰ Mean±SD of intraoperative, after 24 hours and after 48 hours calcium level were 2.1±0.1, 2.2±0.2, and 2.1±0.1 mmol/L respectively.

A pre-structured, peer reviewed and observation based data collection sheet was prepared to collect data. Data regarding sociodemographic, clinical, biochemical, radiological, surgical and post surgical variables were recorded, managed and analyzed.

SPSS (Statistical Packages for Social Science) (version 23.0; SPSS, Chicago) was used for data analysis. Continuous data are represented as mean±standard deviation. To compare continuous variables, mean age and mean operating time were tested using an independent t-test. Chi-square test was used for categorical variables. P value was significant at <0.05.

RESULTS

Table-1 shows baseline characteristics of the patients. Mean age of the patients was 46.79±6.79 years. Male and female patients were 21(30%) and 49(70%) respectively. Male to female ratio was 1:2.3. Most of the patients (75.71%) were from middle class. Only 11 (15.71%) patients came from poor class. Rest of the patients (8.57%) belonged to affluent class. Mean serum calcium level on admission was 2.2±0.2 (mean±SD).

Table-I: Baseline characteristics of the patients underwent thyroid surgery (N=70)

Baseline characteristics	Values
Age (Mean±SD) (in years)	46.79±6.79
Age range (in years)	36 – 73
Sex distribution	
Male	21 (30%)
Female	49 (70%)
Sex ratio (M:F)	1:2.3
Income status	
Poor class	11 (15.71%)
Middle class	53 (75.71%)
Affluent class	6 (8.57%)
Educational status	
Illiterate	6 (8.57%)
Literate	2 (2.85%)
Educated	62 (88.57%)
Habit	
Smoking	19 (27.14%)
Tobacco chewing	22 (31.42%)
Alcohol	1 (1.42%)
Smoking + Tobacco chewing	3 (4.28%)
No addiction	25 (35.71%)
Occupation	
Business	7 (10%)
Service holder	16 (22.85%)
Day Labourer	8 (11.42%)
Garments worker	37 (52.85%)
Others	2 (2.85%)
Associated Medical conditions	
Diabetes mellitus	17 (24.29%)
Hypertension	13 (18.57%)
Heart disease	1 (1.43%)
Cerebrovascular disease	0 (0%)
Impaired renal function	0 (0%)
Diagnosis of thyroid disease	
Papillary carcinoma	35 (50%)
Multi nodular goitre	28 (40%)
Fallicular carcinoma	4 (5.71%)
Medullary carcinoma	2 (5%)
Hashimoto’s thyroiditis	1 (1.43%)
Incidence of hypocalcaemia	42.86%
Gross calcium level on admission (mean±SD) (mmol/L)	2.2±0.2
Range (mmol/L)	2 – 2.6

Table-2 shows that 22(73.33%) patients were found as asymptomatic or with mild hypocalcaemia whereas rest 8(26.67%) of the patients were found with symptomatic hypocalcaemia. Among these 8 patients, 6(75%) had moderate hypocalcaemia and 2(25%) patients were with severe hypocalcaemia

Table-II: Distribution of severity of hypocalcemic patients (n=30)

Severity of hypocalcaemia	Frequency (%)
Asymptomatic/ Mild hypocalcaemia	22 (73.33%)
Symptomatic hypocalcaemia	8 (26.67%)
Moderate	6/8 (75%)
Severe	2/8 (25%)
Total	30 (100%)

Table-3 shows that out of 30 patients, 15(50%) were diagnosed after 20 minutes of resection (intraoperative period). Other 10(33.33%) and 5(16.67%) patients were found with hypocalcaemia after 24 hours and 48 hours of surgery respectively.

Table-III: Distribution of postoperative hypocalcaemia developing time (n=30)

Developing time of hypocalcaemia	Frequency (%)
Intraoperative (20 minutes after surgery)	15 (50%)
After 24 hours of surgery	10 (33.33%)
After 48 hours of surgery	5 (16.67%)
Total	30 (100%)

Table-4 shows different indications of thyroid surgery where patients developed postoperative hypocalcaemia. Among them the highest incidence of hypocalcaemia was found in papillary thyroid malignancy (43.33%) followed by multinodular goiter (33.33%). Hashimoto's thyroiditis contributed to the lowest number (3.33%).

Table-V: Serum calcium (Ca ++) level (mmol/L) all patients (n=70)

Serum calcium level	Mean±SD(mmol/L)	Range
Preoperative calcium	2.2 ± 0.2	2.0-2.6
Intraoperative calcium (20 minutes after surgery)	2.0 ± 0.2	1.6-2.5
After 24 hours (of surgery) Calcium	2.0 ± 0.3	1.5-2.5
After 48 hours (of surgery) Calcium	2.0 ± 0.2	1.5-2.6

Table-IV: Distribution of patients in relation to different thyroid diseases and surgery (n=70)

Diagnosis	Extent of surgery	Percentage
Papillary thyroid carcinoma (n=35)		
Total	24 (68.57%)	9 (37.5%)
Completion	11 (31.43%)	4 (36.36%)
Multinodular goitre (n=28)		
Total	24 (85.71%)	8 (33.33%)
Near total	4 (14.28%)	2 (50%)
Follicular carcinoma (n=4)		
Total	4 (100%)	4 (100%)
Medullary (n=2)		
Total	2 (100%)	2 (100%)
Hashimoto's thyroiditis (n=1)		
Total	1 (100%)	1 (100%)

Figure-1 shows that postoperative hypocalcaemia was found in 30 patients. Of them 24 (80%) patients had total thyroidectomy

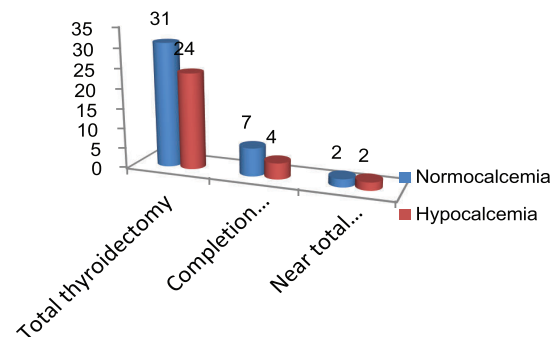


Figure-1: Distribution of postoperative serum calcium status depending on type of thyroid surgery (n=70)

Table-5 shows that level of serum calcium during preoperative, peroperative and postoperative period.

Table-VI: Comparison of intraoperative, after 24 hours and after 48 hours calcium (Ca++) level between hypocalcaemia and normocalcaemia patients (n=70)

Serum calcium level (mmol/L)	Mean±SD		P-value
	Hypocalcaemia pt. (mmol/L) (n=30)	Normocalcaemia pt. (mmol/L) (n=40)	
Intraoperative calcium	1.9 ± 0.2	2.1 ± 0.1	0.001 ^s
After 24 hours calcium	1.8 ± 0.2	2.2 ± 0.2	0.001 ^s
After 48 hours calcium	1.8 ± 0.1	2.1 ± 0.1	0.001 ^s

S=Significant p value reached from unpaired t-test. p value is significant at <0.05

Table-VI shows intraoperative and postoperative serum calcium levels. Out of 70 patients, 40 maintained normal serum calcium level. Only 30 patients showed altered level of serum calcium during intraoperative and post operative periods.

DISCUSSION

Gourgiotis S et al. in their study showed that incidental parathyroidectomy during thyroid surgery is 8-21.6%.¹² It causes permanent hypocalcaemia which requires calcium supplementation for longer period. On the contrary, temporary or transient hypocalcaemia is limited to the first week following surgery.¹³ Several factors like definition of hypocalcaemia, the type of thyroid disease and the surgical technique for thyroidectomy are responsible to determine the exact post thyroidectomy hypocalcaemia.¹⁴ Some authors deal with symptomatic hypocalcaemia whereas some others include asymptomatic biochemical hypocalcaemia associated with transient hypoparathyroidism.¹⁵ To focus our study, we assumed serum calcium level <2.0mmol/L as hypocalcaemia.¹⁰

In this study, a total 70 cases were evaluated. The mean age of the patients was 40.15 ±13.18 years which is consistent with the study of Qari FA.¹⁶ In this study, 21 were male and 49 were female. The male-female ratio was 1:2.3 which is consistent with the studies of Deditis RA.¹⁷ Hypocalcaemia is more common in female after total thyroidectomy. In our study, hypocalcemic patients were 30 in numbers, of which 30.0% were male and 70.0% were female. Females are more prone to develop hypocalcaemia. Our findings are consistent with the findings of Fahmy FF.¹⁸

Hypocalcaemia was found in 43.63% cases after total thyroidectomy which is consistent with the findings of Abboud B.¹⁹ Asymptomatic hypocalcaemia was found in 73.33% patients which is consistent with the findings of Markuszewska MP and Gac EP et al.^{20,21}

Diseases of thyroid gland is a contributing factor of developing post-thyroidectomy hypocalcaemia. Cancer, Hashimoto's thyroiditis, and Graves' disease are high risk disease processes that cause more post-thyroidectomy hypocalcaemia. Higher incidence of hypocalcaemia with verve malignant 25% and toxic goitre 11.4% than that in simple nodular goitre 3.6%. High incidence of hypocalcaemia in thyrotoxicosis was also noted by Lindblom P et al.¹¹ In this study, hypocalcaemia developed in 43.33% papillary carcinoma patients, 33.33% in multinodular goitre patients, 13.33% in follicular carcinoma patients, 6.67% in medullary carcinoma patients, and 3.33% in Hashimoto's thyroiditis patients. Our findings are consistent with the findings of Lindblom P et al.¹¹

Postoperative hypocalcaemia may have a delayed onset.²² The lowest calcium levels are typically recognized 24 to 48 hours after thyroidectomy though hypocalcaemia may be delayed.²⁰ It is usually evident in the first 24 hours.²³ Out of 30 hypocalcemic patients 15 patients developed hypocalcaemia intraoperatively, 10 developed after 24 hours of surgery and 5 developed after 48 hours of surgery which is consistent with the findings of Markuszewska MP et al and Leahu A et al.^{20,23} The mean difference of intraoperative, after 24 hours and 48 hours calcium level were statistically significant (p<0.05) between patients with hypocalcaemia and patients with normocalcaemia in unpaired t test.

CONCLUSIONS

Serum calcium level significantly decreases after total thyroidectomy and most critical time is the first 24 hours of post thyroidectomy period.²⁰ Hypocalcaemia developed more in female and in malignant thyroid diseases.¹¹ If clinical sign symptoms of hypocalcaemia are not developed in this period, patient is considered safe. This can help patients to be discharged early as well as close monitoring of serum calcium level and thereby early calcium supplementation.

Finally, we can conclude that hypocalcaemia after thyroid surgery mostly depends on skill and experience of surgeons and availability of logistic support in operation theatre.

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