International Surgery Journal
Thottath D et al. Int Surg J. 2021 Nov;8(11):3269-3273
http://www.ijsurgery.com
pISSN 2349-3305 | eISSN 2349-2902

DOI: https://dx.doi.org/10.18203/2349-2902.isj20214072

Original Research Article

Incidence of hypocalcaemia among post-thyroidectomy patients at a tertiary care hospital at Trivandrum, Kerala, South India

Deepu Thottath[1]*, Dayananda Babu[2], Saravanan Thangavel[1], Radhika Kannan[3]

[1]Department of General Surgery, [3]Department of Community Medicine, PK DAS Institute of Medical Sciences, Palakkad, Kerala, India
[2]Department of General Surgery, Sree Gokulam Medical College, Venjaramoodu, Trivandrum, Kerala, India

Received: 01 October 2021
Accepted: 08 October 2021

***Correspondence:**
Dr. Deepu Thottath,
E-mail: dipuus07@gmail.com

ABSTRACT

Background: Hypocalcemia is one of the most common complications of thyroid surgery. It is usually temporary, but it may rarely take several months to resolve. The aim of this study was to determine the incidence of hypocalcaemia after total thyroidectomy and assess the biochemical factors that may be predictive of hypocalcemia.
Methods: An observational study was conducted in 98 patients at the general surgery department of a tertiary care medical college hospital for a period of one year. Convenient method of sampling was done. All the patients undergoing total thyroidectomy were included in this study. The serum calcium level was evaluated at different times in the post-operative period as a part of the routine post-operative care at the hospital. During the postoperative period patients were carefully watched for clinical symptoms and signs of hypocalcemia.
Results: In the study group, 19 (19.4%) had hypocalcemia. In the study group, 14 (14.3%) had symptomatic hypocalcemia and 5 patients (5.1%) had asymptomatic hypocalcemia. 18 patients (18.4%) had temporary hypocalcemia and 1 patient (1%) had permanent hypocalcemia. Among the patients with hypocalcemia, 18 (95%) were females and 1 (5%) patient was male. 13 (68%) patients were euthyroid, 5 (26%) patients were hyperthyroid and 1 (5%) patient was hypothyroid. Significant association was seen between diagnosis of thyroid disorders and hypocalcemia, thyroid function and hypocalcemia and between operating time and hypocalcemia.
Conclusions: Incidence of hypocalcemia in patients who had undergone total thyroidectomy was found to be less. Majority of them had temporary hypocalcemia and permanent hypocalcemia was seen only in one patient.

Keywords: Hypocalcemia, Post-thyroidectomy, Thyroid surgery

INTRODUCTION

Thyroidectomy is one of the most commonly done surgical procedures all over the world. It is a very safe operation and mortality is nearly zero other than those associated with complications of general anaesthesia.[1,2] The complications of thyroidectomy such as injury to recurrent laryngeal nerve and/or the superior laryngeal nerve, hypoparathyroidism and airway obstruction remain a matter of concern especially in younger patients who have long life expectancy.[3]

Hypocalcemia is one of the most common complications of thyroid surgery. The incidence varies according to the differences in defining hypocalcemia and the laboratory ranges for normocalcemia. Various causes for postoperative hypocalcemia include haemodilution or increased urinary calcium excretion secondary to surgical stress, endothelin release following manipulation of thyroid and parathyroid leading to decreased parathormone secretion, active calcium uptake by bone after surgery through mechanism called hungry bone syndrome and interference with the functioning of the

parathyroid glands either through direct injury, removal or devascularisation.[1-4]

In most cases, hypocalcemia following thyroidectomy is temporary, but rarely it may take several months to resolve.[5] A small percentage persist beyond this stage and are considered permanent, the cut-off time between temporary and permanent hypocalcemia varies between six months to one year.[6-10] Large volume goiter, total thyroidectomy, recurrent goiter, retrosternal extension, advanced cancer, hyperthyroidism and experience of the surgeons are the risk factors predisposing to post−thyroidectomy hypocalcaemia.[11]

Hypocalcemia presents with signs of generalized neuromuscular irritability including paresthesia, muscle cramps, laryngospasm, tetany and seizures. This neuromuscular instability can also be elicited by Chvostek's sign and Trousseau's sign. Both Chvostek's sign and Trousseau's sign are time-honoured physical predictors that are well- chronicled in medical history to be frequently associated with hypocalcemia.[12,13]

The aim of this study was to determine the incidence of temporary and permanent hypocalcaemia after total thyroidectomy and assess the clinical and biochemical factors that may be predictive of hypocalcemia.

METHODS

An observational study was conducted at the General surgery department of a tertiary care medical college hospital at Trivandrum, Kerala for a period of one year from November 2012 to November 2013. Convenient method of sampling was done. All the patients undergoing total thyroidectomy in the general surgery department of the tertiary care hospital was included in the study. All patients with history of previous thyroid and parathyroid surgeries, endocrine and electrolyte abnormalities were excluded from the study. Sample size was calculated to be 98 using the formula given.

$$n = \{z^2(p \times q)/d^2\}$$

Where z=1.96 (for 95% confidence interval), p=prevalence of hypothyroidism in post-operative period, q=100-p, and d=absolute precision of 5.

Patients were selected after obtaining ethical approval from the Institutional Ethics committee and written informed consent from the participant for the study. The thyroid status was assessed by doing T3, T4 and thyroid stimulating hormone (TSH) estimation prior to the surgery as a part of routine investigation. The serum calcium level was estimated by drawing blood by venepuncture without manipulation. This was also part of the routine post-operative care at the hospital. The normal calcium level ranges from 8-11 mg/dl and values less than 8 mg/dl were considered as hypocalcaemia. Per operative findings such as capsular ligation of inferior thyroid artery, identification of parathyroid, auto-transplantation of parathyroid and duration of surgery were also recorded.

During the postoperative period patients were carefully watched for clinical symptoms and signs of hypocalcemia. Fatigue, weakness, perioral numbness and positive Chvostek's sign (twitching and/or contracture of the facial muscles produced by tapping on the facial nerve at a specific point on the face) and Trousseau's sign (carpopedal spasm occurring after a few minutes of inflation of a sphygmomanometer cuff above systolic blood pressure) were considered as mild hypocalcemia.[12-14] Tetany and those with carpopedal spasm, convulsions and laryngeal spasm were considered as severe hypocalcemia.

Hypocalcemic patients having symptoms and not having symptoms are separately grouped. Serum calcium levels at 6 hours and 24 hours postoperatively and at the time of discharge were evaluated. Follow up was done after 1 month and if hypocalcemia persists follow up was continued for 6 months. Patients who were hypocalcemic beyond 6 months were considered permanent hypocalcemia and others temporary. The histopathology reports were collected and also the identification of parathyroid in the specimen were noted. Patients requiring oral and intravenous (IV) calcium supplementation were recorded. Oral calcium was given in the form of calcium carbonate 500 mg 2 tablets thrice daily along with calcitriol 0.25 microgram twice daily. Intravenous calcium was given in the form of 10% calcium gluconate 10 ml over 10-20 minutes and same dose repeated if needed.[15,16] Data was entered into Microsoft excel sheet and data analysis was done using statistical package for the social sciences (SPSS) version 20 statistical software.

RESULTS

A total of 98 patients who had undergone total thyroidectomy for various indications were included in the study. The minimum age of patient who had undergone total thyroidectomy was 20 and maximum age was 72 years. Out of the 98 patients included in the study, 89 (90.2%) were females and 9 (9.8%) were males (Table 1).

In the study group, maximum number of patients were those diagnosed with multinodular goiter 44 (44.9%) patients. Thyroiditis patients were 25 (25.5%) and malignancy was seen in 23 (23.5%) patients (Table 2).

Majority of patients in this study were euthyroid 81 (82.7%), 10 (10.2%) were hyperthyroid and 7 (7.1%) were hypothyroid. Of the 98 patients who had undergone thyroidectomy, 57 (58.2%) patients had operating time more than 2 hours and 41 (41.8%) had operating time less than 2 hours. Among the study participants, 88 (89.8%) had their parathyroids identified intraoperatively and in

10 (10.2%) patients parathyroids were not identified. Parathyroids were identified in the specimen of 14 (14.6%) patients. In the study group of 98 patients, parathyroid auto-transplantation was done in 4 patients. In the patients who had undergone total thyroidectomy, 19 (19.4%) had hypocalcemia and 79 patients (80.6%) did not have hypocalcemia. In the study group, 14 (14.3%) had symptomatic hypocalcemia and 5 patients (5.1%) had asymptomatic hypocalcemia. 18 patients (18.4%) had temporary hypocalcemia and 1 patient (1%) had permanent hypocalcemia (Table 3).

Table 1: Distribution of patients based on age and gender.

Variables	Frequency (%)
Age group (in years)	
20-29	5 (5.1)
30-39	20 (20.4)
40-49	39 (39.8)
50-59	19 (19.4)
60-69	10 (10.2)
70-79	5 (5.1)
Gender	
Male	9 (9.8)
Female	89 (90.2)

Table 2: Distribution of patients based on diagnosis.

Diagnosis	Frequency (%)
Multinodular goitre	44 (44.9)
Thyroiditis	25 (25.5)
Malignancy	23 (23.5)
Grave's disease	4 (4.1)
Toxic nodular goiter	2 (2)
Total	98 (100)

Majority of the hypocalcemic patients 9 (47.4%) were of the age group 40–49 years. There were no patients with hypocalcemia above the age of 60 years in the study group. Among the patients with hypocalcemia, 18 (95%) were females and 1 (5%) patient was male. 8 (42%) were diagnosed to have thyroiditis, 6 (32%) patients had malignancy and 3 patients had Grave's disease in the hypocalcemic group.

Table 3: Distribution of hypocalcemia in post thyroidectomy patients.

Hypocalcemia	Frequency (%)
Yes	19 (19.4)
Temporary	18 (18.4)
Permanent	1 (1)
No	79 (80.6)
Total	98 (100)

Among the hypocalcemic patients, 13 (68%) patients were euthyroid, 5 (26%) patients were hyperthyroid and 1 (5%) patient was hypothyroid. Out of the 5 hyperthyroid patients 3 had Grave's disease and 2 patients had thyroiditis. Oral calcium correction was given for 5 (26%) patients and combined intravenous and oral calcium supplements were given for 14 (74%) patients. Calcium values were observed at different stages of the post-operative period and values calculated as mean. The calcium level below which patients were symptomatic was 6.5 mg (Table 4).

Table 4: Calcium values observed at different stages of the study.

Timing of calcium estimation	Mean calcium value (range)
Pre-operative	8.66 (8.57–8.76)
At discharge	8.44 (8.31–8.56)
Symptomatic patients with hypocalcemia	6.5 (6.05–6.94)
Asymptomatic patients with hypocalcemia	7 (6.07–7.92)

Significant association was seen between diagnosis of thyroid disorders and hypocalcemia (p value=0.001), thyroid function and hypocalcemia (p value=0.03) and between operating time and hypocalcemia (p value=0.03).

No significant association was found between demographic factors like age and gender with hypocalcemia. No association was seen between intraoperative identification of parathyroid gland and hypocalcemia (Table 5).

Table 5: Association between hypocalcemia with diagnosis, thyroid function and operating time.

Variable						P value
Diagnosis	**MNG**	**Thyroiditis**	**Malignancy**	**Graves d/s**	**Toxic nodular goitre**	
No hypocalcemia	42	17	17	1	2	0.001
% within diagnosis	95.5	68	73.9	25	100	
Hypocalcemia	2	8	6	3	0	
% within diagnosis	4.5	32	26.1	75	0	
TFT	**Euthyroid**		**Hypothyroid**	**Hyperthyroid**		0.03
No hypocalcemia	68		6	5		
% within TFT	84		85.7	50		

Continued.

Variable				P value
Hypocalcemia	13	5	1	
% within TFT	16	14.3	50	
Operating time (hours)	**<2**	**>2**		
No hypocalcemia	50	29		
% within operating time	87.7	70.7		0.03
Hypocalcemia	7	12		
% within operating time	12.3	29.3		

DISCUSSION

In our study hypocalcemia was seen in 19.4% of patients and that of temporary hypocalcemia was 18.4% and permanent hypocalcemia was 1%. The incidence of hypocalcemia reported by various authors in different studies varied from 23.6 to 48% out of this temporary hypocalcemia was upto 40% and permanent hypocalcemia ranged from 0 to 5% (Table 6).[16–19]

Table 6: Comparison of hypocalcemia values in different studies.

Study	Percentage of post-operative hypocalcemia
Nair et al	23.6
Pfleiderer et al	48
Puzziello et al	28.8
Page et al	38
Herranz et al	33.8
Present study	19.4

Out of the four patients in the study who had Grave's disease, three were found to have hypocalcemia indicating that Grave's disease is significantly associated with hypocalcemia. This result is in concordance with other similar studies by Nair et al and Herranz et al.[3,16]

Comparing the incidence of temporary and permanent hypocalcemia with the other series of studies, we observed the incidence of temporary hypocalcemia varied between 18.4-43% and incidence of permanent hypocalcemia varied between 0.9-5%. Incidence of temporary hypocalcemia in our study was 18.4% and that of permanent hypocalcemia was 1% (Table 7).

Table 7: Temporary and permanent hypocalcemia values in different studies.

Study	Temporary hypocalcemia (%)	Permanent hypocalcemia (%)
Nair et al	22	1.6
Pfleiderer et al	43	5
Puzziello et al	27.9	0.9
Page et al	35	3
Herranz et al	29.1	4.7
Present study	18.4	1

In our study, hypocalcemia was compared to euthyroid and hypothyroid groups, the hyperthyroid status was found to be more commonly associated with hypocalcemia and similar results were obtained in a study by Abboud et al.[22] It may be due to hungry bone syndrome observed in hyperthyroid state associated with low bone mineral density.

CONCLUSION

Incidence of hypocalcemia in patients who had undergone total thyroidectomy was found to be 19.4%. Temporary hypocalcemia was 18.4% and that of permanent hypocalcemia was 1%. Symptomatic hypocalcemia was 14.3% and that of asymptomatic hypocalcemia was 5.1%. The mean calcium value below which patients were symptomatic was 6.5 mg.

The incidence of hypocalcemia was not found to be influenced by age or gender. Hypocalcemia was significantly higher in patients with thyroiditis. Patients with hyperthyroid status have a higher incidence of postoperative hypocalcaemia and the subgroup of Grave's disease showed significant association while toxic nodular goitre showed no association. No association was noticed with intra operative identification of parathyroids and hypocalcemia.

Prolonged duration of surgery showed significant association with hypocalcemia. Incidental parathyroidectomy also showed significant association with hypocalcemia.

Calcium measurement at 6 hours and 24 hours after thyroidectomy would be helpful in early identification of hypocalcemia and starting treatment early preventing onset of the symptoms.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Smith P, Salomone L, Hanks JB. Sabiston Text Book of Surgery Volume 1. 19th edition. Townsend C, editor. Philadelphia: Saunders Elsevier. 2012;38:886-921.

2. Pfleiderer AG, Ahmad N, Drapers MR, Vrotsou K, Smith WK. The timing of calcium measurements in helping to predict temporary and permanent hypocalcaemia in patients having completion and total thyroidectomies. Ann R Coll Surg Engl. 2009;91:140-6.
3. Nair CG, Babu MJC, Menon R, Jacob P. Hypocalcaemia following total thyroidectomy: An analysis of 806 patients. Indian J Endocrinol Metab. 2013;17:298-303.
4. Walsh SR, Kumar B, Coveney EC. Serum calcium slope predicts hypocalcaemia following thyroid surgery. Int J Surg. 2007;5:41-4.
5. Sturniolo G, Lo Schiavo MG, Tonante A, D'Alia C, Bonanno L. Hypocalcemia and hypoparathyroidism after total thyroidectomy: a clinical biological study and surgical considerations. Int J Surg Investig. 2000;2:99-105.
6. Jacobs JK, Aland JW, Ballinger JF. Total thyroidectomy. A review of 213 patients. Ann Surg. 1983;197:542-9.
7. Lo CY, Lam KY, Weber CJ, Shaha AR, Davis O. Postoperative hypocalcemia in patients who did or did not undergo parathyroid autotransplantation during thyroidectomy: A comparative study. Surgery. 1998;124:1081-7.
8. Pattou F, Combemale F, Fabre S, Carnaille B, Decoulx M, Wemeau JL, et al. Hypocalcemia following thyroid surgery: Incidence and prediction of outcome. World J Surg. 1998;718-24.
9. Stathatos N. Thyroid Physiology. Med Clin North Am. 2012;165-73.
10. Husein M, Hier MP, Al-Abdulhadi K, Black M. Predicting calcium status post thyroidectomy with early calcium levels. Otolaryngol - Head Neck Surg. 2002;127:289-93.
11. Pisanu A, Cois A, Piu S, Altana ML, Uccheddu A. Factors predicting outcome of hypocalcaemia following total thyroidectomy. Chir Ital. 2003;55:35-40.
12. Ahmed MAS, Martinez A, Mariam S, Whitehouse W. Chvostek's sign and hypocalcaemia in children with seizures. Seizure. 2004;13:217-22.
13. Jesus JE, Landry A. Chvostek's and Trousseau's Signs. N Engl J Med. 2012;15.
14. Hoffman E. The Chvostek sign A clinical sign. Am J Surg. 1958;96:33-7.
15. Huang SM. Do we overtreat post-thyroidectomy hypocalcemia? World J Surg. 2012;36:1503-8.
16. Herranz González-Botas J, Lourido Piedrahita D. Hypocalcaemia after total thyroidectomy: incidence, control and treatment. Acta otorrinolaringológica española. 2013;64:102-7.
17. Thomusch O, Machens A, Sekulla C, Ukkat J, Brauckhoff M, Dralle H. The impact of surgical technique on postoperative hypoparathyroidism in bilateral thyroid surgery: A multivariate analysis of 5846 consecutive patients. Surgery. 2003;133:180-5.
18. Riju R, Jadhav S, Kanthaswamy R, Jacob P, Nair CG. Is total thyroidectomy justified in multinodular goitre. J Indian Med Assoc. 2009;107:223-5.
19. Puzziello A, Rosato L, Innaro N, Orlando G, Avenia N, Perigli G, et al. Hypocalcemia following thyroid surgery: incidence and risk factors. A longitudinal multicenter study comprising 2,631 patients. Endocrine. 2014.
20. Page C, Strunski V. Parathyroid risk in total thyroidectomy for bilateral, benign, multinodular goitre: report of 351 surgical cases. J Laryngol Otol. 2007;121:237-41.
21. Wingert DJ, Friesen SR, Iliopoulos JI, Pierce GE, Thomas JH, Hermreck AS. Post-thyroidectomy hypocalcemia. Incidence and risk factors. Am J Surg. 1986;152:606-10.
22. Moure Rodríguez MD, Luque-Ramírez M, López Gallardo G, López Iglesias M, Gómez-Pan A. Hungry bone syndrome related to hyperthyroidism. Anales de medicina interna (Madrid, Spain : 1984). 2006;326-8.

Cite this article as: Thottath D, Babu D, Thangavel S, Kannan R. Incidence of hypocalcaemia among post-thyroidectomy patients at a tertiary care hospital at Trivandrum, Kerala, South India. Int Surg J 2021;8:3269-73.