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Original Article

Clinical Study of Hypocalcemia following Thyroid Surgery

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Abstract

Introduction: Postoperative hypocalcemia is a common and most often transient event after extensive thyroid surgery. It may reveal iatrogenic injury to the parathyroid glands and permanent hypoparathyroidism.

Aim: To study the incidence of hypocalcaemia following total thyroidectomy and to study the various clinical presentations of post thyroidectomy hypocalcaemia.

Methods: Patients undergoing total thyroidectomise were included in the study.

Results: In 51 patients, 18 patients were had post operative hypocalcemia. Patients who underwent re-surgeries like completion thyroidectomy shows 100% incidence of post thyroidectomy hypocalcaemia.

Conclusion: Post thyroidectomy transient hypocalcaemia is a frequent complication which can be prevented with preoperative preparation of patients with extreme caution and preoperative meticulous dissection, prompt identification of parathyroids and postoperative frequent monitoring of serum calcium and early treatment can prevent significant morbidity.

Key words: Hypocalcemia, Incidence, Postoperative complications, Thyroidectomy

INTRODUCTION

Thyroid disorders and surgical management for thyroid disorders are more common in any surgeon's daily life. Post-operative complications after thyroid surgery are variety and reported more frequently with budding and learning surgeons. Hypocalcemia after bilateral surgical resection of thyroid is a potential early complication.[1] From 9.2% to 25% of transient hypocalcemia are reported in literature and the incidence of permanent hypocalcemia ranges from 0.5% to 2%.[2] Careful meticulous dissection to identify and sparing at least 2 parathyroid glands under direct vision is mandatory to avoid post-operative reduced calcium levels and its complications, that post-operative hypocalcemia is more frequent following bilateral resection of lobes than unilateral 9% and 1.9% respectively.[3] The immediate manifestations of hypocalcemia are mostly neuromuscular symptoms and occasionally psychotic states. Ectodermal changes leading on to alopecia, eczema, and cataract may occur as early as 6 months after operation. Persistent hypocalcemia may cause intracranial lesions and cardiac arrhythmias. Permanent hypocalcemia causes substantial impact on health of patient along with considerable financial loss.[4] Early recognition and prompt initial treatment of post-thyroidectomy hypocalcemia are crucial for successful outcome in the post-operative period following thyroidectomise. There are many predictors are under study till now to establish and effective protocol to be followed in the post-operative period in the thyroidectomy surgeries to manage post-thyroidectomy hypocalcemia successfully.[5] However, the availability of tests in small scale hospitals and the cost factor decides that serum calcium estimation postoperatively is the most ideal tool for early diagnosis and management of post-thyroidectomy hypocalcemia.

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Aim

To study the incidence of hypocalcemia following total thyroidectomy and to study the various clinical presentations of post-thyroidectomy hypocalcemia.

MATERIALS AND METHODS

This prospective study was conducted in the Department of General Surgery, Tirunelveli Medical College. Informed consent and Institutional Ethics Committee approval was obtained. All patients undergoing thyroidectomy surgeries were included in the study. Data will be collected from the patients undergoing total thyroidectomise by meticulous history taking, careful clinical examination, appropriate radiological, hematological investigations including serum calcium and serum albumin, operative findings and follow-up of the cases will be done after surgery for post-operative hypocalcemia. Patients undergoing hemithyroidectomy/lobectomy, primary parathyroid pathologies, age <12 years, previous irradiation to neck, patient already on calcium supplementation were excluded from the study.

RESULTS

In this study, we followed 51 patients who were undergone total thyroidectomise on various indications. After thorough history taking, we excluded patients undergoing surgeries other than total thyroidectomise like hemithyroidectomy near total and subtotal thyroidectomise, in the age group of above 12 years. We excluded patients with pre-operative altered calcium levels to avoid previous altered parathyroid functions and excluded patients with previous history of radiation and also excluded patients already on calcium supplementation. We followed all patients met our study criteria with serial estimation of serum calcium levels postoperatively by day 1, day 2 and day 4 and also records history about various presentations of post-operative hypocalcemia such as perioral numbness, carpopedal spasm, trousseau sign, Chvostek's sign, electrocardiogram changes of hypocalcemia, and other neurological symptoms.

In this study, we followed 47 female patients and 4 male patients underwent total thyroidectomy. This gross difference in sex distribution is due to almost all thyroid disorders are more common with females as described by many literatures (Table 1).

About 16 patients are in 12-30 years followed by 31-40 years, 16 patients. 12 patients are in 41-50 years (Table 2).

According to pre-operative indications of thyroidectomy of these 51 patients, 8 patients are posted for thyroidectomy for suspecting malignancy, 13 patients are posted for thyroidectomy for toxic features after controlling toxicity, 30 patients are posted for thyroidectomy for complaints like swelling or goiter or pressure effects (Table 3).

Of these 51 total thyroidectomise 2 patients are posted for completion thyroidectomy (re-surgery) followed after previous hemithyroidectomy or subtotal thyroidectomy with pre-operative benign fine needle aspiration cytology report and post-operative histopathological finding shows papillary malignancy for one patient and recurrent toxicity for another patient (Table 4).

Of the 51 total thyroidectomized patients, post-operative follow-up shows the following histopathological examination (HPE) reports. 5 patients underwent total thyroidectomy shows papillary thyroid carcinoma in their specimen, 10 patients showing thyroid adenoma, 4 patients HPE report reveals toxic multinodular goiter (MNG) and 3 patients specimen shows graves' disease. Hashimoto thyroiditis reported in post-thyroidectomy specimens of 19 patients and lymphocytic thyroiditis in 1 patient and 9 patients with nodular or colloid goiter (Table 5).

Table 1: Description of study patients

Sex of study population	Number of patients
Male	04
Female	47
Total	51

Table 2: Age distribution of study patients

Age distribution of study population (years)	Number of patients
12-30	16
31-40	16
41-50	12
More than 50	07
Total	51

Table 3: Pre-operative indications for total thyroidectomy

Pre-operative indications for total thyroidectomy	Number of patients
Malignancy	08
Toxic features	13
Swelling/goiter	30
Total	51

Table 4: Distribution of nature of surgery

Nature of surgery	Number of patients
Re-surgery/completion thyroidectomise	02
Total thyroidectomise	49

In our study period, we documented 18 patients out of 51 patients of the study population had experienced signs and symptoms of hypocalcemia in their post-operative period.

It denotes approximately 35% of study population experienced hypocalcemia in their post-operative period (Table 6).

Of these 3 males out of 4 male patients experienced hypocalcemia in their post-operative period, this approximates 75%.Out of 47 female patients 15 patients shows signs and symptoms of hypocalcemia, this approximates 32% (Table 7).

According to age distribution 4 patients in the age group of 12-30 years and 6 patients in the age group of 31-40 years, and 3 patients in the age group of 41-50 years and 5 patients in the age group of more than 50 years are affected by post-operative hypocalcemia.

Around 25% of 12-30 years patients' experienced post-operative hypocalcemia, 27% of 31-40 years experienced hypocalcemia, and 25% of 41-50 years experienced hypocalcemia and 71% of more than 50 years experienced post-operative hypocalcemia. Patients underwent total thyroidectomy with pre-operative diagnosis of malignancy experienced 75 % of post-operative hypocalcemia and approximately 46% of patients with toxic features experienced post-operative hypocalcemia, only 20% of patients with swelling or goiter are reported with post-operative hypocalcemia (Table 8).

Patients who underwent re-surgeries like completion thyroidectomy shows 100% incidence of post-thyroidectomy hypocalcemia (Table 9).

According to final post-operative HPE based diagnosis, the incidence of post-thyroidectomy hypocalcemia experience in our study was 5 out of 5 thyroid malignant patients experienced post-thyroidectomy hypocalcemia and 20% of thyroid adenomas, and 50% of toxic MNG patients and 67% of graves' disease patients and 21% of hashimoto thyroiditis patients and 33% of nodular or colloid goiter patients experienced post-operative hypocalcemia (Table 10).

In our study, 18 patients out of 51 patients experienced post-operative hypocalcemia, majority of them manifested the symptoms on post-operative day 2 such that 61%, remaining patients presented on post-operative day 1 (Table 11).

Table 5: Post-operative final diagnosis based on HPE report

Diagnosis	Number of cases studied
Thyroid malignancy	05
Thyroid adenomas	10
Toxic MNG	04
Graves' disease	03
Hashimoto thyroiditis	19
Lymphocytic thyroiditis	01
Nodular/colloid goiter	09
Total no of cases	51

HPE: Histopathological examination, MNG: Multinodular goiter

Table 6: Post-thyroidectomy hypocalcemia in the study population

Post-operative hypocalcemia in study	Number of patients
Yes	18
No	33

Table 7: Distribution of post-thyroidectomy hypocalcemia in gender

Sex of study population	Number of patients	Post-thyroidectomy hypocalcemia
Male	04	03
Female	47	15

Table 8: Age distribution of patients having post-operative hypocalcemia

Age distribution of study population (years)	Number of patients	Post-thyroidectomy hypocalcemia
12-30	16	4
31-40	16	6
41-50	12	3
More than 50	07	5

Table 9: Distribution of post-operative hypocalcemia in pre-operative indications for thyroidectomy

Pre-operative indications for thyroidectomy	Number of patients	Post-thyroidectomy hypocalcemia
Malignancy	08	6
Toxic features	13	6
Swelling/goiter	30	6

Table 10: Distribution of resurgeries in post-operative hypocalcemia

Nature of surgery	Number of patients	Post-thyroidectomy hypocalcemia
Re-surgery/completion thyroidectomise	02	02
Total thyroidectomise	49	16

Table 11: Distribution of diagnosis in post-operative hypocalcemia

Diagnosis	Number of cases studied	Post-thyroidectomy hypocalcemia
Thyroid malignancy	05	05
Thyroid adenomas	10	02
Toxic MNG	04	02
Graves' disease	03	02
Hashimoto thyroiditis	19	04
Lymphocytic thyroiditis	01	00
Nodular/colloid goiter	09	03

MNG: Multinodular goiter

DISCUSSION

Thyroid diseases are more common in females, as in many literatures. Our study population also reflects the same. Male 8% and female contributes 92% of thyroid disorders. In our study, results show that thyroid diseases that may need thyroid surgeries are frequent in the middle age group between 30 and 40 years.[6] However, the post-thyroidectomy hypocalcemia incidence is more common in the advancing age group, i.e., more than 50 years. A study conducted by Erbil *et al.*[7] named the impact of age, vitamin D level and incidental parathyroidectomy on post-operative hypocalcemia after total or near total thyroidectomy reveals that in advancing ages the level of vitamin D fall postoperatively, increases tremendously, so the incidence 25 times greater for the patients of more than 50 years of age. Benign diseases show less incidence of post-thyroidectomy hypocalcemia than the malignant diseases, this attribute to the extensive surgical dissection performed in malignant disorders to obtain tumor clearance. In a study conducted by Sakouti *et al.*[8] regarding the incidence of transient and permanent hypocalcemia after total thyroidectomy for thyroid cancer reveals higher incidence of hypocalcemia after total thyroidectomy in malignant diseases of the thyroid. The incidence increases more with surgeries combined with radical neck dissection. The incidence of post-thyroidectomy hypocalcemia is more in the toxic thyroid diseases than non-toxic diseases; this also attributes to the extensive surgical dissection in the toxic disorders to avoid recurrence of the disease. The same reason can explain the 100% incidence of post-thyroidectomy hypocalcemia in the resurgeries in our study, and in resurgeries some literatures postulate that extensive fibrosis can be a reason for vascular compromise that results in hypoparathyroidism. Indications for total thyroidectomy in our study population shows majority of them are resected for thyroid mass or goiter.[8] In our study period, we concentrated mainly on immediate post-operative hypocalcemia and due to the poor compliance of patients permanent hypocalcemia was not analyzed. Our study shows the incidence of post-operative hypocalcemia was approximately 35%. In literature, it was reported from 27% to 80%.[8] During the study period, we did parathyroid autotransplantation for 4 patients who are found to be with accidental injury to the parathyroid glands found on table and post-thyroidectomy hypocalcemia did not manifest in that patients. In a study conducted by Lo *et al.*[9] where their team follow routine parathyroid autotransplantation incidence of hypocalcemia was less, patients presenting with hypocalcemia are whom parathyroid autotransplantation was not done. Zendenius *et al.*[10] reported in his study that he did 100 case series with total thyroidectomy and parathyroid autotransplantation and concluded there was no permanent hypocalcemia in his study group. For prevention of post-thyroidectomy hypocalcemia many authors followed identification of parathyroid intraoperatively by various methods, some of them are Esselstyn[11] used parathyroid blush on table, Silverberg used methylene blue staining of parathyroids, Gavilan *et al.*[12] used intravenous methylene blue for identification of parathyroids, Sofola *et al.*[13] used polarized spectral imaging, Pederson *et al.*[14] used portable gamma camera with sestamibi radiotracer, and Yao *et al.* touching print preparations, still the studies are going on.[15]

CONCLUSION

Post-thyroidectomy transient hypocalcemia is a frequent complication which can be prevented with pre-operative preparation of patients with extreme caution and pre-operative meticulous dissection, prompt identification of parathyroids and post-operative frequent monitoring of serum calcium and early treatment can prevent significant morbidity. Parathyroid autotransplantation should be considered in accidental injury to parathyroids during the procedure. For small scale hospitals, serial monitoring of serum calcium levels preoperatively and postoperatively combined with careful monitoring of signs and symptoms of hypocalcemia is an efficient and cost-effective tool to detect post-thyroidectomy hypocalcemia.

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