

Frequency of Hypocalcaemia following total Thyroidectomy

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ABSTRACT

Background: The most common post-thyroidectomy complication is hypocalcaemia. It could be permanent or transitory. Permanent hypocalcaemia has a prevalence of 0-13% and transient hypocalcaemia has a prevalence of 1-6%. **Aim:** The study objective was to ascertain the prevalence of postoperative hypocalcaemia in patients following total thyroidectomy.

Materials and Methods: This cross-sectional study was carried out on 84 thyroid patients who underwent total thyroidectomy in the surgical department of HBS General Hospital, Islamabad for period of nine months during from September 2020 to May 2021. Patients within the age range of 15-69 years and had indicated thyroidectomy caused by carcinoma thyroid, multinodular goiter, and recurrent goiter were enrolled. Informed consent was obtained from each participant. Ethical approval was taken from the institutional ethical committee. Thyroid profile and serum calcium were done for a routine investigation. Serum calcium levels were measured 24 hours, 48 hours, and 7 days after total thyroidectomy. Signs and symptoms in hypocalcaemia patients were recorded on a proforma. Patients with hypocalcaemia were followed for six months. SPSS version 20 was used for data analysis.

Results: The mean age of the patients was 46.7 ± 4.6 years with an age range of 16 to 69 years. Of the total 84 patients, 38 (45.2%) underwent total thyroidectomy and 46 (54.8%) underwent a complete thyroidectomy. The prevalence of male and female patients was 22 (26.2%) and 62 (73.8%) respectively. Malignant and benign were present in 71 (84.5%) and 13 (15.5%) respectively. Of the total 84 patients, 68 (81%) developed hypocalcaemia. Out of 68 hypocalcaemia patients, 29 (42.6%) and 39 (57.4%) were from the benign and malignant groups respectively.

Conclusion: Postoperatively hypocalcaemia was prevalent following thyroidectomy. Malignant patients (84.5%) were more prevalent compared to benign patients (15.5%) after total thyroidectomy. Careful surgical procedures, parathyroid gland vascularity preservation, and identification are critical in preventing hypocalcaemia following total thyroidectomy.

Keywords: Hypocalcaemia; Total thyroidectomy; Complete Thyroidectomy

INTRODUCTION

The most common post-thyroidectomy complication is hypocalcaemia. It could be permanent or transitory. Permanent hypocalcaemia has a prevalence of 0-13% and transient hypocalcaemia has a prevalence of 1-6% [1, 2]. Hypocalcaemia is a major complication related to the endocrine system following thyroidectomy among children and adults [3]. During thyroidectomy, parathyroid glands devascularization or trauma causing hypo-parathyroidism as a major followed by hypocalcaemia as a secondary complication [4]. Muscle spasm presentation along with reduced calcium levels and untreated neurological manifestation cause asymptomatic postoperative hypocalcaemia. Furthermore, prolonged hospitalization of post-operative hypocalcaemia might require regular monitoring and therapy [5]. Post-operative thyroidectomy hypocalcaemia rates were lower in adult patients compared to the pediatric population [6].

Parathyroid hormones (PTH) or treatment with lower calcium was used for post-operative hypocalcaemia management in adult patients [7]. A systematic review suggested preemptive approaches for post-operative hypocalcaemia while investigating the adult populations among patients who underwent total thyroidectomy. They concluded that oral calcium or vitamin D prophylactic supplementation can reduce the incidence of hypocalcaemia following total thyroidectomy [8]. Similarly,

Xing et al [9] found that vitamin D and calcium prophylactic is more effective in post-operative hypocalcaemia prevention compared to the alone calcium treatment. Hypocalcaemia has a reported symptoms going from minor paresthesia to major tetany, cramps, and convulsions with incidence of 20-30%. Hypocalcaemia is usually administered between 24-48 hours after surgery. Serum calcium is measured in both mg/dl and mmol/l units, whereas the normal range varies from 2.10 to 2.6mmol/l and 8.5 to 10.5mg/dl. Unless serum calcium levels are less than 2mmol/l (8mg/dl), hypocalcaemia symptoms are uncommon. Although, serum calcium values are lower than the reference range, but utilized to describe post-thyroidectomy hypocalcaemia.

In several studies, the prevalence of hypocalcaemia ranged between 10.6% and 50%, but it could reach higher value as 83% [10]. This might be caused by calcium hemodilution due to surgical stress, with increased hungry bone syndrome, calcitonin release, and urinary calcium excretion observed in patients with autoimmune fibrosis, osteodystrophy, and hyperthyroidism all of which compromise parathyroid vascularization [11]. Hypocalcaemia in most cases are self-limiting post-thyroidectomy complication but may be potentially risky [12]. Postoperative hypocalcaemia risk has been identified and measured with parathyroid hormones in the early or intraoperative stage whereas an insufficient amount of parathyroid is the prime cause for developing severe

hypocalcaemia [13]. Hypocalcaemia following total thyroidectomy has been diagnosed and coped with various approaches. Recently, the risk of developing hypocalcaemia after thyroidectomy has been predicted by parathyroid hormone intact measurement among the patients. The study objective was to ascertain the prevalence of postoperative hypocalcaemia in patients following total thyroidectomy.

MATERIALS AND METHODS

This cross-sectional study was carried out on 84 thyroid patients who underwent total thyroidectomy in the surgical department of HBS General Hospital, Islamabad for period of nine months during from September 2020 to May 2021. Patients within the age range of 15-69 years and had indicated thyroidectomy caused by carcinoma thyroid, multinodular goiter, and recurrent goiter were enrolled. Inform consent was obtained from each participant. Ethical approval was taken from the institutional ethical committee. Thyroid profile and serum calcium were done for a routine investigation. Serum calcium levels were measured 24 hours, 48 hours, and 7 days after total thyroidectomy. Signs and symptoms in hypocalcaemia patients were recorded on a proforma. Patients with hypocalcaemia were followed for six months. Patients with prior or concurrent parathyroidectomy, preoperative hypocalcaemia, and known hyperparathyroidism were excluded. The outcome studied was post-thyroidectomy hypocalcaemia in the first, second, and fifth postoperative periods, as well as six months after surgery.

In all patients, serum calcium levels were measured 24 hours, 48 hours, and on the seventh postoperative day. Hypocalcaemia patient’s clinical signs and symptoms were noted. Serum parathyroid levels were evaluated in hypocalcaemia patients to differentiate between bone syndrome and hemodilution. Hypocalcaemia patients were acknowledged and preserved with serum calcium levels was monitored until they were discharged. Other parameters such as age, histopathological report of resected thyroid tissue, pathological characteristics, gender, and surgical intervention types such as central neck dissection, re-exploration, and retrosternal extension were noted. Six months follow up with regular intervals was done. Serum calcium, hypocalcaemia signs and symptoms, and parathyroid hormones were measured after each follow-up visit. Hypocalcaemia that persisted for a year or less was considered transient hypocalcaemia while permanent hypocalcaemia last for more than one year. SPSS version 20 was used for data analysis.

RESULTS

The mean age of the patients was 46.7 ± 4.6 years with an age range of 16 to 69 years. Of the total 84 patients, 38 (45.2%) underwent total thyroidectomy and 46 (54.8%) underwent a complete thyroidectomy. The prevalence of male and female patients was 22 (26.2%) and 62 (73.8%) respectively as shown in Figure 1. Malignant and benign were present in 71 (84.5%) and 13 (15.5%) respectively as illustrated in Figure 2. Of the total 84 patients, 68 (81%) developed hypocalcaemia. Out of 68 hypocalcaemia patients, 29 (42.6%) and 39 (57.4%) were from the benign and malignant groups respectively. Of the total 84 patients,

38 (45.2%) underwent total thyroidectomy and 46 (54.8%) underwent a complete thyroidectomy as shown in Figure 3. Table 1 demonstrates the incidence of transient hypocalcaemia in different postoperative days. The transient hypocalcaemia highest prevalence was 36.9% on the second postoperative day in 31 patients followed by the first post-operative day 27 (32.1%). There was a delay up to the fifth postoperative day in 8 (9.5%) patients. Only two patients (2.4%) required calcium and vitamin D supplements for >6 months postoperatively and was considered permanent hypocalcaemia. The parathyroid hormones were low measured postoperatively among patients.

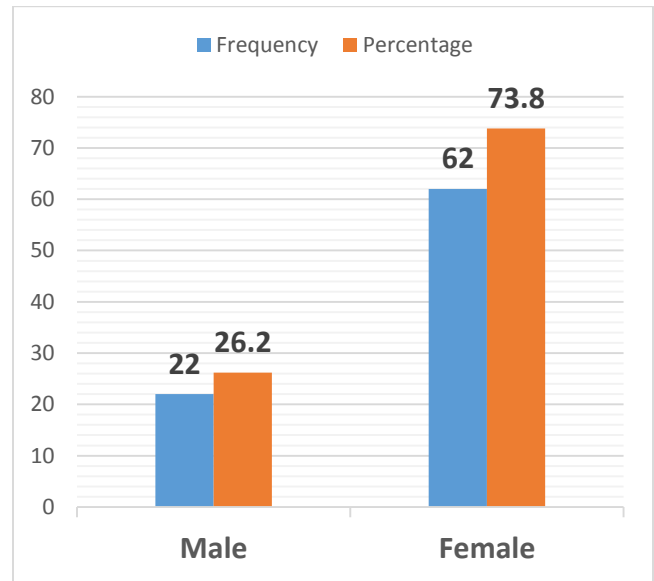


Figure-1 gender distribution of n= 84 patients

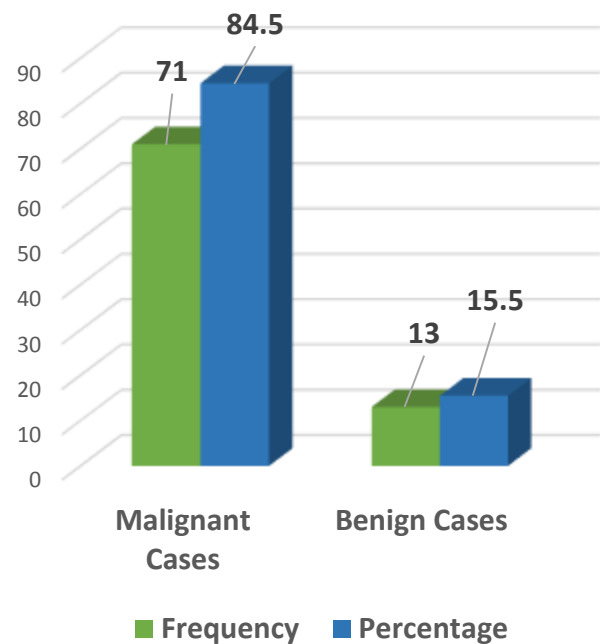


Figure 2. Prevalence of Malignant and Benign cases in 84 patients

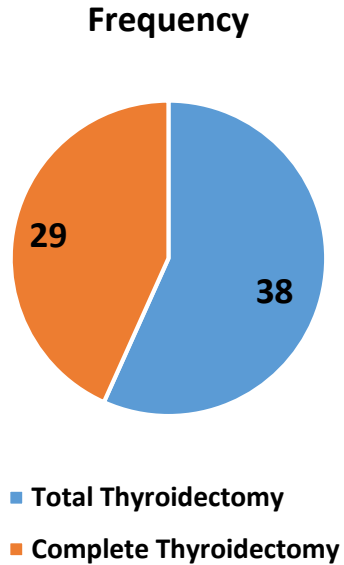


Figure 3. Prevalence of complete and total thyroidectomy in 84 patients

Table-1 Incidence of Transient and Permanent hypocalcaemia in different Post-operative days

Transient Hypocalcaemia	Frequency n	Percentage %
Post-operative Days	27	32.1
First post-operative day	31	36.9
Second post-operative day	8	9.5
Fifth post-operative day	2	2.4
Permanent Hypocalcaemia		

DISCUSSION

Our findings showed the significant differences in the hypocalcaemia definition, prevention, and management of post-thyroidectomy thyroidectomy. The present study aimed to evaluate the present-day practices for post thyroid surgery hypocalcaemia prevention and treatment as well as to assess the calcium and Vitamin D role in hypocalcaemia prevention. The study included 84 patients who had thyroid surgery. Transient or permanent hypocalcaemia were the post-operative thyroidectomy common endocrine complication among these patients. This complication occurs at a rate ranging from 1.6 % to 50% [14]. Hypocalcaemia after thyroidectomy is a well-known short and long-term complication with significant morbidity [15]. It frequently prolongs the hospitalization and significantly raises the thyroidectomy overall cost as well as the patient's discomfort [16]. Aside from the fact that young patients are at a higher risk of developing post thyroidectomy hypocalcaemia caused by their age [17] and others eminent risk factors. Multiple studies in this review identified dissection of lymph node [18, 19], the Grave's disease presence [20] or malignancy [21] as post-operative hypocalcaemia independent predictors, and total thyroidectomy [22].

In adults, Roh et al. found that dissection of lymph node significantly enhanced the post-operative hypocalcaemia rate as compared to alone total thyroidectomy could be avoided with vitamin D and calcium

supplementation as a routine [23]. Similarly, Wang et al. discovered association of post-operative hypocalcaemia with seven factors in adults: namely age, sex, types of injury, PTH pre-operative level, and dissection of lymph node, carbon nanoparticles, and process time [24]. With a better consideration of post-operative hypocalcaemia risk factors, high-risk patients can be supplemented prophylactically.

Many surgeons routinely supplement calcium and vitamin D to patients undergoing total thyroidectomy. However, while this practice may decrease the symptomatic patients, it is troublesome because treatment is tolerated poorly and become costly. It has the potential to alter the postoperative hypocalcaemia incidence rate particularly when descriptions are centered on serum calcium levels [24]. Predicting which patients will develop hypocalcaemia is the ideal method. Patients can be treated with pre-requisite emergency therapy utilizing this approach. The parathyroid hormone (PTH) assay utilized to detect hyperparathyroidism as a reliable and quick method in intraoperative procedures. The costly quick PTH, on the other hand, has frequently limited its applicability [25].

Due to costly PTH and inadequate resources, serum calcium were evaluated on the first, second, and fifth postoperative days to predict post-thyroidectomy hypocalcaemia. Postoperative hypocalcaemia is common two to five days after a total or subtotal thyroidectomy. However, in most cases, hypocalcaemia resolves on its own, but it can be permanent if caused by irreversible damage to the parathyroid glands. Permanent hypocalcaemia is a fatal complication that necessitates lifelong treatment and monitoring. The range of postoperative hypocalcaemia reported in the literature varies greatly after thyroid surgery [26]. Various factors, such as the definition of hypocalcaemia, the type of thyroid disease, and the surgical technique for thyroidectomy, account for these differences in the literature [27]. Patients who underwent local thyroidectomy with central lymph node dissection were at a higher risk of developing temporary hypocalcaemia. Patients with cancer who required central lymph node dissection, on the other hand, were excluded from our study. Transient hypocalcaemia can also be cured by supernumerary rudimentary 5th parathyroid activity at the thymic or mediastina site. Hyperparathyroidism is slightly more common after hyperthyroidism thyroidectomy, previously operated neck or thyroid carcinoma where parathyroid conservation may be risked due to some technical complications [28].

In the present study, thyroid carcinoma hypocalcaemia was not statistically different from other cases. Some investigators believe that even after thyroid arteries ligation (four in No's), parathyroid vascularization remains intact [29]. The operational extent increases the parathyroid gland excision risk beside parathyroid vascularization risk compromised, especially when proximal occurrence of inferior thyroid artery with bilateral ligation, careful dissection is required because it may affects the parathyroid function by tissue edoema venous drainage compression. In case the parathyroid gland is accidentally devascularized, sternocleidomastoid muscles must be reimplanted [30]. When three or more parathyroid glands

were identified and preserved in situ during surgery, all patients recovered spontaneously.

CONCLUSION

Postoperatively hypocalcaemia was prevalent following thyroidectomy. Malignant patients (84.5%) were more prevalent compared to benign patients (15.5%) after total thyroidectomy. Careful surgical procedures, parathyroid gland vascularity preservation, and identification are critical in preventing hypocalcaemia following total thyroidectomy.

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