

Incidence of hypocalcaemia after total thyroidectomy and near total thyroidectomy – a tertiary centre comparative study



General Surgery

KEYWORDS: hypocalcaemia, hypoparathyroidism, total thyroidectomy, near total thyroidectomy

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ABSTRACT

Background: Thyroid surgery is one of the commonest surgical procedures, done by surgeons all over the world. Hypocalcaemia is one of the many complications associated with thyroidectomy. Parathyroid is the most important regulator of serum calcium. Hypoparathyroidism is the most commonly seen after total and near total thyroidectomy. **Materials and methods:** This cross-sectional study was conducted in 2014 in the department of surgery, medical college, Trivandrum, after getting institutional ethics committee approval. **Inclusion criteria:** All patients posted for thyroidectomy in all units in the department were eligible for the study. All patients over the age of 13 and less than the age of 80 were included in the study. **Exclusion criteria:** Patients with previous neck operation, history of thyroidectomy and those posted for neck dissection along with thyroidectomy were excluded from the study. **Result:** There was a higher prevalence of hypocalcaemia in the total thyroidectomy group compared with the subtotal thyroidectomy group (25% versus 16.7%), but was not statistically significant. **Discussion:** The prevalence of hypocalcaemia in our study was 22 percent. In the literature, there is wide variation in the reported incidence of hypocalcaemia ranging from 2 percent to 80 percent.

Introduction

Goiter is the most common endocrinal disorder and therefore, thyroidectomy is one of the most common operative procedures performed by the endocrine surgeons and general surgeons worldwide (1). As with all other operative procedures, thyroidectomy poses many complications but the most important is hypocalcaemia and recurrent laryngeal nerve injury, due to its vital anatomical relations (2). The incidence of postoperative hypocalcaemia is more with total thyroidectomy and near total thyroidectomy than hemithyroidectomy (3-5). However, the percentage of hypocalcaemia has come down in the modern era due to the advances in anaesthetic techniques and better knowledge of thyroid anatomy and physiology, which has enabled the surgeon to perform safe surgery and thereby to reduce the complications (6).

The most important regulator of serum calcium is parathyroid hormone. Parathyroid hormone acts by increased absorption of calcium from GIT and renal tubular resorption of calcium. Therefore, it importantly preserves parathyroid glands and its vascularity. Various studies have shown that the incidence of hypocalcaemia is more in patients undergoing total and near total thyroidectomy. But it varies from hospital to hospital, anaesthetic and surgical techniques followed, and also postoperative hydration. The postoperative hypocalcaemia is either due to inadvertent removal of parathyroid glands or accidental ligation of feeding vessel (2, 7). Even with a meticulous surgical technique, the post-operative hypocalcaemia develops and persists in patients undergoing total thyroidectomy, especially in patients with neoplasms. Primary thyrotoxicosis and thyroiditis may contribute to the likelihood of hypocalcaemia. The most important factor to prevent postoperative hypocalcaemia is the surgical technique with preservation of its vascularity (8). The reported prevalence of postoperative hypocalcaemia varies across the different populations, disease and type of surgery from 2 percent to 80 percent (9-12). However, most of the temporary hypocalcaemia resolves spontaneously over a period of one year (11, 13).

We conducted this cross-sectional study at our institution in patients undergoing near total thyroidectomy and total thyroidectomy. The aim of this study was to find out the prevalence of hypocalcaemia in patients undergoing these surgeries and to look at the association between the type of surgery and prevalence of hypocalcaemia. Our hypothesis was that there is no difference between the prevalence of hypocalcaemia in both groups of patients, and so total thyroidectomy

could be safely done in all cases.

Material and methods

This cross-sectional study was conducted in 2014 in the department of surgery, medical college, Trivandrum.

Institutional ethics committee approval was obtained before conducting the study. The declaration of Helsinki was strictly adhered to while conducting the study. We took informed consent from all patients willing to take part in the study. During the data collection procedure, analysis and manuscript preparation, patient confidentiality was strictly maintained. This study was part of a large study which looked into the relation between calcium levels and parathyroid hormone and tried to predict the occurrence of hypocalcaemia from the changes in the parathyroid hormone level.

This study included 110 consecutive patients satisfying the inclusion and exclusion criteria. All patients posted for thyroidectomy in all units in the department were eligible for the study. All patients over the age of 13 and less than the age of 80 were included in the study. Patients with previous neck operation, history of thyroidectomy and those posted for neck dissection along with thyroidectomy were excluded from the study.

All thyroidectomies were done using a standardized approach. After dissection of middle thyroid veins, medial rotation of the thyroid gland is done, inferior thyroid artery is identified as it emerges behind the common carotid artery gently isolated, dissected by atraumatic fashion and looped with 2.0 vicryl. Using the loop, artery is dissected towards the thyroid, as the dissection proceeds. Most often parathyroid artery is seen as it emerges commonly from the postero-inferior aspect of main stem. Occasionally the branches arise from more distal branches of the inferior thyroid artery. As the dissection proceeds, the recurrent laryngeal nerve is encountered at some point, which is safe guarded. Inferior thyroid artery is traced into the thyroid gland and divided and controlled with bi-polar cautery at the most distal point. In this way, the arterial supply to the parathyroid is safe guarded. Often the parathyroid artery serves as a guide to parathyroid. Superior parathyroid is preserved as usual. However, the consistent and definite preservation of inferior parathyroid probably accounts for reduction in the incidence of hypocalcaemia in postoperative period.

The variables studied were apart from the basic demographic

variables, preoperative and post operative calcium levels were measured. The indications for the operations were also noted. The type of surgery done and post operative histopathological diagnoses were also abstracted. The outcome variable studied was hypocalcemia. For this the difference between preoperative and post operative calcium levels were taken. Thereafter, patients were divided into normocalcemic and hypocalcemic by adopting the standard cut off value for biochemical hypocalcemia. Clinical signs and symptoms of hypocalcemia were also noted.

All data were collected by the principal investigator using a pretested data collection form. Thereafter, the data were entered into an excel based database.

We used R statistical environment for all statistical analysis. We summarized the descriptive statistics with median and interquartile range and used proportion for describing the categorical variables. Chi-square test was used to analyze the association between types of surgery and hypocalcemia and other categorical variables. Statistical significance was taken as p value less than 0.05.

Results

The clinicopathological features of the patients are summarized in table 1. There were more females(86%) in the study group. Multinodular goiter constituted the major subgroup in the histological diagnosis(61%). Hypocalcemia was present only in 24(21.8%) of the patients. Total thyroidectomy was done in 68(61.8%) patients.

Table 1: Baseline characteristics

Variable	[ALL] N=110
Age	38.0 [32.0;45.0]
Sex:	
female	95 (86.4%)
male	15 (13.6%)
Diagnosis:	
Anaplastic CA	2 (1.82%)
Diffuse goitre	14 (12.7%)
Follicular CA	5 (4.55%)
Hashimotos	7 (6.36%)
MNG	67 (60.9%)
pap CA	11 (10.0%)
Toxic goitre	4 (3.64%)
Procedure:	
NTT	42 (38.2%)
TT	68 (61.8%)
Hypocalcemia:	
absent	85 (77.3%)
NA	1 (0.91%)
present	24 (21.8%)

Comparing the operative procedures, there were baseline comparability with respect to age and sex between the two types of procedure done. However, for malignant diseases, there was a statistically significant preference towards total thyroidectomy as shown in table 2. There was one post operative calcium value was missing.

Table 2 : clinic pathological features of patients by the type of surgery done

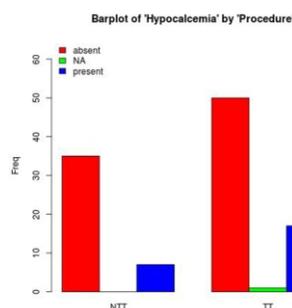
Var	[ALL] N=110	NTT N=42	TT N=68	p.overall
Age	38.0 [32.0;45.0]	36.0 [29.2;41.8]	38.0 [33.8;46.0]	0.135
Sex:				0.203
female	95 (86.4%)	39 (92.9%)	56 (82.4%)	
male	15 (13.6%)	3 (7.14%)	12 (17.6%)	
Diagnosis:				0.005

	2 (1.82%)	0 (0.00%)	2 (2.94%)	
Anaplastic CA				
Diffuse goitre	14 (12.7%)	9 (21.4%)	5 (7.35%)	
Follicular CA	5 (4.55%)	0 (0.00%)	5 (7.35%)	
Hashimotos	7 (6.36%)	3 (7.14%)	4 (5.88%)	
MNG	67 (60.9%)	28 (66.7%)	39 (57.4%)	
pap CA	11 (10.0%)	0 (0.00%)	11 (16.2%)	
Toxic goitre	4 (3.64%)	2 (4.76%)	2 (2.94%)	

There was a higher prevalence of hypocalcemia in the total thyroidectomy group compared with the subtotal thyroidectomy group(25% versus 16.7%), but was not statistically significant(table 3). Moreover, there was no statistically significant association between type of surgery and hypocalcemia (figure 1).

Table 3 : prevalence of hypocalcemia stratified by the type of surgery

variable	[ALL] N=110	NTT N=42	TT N=68	p.overall
Hypocalcemia:				0.524
absent	85 (77.3%)	35 (83.3%)	50 (73.5%)	
NA	1 (0.91%)	0 (0.00%)	1 (1.47%)	
present	24 (21.8%)	7 (16.7%)	17 (25.0%)	



Discussion

Hypocalcemia continues to be one of the dreaded complications after thyroidectomy. In addition, the prevalence of temporary hypocalcemia is very high. This study aimed to find out the association between the type of procedure done and hypocalcemia. Our study has shown that there is no statistically significant difference in the prevalence of hypocalcemia between subtotal thyroidectomy and total thyroidectomy. Moreover, this study inferred that there is no statistically significant association between the type of surgery done and prevalence of temporary hypocalcemia. The prevalence of hypocalcemia in our study was 22 percent. In the literature, there is wide variation in the reported incidence of hypocalcemia ranging from 2 percent to 80 percent(14, 15). In a study by D'Alessandro et al, the incidence of hypocalcemia was 37 percent(16). This is in contrast with the result of another study by Docimo et al where the incidence of laboratory hypocalcemia was only 10%. Nevertheless, another study by Abboud et al showed hypocalcemia in 16 percent of patients undergoing thyroidectomy (11).

In the study by Roh et al, the incidence was comparable to our study(17). The wide variation for the prevalence of post operative hypocalcemic could be due to inclusion of patients with different indications for surgery and difference in the surgical techniques adopted. Another reason for this variation may be due to the difference in the operational definition of hypocalcemia.

In our study, there was no statistically significant difference between the incidence of hypocalcemia and the type of surgery done. However, the prevalence of hypocalcemia in the total thyroidectomy group was 25 percent whereas in the near-total thyroidectomy group it was only 17 percent. Though there was a difference of 6

percent, it was not statistically significant. Post operative hypocalcemia following total thyroidectomy is reported to be varying from 2 to 33 percent in the literature(18). The study by Payne et al, the prevalence(24%) is in consistent with our study(19). Our study results contradicted with the findings by Unalp et al which concluded that total thyroidectomy had increased risk of developing hypocalcemia(20). The difference in the techniques adopted, and the low sample size could account for the different conclusion.

One of the limitations of our study is that there were no formal sample size calculations done to adequately power the study. Another potential issue with our study is the selection of consecutive patients for the study. This could affect the generalization from the results we obtained. Another issue with our study is that the number of patients in the near-total group was low compared to the total thyroidectomy group, the reason being most of the thyroidectomies done in our institution at present total thyroidectomy. In future, adequately powered comparative studies need to be planned.

Our study has shown that the prevalence of hypocalcemia in total thyroidectomy is comparable to near total thyroidectomy. Hence we propose that total thyroidectomy can be adopted as the preferred operation for diseases of thyroid in high-volume centers.

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