

Hypocalcaemia after Total Thyroidectomy, potentially a serious issue!

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Abstract

Introduction: Hypocalcaemia is a common post thyroidectomy complication in addition to nerve injuries and bleeding. The incidence is variable in different studies and total thyroidectomy has higher incidence than partial thyroidectomy.

Objectives: To study the incidence of temporary and permanent hypocalcaemia and to review value of post-operative calcium level in predicting short and long term cases of hypoparathyroidism.

Methods: This was a prospective study carried out at Zayed Military Hospital, Abu Dhabi from January 2007 to December 2011. A total of 105 cases were included in the study who underwent total thyroidectomy. Calcium levels at 6 and 24 hours

operatively were recorded. **Results:** Temporary hypocalcaemia of 25.7% patients and permanent hypocalcaemia of 3.8 % was noted. Calcium drop of less than 1 mg/dl from pre-operative level was not significant as all patients recovered without any symptoms. Calcium drop of more than 1.1 mg/dl needs close follow up. Females had slightly higher incidence of hypocalcaemia. **Conclusion:** Post thyroidectomy calcium is an easy and cost effective way to identify high risk cases which need close monitoring and treatment with vitamin D and calcium. **Key Words:** Hypocalcaemia, Hypoparathyroidism, Total Thyroidectomy.

INTRODUCTION

Hypocalcaemia is the most common postoperative complication after total thyroidectomy,¹ and at times presents serious consequences to the outcome of surgery. However, the incidence of postoperative hypocalcaemia varies widely in the literature, and factors associated with hypocalcaemia after thyroid surgery are not well established². The primary cause is secondary hypoparathyroidism following damage to or devascularisation of one or more parathyroid glands during surgery³, pressure from hematoma or accidental removal of parathyroid glands⁴.

The incidence is variable in various studies. A retrospective review of 739 partial thyroidectomies and 264 total thyroidectomies, post-operative temporary hypocalcaemia of 6.4% and permanent hypocalcaemia of 0.8 was recorded⁵. Total thyroidectomy resulted in a significantly higher incidence (9.0%) of hypocalcaemia when compared with unilateral thyroid lobectomy (1.9%)². In another study hypoparathyroidism was present in 348 patients at discharge (48%), in 23 at 6 months (3.38%)⁶.

AIMS & OBJECTIVES

- To study the incidence and severity of temporary and permanent hypocalcaemia after thyroidectomy.
- To review value of post operative Calcium level in predicting short and long term cases of Hypoparathyroidism.

PATIENTS & METHODS

This prospective study was carried out at Department of General Surgery Zayed Military Hospital, Abu Dhabi, from January 2007 to December 2011. For each patient, a basic information including age, sex, symptoms at presentation, complete blood counts, coagulation profile, urea and electrolytes, liver function tests, serum calcium and albumin, thyroid function tests, ultrasound of neck, operative technique, review of histopathology, post-operative serum calcium and albumin level at 6 hour and 24 hour after surgery and in selected cases subsequently, as required, were recorded. Serum parathormone level and vitamin D level was also performed in prolonged

hypocalcaemia.

All cases were operated by consultants or senior specialist surgeons. No deliberate attempt was made to search for parathyroid glands. If seen during surgery, minimal handling was the objective. Vessels at superior pedicle and inferior pedicle were ligated as close to thyroid gland as possible with multiple ties.

Inclusion Criteria

All cases that underwent total thyroidectomy, irrespective of underlying pathology were included in this study.

OPERATIONAL DEFINITION

- Normal serum calcium value used in our laboratory is 8.5 mg/dl to 10.5 mg/dl. Hypocalcaemia is defined as any corrected level below 8.5 mg/dl, irrespective of any symptoms of hypocalcaemia.
- Hypocalcaemia may be temporary or permanent. Temporary hypocalcaemia is defined as one with complete resolution within six months. Permanent hypocalcaemia is defined as hypocalcaemia of more than six months and persistently below normal parathormone level. This is a serious situation and needs long term treatment with calcium and vitamin D supplements, but still the quality of life may not be same as preoperative.

RESULTS

A total of 105 cases were included in the study. There were 84 (80%) female and 21 (20%) male patients. Female to male ratio is 4:1. Age of patients ranged from 15 to 75 years with median age of 41-50 years. Age-wise distribution of patients is shown in Table-1.

Table-1

Age wise distribution of cases

Age	No. of cases
10 to 20 years	3 cases
21 to 30 years	23 cases
31 to 40 years	21 cases
41 to 50 years	32 cases
51 to 60 years	17 cases
61 to 70 years	8 cases
Above 71 years	1 case

The underlying pathology of all 105 cases is shown in Table-2

Table-2

Histopathological distribution of cases

Under lying Pathology	No. of cases
Multinodular goiter	61
Carcinoma thyroid	30
Graves' disease	6
Follicular adenoma	5
Autoimmune thyroiditis	3

Following are the disease wise results of temporary and permanent hypocalcaemia after total thyroidectomy, the lower corrected level was recorded for calculations. (Table-3).

Table-3

Disease wise results of temporary and permanent hypocalcaemia

Underlying pathology	Normal calcium	Temporary Hypocalcaemia	Permanent Hypocalcaemia
Multi nodular Goiter	41	19	1
Thyroid carcinoma	23	6	1
Grave's Disease	3	2	1
Follicular adenoma	4	0	1
Autoimmune Thyroiditis	3	0	0

In our study if the calcium level at 24 hour after surgery was normal, no further work up was done and none of the patients had any subsequent symptoms or complaints. Patients who had a drop of calcium of up to 1 mg/dl from preoperative level did not develop any symptoms and did not receive any calcium supplement and all recovered well without any subsequent consequences as noted in follow up calcium level at two weeks which turned to be normal. Patients with drop of calcium of 1.1 to 1.5 mg /dl, five out of eight cases were symptomatic and one ended with permanent hypoparathyroidism.

Patients with a drop of calcium of 1.6 to 2.0 mg/dl, 4 out of 9 cases were symptomatic and two ended with

permanent hypoparathyroidism. Patients with drop of calcium more than 2.1 mg/dl, 4 out of 4 had symptoms and one ended with permanent hypoparathyroidism. This is shown in Table 4.

Table-4
Difference of preoperative and postoperative calcium levels and permanent hypoparathyroidism

Pre operative & post operative difference of Calcium level	No. of cases	Symptoms	Permanent Hypoparathyroidism
Less than 0.5 mg/dl	7	No symptoms	---
0.6 mg to 1 mg/dl	3	No symptoms	---
1.1 mg to 1.5 mg/dl	8	Symptomatic cases 5	1 (1.5)
1.6 mg to 2.0 mg/dl	9	Symptomatic cases 4	2 (1.7), (1.7)
2.1 mg to 2.5 mg/dl	4	Symptomatic cases 4	1 (2.2)

DISCUSSION

Hypocalcaemia is a common event after post-total thyroidectomy. Though total thyroidectomy has a higher incidence of hypocalcaemia ², still it seems to be the right approach for cancer of thyroid, Grave's Disease ⁶ and even in Multinodular goiter as it removes the chance of recurrence and at same time excludes the chance of any malignancy ⁷. In our hospital, all cases except single toxic nodule were offered total thyroidectomy.

Various ways have been tried out to identify postoperative hypocalcaemia cases which need close follow up and treatment, like immediate post-operative parathormone level, combination of post-operative calcium and parathormone and post-operative calcium alone. We used post-operative calcium level as it is simple and cost effective when compared to the other two methods.

With immediate post-operative measurement of parathormone level, a fall of the PTH values by more than 88% from preoperative values, 30 min after

completion of the surgery, showed 100% sensitivity and 100% specificity for the occurrence of symptomatic hypocalcaemia and may be considered as a useful method to predict with high certainty which patients will need calcium supplementation, and to separate them from patients who can be safely and early discharged ¹.

In combined parathyroid hormone and serum calcium measurement, serum PTH level showed the highest sensitivity and specificity in predicting hypocalcaemia after 6 h (84.8 % and 93.7 %, respectively) for a criterion value ≤ 12.1 pg/ml. Serum calcium level showed the highest sensitivity and specificity after 24 hours (93.9 and 100.0 %, respectively) for a criterion value ≤ 7.97 mg/dl. Combined cut-offs of 6-h PTH and 24-h serum calcium showed sensitivity and specificity of 100 % ⁸.

Post-operative measurement of calcium is another simple and cost effective way to identify cases at high risk as in our study. In our study none of the patients with a drop of up to 1mg/dl from preoperative level had any symptoms and none received any supplement of calcium / vitamin D. A calcium drop of more than 1.1 mg/dl was recorded in 21 cases (20%). Out of these 13(61.9%) were symptomatic and four (3.8%) ended with permanent hypoparathyroidism.

In a retrospective analysis of immediate pre-operative and early post-operative calcium levels in 100 patients showed, it as a sensitive predictor of hypocalcaemia ³. In the prospective series, 76% of patients who developed hypocalcaemia had calcium drop of ≥ 1.1 mg/dl; which is comparable with our results (61.9%). Use of the 1.1 mg/dl cut-off ³ for deciding whether to start early prophylaxis is also comparable to our cut off level of 1 mg/dl. This study along with our study suggest that calcium alone is also an effective and simple way to identify high risk cases for hypocalcaemia.

In our study the incidence of temporary hypoparathyroidism is 25.7% and permanent hypoparathyroidism 3.8% after total thyroidectomy. This is comparable with international figures, as in a study ⁹ in which hypoparathyroidism was present in 348 patients at discharge (48%), in 23 at 6 months (3.38%).

Sex distribution in our study showed a transient hypocalcaemia in 25 out of 84 (31%) females and 6 out of 21 (23%) males. Three cases with permanent hypocalcaemia were females and one was male. Female patients experienced transient postoperative hypocalcaemia in 24.7% of cases, which was significantly greater than the 11.8% incidence detected in men ¹⁰. Our study also suggests a higher incidence of hypocalcaemia for female gender.

Histological review of our total thyroidectomy specimens showed three parathyroids in one specimen (permanent hypoparathyroidism), one parathyroid in 13 cases (all transient hypocalcaemia) (13.3% of total thyroidectomies). This is slightly lower than ⁴ who reviewed 287 thyroidectomies and 47 (16.4%) patients had incidentally removed parathyroid glands.

Relatively new technique of total thyroidectomy using harmonic scalpel has been also reviewed in respect to complications particularly hypocalcaemia. There were no significant differences concerning transient hypoparathyroidism requiring calcium and/or vitamin D therapy ¹¹, while in another study a reduction of hypoparathyroidism, particularly transitory, was reported using Harmonic Scalpel in thyroid surgery ⁹.

Calcium and calcitriol supplements are standard treatment for patients with post-thyroidectomy serum calcium <2.0 mmol/L ¹². Long term follow up of four cases that had permanent hypoparathyroidism showed a change in quality of life in spite of supplement vitamin D and Calcium, three stopped driving as it was difficult due to persistent muscle cramps.

CONCLUSION

The drop of corrected calcium level of less than 1 mg/dl from preoperative level was not significant, difference of more than 1 mg/dl from preoperative level should be closely watched for symptoms and presence of permanent hypocalcaemia. The quality of life in permanent hypoparathyroidism is different and does not match pre operative level in spite of Vitamin D and calcium supplements. The issue of hypocalcaemia should be well discussed and highlighted in consent for surgery along with nerve injuries and bleeding.

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