

FREQUENCY OF HYPOCALCAEMIA IN TOTAL THYROIDECTOMY

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ABSTRACT

Objective To find out the frequency of hypocalcaemia in total thyroidectomy and the conditions related to it.

Study design Descriptive study.

Place & Duration of study This study was conducted in Surgical Ward 3, Jinnah Postgraduate Medical Center Karachi, from January 2009 to July 2010.

Methodology Patients above 12 years of age of both sexes who underwent total thyroidectomy, were included. Routine preoperative investigations including serum calcium were carried out in outpatient department. Following total thyroidectomy serum calcium level was measured after 24 hours, 48 hours and then after 7 days. In hypocalcemic patients, signs and symptoms were recorded on proforma. Follow-up of patients with hypocalcemia was done for one year.

Results Out of 74 patients who underwent total thyroidectomy sixteen (21.6%) developed hypocalcaemia. It occurred in four cases of total thyroidectomy done for carcinoma thyroid, none with central neck dissection and 17.6% of cases in secondary thyroid surgery (completion thyroidectomy). This was not significantly different from other total thyroidectomies (21.6%) done in this study. Hypocalcaemia was transient in all patients.

Conclusions Frequency of hypocalcaemia in total thyroidectomy was 21.6% and was transient due to hypoparathyroidism.

Key words Hypocalcaemia, Total thyroidectomy, Parathyroid hormone.

INTRODUCTION:

Total thyroidectomy is accepted worldwide as a standard surgical procedure for the management of benign bilateral nodular thyroid goiter disease. Hypocalcaemia is the most common complication of this procedure. The reported incidence of hypocalcaemia is around 20-30% with symptoms ranging from mild paresthesia and tingling to more severe cramps, tetany and convulsions. Nidra for hypocalcaemia typically occurs at around 24-48 hours post operatively.¹ Serum calcium is measured

both in mmol/l and mg/dl with normal range varying from 2.10 to 2.6mmol/l and 8.5 to 10.5mg/dl. Hypocalcaemic symptoms are uncommon unless serum calcium level is below 2mmol/l (8mg/dl). These values have been used to define post thyroidectomy hypocalcaemia, although they are lower than the reference range.

In several series the incidence of hypocalcaemia varied from 10.6% to 50% but may be as high as 83%.² This may be the result of calcium hemodilution secondary to surgical stress with elevation of urinary calcium excretion, calcitonin release and hungry bone syndrome which are found in patients with hyperthyroidism, osteodystrophy and autoimmune fibrosis compromising parathyroid vascularization.³ In patients experiencing significant hypocalcaemia, the most probable cause

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is hypoparathyroidism secondary to trauma, de-vascularization or inadvertent excision of one or more parathyroid glands during surgery.^{4,5} Thus close monitoring of post-operative serum calcium concentration is usually recommended in high risk patients like toxic goiter, retrosternal goiter, recurrent goiter and thyroid cancer where concomitant cervical lymph node clearance is attempted.⁶

In most patients hypocalcaemia after thyroid surgery is self-limiting but in some it may be potentially dangerous.⁷ As parathyroid insufficiency is the main contributor to severe hypocalcaemia, a concept of intraoperative or early post-operative parathyroid hormone measurements to identify the sub-group of patients who are at risk of postoperative hypocalcaemia has been suggested.⁸ Various strategies for diagnosing and managing post thyroidectomy hypocalcaemia have been used. More recently measurement of intact parathyroid hormone after total thyroidectomy has been utilized to try to predict those patients at the risk of developing post thyroidectomy hypocalcaemia.¹

The objective of this study was to find out the frequency of hypocalcaemia in total thyroidectomy and to find out the relation of hypocalcaemia with special characteristics of the disease like carcinoma thyroid, retrosternal extension of goiter and completion thyroidectomy.

METHODOLOGY:

This study was conducted in surgical ward 03, Jinnah Postgraduate Medical Centre, Karachi from January 2009 to July 2010. Patients above 12 year of age in whom total thyroidectomy was indicated due to multinodular goiter, carcinoma thyroid, recurrent goiter, were included. Routine investigations including thyroid profile, serum calcium etc were done. At surgery efforts were made to identify and preserve the parathyroid glands and if parathyroid inadvertently removed or injured then autotransplantation was done in sternocleidomastoid muscle.

Post operatively serum calcium was measured after 24 hours, 48 hours and on 7th postoperative day in all patients. In hypocalcaemic patients the clinical signs and symptoms were recorded. In hypocalcaemic patients serum parathyroid level was also measured to differentiate from hemodilution and hungry bone syndrome. Hypocalcaemic patients kept admitted and treated with IV calcium and monitoring of serum calcium was done till discharge.

The other characteristics of patients like age, gender,

type of surgery (re-exploration, central neck dissection, retrosternal extension) and pathological characteristics of resected thyroid tissue with histopathological report were recorded. Follow up was done weekly for first 2 months and then monthly for 1 year. At each visit signs and symptoms of hypocalcaemia, serum calcium and parathyroid hormone measurement were done. Transient hypocalcaemia was defined as one that persists for less than one year and permanent hypocalcaemia was defined as that lasting for more than one year.

Statistical analysis was performed with SPSS version 13. Confidence interval of different variables was calculated. A sample size of 74 patients from 90 patients of multinodular goiter achieved 100% power, assuming that population proportion with null hypothesis is 21.62%.

RESULTS:

There were a total of 74 patients in this series. Age range was 16 year -65 years. Sixteen patients were of carcinoma thyroid and fifty-eight of multinodular goiter. All patients were euthyroid at the time of surgery. Hypocalcaemia was observed in 16 patients (21.62%) as shown in table I. In all sixteen hypocalcaemic patients, serum parathyroid hormone level was low, but usually became normal in 2 to 3 months. All hypocalcaemic patients recovered and became normocalcaemic between 2 to 3 months. In one patient hypocalcaemia persisted up to 10 months. In four patients parathyroid autotransplantation was done. All of these did not develop hypocalcaemia postoperatively.

Histopathological report of all patients did not reveal any parathyroid tissue in the specimen. All hypocalcaemic patients were symptomatic and presented with perioral numbness, Chvostick's and Trousseau's signs. Cardiac arrhythmias, stridor and other signs were absent. Hypocalcaemia was transient in all patients. Evidence of hungry bone syndrome and dilutional hypokalemia were not found in these patients. Parathyroid hormone level was low in all patients that showed hypocalcaemia is due to hypoparathyroidism.

DISCUSSION:

Patients were classified as hypocalcaemic if they had serum calcium level less than normal range on the 1st postoperative day. In one study hypocalcaemia was observed in 41.2% of all cases persisting in 5.6% at last follow up thus patient probably develop a permanent hypocalcaemia⁹. In other study 33.3% patients developed hypocalcaemia after thyroidectomy 1.2% develop

Table I: Hypocalcaemia in Total Thyroidectomy (n=74)

Type of patients	Total no. of patients	Hypocalcemic patients	Percentage	CI=95%
Gender				
* Male	02	0	0	--
* Female	72	16	22.22	13.6-33.8
Thyroid function tests				
* Euthyroid	70	16	22.85	14.0-34.7
* Hyperthyroid	04	0	0	--
Completion thyroidectomy	17	03	17.64	4.6-44.2
Retrosternal extension of goiter	04	01	25	--
Parathyroid autotransplantation	04	0	0	--
Central neck dissection	04	0	0	--
Carcinoma thyroid	16	04	25	8.3-52.5

and permanent hypocalcaemia in total thyroidectomy.¹⁰ In this study hypocalcaemia was transient and occurred in 21.62% patients. Transient hypocalcaemia is frequent complication after total thyroidectomy,¹¹ but in this study it was comparatively low and transient. Permanent hypocalcaemia was absent in this study. Close monitoring of postoperative serum calcium level was proposed initially to prevent postoperative symptoms.¹² However this approach has been criticized because the lowest concentration of serum calcium is usually not reached until 48 hours after thyroidectomy, with major implication on early safe discharge planning.¹³ In this study we measured the serum calcium level after 48 hours and 7th postoperative day to exclude this limitation.

Few studies have evaluated the accuracy of quick parathyroid hormone assay during thyroidectomy as predictor of postoperative hypoparathyroidism.¹⁴ But in this study all patients belonged to low socioeconomic status, so it was impossible to measure the serum parathyroid hormone levels. In some hypocalcemic patients we financially supported them to measure the parathyroid hormone level. The patients' factors causing hypocalcaemia are haemodilution, calcitonin release and hungry bone syndrome.¹⁵ In this study all hypocalcaemic patients also had a low serum parathyroid hormone level. Thus cause appears to be trauma, devascularization or inadvertent excision of parathyroid glands. This injury can be prevented if thyroidectomy is done by intracapsular approach. It has also been proved that if branches of inferior thyroid artery are individually ligated inside the capsule of thyroid gland instead of ligating trunk in continuity, then more patients can be prevented from developing hypocalcaemia. Upper parathyroid

glands are usually constant in position and lower two parathyroids are variable in location and in 60% of cases they are located away from the thyroid gland. So in total thyroidectomy they usually escape injury.

Transient hypocalcaemia may be cured also due to activity of supernumerary rudimentary 5th parathyroid at thymic or in mediastinal site.² Hyperparathyroidism is slightly more frequent in cases of thyroidectomy for hyperthyroidism, thyroid carcinoma, or previous neck operations in which the parathyroid preservation may be jeopardized due to technical difficulties.² In this study hypocalcaemia (25%) in carcinoma thyroid was not significantly high than other cases. Many authors consider that parathyroid vascularization remain intact even after ligation of all four thyroid arteries.¹⁶ The extent of operation creates not only a higher risk for accidental excision of parathyroid gland but also danger of compromising parathyroid vascularization specially when bilateral ligation of inferior thyroid artery occurs proximally so very cautious dissection is important because parathyroid function could also be altered by compression of venous drainage caused by tissue edema. If parathyroid gland is excised accidentally or is devascularized it has to be reimplanted in the sternocleidomastoid muscles.¹⁷ When 3 or more parathyroid glands could be identified and preserved in situ at operation, spontaneous recovery was observed in all cases.

Transient hypocalcaemia after total thyroidectomy occurred in 26.77% in euthyroid patients, 22.35% in malignant thyroid tumors 11% with thyrotoxicosis, and 14% in auto transplanted parathyroid glands. In this study hypocalcaemia did not occur in autotransplanted patients. In carcinoma thyroid

hypocalcaemia occurred in 25% and none in thyrotoxicosis. The 2nd most common cause of hypocalcaemia after thyroid surgery is hungry bone syndrome.¹⁹ But in this study we did not find any such patient.

In one study permanent symptomatic hypocalcaemia was found in 16.77% and transient hypocalcaemia was in 39% patients.²⁰ But in this study we did not find any permanent hypocalcaemia. In another local study permanent hypocalcaemia was noted in 39%,²¹ but permanent hypocalcaemia was absent in that study mimicking our study.

CONCLUSIONS:

Transient hypocalcaemia was noted which improved within 2 to 3 months. None of the patients suffered from permanent hypocalcaemia. Hypocalcaemia was due to hypoparathyroidism in all cases. Surgery for retrosternal extension of goiter, carcinoma thyroid and completion thyroidectomy did not significantly affected the results.

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