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Original Research Article

Study of incidence of hypocalcaemia in patients undergoing total thyroidectomy for papillary carcinoma: a retrospective study

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ABSTRACT

Background: Hypocalcaemia following total thyroidectomy is a fairly common complication. Occurrence of acute hypocalcaemia can be predicted in patients undergoing thyroid surgery for malignancy, based on serial calcium measurement and this helps in early prediction of hypocalcaemia. The aim of the study was to assess the incidence of post thyroidectomy hypocalcaemia and methods to treat hypocalcaemia and prevention of its complication at the earliest.
Methods: The incidence of hypocalcemia was analysed with serial calcium estimation in immediate post-operative period, 4 hours and 24 hours after surgery and on 5th post-operative day. The factors analysed included pre-operative and post-operative serum calcium levels, clinical features, the disease type and factors related to surgery and histopathologically diagnosis as malignant papillary thyroid carcinoma is confirmed.
Results: In this study 30 patients underwent total thyroidectomy for papillary carcinoma were studied. Incidence of 22% of hypocalcemia, with transient hypocalcemia in 20% and permanent hypocalcemia in 2% of cases were noted.
Conclusions: Patients underwent thyroid surgery for malignant conditions showed higher incidence and severity hypocalcaemia. This complication can be prevented with meticulous peroperative dissection, prompt identification of parathyroid gland. Avoiding injury or spasm of the blood vessels supplying them and frequent postoperative monitoring of serum calcium levels.

Keywords: Hypocalcemia, Incidence, Total thyroidectomy

INTRODUCTION

Post thyroidectomy hypocalcemia is one of the important morbidities of thyroid surgery.[1,2] It can range in severity from being asymptomatic in mild cases to presenting as an acute life-threatening metabolic disturbance.

Patients can have seizures, laryngeal stridor, bronchospasm in acute severe condition. Cardiac arrhythmias, refractory congestive heart failure, cataract and xeroderma are the other manifestations described. Hypocalcemia caused by transient or definitive hyperparathyroidism was the most frequent complication after thyroidectomy, occurring in 63% of the cases and the nadir of hypocalcemia often appears within 48 hours after thyroidectomy it generally present on second to fifth postoperative day. The clinical feature includes circumoral paraesthesia, carpopedal spasm, and in severe cases it may lead to tetany.

However, in a few patients, hypoparathyroidism persists after 1 year and may be considered permanent. The occurrence of permanent hypocalcemia is mainly attributed to postoperative hypoparathyroidism when parathyroid glands are devascularized, injured, or dissected during the surgery present study was done to see the incidence of hypocalcemia after total thyroidectomy and to analyse the factors which might play role in its

development. Post-operative hypocalcemia requires administration of calcium and vitamin D supplementation along with monitoring of blood calcium levels.[3-5]

METHODS

The present prospective study was conducted in department of general surgery at an apex institute of south India. A total 30 patients who underwent bilateral thyroidectomy for papillary carcinoma were analysed. The study period was from June 2019 to June 2021. Thirty patients were enrolled in study who qualified the inclusion criteria i.e. patients more than 13 years of age including both genders admitted and diagnosed as having thyroid swelling requiring thyroid surgery. Patients less than 12 years of age, pervious thyroid operation or irradiation, concomitant parathyroid disease, hypocalcaemia patients, patients already on calcium supplementation were excluded from the study. An informed consent was taken from all patients/guardians for inclusion in study. Data was collected from the patients undergoing total thyroidectomise by meticulous history taking, careful clinical examination, appropriate radiological, haematological investigations including serum calcium and serum albumin, operative findings and follow-up of the cases will be done after surgery for post-operative hypocalcaemia. Duration of operation and detailed operative findings like site and size of specimen, anatomy of parathyroid glands, anatomy of laryngeal nerves and relation of goitre with regional structures like trachea, esophagus etc. were noted. In post-operative period, all the patients were assessed for any symptoms and signs of hypocalcemia.

Serial monitoring of serum calcium levels in pre-op period, immediate and early post-operative period i.e.; immediately after the surgery, 4 hours after surgery and 24 hours after surgery and on 5th post-operative day was done. All these findings were entered into predesigned patient proforma and results were analysed.

Study sample

With 95% confidence level and margin of error of ±15%, a sample size of 26 subjects will allow the study to determine the incidence of post-operative hypocalcemia after total thyroidectomy. Adjusting for 15% drop out rate, recruitment target will be set at 30 subjects by using the formula:

$$N = \frac{Z^2 p(1-p)}{d^2}$$

Where Z= z statistic at 5% level of significance; d was margin of error; and p was anticipated prevalence rate (50%).

RESULTS

In this study 30 patients underwent total thyroidectomy for papillary carcinoma were studied. Patients with altered calcium before surgery were excluded. 27 female patients and 3 males' patients were included (Table 1).

Table 1: Description of study patients.

Sex distribution	Number of patients
Male	3
Female	27
Total	30

Table 2: Age distribution of study patients.

Age distribution (years)	Number of patients
12-30	5
31-40	13
41-50	7
>50	5
Total	30

According to age distribution higher incidence of hypocalcemia occurred in patients between 20 to 35 years. During surgery, all precautions were taken recurrent laryngeal nerve and parathyroid glands. Recurrent laryngeal nerve was identified in 12 (93.33%) patients on right side and 13 (96.67%) patients on left side.

In post-operative period, all the patients were thoroughly examined and evaluated for signs and symptoms of hypocalcemia like paresthesia's, carpopedal spasm, convulsions, Chvostek's sign and Trousseau's sign.[7] Post-operative progress of the patients showed that paresthesia was observed in 18 (60.0%) patients, Chvostek's sign in 10 (33.33%), Trousseau's sign in 3 (10%) and convulsion in one patient. In none of the patients, authors found carpopedal spasm.

Table 3: Post-operative evaluation of hypocalcemia.

Post-operative progress	No. of patients	Percentage (%)
Paraesthesia	18	60
Carpopedal spasm	0	0
Convulsions	1	3.33
Chevostek's sign	10	33.33

Table 4: Incidence of hypocalcemia in different thyroid conditions.

Severity of hypocalcemia	No. of patients	Incidence (%)
Severe	6	20
Mild to moderate	15	50
Normocalcemic	9	30

DISCUSSION

In the present era mortality after thyroid surgery has decreased drastically because of expertise of surgeons and better surgical techniques. But post-operative complications specially hypocalcemia remains a fairly prevalent complication in patients undergoing total thyroidectomy and central lymph node dissection.

Recurrent laryngeal nerve and parathyroid gland identification

In the present study, recurrent laryngeal nerve (RLN) was tried to identify in all the patients. In 12 patients (93.33%) it was identified on left side and in 13 patients (96.67%) it was identified on right side. Zakaria et al in their study identified recurrent laryngeal nerve in 67.35% patients.[8]

The identification of recurrent laryngeal nerve by the surgeon during the surgery minimizes the risk of damage to the nerve during surgical dissection. Recurrent laryngeal nerve injury after thyroidectomy can jeopardize the quality of life. In addition to the hoarseness of voice that occurs with unilateral recurrent laryngeal nerve injury, bilateral nerve injury leads to dyspnea and often life-threatening glottal obstruction. In this surgeon identified all parathyroid glands in 46.6% patients, three parathyroid glands in 23.3% patients, two parathyroid glands in 23.3% patients and one parathyroid gland in 6.8% patients. Nair et al in their study could identify all parathyroid gland in 80.14% patients and three parathyroid glands in 19.8% patients.[9] Eismontas et al in their study identified all parathyroid glands in 21.3% patients, three parathyroid in 52% patients, two parathyroid in 24.2% and single parathyroid gland in only 2% patients. The greater the number of PGs found during the surgery, lower the chance of hypocalcemia. The study by Thomusch et al determined that permanent post-operative hypocalcemia was more likely to developed if less than two PGs were found during surgery.[10] On other hand, some studies have found that more PGs found during the surgery may be associated with temporary hypocalcemia.

The prevalence of post-operative hypocalcemia following thyroidectomy which may be temporary or permanent ranges from 0% to 83%, with the highest incidence seen in patients undergoing total thyroidectomy for papillary carcinoma (70%). Decreased serum calcium, secondary to hypoparathyroidism, may present clinically with muscle cramps, perioral and peripheral paresthesia's, tetany and confusion.

Management protocol

Management protocol was as follows- (a) every total thyroidectomy patient or completion thyroidectomy patient is started on 3 g of elemental calcium, p.o., per day. This should begin as soon as the patient can take p.o. unless there is a specific contraindication to oral calcium in the patient; (b) check ionized calcium q8 hours post-op; (c) if two consecutive calcium values (within the normal range) are stable or increasing, discontinue checking and patient is tapered off calcium supplementation. Regimen as follows: 1 g elemental calcium TID for 1 week, 1 g elemental calcium BID for 1 week, 1 g elemental calcium Q-day until RTC attending. Of note 2.5 g of TUMS (calcium carbonate) is equivalent to 1 g of elemental calcium. If calcium is decreasing, increase oral calcium to 4 g elemental per day. If this stabilizes the calcium, arrangements for the above taper regimen beginning at 1 g QID and tapering down by one gm per week are made at discharge. Check and correct abnormal magnesium. The patient should have calcium checked 1 week after discharge (locally or at UIHC follow-up); (d) every total thyroidectomy/completion thyroidectomy patient started on Os- Cal with vitamin D (500 mg $CaCO_3$- 200 IU vitamin D3 per tab), 2 tabs (total of 1000 mg $CaCO_3$) TID taper over 3 weeks- 2 tabs TID for one week, then 2 tabs BID for one week, then 2 tabs daily for one week, then off; (e) if the patient requires 1,25-dihydroxy vitamin D, the patient should be sent home on the dose of oral calcium and vitamin D that stabilized the ionized calcium; (f) for patients that are severely symptomatic with last evaluated ionized calcium below 3.8 or for those with a calcium below 3.2, IV calcium may be administered ONE amp of calcium gluconate (10 ml calcium gluconate 10% contains 1 g calcium gluconate) in 500 ml of D5W is given IV over 5 hours. Be sure that the IV is functioning well before administration of the calcium. This infusion will usually stop the symptoms. Recheck calcium after the administration. If necessary, this may be repeated. Recheck or check the magnesium level and correct if needed.

What did this study add to existing knowledge?

The study described the incidence of hypocalcemia after total thyroidectomy when only papillary carcinoma were taken into account.

CONCLUSION

Post-operative hypocalcemia remains a frequent complication which can be avoided by identification of risk factors, by following proper meticulous surgical technique. The estimation of serial serum calcium levels is fairly predictable and cost-effective method for diagnosis of early post-operative hypocalcemia and prediction of patients who are at higher risk of developing long-term hypocalcemia after thyroid surgery. It aids in early management with calcium and vitamin supplements reducing the morbidity involving total thyroidectomy

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