



Original research

Prospective evaluation of intra-operative quick parathyroid hormone assay as an early predictor of post thyroidectomy hypocalcaemia



Ashwini C. Reddy*, Gyan Chand, M. Sabaretnam, Anjali Mishra, Gaurav Agarwal, Amit Agarwal, A.K. Verma, S.K. Mishra

Department of Endocrine Surgery, Sanjay Gandhi Post Graduate Institute of Medical Sciences, Lucknow, 226014, India

HIGHLIGHTS

- Prospective study evaluating the utility of Intra operative serum quick parathyroid hormone level measurement twenty minutes after total thyroidectomy in predicting post-operative hypocalcemia.
- Prospective longitudinal study which included patients undergoing total thyroidectomy for benign or malignant thyroid disorders at tertiary hospital.
- Intra operative serum quick PTH level measurements were done twenty minutes after resection of thyroid.
- IOPTH level of 9 pmol/L, twenty minutes after total thyroidectomy, had the highest sensitivity and specificity of 92% and 83% respectively in predicting post-operative hypocalcemia.

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ABSTRACT

Background: Hypocalcaemia following total thyroidectomy is a major contributing factor in delayed hospital discharge and dissuading surgeons from day care thyroidectomy. We prospectively evaluated the utility of Intra-operative serum quick parathyroid hormone level measurement twenty minutes after total thyroidectomy in predicting post-operative hypocalcemia.

Material and methods: Prospective longitudinal study which included patients undergoing total thyroidectomy for benign or malignant thyroid disorders at SGPGIMS, Lucknow, India from November 2013 to February 2015. Patients who received calcium prophylaxis were excluded from the study. Intra-operative serum quick PTH level measurements were done twenty minutes after resection of thyroid. Serum calcium levels were estimated preoperatively and on three consecutive post operative days. Calcium supplementation was started in patients with symptomatic hypocalcemia.

Results: The study included 100 patients with a mean age of 41 years, range 17–72 years. 48 patients had Euthyroid multinodular goitre, 10 patients grave's disease and 42 patients had differentiated thyroid cancer. Total thyroidectomy was performed in 88 patients, total thyroidectomy with lymph node dissection in 12 patients. Post-operatively 23% patients experienced symptomatic hypocalcemia. The IOPTH level of 9 pmol/L, twenty minutes after total thyroidectomy, had the highest sensitivity and specificity of 92% and 83% respectively in predicting post-operative hypocalcemia.

Conclusion: Parathyroid hormone assay twenty minutes after thyroidectomy is an accurate and reliable means of predicting clinically relevant hypocalcemia. Patients with PTH values greater than 9 pmol/L twenty minutes after thyroidectomy, can be safely discharged on the same postoperative day as the probability of life threatening hypocalcemia is unlikely.

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* Corresponding author. Department of Endocrine surgery, Sanjay Gandhi Post Graduate Institute of Medical Sciences, Raebareilly Road, Lucknow, 226014, India.
E-mail address: drashwini@gmail.com (A.C. Reddy).

1. Introduction

Thyroidectomy has evolved a long way since the 1970's. The technique of total thyroidectomy has shifted from lateral approach to capsular dissection in order to avoid injury to the recurrent laryngeal nerve and the parathyroids, and the completeness of

resection has progressed from anatomical dissection to embryological dissection with complete excision of the pyramidal remnants and tubercle of zuckerkanndl so as to prevent recurrence. With a significant decrease in the rates of postoperative hemorrhage, RLN palsy and permanent hypocalcaemia, there has been a subsequent reduction in hospital stay and thyroidectomy can now be performed as a day care surgery. However, temporary hypocalcaemia commonly occurring secondary to temporary hypoparathyroidism is one of the most frequent morbidities following thyroidectomy, with incidence ranging between 3 and 40% [1,2]. Additionally, as potentially life threatening hypocalcaemia may not develop for 24–48 h following surgery, besides postoperative bleeding, hypoparathyroidism is a major concern for delayed hospital discharge and dissuading surgeons from performing day care thyroid surgery.

To safely manage postoperative hypoparathyroidism/hypocalcaemia, various approaches have been adopted. The most common being serial calcium monitoring wherein calcium levels are typically drawn at 6–12 h intervals until a normocalcaemic plateau or a stable upward trend is demonstrated but this involves patients staying for at least 1–2 nights in the hospital [3]. In the era of cost containment, in order to avoid unnecessary prolonged hospital stay, there has been a gradual shift from Serial calcium monitoring to the other approaches like Routine calcium supplementation and Parathyroid hormone (PTH) directed supplementation. The availability of a perioperative method like PTH assay that can accurately identify patients who are at low risk to develop hypocalcaemia would be beneficial. These low risk patients, who comprise the majority of thyroidectomy patients, can undergo day care surgery. Similarly, those patients that can be identified early as high risk for developing hypocalcaemia can receive immediate prophylactic treatment there by mitigating troublesome symptoms and prolonged hospitalization. To detect hypocalcaemia, a comparison of decrease in serum PTH level after thyroidectomy to preoperative baseline PTH has been studied. However, this approach required the collection of several samples during and after surgery and the test's accuracy varied with preoperative PTH level [4,5]. Recently, a single PTH measurement some time after surgery has been advocated. Numerous PTH criteria with regards to timing of assay have been proposed but none have clearly been shown to be superior [5–7]. Recent reviews have suggested that measurement of a single PTH assay any time from 10 min to up to 6 h postoperatively seemed to provide equally accurate predictive results [5,7]. In our study, a single quick intraoperative PTH (ioPTH) level measurement was taken 20 min after thyroidectomy so that the PTH results would be available sooner and would facilitate ambulatory surgery. The aim of our study was to evaluate prospectively the utility of quick intraoperative PTH (ioPTH) assay in predicting clinically relevant postoperative hypocalcaemia [8–11].

2. Patient and methods

2.1. Study design

This was a single-center prospective cohort study conducted at a tertiary referral center from November 2013 to February 2015. One hundred patients who underwent total thyroidectomy for benign as well as malignant pathologies of thyroid gland were studied. The protocol was approved by the Institution's Ethics Committee, and written informed consent were obtained from all participants.

2.2. Patients

Inclusion criteria included all patients who underwent either a total or a completion total thyroidectomy for benign or malignant

thyroid disease. Exclusion criteria included patients who received postoperative calcium prophylaxis, patients with known hyperparathyroidism, chronic renal insufficiency, pregnancy or those with concomitant serious illnesses requiring hospitalization during the perioperative period and those with incomplete biochemical values. Patients on medications known to affect calcium or PTH levels such as lithium, octreotide, antiepileptics, glucocorticoids, bisphosphonates, diuretics and estrogens were excluded from the study.

2.3. Methods

Total thyroidectomy was defined as excision of both lobes and isthmus of the thyroid gland. Completion thyroidectomy was defined as a patient who had a previous thyroid lobectomy and who was presenting for excision of the remaining thyroid lobe. All surgeries were performed according to the department protocol, the recurrent laryngeal nerves were carefully identified and dissected, and the superior thyroid artery and vein were separately identified and ligated close to the thyroid gland. Parathyroid glands were routinely identified and preserved, with meticulous dissection to preserve their blood supply. If the parathyroid glands could not be readily identified, further dissection was not undertaken to identify them. Any devascularized parathyroid glands were immediately minced and auto transplanted to the ipsilateral sternocleidomastoid muscle. Operative findings such as the weight of the thyroidectomy specimen and the number of parathyroid glands identified and auto transplanted were recorded. The quick ioPTH level measurements were taken twenty minutes after excision of the thyroid, while the patient was still anesthetized. Serum Calcium levels were checked preoperatively and on post-operative days 1, 2 and 3. All patients were observed for the development of either asymptomatic (biochemical) or symptomatic (clinical) hypocalcaemia. The decision of calcium supplementation was not dependent on the ioPTH levels. Asymptomatic/biochemical hypocalcaemia was defined as a serum calcium of less than 8.0 mg/dL in the absence of clinical signs or symptoms. Symptomatic/Clinical hypocalcaemia was defined as the presence of clinical signs or symptoms of hypocalcaemia with a serum calcium less than 8.0 mg/dL, or the presence of signs and symptoms of hypocalcaemia in patients with a serum calcium equal to or greater than 8.0 mg/dL. Patients who developed biochemical hypocalcaemia were treated with elemental oral calcium supplementation. Patients who developed clinically relevant hypocalcaemia were treated with intravenous calcium gluconate and/or oral vitamin D supplementation in addition to elemental oral calcium.

All post thyroidectomy patients were followed up within 1 week and were asked specifically about hypocalcaemic symptoms after hospital discharge. They were then followed up every 2–3 months for the first year. Those patients who discontinued all supplements in the presence of normocalcaemia within 6 months of surgery were regarded as having temporary hypoparathyroidism, whereas those who continued on the supplements for more than 6 months with low serum PTH at 6 months were categorized as having permanent hypoparathyroidism.

2.4. Laboratory

The Siemens Immulite Immunoassay System, a rapid assay based upon chemiluminescence for intact parathyroid hormone, was utilized in our study. The result is usually available within 15–30 min, and all serum utilized was obtained from peripheral venipuncture. The lower and higher limits of detection range from 5 to 2500 pg/ml with an analytical sensitivity of 4.0 pg/ml. The intraassay and interassay precision are <12% and <10% respectively.

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