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# A "safe and effective" protocol for management of post-thyroidectomy hypocalcemia

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**KEYWORDS:**
Hypocalcemia;
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Protocol;
Parathyroid hormone

**Abstract**

**BACKGROUND:** This study evaluates the outcomes of a protocol to manage hypocalcemia after thyroidectomy (TTX).

**METHODS:** A review of prospectively collected data was performed in 130 patients who underwent TTX after the introduction of a specific protocol. These patients were compared with a control group of 195 patients who underwent TTX the year prior when routine calcium supplementation was utilized and no specific protocol was used.

**RESULTS:** Of the 120 patients in whom the protocol was followed, 44 (37%) patients were classified as high risk, 15 (13%) intermediate risk, and 61 (51%) low risk. The protocol had a sensitivity of 85% and a negative predictive value of 92% for predicting subsequent hypocalcemia. With the implementation of the protocol, there was significant reduction in temporary hypocalcemia events ($P = .008$) and intravenous calcium drip ($P = .49$). Also, calcium supplementation was significantly lower in the protocol group ($P \leq .001$).

**CONCLUSIONS:** This hypocalcemia protocol identifies patients who do not require additional supplementation and additional monitoring. At the same time, it identifies those who will benefit from supplementation after TTX.

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Hypocalcemia is the most common complication after thyroidectomy (TTX). There is a wide variation in the reported incidence ranging from 1.6% to 50.0%, although most surgical units experienced in total TTX report a 2% or less incidence of persistent dysfunction.[1] This wide range is due to differences in definitions,[2] surgical procedure, surgeon expertise, and patient population. There is a risk of iatrogenic injury to the parathyroid glands during any operation in which both lobes of the thyroid gland are explored or resected, although permanent hypoparathyroidism may not be due to direct injury alone. Apart from surgical injury, unsuspected excision of one or more parathyroids or metabolic factors such as "hungry bones" associated with

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thyrotoxicosis may cause postoperative hypocalcemia.[1,3] Although few patients develop symptomatic hypocalcemia, the social, emotional, and physical costs of symptomatic hypocalcemia requiring aggressive supplementation, repeat biochemical evaluation, and possibly hospital readmission are considerable.[4]

There are numerous published strategies for the management of post-TTX hypocalcemia: the traditional approach of inpatient clinical assessment and monitoring calcium levels,[5] routine use of oral calcium and/or vitamin D,[3,6] use of calcium levels to predict and direct management,[7] and, lately, various parathyroid hormone (PTH)-driven algorithms.[8] However, to date there are no standard guidelines or an optimal algorithm for its management.

We hypothesized that by implementing a standard protocol driven by immediate postoperative PTH and calcium levels for the management of hypocalcemia, we will safely and efficiently reduce symptomatic hypocalcemia, the need for intravenous (IV) calcium, and unnecessary calcium supplementation. The protocol will also recognize those at high risk and allow closer supervision and prompt early therapy. Moreover, it will identify those who are at low risk, allowing for a safe earlier/same-day discharge.

## Patients and Methods

A retrospective review of prospectively collected data was performed in 130 consecutive patients who underwent total TTX, completion TTX, and/or central neck dissection (CND) after the introduction of a protocol to manage post-TTX hypocalcemia at a single tertiary care center. Surgical procedures were performed by 3 different high-volume endocrine surgeons over this study period. The protocol incorporated preoperative PTH and immediate postoperative PTH, percentage PTH drop, and corrected calcium level (CCL). CCL was calculated with the following equation: serum calcium (mg/dL) + .8 × [4 − albumin (g/dL)].[9] Patients were stratified into 3 categories: high, intermediate, and low risk (Fig. 1). Patients were classified as high risk if the postoperative PTH level was 10 pg/mL or higher[10] and/or had a drop in PTH level of higher than 60%.[11] Patients in the high risk group were immediately started on oral calcitriol .5 mcg twice daily and oral calcium carbonate 1,000 mg three times a day. Patients were in the intermediate risk group if the postoperative PTH level was 11 to 19 pg/mL and/or the CCL was less than 8 mg/dL. Intermediate risk patients were given only oral calcium carbonate 1,000 mg three times a day. Patients were classified as low risk if the postoperative PTH was 20 pg/mL or higher[12] and CCL was 8 mg/dL or higher. Low risk patients received no supplementation. For patients with a history of gastric bypass surgery, achlorhydria, or taking an antacid medication (ie, H2 blockers, proton pump inhibitors), oral calcium citrate 1,900 mg three times a day was given instead of calcium carbonate. Additionally, calcium levels were checked at 10 pm on the day of surgery and at 6 am the next day. The CCLs at these times and the presence of symptoms were used to further direct the management of hypocalcemia (Figs. 2 and 3).

These study patients were compared with a control group of 195 consecutive patients who underwent total TTX, completion TTX, and CND the year prior to the protocol when routine calcium supplementation plus/minus calcitriol was the practice; the decision to add calcitriol was by attending choice. Patient demographics, indications for TTX, concomitant central and/or lateral neck dissection, parathyroid autotransplantation, hypocalcemia events, symptomatic and severe hypocalcemia events, need for supplementation on discharge, length of hospital stay (LOS), and readmissions were compared between both groups.

Hypocalcemia prior to the implementation of the protocol was defined by an uncorrected serum calcium level of less than 8 mg/dL,[6,13,14] while on protocol it was defined as a CCL less than 8 mg/dL.[2] Severe hypocalcemia was defined as a serum calcium level of 7 mg/dL or higher prior to protocol and a CCL of 7 mg/dL or higher on protocol. Hypocalcemia event was defined as an episode of hypocalcemia at any point after the operation (10 pm and/or 6 am). Mild paresthesia and tingling were considered as mild symptoms of hypocalcemia. On the other hand, muscle cramping, tetany, confusion, and convulsions were defined as severe symptoms. Mild hypercalcemia was defined as a corrected serum calcium level of 10.4 to 11.9 mg/dL, moderate 12 to 14 mg/dL, and severe higher than 14 mg/dL. Vitamin D insufficiency was defined as a serum 25-hydroxyvitamin D level of less than 30 ng/mL and deficiency as less than 20 ng/mL.[15]

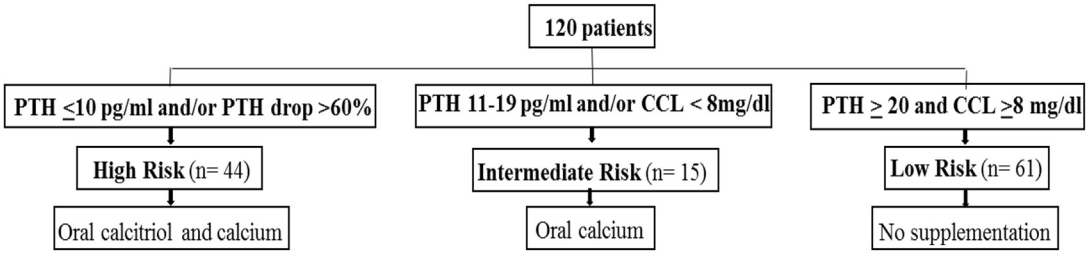


**Figure 1** Risk stratification and initial management based on immediate postoperative laboratory results. CCL, corrected calcium; PTH, parathyroid hormone.

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