Serum Parathyroid Hormone Is Not an Accurate Predictor of Postthyroidectomy Hypocalcemia in Vitamin D–Deficient Patients: A Pilot Study

To the Editor:

Transient hypoparathyroidism resulting in temporary hypocalcemia is the most frequent complication of total thyroidectomy and affects up to one third of patients. The ability to accurately predict hypocalcemia after thyroidectomy allows timely intervention and facilitates early discharge of patients. The postoperative decline in serum parathyroid hormone (PTH) is currently regarded as the gold standard biochemical predictor of postthyroidectomy hypocalcemia. Although the value of PTH in predicting postthyroidectomy hypocalcemia has been extensively studied, its predictive accuracy in vitamin D–deficient patients is unclear. This is of particular importance because there is a high prevalence of vitamin D deficiency in patients with thyroid nodules, malignancy, and Graves disease, the major indications for thyroidectomy. We retrospectively examined the value of serum PTH as a predictor of postthyroidectomy hypocalcemia in patients with and without vitamin D deficiency.

We identified 74 consecutive patients who had undergone total/completion thyroidectomy. Serum 25-hydroxyvitamin D concentration was measured preoperatively, and serum PTH and calcium concentrations were measured in all patients 8–10 h after surgery. Serum calcium and albumin were measured by using standard automated assays (Abbott Architect, Abbott Diagnostics). PTH was measured by using an automated immunoassay (Abbott Architect, Abbott Diagnostics). The CV for this assay was <8% across the diagnostic range.

Serum 25-hydroxyvitamin D was measured by using the automated Liaison assay (Diasorin) with a CV of <11% across the diagnostic range. A 25-hydroxyvitamin D concentration <25 nmol/L was used to indicate vitamin D deficiency, as suggested by the manufacturer’s reference range.

The definition of temporary hypocalcemia after thyroidectomy in the literature varies between different studies. In one prospective study of hypocalcemia developing after thyroidectomy, patients were treated if they were symptomatic or had serum calcium <1.95 mmol/L (3). We used similar criteria and defined temporary hypocalcemia as a corrected serum calcium of ≥1.95 mmol/L or the presence of hypocalcemic symptoms.

Patients were divided into 2 groups according to their preoperative serum 25 hydroxyvitamin D concentrations. Of 58 patients with 25-hydroxyvitamin D concentrations ≥25 nmol/L, 23 patients developed hypocalcemia requiring treatment. Of 16 patients with vitamin D deficiency developed hypocalcemia requiring treatment. ROC curves for serum PTH were created for both groups (Fig. 1). The ROC curve reflects the effectiveness of a test in correctly establishing the diagnosis. The area under the ROC curve for serum PTH to predict hypocalcemia postthyroidectomy hypocalcemia in patients with a 25-hydroxyvitamin D concentration ≥25 nmol/L was 0.93 (95% CI: 0.86–1.00; P < 0.0001). The area under the ROC curve for serum PTH to predict hypocalcemia postthyroidectomy hypocalcemia in patients with a 25-hydroxyvitamin D concentration >25 nmol/L was 0.68 (95% CI: 0.39–0.97; P = 0.23). Our results show that serum PTH is a good predictor of postthyroidectomy hypocalcemia in the absence of vitamin D de-
ficiency. However, serum PTH was not an accurate predictor of post-thyroidectomy hypocalcemia in patients with vitamin D deficiency. Vitamin D deficiency is associated with increased serum PTH. Therefore the decline in serum PTH to an absolute cutoff value may take longer in these patients. We measured serum PTH at 8–10 h postthyroidectomy. Further studies should assess the value of PTH measured at a later time point in predicting postthyroidectomy hypocalcemia in vitamin D–deficient patients. A limitation of this pilot study was the small number of patients with vitamin D deficiency, which may have had an effect on the area under the ROC curve in this group.

Absolute concentrations of PTH are commonly used to predict postthyroidectomy hypocalcemia. Our results confirm that a serum PTH concentration measured 8–10 h after total thyroidectomy predicts the development of hypocalcemia, but only in the absence of vitamin D deficiency. Further studies are required to investigate whether percentage decrease in serum PTH (rather than absolute concentration) is a better predictor of postthyroidectomy hypocalcemia in vitamin D–deficient patients. A decrease in PTH of 60% coupled with a simultaneous decrease in calcium of 10% that occurs 5–6 h postthyroidectomy has been reported to have a sensitivity and specificity of 100% for predicting hypocalcemia (4).

Serum PTH did not accurately predict the occurrence of hypocalcemia in vitamin D–deficient patients. It is therefore important to recognize this limitation of serum PTH, given the high prevalence of vitamin D deficiency in patients undergoing total thyroidectomy. It has been shown that the Liaison immunoassay is less accurate than liquid chromatography–tandem mass spectrometry for measuring concentrations of 25-hydroxyvitamin D (5). It would therefore be desirable to use liquid chromatography–tandem mass spectrometry for measuring 25-hydroxyvitamin D in future studies. Preoperative measurement of 25-hydroxyvitamin D and vitamin D replacement before surgery, where possible, may increase the reliability of PTH as a predictor of postthyroidectomy hypocalcemia.

Author Contributions: All authors confirmed they have contributed to the intellectual content of this paper and have met the following 3 requirements: (a) significant contributions to the conception and design, acquisition of data, or analysis and interpretation of data; (b) drafting or revising the article for intellectual content; and (c) final approval of the published article.

Authors’ Disclosures or Potential Conflicts of Interest: No authors declared any potential conflicts of interest.

Role of Sponsor: The funding organizations played no role in the design of study, choice of enrolled patients, review and interpretation of data, or preparation or approval of manuscript.

References