



Case Report

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Transient Symptomatic Hypocalcemia after Total Thyroidectomy: Two Case Reports

Elham Nazar¹, Seyed Amir Miratashi Yazdi², Elahe Farmani¹, Aysan Nozheh^{1*}

1. Department of Pathology, Sina Hospital, School of Medicine, Tehran University of Medical Sciences, Tehran, Iran.

2. Department of General Surgery, Sina Hospital, School of Medicine, Tehran University of Medical Sciences, Tehran, Iran.

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Citation Nazar E, Miratashi Yazdi SA, Farmani E, Nozheh A. Transient Symptomatic Hypocalcemia after Total Thyroidectomy: Two Case Reports. Case Reports in Clinical Practice. 2026; 11(2): 91-95. DOI:10.18502/crcp.v11i2.22389

Running Title Hypocalcemia after Thyroidectomy



Article info:

Received: March 18, 2026

Revised: April 11, 2026

Accepted: April 15, 2026

Keywords:

Hypocalcemia; Thyroidectomy; Graves' disease; Multinodular goiter

ABSTRACT

Transient hypocalcemia after thyroidectomy happens despite watchful preservation of the parathyroid glands and their blood supplies during surgery. Thyroidectomy for Graves' disease is accompanied by a higher risk of transient hypocalcemia than for benign thyroid disease, including goiter, and the reasons are still unclear. We report two patients with Graves' disease and goiter with symptomatic hypocalcemia after total thyroidectomy.

We report a 64-year-old woman with multinodular goiter and a 41-year-old Iranian woman with a history of Graves' disease who presented with transient symptomatic hypocalcemia after total thyroidectomy with intact parathyroid glands on surgery. They had a longer hospitalization time than usual surgeries due to hypocalcemia. However, they had normocalcemia at 1-year follow-up after discharge.

Severe hypocalcemia after thyroidectomy can have some related complications and may be life-threatening. Calcium supplementation before surgery is a simple choice of treatment for the reduced probability of symptomatic hypocalcemia after Graves' disease or benign thyroid disease in high-risk patients.

Introduction

The standard treatment for the management of benign thyroid diseases is total thyroidectomy. Hypocalcemia is one of the complications of total thyroidectomy, with a prevalence rate from 1% to 50%, with various symptoms. Hypocalcemia happens around 24 to 48 hours after surgery but may be delayed about 4 days. Hypocalcemia is a reason for longer patient stays than is usual for this

surgery. With the increasing trend for shorter hospital stays, there has been attention to hypocalcemia after thyroidectomy [1]. The parathyroid glands are placed in the posterior of the thyroid gland and have parathyroid hormone (PTH) secretion for calcium homeostasis [2]. Total thyroidectomy is now usually done with the separation of the vascular source of parathyroid glands by directly entering the capsule of the thyroid gland [3]. However, only some patients show hypocalcemia after surgery and have variations in symptoms. So, the reasons for transient hypocalcemia

* Corresponding Author:

Aysan Nozheh

Address: Department of Pathology, Sina Hospital, School of Medicine, Tehran University of Medical Sciences, Tehran, Iran.

E-mail: a-nozheh@razi.tums.ac.ir



after thyroidectomy are not completely understood [4]. We report two cases of transient hypocalcemia after total thyroidectomy due to different reasons (Graves' disease and benign multinodular goiter).

Case Presentation

Case Presentation 1

A 64-year-old Iranian woman was referred to the surgery department with an enlarged thyroid gland and hoarseness for 6 months. She had no past medical or family histories. Physical examination showed nodular enlargement at both thyroid lobes. Routine laboratory data were within normal limits, including a serum calcium level of 9.5 mg/dL, and she was also euthyroid. Sonography reported benign iso-hyperechoic nodules suggestive of multinodular goiter without any suspected nodules. She was scheduled for total thyroidectomy due to a symptomatic multinodular goiter. On surgery, the thyroid gland had a multinodular appearance with a weight of 400 g and measuring 11×5×4.5 cm in the right thyroid lobe, 9×3×1.5 cm in the isthmus, and 9×5×4 cm in the left thyroid lobe, and total thyroidectomy was performed without any complications (Figure 1, right). Histopathological examination revealed a multinodular goiter without any parathyroid gland in all of the submitted sections (Figure 2, right). At 24 hours after surgery, she had fatigue and muscle cramps, and her serum calcium level was 7 mg/dL. The patient was hospitalized for longer than the usual time to reach a normal calcium level (10.9 mg/dL), achieved with oral calcium supplementation.

Case Presentation 2

A 41-year-old Iranian woman was referred to the

surgery department with an enlarged thyroid gland and dysphagia 1 year ago. She had established a Graves' disease diagnosis 5 years ago. Graves' disease is caused by excessive thyroid-stimulating hormone (TSH) production. So, the patient, before surgery, was treated with methimazole to have a normal serum TSH level. She had no other past medical or family histories. Physical examination revealed a firm consistency in both enlarged thyroid lobes. Routine laboratory data were within normal limits, including a serum calcium level of 8.5 mg/dL. Sonography showed a heterogeneous, hyperechoic thyroid texture without nodularity. She was scheduled for total thyroidectomy due to symptomatic Graves' disease. On surgery, the thyroid gland had diffuse symmetrical enlargement with firm consistency and a weight of 510 g, measuring 6×3×1.5 cm in the right thyroid lobe, 4×2×0.6 cm in the isthmus, and 4×3.5×2 cm in the left thyroid lobe, and total thyroidectomy was performed without any complications (Figure 1, left). Histopathological examination revealed hyperplastic thyroid follicles coexistent with severe chronic lymphocytic thyroiditis consistent with Graves' disease, without any parathyroid gland in all of the submitted sections (Figure 2, left). At 24 hours after surgery, she had mild tetany and muscle cramps, and her serum calcium level was 7.5 mg/dL, and her parathyroid hormone (PTH) was less than 1 pg/mL. The patient was hospitalized for about one week, which was longer than the usual time, to reach a calcium level of 9.4 mg/dL and PTH of 8.1 pg/mL with oral calcium supplementation.

Post-thyroidectomy hypocalcemia, transient hypoparathyroidism, permanent hypoparathyroidism, parathyroid gland ischemia or devascularization, hypomagnesemia, respiratory alkalosis (hyperventilation), postoperative laryngospasm, thyroid storm (rare postoperative differential), and

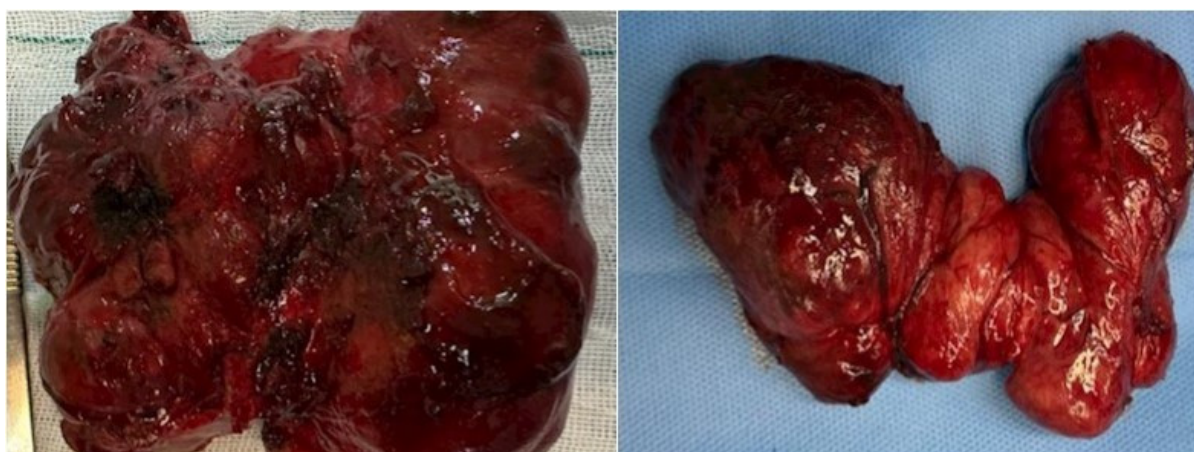


Fig. 1. On operation time, enlarged thyroid glands (right: multinodular goiter and left: Graves' disease)

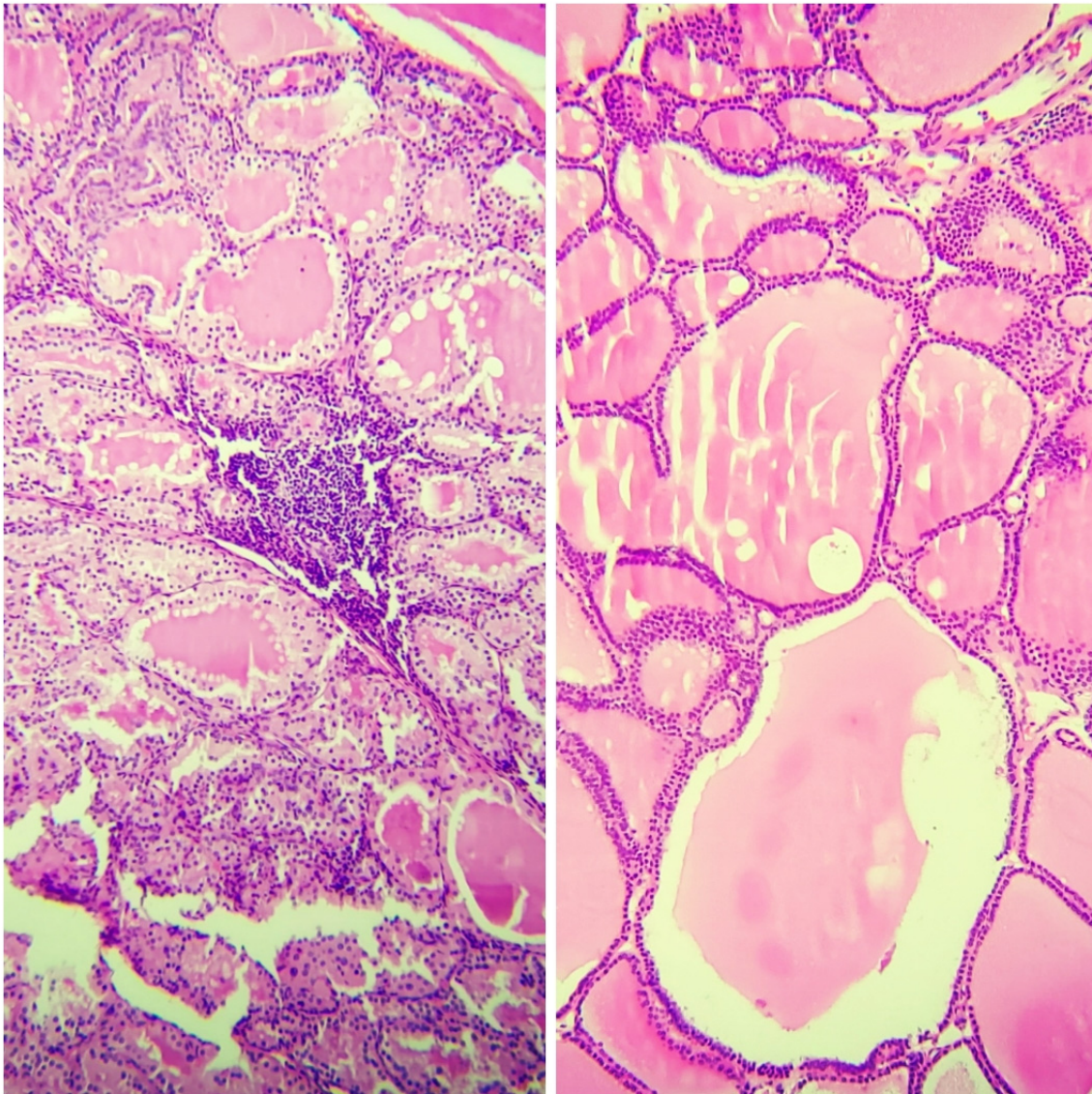


Fig. 2. Histopathological examination shows multinodular goiter (right) and Graves' disease (left) (H&E X100)

hypothyroidism (delayed postoperative effect).

Preoperative calcium supplementation in patients undergoing total thyroidectomy for Graves' disease or benign multinodular goiter may reduce the risk of transient symptomatic hypocalcemia, even when parathyroid glands are preserved during surgery.

Discussion

Calcium homeostasis is essential for the normal function of body organs. The serum calcium level is 8.9–10.1 mg/dL in the normal range. Hypocalcemia is a common complication in surgical and medical units. Transient hypoparathyroidism happens in 5 to 10% of patients; transient hypocalcemia occurs in 19 to 38%, and permanent hypocalcemia happens in 1% of patients after total thyroidectomy [5].

Hypocalcemia after thyroidectomy is a common complication. Some studies have reported rates ranging from 0.3% to 66.2% of patients. However, the rate of hypocalcemia following thyroidectomy varies extensively, and risk factors related to hypocalcemia after thyroidectomy are not well recognized [6]. The progression of hypocalcemia following surgery has multiple etiologies. The proposed etiologies include blood dilution after administration of intravenous fluid during the operation, urinary calcium excretion due to operative stress, thyroid gland manipulation and release of calcitonin, and increased bone metabolism, especially in patients with Graves' disease. Also, hypoparathyroidism due to direct damage, loss of blood supply, or removal of parathyroid glands is a possible reason for hypocalcemia following thyroidectomy [7]. This complication is very significant and burdensome due to prolonged hospitalization

and additional costs for patients. Hypocalcemia occurrence differs by gender, and women have a higher risk, as both of our patients are female. Also, lymph node dissection, type of thyroidectomy, type of underlying disease, and duration of procedure carry an increased risk for hypocalcemia after surgery [8]. Both of our patients underwent similar surgery (total thyroidectomy without cervical lymph node dissection) and similar operative duration (about 2 hours) with different underlying diseases (multinodular goiter and Graves' disease). Transient hypocalcemia often happens after total thyroidectomy. Patients are usually symptomatic when serum calcium is low. So, it is important to measure calcium levels following surgery in symptomatic patients and correct calcium levels to resolve symptoms [9]. Hypocalcemia after thyroidectomy for Graves' disease is often triggered by transient hypoparathyroidism and an increase in bone formation through the resolution of hyperthyroidism. Also, a few reports have described hypocalcemia after Graves' disease treatment with antithyroid drugs such as methimazole. Our patient, before surgery, received methimazole to reach a normal TSH level. Miyashita et al. reported one case, which is the first report of symptomatic hypocalcemia following Graves' disease treated with an antithyroid drug [10], which is similar to our case. Also, patients with Graves' disease need higher dosages of calcium for correction of homeostasis levels. Graves' disease patients experience more tetany after total thyroidectomy than patients undergoing surgery for other diseases. Our patient also had mild tetany, whereas our patient with multinodular goiter had muscle cramps and fatigue. Thus, patients who underwent surgery for Graves' disease need close observation for hypocalcemia symptoms [11]. Risk factors for hypocalcemia, including young age, duration of surgery, and type of hospital, were related to early hypocalcemia following surgery. Thyroid gland weight and reoperation for control of bleeding were also related to hypocalcemia [12]. Both of our patients had overweight thyroid glands, which is a risk factor for post-operative hypocalcemia. PTH measurement after thyroidectomy has adequate accuracy to predict whether patients will develop symptomatic hypocalcemia. However, we measured it in only one patient, which was below the normal range and is a good predictor. Routine PTH measurement should be considered because it can lead to earlier recognition of patients requiring hypocalcemia treatment [13]. Oral calcium supplements are valuable in patients at risk of hypocalcemia to increase the chance of early hospital discharge [14]. In our patient with low PTH levels, we could have administered an oral calcium supplement before tetany, and in the other patient, we should have measured PTH after surgery. We suggest measuring serum PTH and calcium levels in all patients with

every underlying disease after total thyroidectomy to prevent symptomatic hypocalcemia.

Conclusion

Transient symptomatic hypocalcemia following surgery is a main concern after total thyroidectomy. It is often the reason for prolonged hospitalization of patients and the requirement for multiple laboratory tests, and it is important due to increases in the overall cost of a total thyroidectomy procedure.

Ethical Considerations

Ethics approval and consent to participate:

This study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki. Ethical approval was obtained from the ethics committee of Tehran University of Medical Sciences. All items of the project were approved by the Ethics Committee of Sina Hospital affiliated with the Tehran University of Medical Sciences on 2024-03-05 (IR.TUMS.SINAHOSPITAL.REC.1402.148).

The patient's written informed consent:

Written informed consents were obtained from the patients for the publication of this case report and accompanying images. Two copies of the written consent are available for review by the Editor-in-Chief of this journal on request.

Funding

No funding was received to assist with the preparation of this manuscript.

Conflict of Interests

The authors declare that they have no known competing financial interests or personal relationships regarding the publication of this paper.

Availability of data and materials

All data generated or analyzed during this study are included in this published article.

Authors' contributions

Elham Nazar: Conceptualization, Methodology, Project administration, Writing - original draft, Supervision.

Seyed Amir Miratashi Yazdi: Investigation, Validation, Writing - review & editing, Resources.

Elahe Farmani: Investigation, Validation, Writing - review & editing, Resources.

Aysan Nozheh (Corresponding author): Writing - review & editing, Writing - original draft, Data curation, Software, Formal analysis.

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