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Visual Diagnosis Pearl

Concurrent New-Onset Hyperparathyroidism and Hyperthyroidism

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Figure 1. Low suspicion left inferior thyroid nodule measuring 2.85 x 1.71 x 1.88 cm.

A 36-year-old woman with no significant past medical history and taking no prescribed medications presents for her annual physical. Palpation during the exam noted a left-sided thyroid nodule. Initial laboratory testing was notable for subclinical hyperthyroidism with a TSH (thyroid stimulating hormone) of 0.05 mIU/mL (0.3 – 4.7 mIU/mL), free T4 1.1 ng/dL (0.8 – 1.7 ng/dL), free T3 395 pg/dL (222 – 383 pg/dL) and hypercalcemia with a serum calcium of 11.2 mg/dL (8.6 – 10.4 mg/dL). Further laboratory evaluation showed undetectable levels of thyroid autoantibodies including TSI (thyroid stimulating immunoglobulin), TBII (thyrotropin binding inhibitory immunoglobulin), thyroid peroxidase antibody, and thyroglobulin antibody. Laboratory evaluation of the hypercalcemia showed a PTH (parathyroid hormone) of 59 pg/mL (11 – 51 pg/mL), vitamin D, 25-hydroxyl of 38 ng/mL (20 – 50 ng/mL), and 24-hour urine calcium of 339 mg (0 – 300 mg). This confirmed the diagnosis of primary hyperparathyroidism.

Given the diagnosis of both subclinical hyperthyroidism and primary hyperparathyroidism, a thyroid-parathyroid ultrasound was ordered. The ultrasound showed a 2.85 cm complex, mixed solid/cystic, isoechoic nodule in the left inferior thyroid gland, wider-than-tall with smooth margins with punctate hyperechoic foci with comet tail artifact, suggestive of colloid, and possible small focus of coarse calcification (Figure 1). No parathyroid pathology was noted.

To further evaluate the primary hyperparathyroidism, a Tc 99m (technetium pertechnetate) and sestamibi parathyroid scan with SPECT (Single Photon Emission Computed Tomography) was performed (Figure 2). Both the Tc 99m

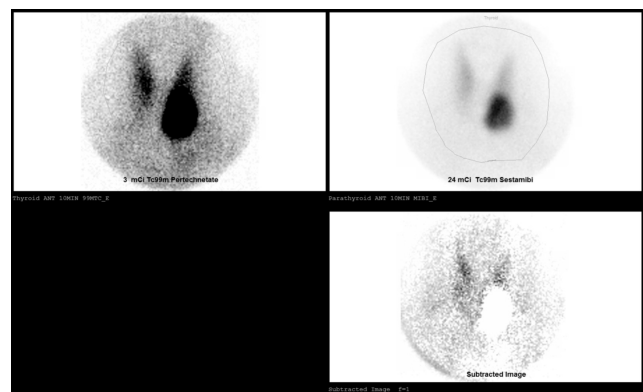


Figure 2. Technetium pertechnetate and sestamibi scan demonstrating a hyperfunctioning focus in the left inferior pole. Computer-assisted subtraction images do not show any residual activity consistent with a parathyroid adenoma, highlighting the masking effect of the hyperfunctioning thyroid nodule.

and sestamibi scans showed a hyperfunctioning focus on the left inferior thyroid lobe corresponding to the 2.85 cm thyroid nodule. There were no focal areas of Tc 99m sestamibi uptake mismatch that are diagnostic of a parathyroid adenoma nor was there evidence for an ectopic parathyroid adenoma. CT parathyroid showed similar results: a 3 cm left thyroid nodule but no high suspicion parathyroid adenoma candidates.

Diagnostic challenge: Localize the source of primary hyperparathyroidism in the setting of a dominant hyperfunctioning left thyroid nodule.

At this point, the possibility of an intrathyroidal parathyroid adenoma (IPA) was considered. FNA (fine needle aspiration) of the 2.85 cm left thyroid nodule was performed with PTH washout of the sample. Cytology showed benign thyroid cells with cystic degeneration. The PTH washout was positive at 549 pg/mL, confirming the presence of intrathyroidal parathyroid tissue. Endocrine surgery was consulted and recommended a left thyroid lobectomy with intraoperative exploration for parathyroidectomy.

Diagnosis: Intrathyroidal parathyroid adenoma within a hyperfunctioning thyroid nodule.

Intraoperatively, the left thyroid lobe removed and visualized to contain a 2.8 cm benign appearing nodule. The left superior parathyroid gland was found to be normal, flat, pale and in its typical location. The left inferior parathyroid gland was not found in the usual location. Sectioning of the

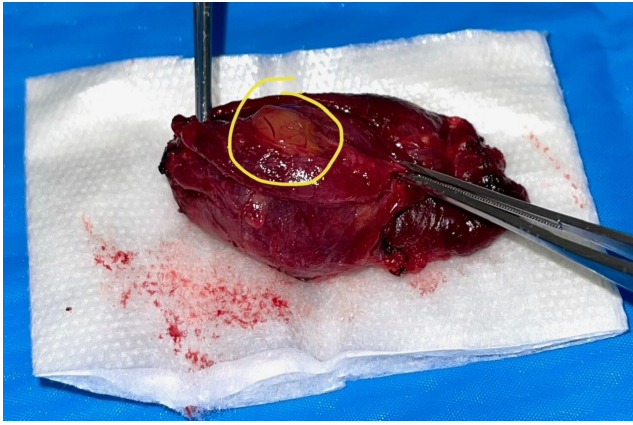


Figure 3. Left thyroid lobe showing a thyroid nodule containing intrathyroidal parathyroid adenoma (circled in yellow), confirming the diagnosis.

left thyroid lobe showed an intrathyroidal 1.0 cm parathyroid adenoma (Figure 3).

Intraoperative PTH levels dropped from 190 pg/mL to 6 pg/mL within 20 minutes, indicating complete resolution of the hyperparathyroidism. 3 months after surgery, TSH normalized to 4.4 mIU/mL vs. 0.07 mIU/mL prior to surgery, indicating resolution of the hyperthyroidism. PTH was 38 pg/mL and calcium was 9.5 mg/dL, indicating resolution of the hyperparathyroidism. In the 5-years after surgery, thyroid function tests, parathyroid hormone levels, and calcium levels have remained normal.

DISCUSSION

Intrathyroidal parathyroid adenomas (IPAs) are an uncommon but important cause of primary hyperparathyroidism (PHPT), accounting for approximately 1–7% of all parathyroid adenomas.^{1,2} Even more rare is an intrathyroidal parathyroid adenoma inside a hyperfunctioning thyroid nodule. IPAs present a unique diagnostic challenge because they are frequently missed by conventional imaging, including sestamibi and 4D-CT, as the adenoma is obscured by surrounding thyroid parenchyma with similar radio-tracer retention and contrast enhancement. In the current

case, both sestamibi and 4D-CT were negative for a parathyroid lesion, delaying diagnosis until fine-needle aspiration (FNA) with parathyroid hormone (PTH) washout was performed.

FNA with PTH washout is a highly sensitive and specific diagnostic tool for IPAs. A washout PTH level greater than 500 pg/mL is considered diagnostic of parathyroid tissue, with specificity exceeding 95%.³ This simple adjunct to standard thyroid FNA cytology can prevent unnecessary additional imaging or failed cervical explorations. In this case, a washout PTH of >500 pg/mL directly guided hemithyroidectomy.

The coexistence of an autonomously functioning thyroid nodule (AFTN) causing hyperthyroidism and an IPA causing PHPT within the same thyroid lobe is exceptionally rare. Conveniently, hemithyroidectomy cured both endocrinopathies in one operation, with intraoperative PTH monitoring confirming cure (baseline 190 pg/mL → post-excision 6 pg/mL). At 5-year follow-up, the patient remained normocalcemic and euthyroid.

In summary, IPAs should be suspected in PHPT patients with negative imaging who have a dominant thyroid nodule. FNA with PTH washout is the diagnostic procedure of choice.

TEACHING POINTS

- Intrathyroidal parathyroid adenoma should be considered in patients with biochemically confirmed primary hyperparathyroidism and negative conventional localization studies, particularly when a dominant thyroid nodule is present.
- A hyperfunctioning thyroid nodule may obscure or mimic parathyroid localization on sestamibi and CT-based studies.
- FNA with PTH washout can confirm parathyroid tissue when imaging is non-localizing and can directly guide operative planning.
- In select cases, hemithyroidectomy can treat both an autonomously functioning thyroid nodule and an intrathyroidal parathyroid adenoma in a single operation.



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