





## CASUISTIC PAPER

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# Persistent hyperthyroidism in a patient after total thyroidectomy: the thyroid anatomy has implications for treatment

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## ABSTRACT

**Introduction.** Grave's disease (GD) can be treated using three modalities: anti-thyroid medications, radioactive iodine therapy (RAI), or surgery. If surgery is selected, total thyroidectomy is the procedure of choice. Patients with hyperthyroidism frequently have an enlarged thyroid gland, occasionally with a pyramidal lobe.

**Aim.** We point the usefulness of thyroid scintigraphy, which provides valuable information regarding the thyroid anatomy.

**Description of the case.** The manuscript presents a case report of 43-year-old woman with unstable Grave's disease, who underwent thyroidectomy and developed persistent hyperthyroidism postoperatively. She was referred by an endocrinologist to a nuclear medicine outpatient clinic for RAI therapy. I-iodide scintigraphy revealed two foci with excessive tracer accumulation. One of the foci in the middle of the neck corresponded to the pyramidal lobe.

**Conclusion.** The thyroid anatomy anomalies can lead to unnecessary implications for treatment. Identifying the pyramidal lobe preoperatively and removing it from patients requiring total thyroidectomy may decrease the recurrence rate of hyperthyroidism. Thyroid scintigraphy is a useful diagnostic tool to visualize the pyramidal lobe.

**Keywords.** Grave's disease, pyramidal lobe, scintigraphy, thyroidectomy

## Introduction

Grave's disease is a kind of hyperthyroidism in which thyroid hyperplasia and toxicosis occur in response to high levels of antibodies to the TSH receptors. GD can be treated using three modalities: anti-thyroid medications, RAI, or surgery. The choice of treatment for GD requires presenting all short- and long-term side effects of the treatment options to the patient.

RAI therapy or total thyroidectomy are options for those resistant to medication or suffer from relapse of

symptoms. Approximately one in four patients with GD may undergo total thyroidectomy. Patients with hyperthyroidism frequently have an enlarged thyroid gland, occasionally with a pyramidal lobe.<sup>1</sup> On the other hand detection of pyramidal lobe in patients with hyperthyroidism very often indicates an autoimmune reason of thyrotoxicosis. The pyramidal lobe (PL) is a remnant of the thyroglossal duct that extends superiorly from the isthmus and can reach the level of the hyoid bone. It is more common in men than in women, most commonly

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develops left of the midline, and has multiple anatomical variations. Based on anatomical studies, the frequency of pyramidal lobe development is between 15% and 75%.<sup>2,3</sup> In a study conducted by Wahl et al., pyramidal lobe was observed to have left lobe origin at 53%, right lobe origin at 39% and isthmus at 8%.<sup>4</sup> We report a patient who underwent total thyroidectomy and developed persistent hyperthyroidism postoperatively.

**Aim**

We point the usefulness of thyroid scintigraphy, which provides valuable information regarding the thyroid anatomy and can be helpful not only for endocrinologists but also for surgeons.

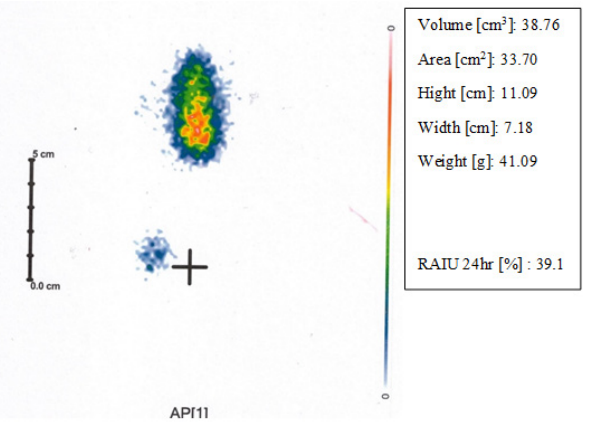
**Description of the case-**

A 43-year-old woman presented to the nuclear medicine outpatient clinic with a few-months history of weakness, increased sweating and emotional lability. She was referred by an endocrinologist to a nuclear medicine outpatient clinic for possible RAI- therapy and it was our first meeting with the patient. The woman underwent total thyroidectomy 10 months prior due to unstable GD for three years (unsuccessfully treated with thyrostatic drugs). Preoperative ultrasound of the thyroid gland revealed a goiter with a volume about 55.5 ml.

Thyroid scintigraphy was not performed before surgery. She was smoking cigarettes. The choice of surgical treatment was associated with a large volume of the thyroid gland , high levels of antibodies (TRAb) and the patient's preferences. Information from the referral also included thyroid ultrasound examination after the surgery and histopathology. Please notice that the thyroid ultrasound showed only *stumps* of the *thyroid* lobes following thyroidectomy. The histopathology report described two lobes and isthmus of the thyroid and confirmed goiter hyperactivity. After surgery she received replacement levothyroxine (LT4) supplementation in a dose of 75 ug per day from a surgeon. Due to first symptoms of hyperthyroidism (six months after surgery) the endocrinologist reduced the dose of LT4 to 25 µg and next stopped the LT4 supplementation. The patient still presented symptoms of hyperthyroidism. Physical examination at the nuclear medicine outpatient clinic revealed inactive mild orbitopathy, increased sweating, regular heart rate of 90 beats/minute, normal blood pressure and an absence of pathology during palpation the neck area.

Ancillary investigations showed: suppressed serum levels of thyrotropin (TSH) 0.001 µIU/mL (0.55–4.78 µIU/mL), free thyroxine (fT4) 1.39 ng/dL (0.89–1.76 ng/dL), free triiodothyronine (fT3) 2.82 pg/ml (1.88–3.18 pg/ml), thyrotropin receptor antibody (TRAb) 34.0 IU/L (<1.5 IU/L). The thyroid ultrasound showed *stumps* of the *thyroid* lobes and the PL was not visual-

ized. <sup>131</sup>I-iodide scintigraphy revealed two foci with excessive tracer accumulation. One of the foci in the middle of the neck corresponded to the PL (Fig. 1). The thyroid radioiodine uptake during the 24th hour was 39%. RAI therapy was administered after the patient's agreement. She was treated with 21.6 mCi of I 131 and developed symptoms of hypothyroidism.



**Fig. 1.** Thyroid <sup>131</sup>I-iodide scintigraphy: foci with excessive accumulation of the tracer. In the middle of the neck, the pyramidal lobe was revealed

Currently, the patient is under observation in an endocrinology outpatient clinic. The patient is in a better condition without symptoms of hyperthyroidism, she takes LT4 (100 and 112 µg every other day, alternately). The thyroid hormone levels are normal.

**Discussion**

The pyramidal lobe could be a source of pitfalls in thyroidectomy, due to unreliable preoperative diagnostics. Imaging evaluation may influence the conduct and extent of thyroidectomy. The European Thyroid Association guidelines for the Management of Grave's hyperthyroidism recommend that if surgery is selected, total thyroidectomy is the procedure of choice. The initial thyroid imaging study is ultrasonography and should be performed in all patients before surgery. According to these guidelines scintigraphy of the thyroid is suggested when thyroid nodularity coexist with hyperthyroidism, and prior to RAI therapy.<sup>5</sup>

Total thyroidectomy rarely results in the removal of all thyroid tissue. The use of single-photon emission computed tomography to define specific anatomical sites of residual RAI uptake foci after total thyroidectomy shows uptake in 99% of patients, with 46 % in the pyramidal lobe. <sup>6</sup> When performing total thyroidectomy it's very important to look for identify and remove PL. Thyroid cells in the PL can become active after excision of the functioning thyroid tissue, so hyperthyroidism can appear in patients after total thyroidectomy due to GD.<sup>7</sup> The analysis of the available data presented by

Kim et al. revealed the sensitivity of preoperative sonographic detection of thyroid PL about 81%. There was no statistically significant difference in the sonographic detection rate of thyroid PL according to sex but the sonographic detection rate decreased with increasing age. In this study the number of false-negative cases of thyroid sonography were 11.4 %.<sup>8</sup>

Our patient had only undergone thyroid ultrasound examination before the surgery in which PL was not visualized. Undoubtedly, RAI ablation should be considered for hyperthyroidism recurrence after surgery, but the usefulness of thyroid scintigraphy before planning a surgery must be noted.

In many cases scintigraphy provides considerably more functioning and anatomic details than ultrasound.<sup>9</sup> According to the surgeon's guidelines, thyroid scintigraphy is not necessary before surgery.<sup>10</sup> Some reports have indicated that preoperative diagnosis of the PL based on scintigraphic images is unreliable, while other reports have suggested that thyroid scintigraphy is recommended in every patient before surgery.<sup>3,7</sup>

According to reports Braun et al. it is not reliably diagnosed the presence of PL by scintigraphy imaging because it can only give functional information. The authors note that the anterior cervical region has to be investigated very carefully during operation in order not to leave residual thyroid tissue in total thyroidectomy.<sup>3</sup> In a study presented by Cengiz et al. the prevalence of PL visualization using thyroid scintigraphy can reach 18%. PL visualization rate in patients with diffuse goiter was found to be significantly higher compared to other patients.<sup>7</sup>

In thyroid scintigraphy, PL is observed in higher rates in patients with hyperthyroidism and large thyroid gland.<sup>7,11</sup> In the study by Siraj QH et al. a PL was visualized on thyroid scintigraphy in 85 (41%) of the 207 patients.<sup>12</sup> In another study, PL was observed at a rate up to 81% among Graves' patients.<sup>4</sup>

The thyroid scintigraphy is useful for evaluating size, location and ectopia of thyroid tissue. Visualization of radiotracer uptake within a thyroglossal duct remnant and PL is frequently seen in the Graves' disease.<sup>13</sup> Neck CT is also useful for detecting the presence, size, configuration, and location of the PL but due to cost currently is less common.<sup>14</sup>

PL often remains non-visualized during preoperative imaging studies so anterior compartment of the neck should be explored for variations of the PL and completely excised during thyroid surgery.

## Conclusion

This case shows that the thyroid anatomy anomalies can lead to unnecessary implications for treatment. The knowledge about the presence of the PL of the thyroid is very important for surgeons to perform better resection of the thyroid tissue (especially in cases of thyroid

cancer, but also in cases of GD). Identifying the PL preoperatively and removing it from patients requiring total thyroidectomy may decrease the recurrence rate of hyperthyroidism.

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