

Marine-Lenhart Syndrome: A Rare Cause of Hyperthyroidism - A Case Report

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Abstract

Case Report

Marine-Lenhart syndrome is a rare cause of hyperthyroidism characterized by the coexistence of Graves' disease and one or more autonomously functioning thyroid nodules, with significant diagnostic and therapeutic implications. We report the case of a 40-year-old man who presented with severe clinical and biochemical hyperthyroidism and positive thyrotropin receptor antibodies consistent with Graves' disease. Cervical ultrasound identified a left thyroid nodule classified as EU-TIRADS 4. Thyroid scintigraphy, performed after the initiation of antithyroid drug therapy, revealed a hyperfunctioning ("hot") nodule within a diffusely hyperactive thyroid gland, confirming the diagnosis of Marine-Lenhart syndrome. This scintigraphic pattern established the coexistence of autoimmune hyperthyroidism and nodular autonomy. Given the persistence of hyperthyroidism and the presence of an autonomously functioning nodule, definitive treatment with radioactive iodine therapy was indicated. Marine-Lenhart syndrome should be suspected in patients with Graves' hyperthyroidism associated with thyroid nodules, particularly when imaging demonstrates focal areas of increased uptake within a diffusely hyperfunctioning gland. Early recognition of this uncommon entity is essential, as it may influence therapeutic strategy and favor definitive treatment approaches to achieve sustained remission and prevent relapse.

Keywords: Marine-Lenhart syndrome, Graves' disease, hot nodule, hyperthyroidism, thyroid scintigraphy.

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INTRODUCTION

Graves' disease is the most common cause of autoimmune hyperthyroidism and is characterized by diffuse stimulation of the thyroid gland mediated by thyrotropin receptor antibodies (TRAb) [1]. Marine-Lenhart syndrome, first described in the early twentieth century, refers to the rare coexistence of Graves' disease and one or more autonomously functioning thyroid nodules [2]. Its prevalence is estimated to range from 1% to 3% of all cases of hyperthyroidism [3].

This entity poses diagnostic challenges, particularly in distinguishing it from non-functioning thyroid nodules frequently observed in Graves' disease, and often requires a radical therapeutic approach. We report an illustrative case highlighting the diagnostic value of thyroid scintigraphy.

CASE REPORT

A 40-year-old male patient with no significant past medical history was referred for symptoms of hyperthyroidism evolving over several weeks, including palpitations, weight loss, nervousness, and heat intolerance.

Physical examination revealed signs of thyrotoxicosis without associated Graves' orbitopathy. The thyroid gland was of normal size on palpation and non-tender.

Initial laboratory investigations showed:

- Ultrasensitive TSH: 0 mIU/L
- Free T4: 27.04 pmol/L
- Free T3: > 30.72 pmol/L
- Thyrotropin receptor antibodies (TRAb): positive at 6.55 IU/L

Cervical ultrasound demonstrated a thyroid gland of normal size with regular contours, hypoechoic and heterogeneous echotexture, and diffuse hypervascularization on color Doppler imaging. A left thyroid nodule measuring 15 × 7.4 mm, classified as EU-TIRADS 4, was identified.

Antithyroid drug therapy was initiated as first-line treatment using an appropriate loading dose. However, the patient showed an unsatisfactory clinical and biochemical response, with persistent hyperthyroidism despite adequate initial dosing.

Thyroid scintigraphy was indicated to further evaluate the functional status of the nodule; however, the examination was postponed for approximately one year due to financial constraints. During this interval, hyperthyroidism remained inadequately controlled under medical therapy.

When eventually performed, thyroid scintigraphy revealed diffuse increased uptake throughout the gland associated with a hyperfunctioning (“hot”) nodule in the left lobe. This scintigraphic pattern confirmed nodular autonomy coexisting with Graves’ disease, establishing the diagnosis of Marine-Lenhart syndrome (**Figure 1**).

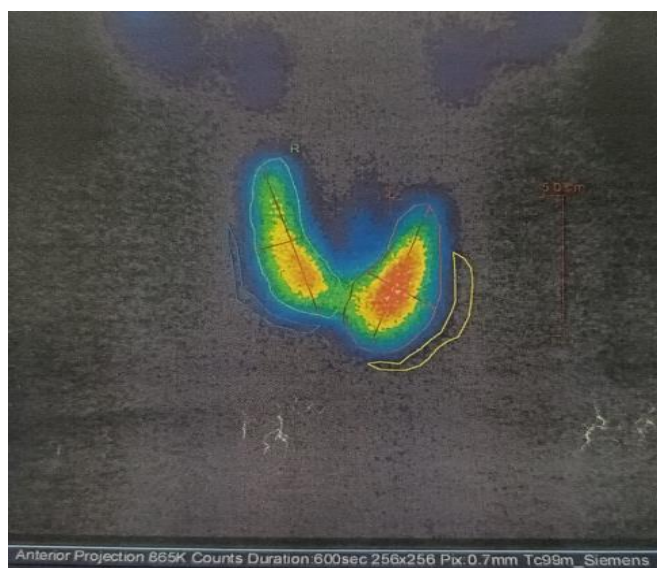


Figure 1: Anterior thyroid scintigraphy showing diffuse increased radiotracer uptake throughout the gland with a focal area of markedly increased uptake in the left lobe (outlined), consistent with an autonomously functioning (“hot”) nodule in the setting of Graves’ disease (Marine-Lenhart syndrome)

Given this association and the potentially incomplete response to antithyroid drugs, a definitive treatment with radioactive iodine therapy was selected.

DISCUSSION

Marine-Lenhart syndrome is a rare cause of hyperthyroidism, defined by the coexistence of Graves’ disease and one or more autonomously functioning thyroid nodules. Although thyroid nodules are relatively common in patients with Graves’ disease, true nodular autonomy remains exceptional, explaining why this syndrome is often underrecognized or diagnosed late [3,4].

From a physiopathological perspective, the mechanisms underlying Marine-Lenhart syndrome are not fully understood. The most widely accepted hypothesis involves prolonged and excessive stimulation of the TSH receptor by TRAb, leading to thyroid tissue hyperplasia and the functional autonomization of pre-existing nodular foci [5]. Another hypothesis suggests the presence of a previously silent autonomous nodule,

whose hyperfunction becomes clinically apparent with the onset of Graves’ disease, resulting in more severe and difficult-to-control hyperthyroidism [6].

Thyroid scintigraphy plays a central role in the diagnosis of Marine-Lenhart syndrome. It demonstrates the characteristic association of diffuse increased uptake, reflecting autoimmune stimulation of the thyroid gland, and one or more hyperfunctioning nodules, indicating nodular autonomy [7]. This functional imaging modality is essential for differentiating Marine-Lenhart syndrome from more common situations in which non-functioning, hypofunctioning nodules coexist with Graves’ disease without contributing to hormone overproduction.

Thyroid ultrasound is an indispensable complementary examination. It allows assessment of gland morphology, characterization of thyroid nodules, and evaluation for suspicious features of malignancy. In Marine-Lenhart syndrome, ultrasound typically reveals a hypoechoic, heterogeneous, and hypervascular thyroid gland consistent with Graves’ disease, along with a

nodule whose morphological characteristics may warrant specific monitoring or further investigations, independently of its functional status [8].

The main differential diagnosis is toxic multinodular goiter, in which hyperthyroidism results from multiple autonomous nodules in the absence of autoimmune mechanisms, with negative TRAb. Another condition to consider is Graves' disease associated with a non-functioning (cold) thyroid nodule, which does not contribute to hyperthyroidism and requires a different management strategy. In our case, the positivity of TRAb combined with the presence of a hot nodule within a diffusely hyperfunctioning thyroid gland allowed exclusion of these diagnoses and confirmed Marine-Lenhart syndrome.

Therapeutic management of Marine-Lenhart syndrome presents specific challenges. Antithyroid drugs can achieve transient biochemical control by inhibiting thyroid hormone synthesis but do not address the underlying autoimmune stimulation or nodular autonomy. Consequently, the response to medical therapy is often incomplete, and the risk of relapse after treatment withdrawal is high [9].

Therefore, definitive treatment is frequently recommended to achieve long-term control of hyperthyroidism. Radioactive iodine therapy represents an effective option, targeting both diffusely hyperfunctioning thyroid tissue and autonomous nodules. Thyroidectomy may also be considered in selected cases, particularly in the presence of large goiters, suspected malignancy, or contraindications to radioactive iodine therapy [10]. In our patient, radioactive iodine therapy was considered the most appropriate strategy given the confirmed nodular autonomy and active Graves' disease.

CONCLUSION

Marine-Lenhart syndrome is a rare cause of hyperthyroidism combining Graves' disease and nodular autonomy. It should be systematically considered when

a thyroid nodule is identified in a patient with Graves' disease. Thyroid scintigraphy plays a pivotal role in diagnosis and guides therapeutic strategy, which is often definitive.

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