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Tricuspid Regurgitation and Acute Right-Sided Heart Failure: Unexpected Complications of Thyrotoxicosis

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Abstract

Hyperthyroidism, characterized by excessive production of thyroid hormones, can cause various cardiovascular complications, ranging from palpitations and exercise intolerance to severe conditions like atrial fibrillation and heart failure. This case study describes a 56-year-old man presenting with progressive dyspnea, lower limb edema, and palpitations, diagnosed with acute decompensated right-sided heart failure and severe tricuspid regurgitation, a rare but serious condition. Examinations revealed atrial fibrillation, atrial dilation, severe tricuspid regurgitation, and thyrotoxicosis. Treatment, including diuretics, beta-blockers, and antithyroid medications, led to significant improvement after 8 months. This case highlights the importance of including hyperthyroidism in the differential diagnosis of unexplained cardiac symptoms, as timely and adequate treatment can prevent severe complications and significantly improve prognosis and quality of life for patients. Previous studies corroborate that hyperthyroidism can cause right-sided heart failure and tricuspid regurgitation, often reversible with appropriate treatment.

Introduction

Hyperthyroidism, a condition characterized by excessive production of thyroid hormones, is well known for its systemic effects, including a wide range of cardiovascular manifestations. These manifestations can vary from mild symptoms, such as palpitations and exercise intolerance, to more severe complications like atrial fibrillation, heart failure, and hypertension [1]. Thyroid hormones play a crucial role in regulating basal metabolism, explaining their significant impact on the cardiovascular system. Hyperstimulation of the heart due to accelerated metabolism can lead to significant hemodynamic alterations.

Acute decompensated right-sided heart failure accompanied by severe tricuspid regurgitation is a rare but serious presentation of hyperthyroidism [2].

By exploring this rare clinical presentation, we emphasize the need to include hyperthyroidism in the differential diagnosis of patients presenting with unexplained cardiac symptoms [3]. Furthermore, this study aims to raise awareness of the possibility of severe cardiovascular complications associated with hyperthyroidism, even if they are rare. Appropriate antithyroid treatment and management of cardiac symptoms can significantly improve patient prognosis.

Case presentation

A 56-year-old man with no significant medical history presented to the emergency department with exertional dyspnea evolving over a month to resting dyspnea, accompanied by lower limb edema and palpitations. Initial examination showed blood pressure of 140/86 mmHg and heart rate of 80 bpm. The patient exhibited signs of right-sided heart failure, including jugular venous distension, pitting edema of the lower limbs, and pleural effusion. Cardiac auscultation revealed a holosystolic murmur at the left sternal border, accentuated by inspiration.

The electrocardiogram showed atrial fibrillation with a ventricular rate of 80 bpm, an incomplete right bundle branch block, and secondary repolarization abnormalities. Transthoracic echocardiogram revealed a Left Ventricular Ejection Fraction (LVEF) of 55%. There was dilation of the left atrium (30 cm^2) and right atrium (25 cm^2), severe tricuspid regurgitation due to an 8 mm coaptation defect of the tricuspid valve leaflets, and moderate mitral regurgitation with a myxomatous mitral valve. The right ventricle was dilated (right ventricular basal diameter of 58 mm) with moderately reduced systolic function and signs of pulmonary hypertension (estimated pulmonary artery systolic pressure of 56 mmHg) and an Inferior Vena Cava (IVC) diameter of 27 mm, with no interatrial communication (ASD).

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Biological analyses showed a high Brain Natriuretic Peptide (BNP) level of 950 pg/mL, undetectable ultrasensitive TSH (<0.01 mU/L), free T4 of 40 mU/L, and free T3 of 10.5 mU/L. D-dimers were normal. Hypochromic microcytic anemia was also present with hemoglobin at 5 g/dL and ferritin at 47 ng/mL. Chest CT excluded pulmonary embolism and showed bilateral pleural and pericardial effusion with signs of associated pulmonary hypertension. Carcinoid syndrome and tricuspid valve endocarditis were also excluded.

The patient was hospitalized for acute decompensated right-sided heart failure, recently diagnosed, with severe tricuspid regurgitation and preserved left ventricular ejection fraction, revealing cardiothyrotoxicosis.

Treatment included injectable Lasilix with potassium supplementation, spironolactone, curative anticoagulation, propranolol, and antithyroid treatment with thionamide. The patient was followed up for 8 months with regular biological and echocardiographic controls. At the last evaluation, the clinical signs of right-sided heart failure had regressed, with normalization of the thyroid profile, a non-dilated right ventricle with good longitudinal systolic function, and minimal tricuspid regurgitation.

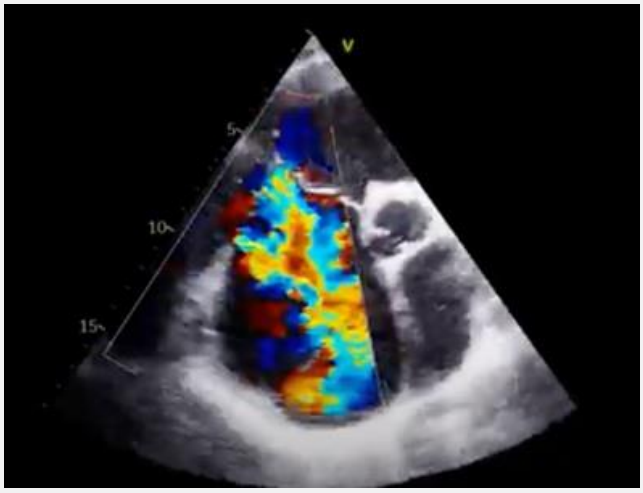

Figure 1: Clinical image.

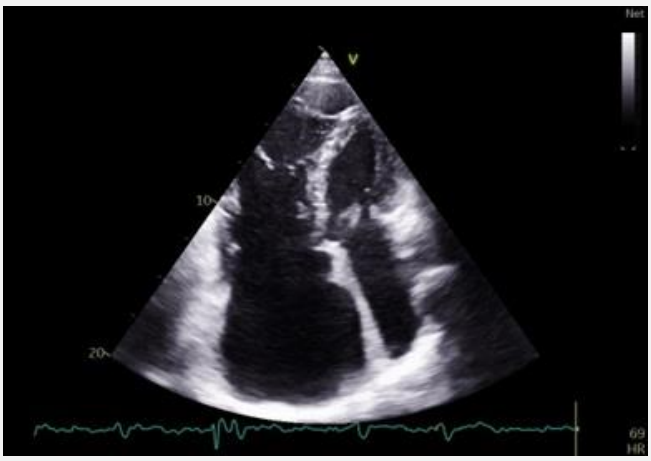

Figure 2: Clinical image.

Discussion

This clinical case highlights a rare but serious manifestation of hyperthyroidism. In general, hyperthyroidism can cause various cardiovascular symptoms, often induced by sympathetic hyperstimulation and metabolic alterations [4]. Common manifestations include palpitations, exercise intolerance, tachycardia, and in more severe cases, atrial fibrillation and heart failure. However, the presentation of acute decompensated right-sided heart failure with severe tricuspid regurgitation is exceptionally rare.

In this specific case, the observed severe tricuspid regurgitation could result from right ventricular dilation and pulmonary hypertension secondary to hyperthyroidism [5]. Hyperthyroidism causes an increase in cardiac output and an increased metabolic demand, which can lead to right ventricular hypertrophy and dilation, thus increasing pressure on the tricuspid valve and causing regurgitation. Additionally, associated pulmonary hypertension could exacerbate this condition by increasing the afterload on the right ventricle.

The successful management of this patient with antithyroid treatment highlights the importance of considering hyperthyroidism in the differential diagnosis of patients with unexplained cardiac symptoms. Rapid diagnosis and treatment of thyroid disorders are crucial to preventing severe cardiovascular complications. In this case, treatment included diuretics to manage heart failure, beta-blockers to control heart rate, and antithyroid medication to correct thyrotoxicosis. The significant improvement in the patient's condition after 8 months of treatment confirms the effectiveness of this approach.

Previous studies have shown that hyperthyroidism can cause isolated right-sided heart failure and tricuspid regurgitation, often reversible with adequate treatment of thyrotoxicosis. For example, Whitner et al. (2005) [2] and Dhital et al. (2018) [6] reported similar cases where antithyroid treatment led to significant improvement in symptoms. The association of severe tricuspid regurgitation, right-sided heart failure, and hyperthyroidism is well documented in the literature. For example, Jaya et al. (2022) [1] describe the case of a 72-year-old woman presenting with progressive dyspnea and lower limb edema, whose condition improved after antithyroid treatment. Another case, reported by Whitner et al. (2005) [2], shows complete resolution of symptoms after thyroid ablation.

Finally, a report by Ismail (2007) [4,7] indicates that hyperthyroidism can cause reversible pulmonary hypertension and isolated right-sided heart failure, highlighting the reversibility of these conditions after adequate treatment. It is important to note that primary tricuspid regurgitation can be caused by various etiologies such as tricuspid valve prolapse, carcinoid syndrome, chest wall trauma, and tricuspid valve endocarditis. However, in this context, these causes were excluded, reinforcing the hypothesis that hyperthyroidism was the main factor.

Conclusion

Severe tricuspid regurgitation and isolated right-sided heart failure can be associated with thyrotoxicosis. Therefore, thyroid disease should be considered in the differential diagnosis of isolated right-sided heart failure. To our knowledge, there are only a few reported cases in the literature presenting severe tricuspid regurgitation, isolated right-sided heart failure, and mild pulmonary hypertension due to hyperthyroidism. This case emphasizes the importance of considering thyroid disorders in the evaluation of patients with unexplained cardiac symptoms, as adequate management of thyrotoxicosis can lead to significant improvement in cardiac symptoms and patient quality of life.

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