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Severe pulmonary hypertension associated with hypothyroidism and mixed aortic valve disease: A case report

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Abstract

Pulmonary hypertension is a condition characterised by elevated pulmonary arterial pressures secondary to various aetiologies; the most common ones are left heart diseases. Similarly, an association between thyroid diseases and pulmonary hypertension has been reported in some cases, but the pathophysiological relationship has not been fully elucidated. Etiological investigation is an important step in the management of pulmonary hypertension and determines the appropriate treatment. In this report, we present a case of severe pulmonary hypertension in a 57-year-old woman, in which mixed aortic valve disease and hypothyroidism were involved.

Keywords

Pulmonary hypertension, hypothyroidism, aortic disease, aortic stenosis, Hashimoto's thyroiditis

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Introduction

Pulmonary hypertension (PH) is a multifactorial pathology defined by a mean pulmonary artery pressure (mPAP) higher than 20 mm Hg on right heart catheterization.[1] Pre-capillary PH is characterised by a combination of elevated mean PAP and pulmonary artery wedge pressure (PAWP) ⩽ 15 mm Hg, associated in some cases with elevated pulmonary vascular resistance (PVR) > 2 WU (Wood Units), while post-capillary PH is characterised by a concomitant rise in mPAP and PAWP > 15 mm Hg.[2] Based on the different aetiologies, PH is classified into five groups: group 1, which includes pulmonary arterial hypertension; group 2, which includes PH secondary to left heart disease; group 3, which is associated with chronic lung disease and/or hypoxia; group 4, which is associated with pulmonary artery obstructions; and group 5, which includes multifactorial PH.[1–3] Although PH associated with left heart diseases is the group most commonly encountered,[2] attention should also be paid to some rare aetiologies such as thyroid diseases and metabolic disorders.

A few publications have reported cases of PH associated with hypothyroidism. However, the association of hypothyroidism and aortic disease with PH is rare.

Our paper was written according to the CARE guidelines.[4]

Case presentation

We present the case of a 57-year-old woman admitted to our intensive care unit for rest dyspnoea. The patient had no particular history and was not taking any treatment. Her symptoms began a year ago with the onset of dyspnoea on exertion, which progressed from minor to NYHA stage IV. Clinical examination on admission revealed a conscious, haemodynamically stable patient with a HR of 90 bpm and a BP of

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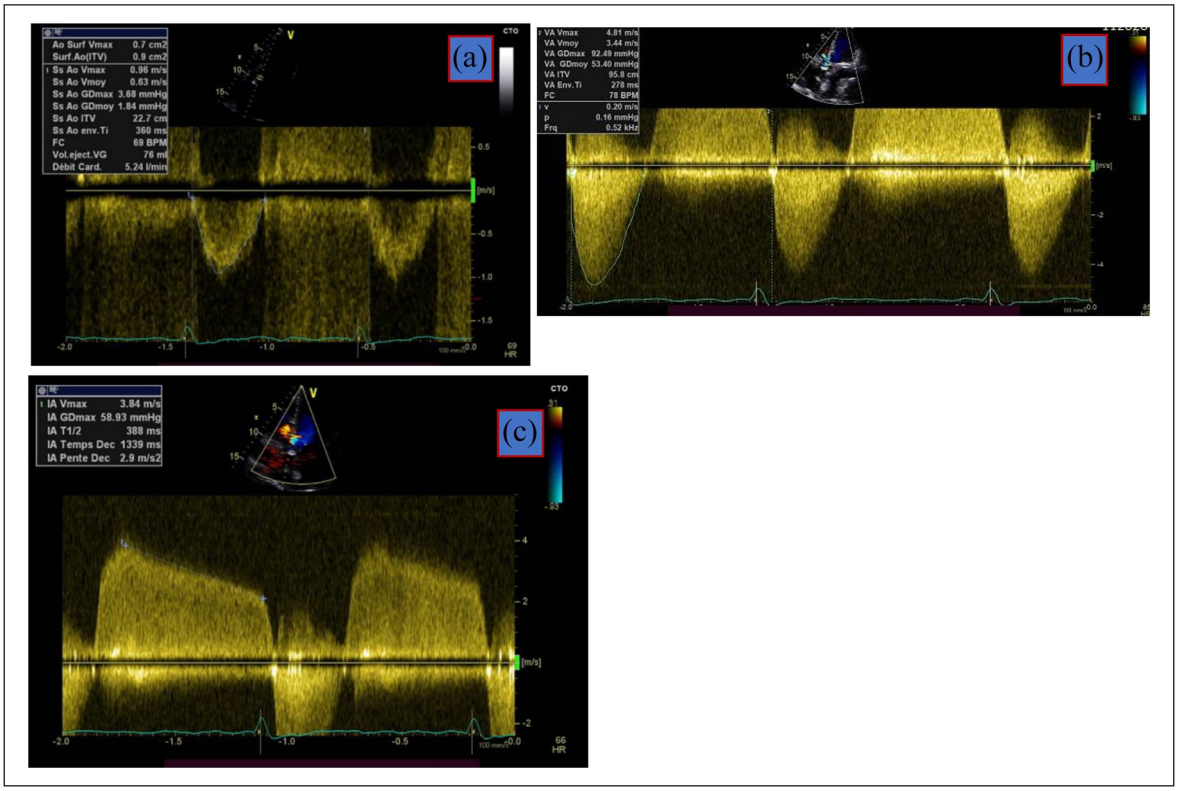

Figure 1. (a) pulsed doppler in the aortic valve showing severe AS (surface: 0.7 cm^2); (b) continuous wave doppler showing severe AS (Vmax: 4.8 m/s, mean gradient: 53 mm Hg); (c) continuous wave doppler in the aortic valve showing moderate aortic insufficiency (PHT: 388 ms).
AS: aortic stenosis; PHT: Pressure Half Time.

129/95 mmHg. The patient was orthopneic with an oxygen saturation of 89%. Cardiac auscultation revealed a systolic murmur at the aortic focus assessed at 4/6. There were also crackles at the base of the lungs and oedema of the lower limbs. The ECG showed an atrial fibrillation (AF) rhythm with a mean ventricular rate of 94 bpm. After initial treatment with IV furosemide, transthoracic echocardiography showed severe aortic stenosis (AS) (aortic area: 0.9 cm^2, mean gradient: 53 mm Hg, peak velocity: 4.8 m/s) (Figure 1) associated with moderate aortic regurgitation and severe tricuspid regurgitation (EROA: 0.6 cm^2, RV: 98 ml) (EROA: Effective Regurgitant Orifice Area; RV: Regurgitant Volume) with a high probability of PH (systolic pulmonary artery pressure estimated at 95 mmHg on tricuspid regurgitation flow) (Figure 2). Left and right ventricular functions were preserved (Figure 2). The thyroid work-up showed Hashimoto's thyroiditis in the stage of hypothyroidism with a TSH at 5.7 µU/ml (NV: 0.4–4 µU/ml), T4 at 0.1 ng/dl (NV: 0.7–1.48 ng/ml), anti-thyroglobulin antibodies at 95 UI/ml (NV: <5.61 UI/ml) and anti-thyroperoxidase antibodies at 44 UI/ml (NV: 0.2–4.11 UI/ml). Following these results, in order to investigate other autoimmune diseases, anti-DNA, anti-nuclear, and anti-Scl 70 antibodies were requested, but all came back negative. On the basis of these results, it was decided that hypertension should be investigated for a precapillary component. Right heart catheterization revealed mixed hypertension (mPAP: 54 mm Hg, sPAP: 94 mm Hg, PAWP: 28 mm Hg, PVR calculated at 7.2 WU), a chest computed tomography (CT) scan showed signs of PH but no signs of chronic pulmonary embolism (Figure 3), viral serologies (HIV, HBV, HCV) were negative, and D-dimer values were also normal. After 3 months of treatment, the patient was euthyroid, and cardiac echocardiography showed a reduction in the PAPs value (Figure 2). Thus, a mixed PH associating hypothyroidism and mixed aortic disease was therefore retained, but the patient died before surgery.

Discussion

PH is a serious, life-threatening condition associated with increased mortality, regardless of the underlying aetiology.[1] Diagnosis is based on clinical suspicion based on both symptoms and test results and is then confirmed by targeted investigations. Transthoracic echocardiography plays an important role in the diagnosis by estimating the probability of PH, but also in the search for underlying heart disease. High-resolution thoracic CT is also useful in the diagnosis by revealing underlying pulmonary disease or thromboembolic pathology. Right-heart catheterization is the key test for confirming the diagnosis.[5] Group 2 PH is caused by an increase in left atrial

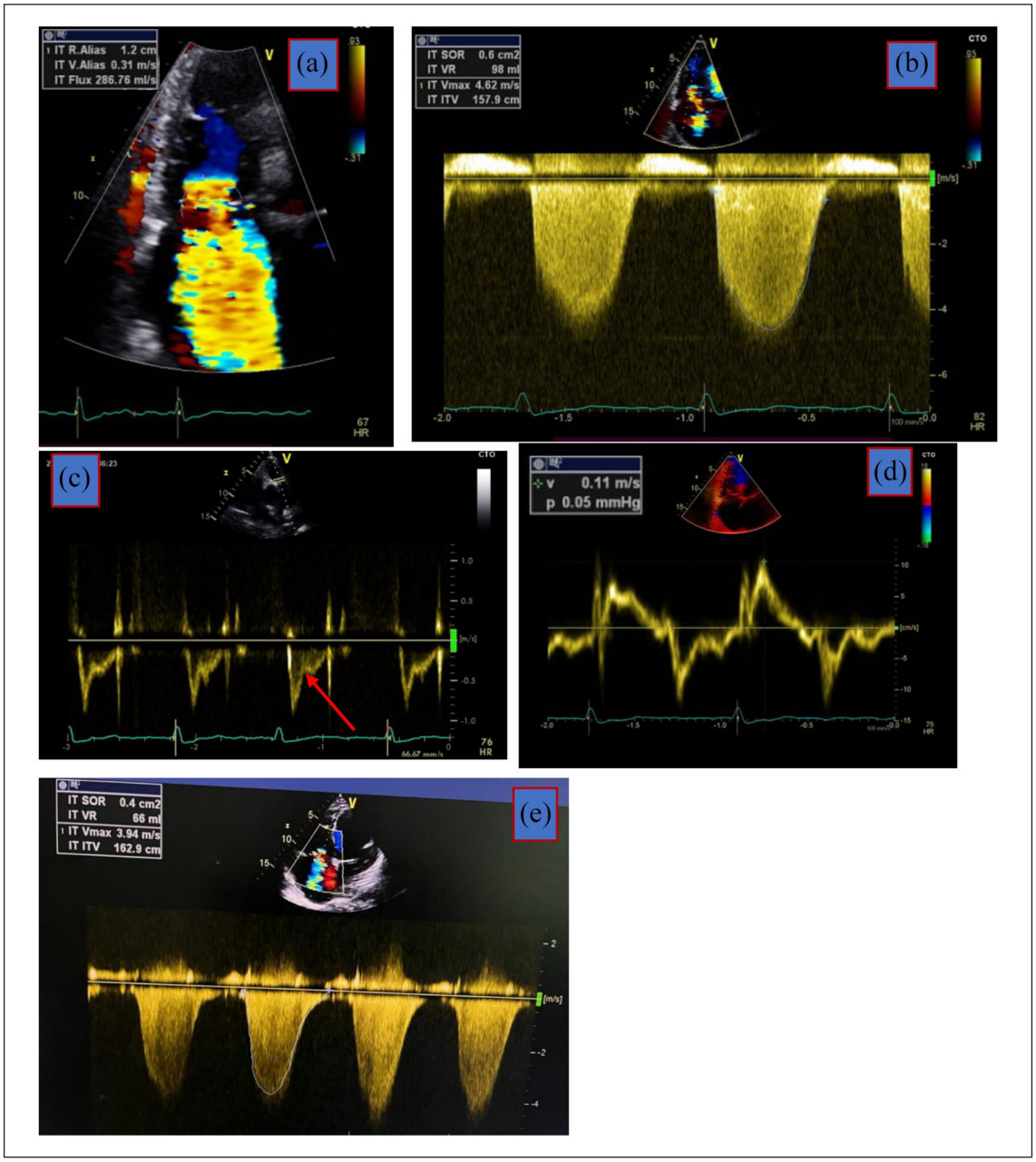

Figure 2. (a–b) colour Doppler and continuous wave doppler in the tricuspid valve showing severe tricuspid insufficiency (EROA: 0.6 cm^2, RV: 98 ml, Vmax: 4.62 m/s); (c) pulsed Doppler in the pulmonary valve showing the appearance of the mid systolic notch (red arrow) in favour of severe PH; (d) pulsed tissue doppler showing normal peak systolic velocity of tricuspid anulus (S'); (e) colour Doppler and continuous wave doppler in the tricuspid valve showing a reduction in severity of tricuspid insufficiency after euthyroidism (EROA: 0.4 cm^2, RV: 66 ml, Vmax: 3.94 m/s).
PH: pulmonary hypertension.

pressure as a result of underlying heart disease, such as heart failure or valvular disease. PVR ⩽ 2 WU and PAWP > 15 mm Hg indicate an isolated post-capillary form of PH. However, in certain cases, a mixed pre-capillary and post-capillary form may be present, which is associated with a secondary increase in PVR as a result of pulmonary vascular remodelling (PAWP > 15 mm Hg and PVR > 2 WU).[1] When present, PH is associated with a worse prognosis in patients with left heart diseases.[6] Similar to our patient, patients suffering from AS and AF exhibit a markedly inferior haemodynamic profile. This is evidenced by reduced left ventricular ejection fraction, enlarged left atrial size, impaired right ventricular function, elevated PVR and mPAP, as well as a lower stroke volume index in comparison to patients with AS in sinus rhythm.[7] Different changes in the normal physiology of the cardiovascular system are known to be caused by thyroid disease. Pathophysiological

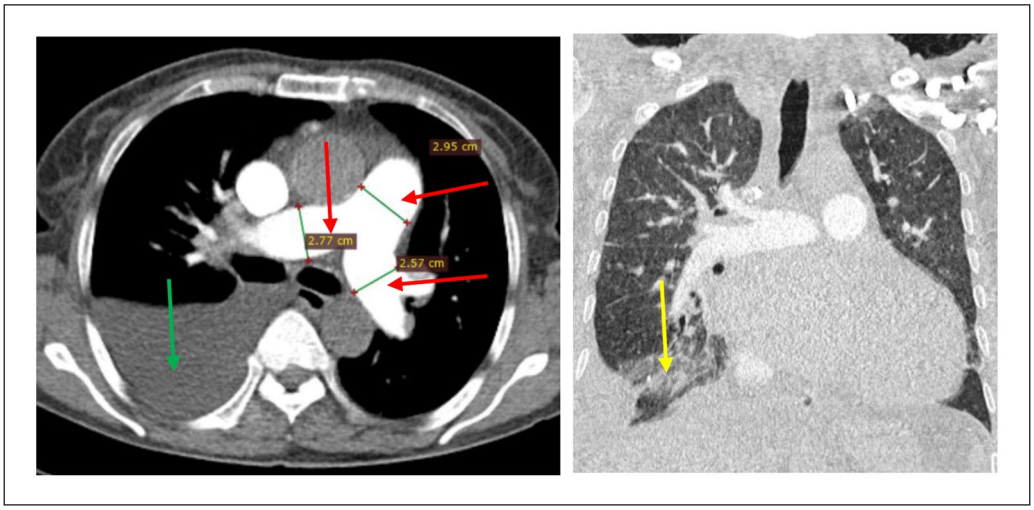

Figure 3. Thoracic computed tomography scan showing dilation of the pulmonary artery trunk and its branches (red arrows) without signs of chronic pulmonary embolism, right moderate pleurisy (green arrow), cardiomegaly, passive ventilation disorders of the right lower lobe (yellow arrow).

alterations in the thyroid gland can have a significant impact on cardiac vessels and structures, which explains the potential connection between cardiovascular pathology, hyperthyroidism, and hypothyroidism.[8] While recent prospective studies are rare, some studies have reported a relationship between hypothyroidism and PH. Hypothyroidism was found in 22.5% of the patients in a prospective study by Curnock et al.[9] that included 41 patients. Compared to the general population, PH patients have a higher prevalence of thyroid disease. According to a retrospective study published by Li et al.,[10] dysthyroidism was present in 24% of PH patients and 15% of controls. Ninety-four per cent of the dysthyroid patients also had hypothyroidism, and 17% of those patients had antithyroperoxidase antibody positivity. Though a clear relationship between dysthyroidism and the development of PH has not yet been fully elucidated, some studies in the literature have attempted to explain the pathophysiological relationship between them. The relationship between PH and hypothyroidism is attempted to be explained by a number of theories. Hypothyroidism leads to remodelling of the pulmonary vascular bed, which increases PVR and ultimately PH via various mechanisms. These include decreased vasodilation because endothelial and smooth muscle cells express different isoforms of nitrite oxide synthase, decreased adenosine-mediated vascular relaxation because ATP is not as readily converted to adenosine, and decreased inhibition of angiotensin II by T3 which increases smooth muscle cell proliferation and vascular remodelling.[8] PH can also be brought on by the autoimmune thyroiditis-induced chronic inflammatory state, which can lead to pulmonary vascular remodelling, increased resistance and vessel obliteration.[11] According to the findings of right heart catheterization and echocardiography, the primary diagnosis in our case was advanced aortic disease complicated by mixed PH and remodelling of the pulmonary vascular bed, which raised pulmonary vascular resistance. However, in some circumstances, there could be a mix of two types of PH, such as aortic disease-related PH and another caused by a pathology unrelated to group 2 (i.e. precapillary PH).[7] It was therefore thought necessary to look into a number of aetiologies not listed in group 2, specifically using a chest CT scan to rule out thromboembolic pathology and a search for antibodies to connective or systemic diseases like scleroderma, all of them turned up negative. According to data published in the literature about the association between thyroid disease and pulmonary arterial hypertension[8–10] and the reduction in PH severity after hypothyroidism treatment, hypothyroidism due to Hashimoto's thyroiditis was considered to be our patient's second cause of PH.

Conclusion

PH is a serious and complex disease with several aetiologies that may be associated with each other. The cornerstone of group 2 PH treatment is early management of underlying left heart disease, which lowers morbidity and mortality. Although it is frequently misdiagnosed, thyroid disease, including hypothyroidism is sometimes linked to the development of PH and the presence of AF can make patients' prognosis worse. In the etiological work-up of PH, cardiologists should consider this association and check for dysthyroidism.

Author contributions

Thierno Hamidou Diallo was involved in study concept, data collection, data analysis, and writing the paper. Frederick Nana Yeboah was involved in study concept, data collection, data analysis, and writing the paper. Raynatou Djafarou Boubacar was involved in data collection and data analysis. Raid Faraj was involved in data collection and data analysis. Keltoum Boui-Issoui was involved in data collection and data analysis. Ely Sidi Sidi Mhamed was involved in data collection and data analysis. Hanaa El Ghiati was involved in data collection and data analysis. Ibrahima Dokal Diallo was involved in data collection and data analysis.

Najat Mouine was involved supervision and data validation. Aatif Benyass was involved in supervision and data validation.

Availability of data and materials

Data sharing is not applicable to this article as no datasets were generated or analyzed during the current study.

Declaration of conflicting interests

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Ethics approval

Our institution does not require ethical approval for reporting individual cases or case series.

Informed consent

Written informed consent was obtained from the patient's husband for the anonymized publication of this case report.

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References

1. Mandras SA, Mehta HS and Vaidya A. Pulmonary hypertension: a brief guide for clinicians, *Mayo Clin Proc* 2020; 95(9): 1978–1988.
2. Humbert M, Kovacs G, Hoeper MM, et al. 2022 ESC/ERS guidelines for the diagnosis and treatment of pulmonary hypertension. *Eur Heart J* 2022; 43(38): 3618–3731.
3. Fukuda K, Date H, Doi S, et al. Guidelines for the treatment of pulmonary hypertension (JCS 2017/JPCPHS 2017. *Circ J* 2019; 83(4): 842–945.
4. Riley DS, Barber MS, Kienle GS, et al. CARE guidelines for case reports: explanation and elaboration document. *J Clin Epidemiol* 2017; 89: 218–235.
5. Kovacs G, Dumitrescu D, Barner A, et al. Definition, clinical classification and initial diagnosis of pulmonary hypertension: updated recommendations from the Cologne Consensus Conference 2018. *Int J Cardiol* 2018; 272: 11–19.
6. Haddad F, Kudelko K, Mercier O, et al. Pulmonary hypertension associated with left heart disease: characteristics, emerging concepts, and treatment strategies. *Prog Cardiovasc Dis* 2011; 54(2): 154–167.
7. Maeder MT, Weber L and Rickli H. Pulmonary hypertension in aortic valve stenosis. *Trends Cardiovas Med* 2022; 32(2): 73–81.
8. Scicchitano P, Dentamaro I, Tunzi F, et al. Pulmonary hypertension in thyroid diseases. *Endocrine* 2016; 54(3): 578–587.
9. Curnock AL, Dweik RD, Higgins BH, et al. High prevalence of hypothyroidism in patients with primary pulmonary hypertension. *Am J Med Sci* 1999; 318(5): 289–292.
10. Li JH, Safford RE, Aduen JF, et al. Pulmonary hypertension and thyroid disease. *Chest* 2007; 132(3): 793–797.
11. Badesch DB. Hypothyroidism and primary pulmonary hypertension: an autoimmune pathogenetic link. *Ann Intern Med* 1993; 119(1): 44–46.