

## CASE REPORT

### GRAVES' DISEASE INDUCED REVERSIBLE SEVERE RIGHT HEART FAILURE

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**ABSTRACT:** A middle aged man presented with evidence of right-sided heart failure in atrial fibrillation (AF) and was found to have severe Tricuspid Regurgitation (TR) with pulmonary artery hypertension (PAH), with normal left ventricular function. The common possible secondary causes of PAH were ruled out, but during investigation he was found to have elevated thyroid function tests compatible with the diagnosis of Graves' disease. The treatment of Graves' disease was started with anti-thyroid drugs and associated with a significant reduction in the pulmonary arterial pressure. This case report is presented to highlight one of the rare and underdiagnosed presentations of Graves' disease. Thyrotoxicosis can present with profound cardiovascular complications. In recent times, there have been few reports of secondary PAH with TR in patients with hyperthyroidism. Previously asymptomatic Graves' disease having the signs and symptoms of right heart failure is a rare presentation and the association could be easily missed. This case presentation emphasizes that the diagnosis of thyroid heart disease with heart failure secondary to Graves' disease should be considered in any patient regardless of age, gender with clinical features of heart failure of unknown etiology and timely initiation of anti-thyroid drugs is necessary to treat these reversible cardiac failures.

**KEYWORDS:** Grave's Disease, Right Heart Failure.

**INTRODUCTION:** Graves' disease(GD) accounts for 60–80% of thyrotoxicosis, presents between 20 to 50 years of age.<sup>(1)</sup>Combination of environmental and genetic factors contributes to GD. Hyperthyroidism of GD is caused by thyroid-stimulating immunoglobulins (TSI) that are synthesized in the thyroid gland, bone marrow and lymph nodes, and detected by bioassays or TSH-binding inhibiting immunoglobulins(TBII) assays. Thyroid peroxidase (TPO) antibodies occur in up to 80% of cases.<sup>(1)</sup> Thyroid hormones increase B adrenergic receptors on heart, skeletal muscles, adipocytes etc. and increase the catecholamine action at post receptor site. Increased heart rate resulting from increased sinoatrial activity, lower threshold for atrial activity, and shortened atrial repolarisation; the last two also increases chances of atrial fibrillation (AF) and ventricular dysrhythmias.<sup>(2)</sup> T3 induced peripheral vasodilatation, increased vascular volume due to RAAS activation, and increased cardiac contractility from direct effect of T3 on heart increases cardiac output to >7 liters/mt, seen as in figure 1.<sup>(3)</sup>

The high cardiac output can lead to worsening of angina or Congestive heart failure (CHF) in the elderly or those with preexisting heart disease. AF is more common in patients >50 years of age. GD associated with increased risk of auto immune cardiac involvement: Pulmonary Arterial Hypertension (PAH), Autoimmune cardiomyopathy, and myxomatous cardiac valve disease. Systemic vascular resistance falls with hyperthyroidism, but increased output to the

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pulmonary circulation, causes PAH and right heart failure (RHF). Patients with long-standing hyperthyroidism and marked sinus tachycardia or AF can develop low cardiac output, impaired cardiac contractility with a low ejection fraction, an S3, and pulmonary congestion, all consistent with left heart failure (LHF).<sup>(3)</sup>

GD is diagnosed by clinical features with laboratory evidence of raised T3, T4, and a low TSH, presence of antibodies to TPO and thyroglobulin (Tg) which are markers of autoimmunity, and increased uptake on Tc pertechnate scan.<sup>(1)</sup>

Treatment is aimed at rapidly improving symptoms and reducing demands on heart by preventing thyroid hormone synthesis and release by anti-thyroid drugs, followed by radio-active thyroid ablation if necessary.<sup>(1)</sup>

**CASE REPORT:** Forty six year old male admitted with history of breathlessness and palpitations, weight loss and swelling of feet since 12months, 6 months and 10 days respectively. He noticed tremors. His bowel habits are normal. No history of chest pain or previous cardiovascular diseases.

The patient was lean. Anemia, jaundice and pedal oedema (As in figure 2) are present. Midline neck swelling is present as in figure 3. No bruit heard over the swelling.

He had moist and hot palms with tremors. He was afebrile, respiratory rate was 28 per minute, blood pressure was 140/90 mmHg with irregularly irregular pulse of 120 beats per minute with JVP 12 cm above sternal angle as in figure 4.

Diffuse hyperdynamic apex beat, left parasternal heave and palpable P2 are present. Short systolic murmur in mitral area of grade 2/6, holosystolic murmur of grade 2/6 at left sternal border accentuated with inspiration and passive leg raising test, systolic murmur of grade 2/6 in pulmonary area are present. Chest x-ray showed cardiomegaly with B/L pleural effusions and electrocardiogram showed AF with rapid ventricular response (120 beats/min).

2D Echo showed AF with fast ventricular rate, A dilated right atrium and right ventricle (RV) with severe TR, moderate PAH, with right ventricular systolic pressure (RVSP) of 66 mmHg, ejection fraction (EF) 77%, RV dysfunction with normal LV systolic function as in figure 5.

Blood tests revealed decreased TSH (0.01uIU/ml; N 0.25-4.3Uiu/ml) and elevated T3 (3.00ng/ml; N 0.7-2ng/ml), T4 (19ug%; N 5-13ug%) levels consistent with hyper thyroidism. TPO Antibodies positive (230 IU/ml).

Ultrasound neck showed diffuse goitre. FNAC thyroid gland showed colloid goitre. Radio-active iodine uptake study showed increased uptake by 12% as in figure 6.

HRCT chest showed cardiomegaly and B/L pleural effusions as in figure 7, and excluded pulmonary embolism, carcinoid syndrome and tricuspid endocarditis, pericarditis, connective tissue diseases. CT abdomen showed hepatomegaly as in figure 8 and excluded carcinoid syndrome.

The only concurrent illness identified was Graves' disease.

The patient was treated with neomercazole 20 mg TID, tachycardia and tremors were treated with propranolol, CHF was treated with furosemide and spiranolactone, digoxin and enalapril. Enoxiparin was given prophylactically against thrombo embolic events of AF for 5 days followed by acitrom (Acenocoumarol) 2mg. Pulse rate reduced from 120 to 76 minute, BP from

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140/90mmHg to 100/80 mmHg. After 4wks of treatment his thyroid profile is with values of T3 149ng/dl(N120-190ng/dl),T4 12.6micro g/dl(N 5-12 micro g/dl), TSH 0.07 microIU/L (N 0.5-5micro IU/L) and he had significant clinical improvement and resolution of right heart failure.

**DISCUSSION:** Thyrotoxicosis can present with profound cardiovascular complications. Our patient presented with thyrotoxicosis in AF and CHF predominantly right sided with severe TR, and moderate PAH.

The prevalence of AF ranges from 2% to 20%, common with advancing age.<sup>(3)</sup>

Virani et al., reported association of hyperthyroidism and PAH and symptomatic relief after normal thyroid function was restored, autoimmune mechanisms playing role in pathogenesis.<sup>(4)</sup>

Study by Suk et al., found that the prevalence of PAH in the untreated patients was 44% and concluded that PAH is a frequent reversible complication of GD, also states Increased pulmonary blood flow from thyrotoxicosis might contribute to PAH in GD.<sup>(5)</sup> Study by Marvisi et al showed association between hyperthyroidism and PAH.<sup>(6)</sup> Study by Conradie M et al., also states that thyrotoxicosis as cause of PAH with autoimmune etiopathogenesis and reversibility of PAH on restoration of normal thyroid state.<sup>(7)</sup>

GD rarely causes CHF in otherwise healthy individuals.<sup>(1)</sup>In hyperthyroidism CHF may occur in the absence of underlying heart diseases as reported in children by cavallo et al.<sup>(8)</sup>

RHF accompanies LHF often, but isolated RHF occurs in the setting of PAH, PS, TS, Constrictive pericarditis, Ebsteins anomaly, primary TR. Hyperthyroidism rarely causes isolated RHF. Increased blood volume, PAH, and increased workload on RV seen in patient with hyperthyroidism were possible contributory factors for the development of RHF.

Echocardiographic findings in our patient were strongly suggestive of severe TR, moderate PAH, RV dysfunction secondary to hyperthyroidism. Other causes of secondary TR were excluded. Ebstein's anomaly was excluded since there was no displacement of the TV annulus. Endocarditis was unlikely since blood cultures were negative with no echocardiographic evidence. Carcinoid syndrome was excluded as there were no focal hepatic lesions on abdominal computed tomography. So in our present case we can make a diagnosis of CHF isolated RV failure with severe TR, PAH, RV dysfunction with patient in AF secondary to hyperthyroidism.

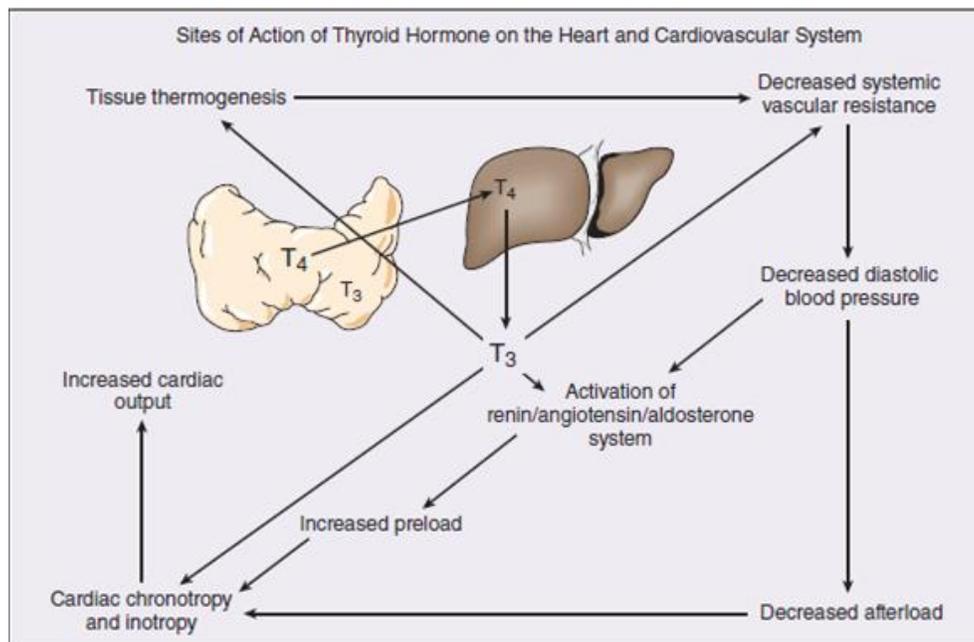
Treatment can be started with lower doses of short-acting beta blockers in conjunction with classic forms of treatment of acute CHF.<sup>(3)</sup> Definitive therapy can then be accomplished safely with antithyroid drugs, iodine-131 alone or in combination with an antithyroid drug.<sup>(3)</sup> Study by Iryna et al states that Restoring euthyroid state in patients with GD is associated with significant elimination of cardiovascular disorders.<sup>(9)</sup>

**CONCLUSION:** Diagnosis of thyroid heart disease with CHF secondary to GD should be considered in any patient regardless of age, gender with clinical features of heart failure of unknown etiology. Assessment of thyroid hormone status in these patients would help in earlier recognition of thyroid heart disease and timely intervention to treat these reversible cardiac failures.

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**Fig. 1: Sites of action of thyroid hormones on cardio vascular system and mechanism of increased cardiac output**

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**Fig. 2: Pedal Oedema**



**Fig. 3: Midline Neck Swelling**

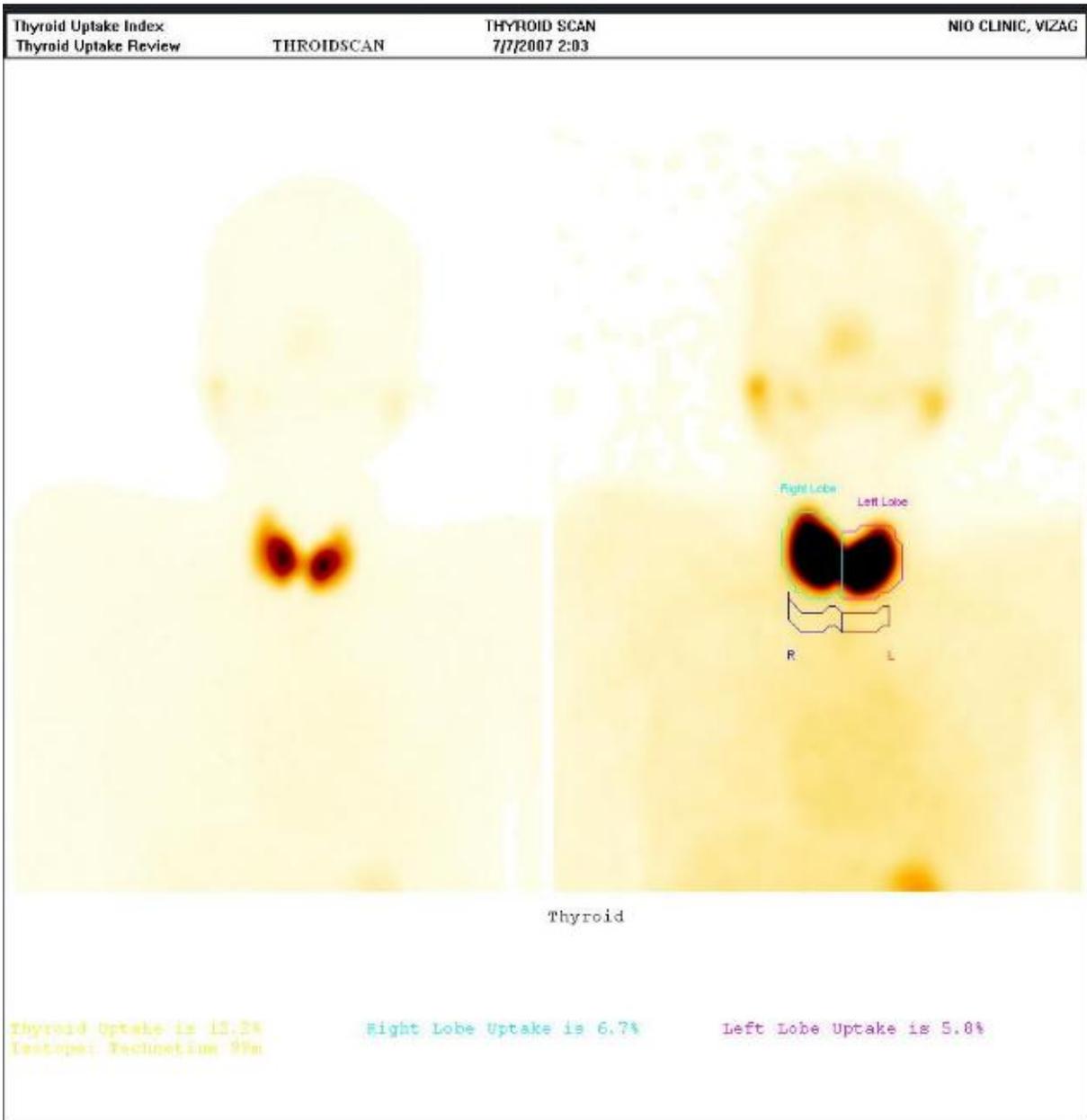


**Fig. 4: Raised JVP**



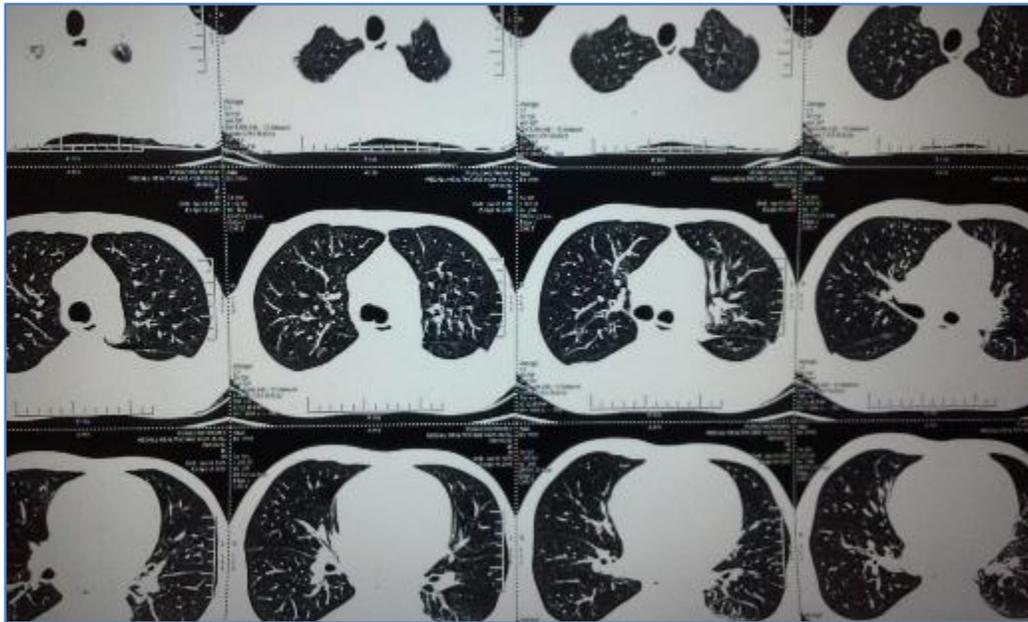
**Fig. 5: 2D Echo**

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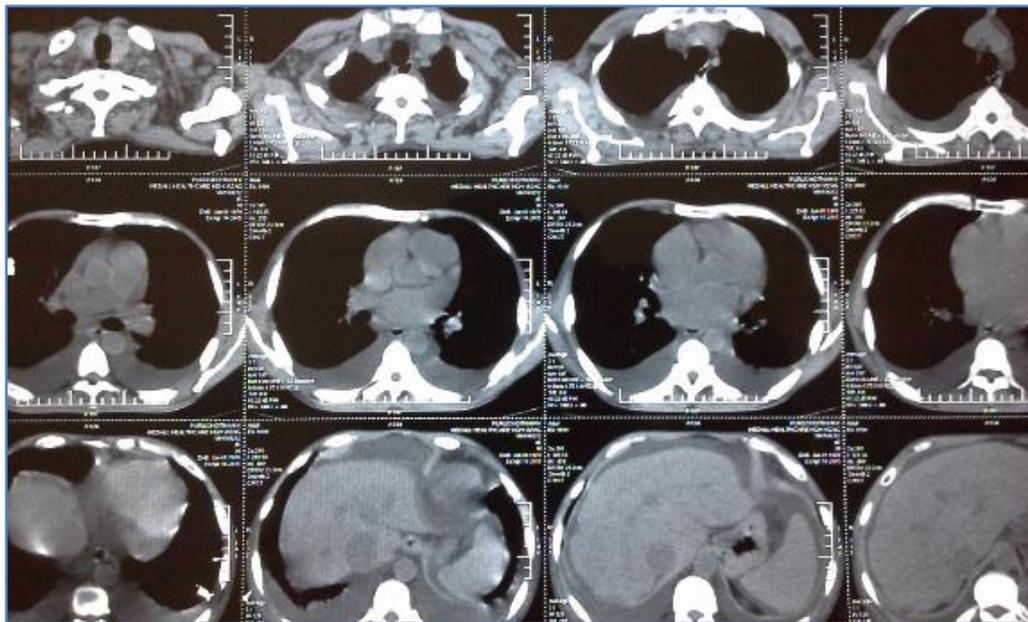


**Fig. 6: Radioactive Uptake Scan**

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**Fig. 7: HRCT CHEST**



**Fig. 8: CT abdomen**

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