Hypothyroidism Presenting as Dilated Cardiomyopathy

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Introduction

Alteration in thyroid status can lead to changes in systolic and diastolic function of left ventricle. Heart is very sensitive to thyroid hormone changes and cardiac disorders are commonly associated with both hyper and hypothyroidism. Diastolic dysfunction is the most common abnormality reported in hypothyroidism. In systolic function, prolonged systolic time interval or normal cardiac function has been reported by most workers. Dilated cardiomyopathy is a very rare presentation of hypothyroidism.

Case Report

A 34 years old female presented with history of dyspnoea for the last two and half years. It was gradually progressive. For the last one and half months, she had dyspnoea on routine activities. She had history of orthopnea and paroxysmal nocturnal dyspnoea (PND) for the last six months.

She also had swelling of both lower limbs for the last two and half years. There was no history of fever, joint pains, chest pain and cough, loss of weight or loss of appetite. She went to a private hospital where she was investigated and was diagnosed as a case of dilated cardiomyopathy (DCM) based on electrocardiograph (ECG), chest radiograph and echocardiography. She was put on digoxin, angiotensin converting enzyme inhibitor (ACE I) and diuretics without significant relief. Thereafter she reported to our hospital.

On examination she had a crowing voice and on direct questioning she told that she had a change in voice for the last two years. She had bilateral pedal edema, which was non pitting. Jugular venous pressure (JVP) was not raised. Her blood pressure was 110/70 mm Hg, pulse 88/min. Her apex beat was in 6th intercostal space in anterior axillary line. S1 and S2 were normal, left ventricular S3 was present. There was no murmur. There was no hepatomegaly. Her echocardiography was done which showed enlargement of left ventricle (LV) with severe LV global hypokinesia and ejection fraction of 20%. There was no mitral, tricuspid or aortic regurgitation. Right atrium and right ventricle were mildly enlarged with good right ventricle contractility. There

was no pericardial effusion. Her renal functions were normal. Total cholesterol was 270mg/dl, LDL 150 mg/dl and HDL 40mg/dl. Her triglyceride levels were 170mg/dl.

Keeping in view the change in voice and gross pedal edema, without raised JVP and hepatomegaly, she was advised thyroid function tests (TFT). She had severe hypothyroidism with TSH > 60mU/L. She was started on tab thyroxine 25µg/day (May 2004) in addition to the therapy she was receiving for DCM, which was increased to 50µg/day after two weeks. She started having symptomatic improvement. TFT repeated in July still showed evidence of hypothyroidism and dose of thyroxine was increased to 100µg/day (Table 1). Repeat echo showed EF of 33% in Oct 2004 (Table 2). Repeat TFT in Feb 2005 still showed evidence of hypothyroidism and dose of thyroxine was increased to 150µg/day. This time her EF was 45%. Her digoxin and diuretics were omitted and she was continued on ACE I. Subsequently repeat TFT and EF were normal on repeated testing (Tables 1,2). Now she is off all drugs except thyroxine for the last three years, and she is well controlled on thyroxine 150µg/day and is symptom free. Her repeated echocardiography, done every six months, shows normal LV functions.

Discussion

Dilated cardiomyopathy, by definition, is decreased overall contractility of heart of idiopathic origin. It is irreversible and is slowly progressive. However, there are case reports of reversible dilated cardiomyopathy in literature. Hyperthyroidism [1], drugs [2], or other endocrine dysfunction [3,4] are some of the causes of reversible dilated cardiomyopathy.

It has been recognized for several decades that thyroid hormones exert direct cellular effects on almost all tissues of the body including heart. The available data suggests that effects of thyroid hormone on heart are primarily via a change in protein synthesis. Some abnormalities of cardiac function in patients with thyroid dysfunction directly reflect the effects of thyroid hormone on calcium-activated ATPase and phospholamban, which are involved primarily in the

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Table 1

Left ventricular functions by Simpson's method at variable intervals

	May 2004	Oct 2004	April 2005	Aug 2005	Dec 2005	June 2006
EDV (ml)	135	96	81	73	75	55
ESV (ml)	108	64	44	30	33	24
EF (%)	20	33	46	59	56	56

EDV - end diastolic volume, ESV - end systolic volume, EF - ejection fraction

Table 2

Thyroid function tests at variable intervals

	May 2004	July 2005	Feb 2005	July 2005	Nov 2005	May 2006
T3	0.12 ng/ml	0.20 ng/ml	0.37 ng/ml	0.89 ng/ml	0.93 ng/ml	0.99 ng/ml
			(normal 0.75 - 2.1)			
T4	0.5 ug/dl	1.5 ug/dl	2.04 ug/dl	5.03 ug/dl	5.16 ug/dl	9.83 ug/dl
			(normal 5.0-12.0)			
TSH (μU/ml)	> 60	20.5	10.06	4.11	3.11	0.53
			(normal 0.4 - 5.0)			

regulation of systodiastolic calcium concentrations in cardiomyocytes. Sarcoplasmic reticulum calcium-activated ATPase is responsible for the rate of calcium reuptake into the lumen of the sarcoplasmic reticulum during diastole that, in turn, is a major determinant of the velocity of myocardial relaxation after contraction. Thyroid hormone also modifies the expression of other ion channels, such as Na⁺/K⁺-activated ATPase, Na⁺/Ca⁺⁺ exchanger, and some voltage-gated K⁺ channels (Kv1.5, Kv4.2, Kv4.3), thereby coordinating the electrochemical and mechanical responses of the myocardium. Bradycardia, systemic hypertension, with narrow pulse pressure and slightly increased mean arterial pressure and some degree of exercise impairment are the most common findings in patients with overt hypothyroidism [5,6]. Many patients with overt hypothyroidism have abnormal standard ECG, including QT prolongation and flattening/inversion of T wave [6,7] which reflect prolonged cardiac action potential.

Most consistent cardiac abnormality recognized in patients with overt hypothyroidism is impairment of LV diastolic function which is characterized by slowed myocardial relaxation and impaired early ventricular filling [8,9]. LV systolic function is only marginally subnormal. Rawat et al [10] in their study on overt hypothyroid patients did not find any difference between severity of hypothyroidism and LV systolic function or LV size. Bhupathi et al [11] found that systolic time intervals like pre ejection period and ejection time and diastolic functions like isovolumic relaxation time were affected in hypothyroid children. However EF and circumferential fiber shortening were not significantly affected.

Hypothyroidism alone as a cause for dilated cardiomyopathy is controversial. Bezdah et al [12]

report the case of a patient with severe hypothyroidism and a dilated cardiomyopathy complicated by heart failure, which has receded after recovery to euthyroidism with L-thyroxine therapy. They suggested that hypothyroidism should be evoked systematically when a dilated cardiomyopathy is diagnosed. Landerson et al [13] found reversible alteration in myocardial gene expression in a young man with DCM and hypothyroidism.

Our patient had LV enlargement, LV global hypokinesia and severe LV global systolic dysfunction and therefore was on treatment for DCM. She responded well to hormone replacement therapy and as euthyroid status was achieved, her LV functions including EF and LV size normalized, suggesting that reversible LV dysfunction was due to hypothyroidism.

Conflicts of Interest

None identified

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Answer to Pathological Quiz

Diagnosis: Oral lichen planus (reticular type)

Discussion

Oral pathologists often are the first to recognize oral lichen planus (OLP). The exact etiology of OLP is unknown but thought to arise due to immunologic disturbances (T cell mediated and antigen specific mechanisms) [1]. Lichen planus commonly affects middle aged adults and the prevalence is greater among women [2]. Several types of OLP have been described, the two main types being reticular, atrophic or erosive [3]. The reticular type, the most common type presents as interlacing white keratotic lines (Wickham's striae) typically located bilaterally on the buccal mucosa [4]. Topical corticosteroids are the treatment of choice for OLP although several other medications have been instituted such as retinoids, tacrolimus, cyclosporine and photodynamic therapy [5]. Erosive or atrophic OLP may undergo malignant transformation and the exact incidence and mechanisms are still controversial [6].

Conflicts of Interest

None identified

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