



## Original Article

# Cardiac Complications of Hyperthyroidism: Echocardiographic Evaluation of 69 Hyperthyroid Patients

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### Abstract

Echocardiography were done on 69 patients suffering from hyperthyroidism. All of them presented with palpitation and tremor. Clinical diagnosis was confirmed by radioimmunoassay of thyroid hormones. Echocardiography as well as Electrocardiography and chest radiography were done in all of them. Forty seven patients showed different types of cardiac pathology, results of which are demonstrated in details. We conclude that thorough cardiac evaluation is necessary in all hyperthyroid patients .

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### Introduction

High circulating levels of thyroid hormones can alter almost all organ systems of the body. In case of hyperthyroidism due to Graves' disease, however, some of the signs and symptoms reflect extra-thyroidal immunological processes rather than the excessive levels of thyroid hormone. Thyroid hormone have positive chronotropic and inotropic effects on the heart, with the result that in hyperthyroidism cardiac output and cardiac rate rise, as would be expected because of the increased demand for oxygen in peripheral tissues and increased blood flow to the skin, muscles, brain thyroid and kidneys<sup>1</sup>. Clinically, the patients manifest a tachycardia and a bounding pulse, the widened pulse pressure reflects both increased cardiac output and decreased peripheral vascular resistance. In most of the patients cardiac symptoms may be the presenting feature of thyrotoxicosis. Due to increased cardiac output, the maximum velocity of fiber shortening<sup>2</sup> and

myocardial excitability<sup>3</sup> increases, as a result the circulating blood volume expands<sup>4</sup> and the pulse pressure widens.

What are the implications for the heart in hyperthyroidism? Seemingly the only satisfactory way of restoring myocardial function, even in uncomplicated hyperthyroidism is to restore the raised serum hormone concentrations to normal as quickly as possible<sup>6</sup>.

Cardiac failure is uncommon in hyperthyroidism, but if untreated, altered thyroid hormone level can manifest and even exacerbate pre-existing cardiac pathology<sup>7,8</sup>.

Now-a-days cardiac performance can be assessed by several relatively simple & non-invasive methods. As a goiter endemic zone, prevalence of hyperthyroidism is very common in northern part of Bangladesh. The aim of this study is to assess the frequency of cardiac complications in patients with hyperthyroidism.

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## Materials and method

Sixty-nine clinically hyperthyroid patients were selected in our study from January 2002 to October 2003. All the patients presented with palpitation, weight loss, tremor and hot flushes all over body. Visible & also palpable thyroid gland was found in 57 of them. Careful drug history revealed that almost all of them have taken some kind of beta- blocker drugs. But none of them had have taken any anti-thyroid drugs.

Radio immunoassay (RIA) of thyroid hormones were done in all of them using kit from China National Lab. The serum specimen were processed in automatic multi channel counter in triplicate. The results were processed with RIA program supplied by the manufacturer.

Repeat count were also done manually using single analyzer (Mini Assay, USA) in duplicate. All the results were then processed, using MS Excel.

Echocardiography were done in all of them using Aloka SSD 1100 & HP Image Point Color Doppler ultra-sonogram machine. A team of nuclear medicine physicians and cardiologists reviewed the results, which included echocardiographic findings, ECG and plain X-Ray of the chest.

## Results

A total of 69 hyperthyroid patients were evaluated in this study. The mean age of the patients was  $38 \pm 7.1$  years. Male to female ratio was 1:1.3. All the patients showed clinical features of frank hyperthyroidism.

Echocardiographic findings are shown in Table 1. Echocardiographic findings were also correlated with ECG and chest radiograph, which revealed well correlation.

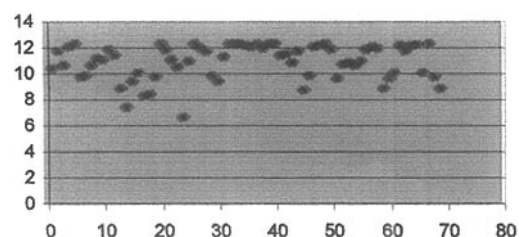
RIA results confirmed the clinical diagnosis. Results of RIA are shown in Table 2 (T3  $10.7 \pm 2.4$ nmol/1, T4  $282 \pm 21$  nmol/1, TSH  $0.2 \pm 0.1$  mIU).

Standard deviation between automatic MCA and manual single channel analyzer is for 1.32 of T<sub>3</sub>, 34.33 for T<sub>4</sub> and 0.06 TSH.

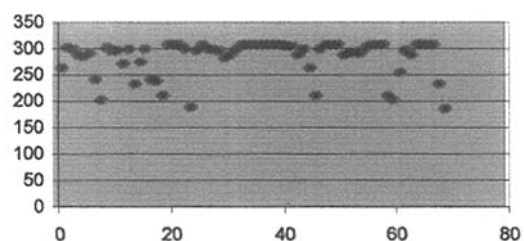
**Table 1:** Shows different types of Cardiac pathology seen in the hyperthyroid patients in this study.

Types of cardiac pathology	No. of Patients
Atrial fibrillation	29
Cardiomyopathy	9
Cardiac failure	1
Mitral stenosis	2
Sinus arrhythmia	5
Mitral valve prolapse	1
Total	47

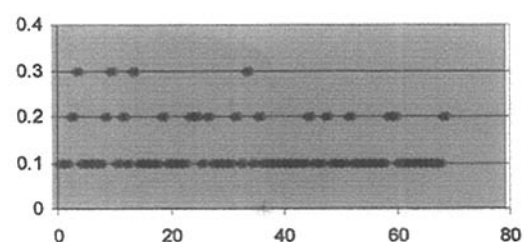
**Table 2:** Shows the serum concentration of different thyroid hormones.



**T3 (nmol/l)**



**T4 (nmol/l)**



**TSH (nmol/l)**

## Discussion

Thyroid hormones have positive chronotropic and inotropic effects on the heart, with the result that in hyperthyroidism cardiac rate and output rise, the

maximum velocity of fiber shortening<sup>9</sup> and myocardial excitability<sup>3</sup> increase, the circulating blood volume expands<sup>4</sup> and the pulse pressure widens<sup>10</sup>. The cardiac output is increased in hyperthyroidism as would be expected because of the increased demand for oxygen in peripheral tissues, where the patients clinically manifests tachycardia and a bounding pulse.

Simply the presence of a high thyroxin level in clinically euthyroid patients of 60 years or older was associated with a threefold higher risk of developing atrial fibrillation<sup>8</sup>.

In our study, a considerable number of hyperthyroid patients showed different types of cardiac pathology, which is about 68%. However, there is no clear evidence that screening all clinically euthyroid patients with atrial fibrillation for occult hyperthyroidism will detect sub clinical disease with any greater frequency than control subject<sup>11, 12</sup>. But in hyperthyroid patients, it is extremely necessary to rule out any cardiac pathology. Many patients turn out to be elderly with 'hot' thyroid nodules; the classic symptoms and signs of hyperthyroidism are often absent and the serum concentration of thyroxin may be normal<sup>13</sup>. Diagnosis then rests on a raised serum concentration of tri-iodothyronine or a blunted response of thyroid stimulating hormone or both<sup>14</sup>.

The risk of thrombo-embolism is reportedly as great as that due to mitral stenosis<sup>15,16,17</sup>. Systolic and diastolic left ventricular functions at rest are not necessarily depressed by hyperthyroidism<sup>18</sup>. During exercise, the left ventricular ejection fraction may actually fall<sup>19</sup>, but despite this apparently pathological response, frank congestive heart failure is not common in hyperthyroidism, unless the patient has underlying cardiac disease.

## Conclusion

High circulating levels of thyroid hormones can affect almost all organ systems of the body. In some cases, however, some of the signs and symptoms reflect extra thyroidal immunological

processes rather than the excessive levels of thyroid hormone. It should be noted that hyperthyroidism might also present in an atypical fashion. The cardiac complications of long standing hyperthyroidism are serious if the aetiologies are not diagnosed properly earlier. As a non-invasive method, echocardiography can play a vital role in recognizing the cardiac pathology in hyperthyroidism as well as to follow up the response to therapy.

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