Effect of L-thyroxin on left ventricular diastolic dysfunction among subclinical hypothyroid patients

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Abstract

The present study draws special attention to find the effect of thyroxin in subclinical hypothyroid patients with left ventricular diastolic dysfunction. The aim of the study is to assess the left ventricular diastolic function in patients with subclinical hypothyroidism after starting treatment with thyroxin. In this study all patients were above the age 18 years having subclinical hypothyroidism with left ventricular diastolic dysfunction. Apart from the detailed clinical history, relevant clinical examination was done in very participants. This study shows that after starting thyroxin in subclinical hypothyroid patients with left ventricular diastolic dysfunction, there was drastic improvement in left ventricular diastolic function.

Keywords: thyroxin, ventricular diastolic dysfunction, subclinical hypothyroid patients

Introduction

Subclinical hypothyroidism is biochemically defined as an elevation in serum thyrotropin level in combination with a serum free T4 level that is within the reference range. The incidence of subclinical hypo-thyroidism varies among populations and ranges from 3 to 15%, with a higher incidence associated with increasing age, female sex, and a suboptimal iodine status [1, 2]. There is inverse relationship between serum thyrotropin and free T4 such that a small decrease in free T4 can result in upward fluctuation in serum thyrotropin, which can subsequently lead thyrotropin level above the reference range while the free T4 level is still within the reference range. In cases of progression to overt hypothyroidism, the thyrotropin level continues to increase and the free T4 level falls below the reference range. In this aspect, subclinical hypothyroidism can be seen as a mild form of thyroid failure, one that is caused by autoimmune thyroid disease in the majority of cases. A thyrotropin cutoff level of 10 mIU per liter is commonly used to distinguish between mild and more severe subclinical hypothyroidism [3, 4, 5]. Approximately 75 % of patients with subclinical hypothyroidism have a thyrotropin level of less than 10 mIU per liter. Serum thyrotropin and free T4 show significant variability among healthy persons, whereas the range of variability within a healthy individual person tends to be relatively narrow.

Aims and Objective

The aim of this study is to assess improvement in left ventricular diastolic dysfunction after starting thyroxin therapy in subclinical hypothyroid patients.

Study Duration

The duration of the present study is six months.

Participants

In this study all patients were above age of 18 having subclinical hypothyroidism with left ventricular diastolic dysfunction.

Investigation

The following investigations to be done for the present study were stated as under:

1. Thyroid panel (TSH and F T3, T4)
2. 2D Eco

Table 1: Thyroid function test in study patients (N=50, before starting thyroxin therapy)

		Range	N	Percent
TSH	Normal	0.35 to 5.50µIU/mL	0	0.0
	High	5.51 to 9µIU/mL	50	100
	Total		50	100
Ft3	Normal	0.61 to 1.81ng/mL	50	100
	High	1.82 & above ng/mL	0	0.0
	Total		50	100
Ft4	Normal	5.01 to 12.45µg/mL	50	100
	High	12.46 & above µg/mL	0	0.0
	Total		50	100

Table 2: Eco cardio graphic finding in study patients (N=50, before starting thyroxin therapy)

	Subclinical hypothyroid patients (N=50)		*P*-value
	Mean ± S.D.	Std. Error Mean	
E (cm/s)	86±5	0.02	0.231
A (cm/s)	78±7	0.152	0.324
E` (cm/s)	10.4±2.3	0.021	0
IVRT (ms)	107±0.16	0.031	0
DT (ms)	176±29	0.127	0
E/A	1.12±0.25	0.215	0.264
E/E`	8.4±2.9	0.014	0

Table 3: Thyroid function test comparison before and after treatment

	Thyroid profile before treatment	Thyroid profile after treatment	P Value
	Mean ± Standard deviation	Mean ±Standard deviation	
TSH	7.40±1.506	3.25±2	0
Ft3	.95±.218	.98±.218	0
Ft4	6.02±1.458	7.02±1.458	0

Table 4: Echo cardio graphic comparison before and after treatment

Parameters	Echo cardio graphic finding before treatment	Echo cardio graphic finding after treatment	P Value
E (cm/s)	86±5	86±7	0.749
A (cm/s)	78±7	76± 5	0.438
E` (cm/s)	10.4±2.3	11.1±2.9	<0.001
IVRT (ms)	107±0.16	75±11	<0.001
DT (ms)	176±29	175±22	0.213
E/A	1.12±0.25	1.12±0.22	0.189
E/E`	8.4±2.9	7.8±2.5	<0.001

Discussion

Subclinical hypothyroidism is a common clinical problem with a prevalence of about 3 to 15% globally, and is associated with cardiovascular morbidity and mortality. The present study was aimed to assess the improvement in diastolic dysfunction in patients having subclinical hypothyroid is, after starting thyroxin therapy.

In our study a total of 50 patients were studied. All patients were in the age group of 18 to 40 with 44% being males and 56% were females; the echo cardio graphic finding of patients having subclinical hypothyroidism was assessed with the following parameters

E cm/sec=86±5
A cm/sec = 78±7
E`cm /se=10.4±2.3
IVRT ms = 107±16
DT ms = 176±29
E/A = 1.12±0.25
E/E` = 8.4±2.9

As Subclinical hypothyroidism is evident cause of left ventricular diastolic dysfunction. There are various studies supporting the statement, study done by Pankaj Kumar *et al*. [6], in 2015, where they studied the effect of subclinical hypothyroidism on left ventricular function in subclinical hypothyroid patients and found that about 75% of patients had diastolic dysfunction. The results of their study showed that in patients with subclinical hypothyroidism, the diastolic parameters on ECHO were altered mainly the increased intraventricular relaxation time and reduction of E/A ratio.

Meena C.L. *et al*. (2012) [7] concluded that subclinical hypothyroidism significantly affects LV and RV structure, systolic, diastolic and global function, and LV and RV mechanics. Levothyroxine replacement therapy significantly improved cardiac structure, function, and mechanics in the SHT patients.

Bernadette *et al*, (2008) [8] found that in subclinical hypothyroid patients there is impairment in left ventricular relaxation time.

Biondi Serafino *et al* [9] found significant prolongation of IVRT in subclinical hypothyroid patients.

Marco Ziun *et al* (2016) [10] came to conclusion that in young sub clinical hypothyrioid patients there is impairment in diastolic function moreover, it could be the prelude to more serious cardiac impairment, given that LVDD often precedes and/or causes systolic dysfunction.

Yuthika Malhotra *et al* [11] found that SCH patients had a higher prevalence of LVDD than controls (13.43% versus 1.49%; p=0.017.

In this study these patients were kept on thyroxin therapy (50 microgram of thyroxin) for 6 months, after treatment there was a tremendous improvement in left ventricular diastolic dysfunction among subclinical hypothyroid patients. The diastolic function was assessed by using echocardiography with the following parameters

E cm/sec=86±7
A cm/sec = 76±65
E`cm/sec=11.1±2.9
IVRT ms = 75±11
DT ms = 175±22
E/A = 1.12±0.22
E/E` = 7.8±2.9

There are various supporting evidences showing improvement in left ventricular diastolic dysfunction among subclinical hypothyroid patients. According to the study given by Meena C.L. *et al*. (2012) [7], The Levothyroxine replacement therapy significantly improved cardiac structure, function, and mechanics in the SHT patients. Yuthika Malhotra *et al*. [11], Studied that LVDD occurs commonly in SCH patients. It can be detected using echocardiography and may be reversed by L-thyroxin therapy. T K Mishra *et al*. [12] Studied that hypothyroidism, even in subclinical stage, can cause diastolic dysfunction of the LV. These abnormalities in diastolic function can be reversed by thyroxine therapy**.** H C C E Villar *et al* [13], assessed some echocardiographic parameters in subclinical hypothyroid patients where there was improvement in echocardiographic parametres after levothyroxine replacement therapy, like myocardial relaxation, as indicated by a significant prolongation of the isovolumic relaxation time as well as diastolic dysfunction. Mehmet Yazici *et al* [14], has done a study among subclinical hypothyroid patients having diastolic dysfunction, and there was improvement in diastolic function after giving T4 therapy which was observed in SHT patients. F Franzoni *et al*. [15], There data suggest that SH is associated with some reversible impairment of myocardial function,where they find L-T4 replacement therapy should be given for these patients with the aim to normalise preclinical cardiac dysfunction and to prevent the further clinically significant myocardial dysfunction.

Summary and Conclusion

The present study was conducted in post graduate department of medicine, Government medical college Srinagar, over a period of six months to assess the effect of L- thyroxin therapy in subclinical hypothyroidism patients having diastolic dysfunction. In our study there was drastic improvement in diastolic function among subclinical hypothyroid patients having diastolic dysfunction.

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