

Original Research Article

Assessment of left ventricle diastolic dysfunction in patients with subclinical hypothyroidism

Dr. Thirumaleshwara M¹, Dr. Venugopal K², Dr. Muthuraj N³ and Dr. Venkatesh K B^{4,*}

¹ Assistant Professor, Department of General Medicine, Hassan Institute of Medical Sciences, Hassan, Karnataka, INDIA.

² Associate Professor, Department of General Medicine, Hassan Institute of Medical Sciences, Hassan, Karnataka, INDIA.

³ Associate Professor, Department of General Medicine, Hassan Institute of Medical Sciences, Hassan, Karnataka, INDIA.

⁴ Senior Resident, Department of General Medicine, Hassan Institute of Medical Sciences, Hassan, Karnataka, INDIA.

* Correspondence: venkivolvo77@gmail.com

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Abstract: Background and Aims: Diastolic dysfunction is the common condition with Subclinical Hypothyroidism and is reversible in many cases after treatment. We aimed to investigate the response of diastolic dysfunction to thyroid hormone replacement therapy in patients of Subclinical Hypothyroidism.

Methods: 100 newly diagnosed cases of Subclinical Hypothyroidism (78 females and 22 males) and age more than 18 years were included. Diagnosis was made on the basis of history, clinical examination and thyroid function tests. Echocardiography was performed in all and was repeated after 4-6 months in those who had diastolic dysfunction. Distribution of Diastolic dysfunction among the involved cases and their response to treatment with L-thyroxine were studied.

Results: Out of 100 patients included in the study, 78 patients were female and 22 patients were males. Out of 78 female patients, 28 patients had grade-1 diastolic dysfunction and 50 patients did not have diastolic dysfunction. Out of 22 male patients, 08 patients had grade-1 diastolic dysfunction and 14 patients did not have diastolic dysfunction. With replacement therapy, 28 reverted back to the normal whereas one having grade 2 diastolic dysfunction (pseudonormal pattern) reverted to grade 1. One patient who had grade 1 diastolic dysfunction (impaired relaxation) did not improve. Pericardial effusion subsided in all 5 cases.

Conclusions: Echocardiography may be a useful tool for monitoring the response of diastolic dysfunction to thyroid hormone replacement therapy in patients with Subclinical Hypothyroidism. Our findings suggest that Thyroid Hormone Replacement Therapy may reverse diastolic dysfunction in Subclinical Hypothyroidism.

Keywords: Hypothyroidism; Echocardiography; Diastolic Dysfunction; L-thyroxine.

1. Introduction

Thyroid dysfunction is a major public health problem among the local population. Subclinical hypothyroidism (SCH) is defined as a state of increased serum thyroid-stimulating hormone (TSH) levels, with circulating thyroxine (T₄) and tri-iodothyronine (T₃) concentrations within the population reference range.

Cardiovascular effects of thyroid hormones are quite dramatic and the cardiac abnormalities associated with thyroid dysfunction have attracted a great deal of investigative report [1]. The most-consistent cardiac abnormality recognized in patients with hypothyroidism is impairment of left Ventricular (LV) diastolic function, which is characterized by slowed myocardial relaxation and impaired early ventricular filling. LV systolic function is usually subnormal, as demonstrated by slightly reduced values of ejection fraction and stroke volume.

The present study aimed to find out Echocardiography findings of cardiac changes with special regards to diastolic function in patients of Subclinical hypothyroidism.

2. Aims and objectives

1. To study the prevalence of diastolic dysfunction in patients with subclinical hypothyroidism.
2. To study the response of diastolic dysfunction after thyroxin treatment.

3. Methodology

3.1. Study place

Patients attending out-patient department of the general medicine at Hassan Institute of Medical Sciences, Hassan.

3.2. Study duration

June 2020 to June 2022.

3.3. Sample size

100.

3.4. Study design

Observational study.

3.5. Inclusion criteria

- Age >18 years and <60 years.
- A patient with Subclinical hypothyroidism.
- Both genders.

3.6. Exclusion criteria

- Age <18 years and >60 years.
- Overt hypothyroidism.
- Patient with hypertension, diabetes, Ischemic heart disease, congenital heart disease.
- Patient with renal failure.
- Patient with liver failure.
- Pregnancy and lactation.
- Those who doesn't want to be the part of the study.

After fulfilling the inclusion and exclusion criteria, patients were selected and socio demographic parameters like age, sex, education and detail history regarding past medical co-morbidities were taken and tabulated. The diagnosis of hypothyroidism was made on the basis of history, clinical examination and thyroid function test report. Assessment of Thyroid function tests (TFT): FT3, FT4, TSH) was done by ELISA method using standardized commercially available kits employing Competitive ELISA for FT3 & FT4 and Sandwich ELISA for TSH. The normal reference values for TFT were FT3:1.4-4.2 pg/ml, FT4:0.8-2.2 ng/dl, TSH: 0.3-6.2 mIU/l.

2D echocardiography was performed in all the patients and diastolic dysfunction was assessed and all the parameters were tabulated in a Microsoft excel and statistically analyzed using SPSS software.

3.7. Echocardiographic Diagnostic Criteria of Diastolic Dysfunction

3.7.1. Indices used were: (with normal values)

- Peak E (86 ± 16 cm)
- Peak A (56 ± 18 cm)
- E/A ratio (1.6 ± 0.5)
- Deceleration time (DT) (160-240 m sec)
- Left ventricular isovolumetric relaxation time (IVRT)(70-90 m sec)

A mitral inflow pattern of abnormal relaxation [E<A;prolonged IVRT; prolonged DT].

- In patients less than 55 years of age E/A <1
- In patients more than 55 years <0.8
- DT >240 msec
- IVRT >90 msec

Statistical analysis: Data were analyzed using Statistical package for social sciences (SPSS version-10) for windows. Student’s T test was used to compare the Mean values between the two groups i.e., diastolic dysfunction and no diastolic dysfunction, using P-value<0.05 as statistically significant. Percentage, Proportion, and other Statistical parameters were calculated and applied as applicable to other variables.

4. Results

Out of 100 patients included in the study, 78 patients were female and 22 patients were males (Figure 1)

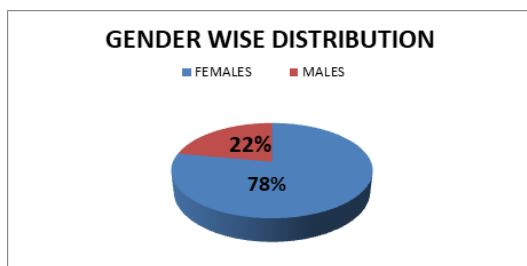


Figure 1. Gender wise distribution of the study population

Out of 78 female patients, 28 patients had grade-1 diastolic dysfunction and 50 patients did not have diastolic dysfunction. Out of 22 male patients, 08 patients had grade-1 diastolic dysfunction and 14 patients did not have diastolic dysfunction.

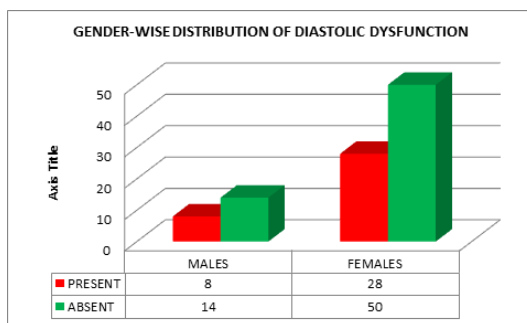


Figure 2. gender-wise distribution of diastolic dysfunction

Out of 100 patients, 34 patients were in the age group of 20-30 years, 36 patients in the age group of 30-40 years, 14 patients in the age group of 40-50 years and 16 patients in the age group of 50-60 years. Out of this age group, diastolic dysfunction is seen highest in the age group 30-40 years.

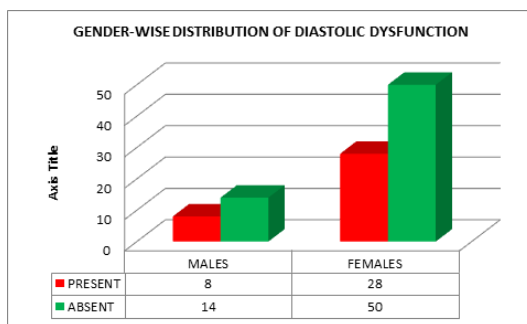


Figure 3. Age-wise distribution of study population

5. Discussion

There is some conflicting evidence in regards to subclinical hypothyroidism. A study published by Cappola *et al.*, stated that unrecognized subclinical hypothyroidism is not a cardiovascular risk factor [2]. The cardiovascular health study found no increased cardiovascular risk in subjects with TSH <10.0 mU/l [3]. Again, in another study, Rodondi *et al.*, said that there may be increased risk of heart failure in patients with TSH level >7 mIU/L, but no other cardiovascular events [4]. Based on the reviewed data, recommendation was made against routine treatment of subclinical hypothyroid disease with TSH level 4.5-10.0 mIU/L [5]. Contrary to that, Biondi *et al.*, found subclinical hypothyroidism to be associated with left ventricular systolic and diastolic dysfunction and enhanced risk for atherosclerosis and myocardial infarction based on the fact that heart responds to minimal, but persistent changes in blood level of thyroid hormone that is typical for subclinical hypothyroidism [6]. Hak *et al.*, had similar observation that it is a strong indicator of risk for atherosclerosis and myocardial infarction in elderly woman [5]. There is also evidence regarding increased arterial stiffness in this disorder [7]. A number of studies demonstrated diastolic dysfunction in subclinical hypothyroidism, and, based on their observation, they recommended to treating these patient as levothyroxine may reverse this diastolic dysfunction over the period of time [8–11]. Our study found significant diastolic dysfunction of left ventricle in patients with subclinical hypothyroidism though systolic function remains unaffected. We found significant increase in mitral peak "A" velocity, reduced E/A ratio, and prolongation of IVRT in Doppler echocardiography. Mitral peak E velocity is unaltered. There is also higher Tei index among subclinical hypothyroidism compared to normal subjects. This is similar to the findings stated by Biondi *et al.*, though they had not measured Tei index [12]. Our study also supports data from Kosar *et al.*, where they found significant lower E/A ratio and prolongation of IVRT in both the left and right ventricle, though we have not included right ventricular dysfunction in our study [13].

We followed strict exclusion criteria in patient selection. Other potential causes of diastolic dysfunction (such as diabetes, hypertension, and coronary artery disease) were not included in this study. We also excluded alcoholics and person aged over 60 years in fear of presence of preexisting diastolic dysfunction. Hence, diastolic dysfunction in the study group is mainly attributed by the disease entity itself that is, subclinical hypothyroidism. Based on results from our study, we can say that diastolic dysfunction is a recognized threat to subclinical hypothyroidism. Pulse wave Doppler echocardiography is sufficient to detect this diastolic dysfunction. It should be applied to all patients with subclinical hypothyroidism who is a potential candidate of suffering from diastolic dysfunction.

6. Conclusion

The reversal to the normal echocardiography findings was possible with the L-thyroxine treatment and therefore has an advantage on treating subclinical hypothyroidism cases depending on the high level of TSH and subsequent Echocardiography studies.

Author Contributions: All authors contributed equally to the writing of this paper. All authors read and approved the final manuscript.

Conflicts of Interest: "The authors declare that they do not have any competing interests."

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