

# Electrocardiographic and Echocardiographic Evaluation of Heart in Newly Diagnosed Hypothyroid Patients.

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## ABSTRACT

**Background:** Hypothyroidism is a clinical syndrome resulting from a deficiency of thyroid hormones, which in turn results in a generalized slowing down of metabolic processes. Hypothyroidism affects 2% of adult women and 0.1-0.2% of adult men. Thyroid hormones exert direct cellular effects on almost all tissues of the body. It causes multi-organ dysfunction due to deranged metabolism. **Objectives:** To study Electrocardiographic and echocardiographic evaluation of heart in newly diagnosed hypothyroid patients. **Methods:** This study was conducted as a prospective study carried out from January 2012 to July 2013 at Mediciti Institute of Medical Sciences. The criteria for diagnosis of hypothyroidism was Clinical assessment, Thyroid hormone assay—TSH - >5  $\mu$ IU/ml, FT4 - < 0.7 ng/dl, FT3 - < 2.4 pg/dl. Investigations like Complete Blood Picture, Complete Urine Examination, Random Blood Sugar, Blood urea, Serum Creatinine, Fasting lipid profile, Chest X Ray, Standard 12 Lead ECG were done. **Results:** On systemic examination, Cardiomegaly and diminished heart sound was found in 13.3% and 9.99% patients. Normal ECG is found in 36.66% of patients before treatment and 66.66 % after treatment. Bradycardia is most common finding seen in 6 patients counting for 20%, followed by low voltage complexes and ST changes in 16.66% patients respectively before treatment. Echo findings are normal in 43.33% cases before treatment and 66.66% after treatment. Pericardial effusion and Diastolic dysfunction are the common findings seen in 8 cases each accounting to 26.66% cases, which reduced to 13.3% and 9.99% respectively after management. Systolic dysfunction was found in 9.99% of patients after treatment. **Conclusion:** Hypothyroid state, which has significant impact on cardiac structure/function associated with increased CVS morbidity and mortality is reversible with treatment.

**Keywords:** Hypothyroid state, cardiac structure, morbidity, mortality

## INTRODUCTION

Hypothyroidism is a clinical syndrome resulting from a deficiency of thyroid hormones, which in turn results in a generalized slowing down of metabolic processes. Hypothyroidism affects 2% of adult women and 0.1-0.2% of adult men. Thyroid hormones exert direct cellular effects on almost all tissues of the body. It causes multi-organ dysfunction due to deranged metabolism.<sup>[1]</sup>

Cardiovascular complications are some of the most profound and reproducible clinical findings associated with thyroid disease. Hypothyroidism is associated with increased cardiovascular mortality and morbidity. The dysfunction ranges from functional systolic and diastolic dysfunction to overt failure and coronary artery disease.<sup>[2]</sup>

There are only few studies done in our country to assess the cardiovascular parameters in hypothyroid patients. Cardiac abnormalities associated with hypothyroidism attracted a great deal of investigation effort.

hypothyroidism by ECG and ECHOCARDIOGRAPHY in newly diagnosed hypothyroid patients and shows the reversion of findings after treatment, thereby reassessing the need for early recognition and more aggressive management of the disease, aiming at preventing the fore-mentioned complications

## MATERIALS AND METHODS

- ❖ This study is a conducted as a prospective study.
- ❖ Study Period: January 2012 to July 2013.
- ❖ Set-up: Mediciti Institute of Medical Sciences

The criteria for diagnosis of hypothyroidism

1. Clinical assessment
2. Thyroid hormone assay – TSH - > 5  $\mu$ IU / ml.  
FT4 - < 0.7 ng / dl.

### Investigations:

Complete Blood Picture  
Complete Urine Examination  
Random Blood Sugar  
Blood urea  
Serum Creatinine  
Fasting lipid profile  
Chest X Ray  
Standard 12 Lead ECG  
Thyroid Hormone Assay:

3 ml of early morning fasting samples containing plain clotted blood are collected and sent for T3, T4, and TSH estimation. The hormone estimation

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The completely reversible nature of these complications is well known. Hence this study aims at studying the cardiac manifestations of

is done by Solid Phase, competitive Chemiluminescent enzyme immunoassay viz. ADVIA Centaur CP. Sample taken for the detection was an ultracentrifuge.

**Echocardiography**

The Phillips Hd11xe was the machine used for all echo reports.

Following Parameters were assessed using standard

**M-Mode echocardiography**

**LVEDD:** The distance between left side of IVS and posterior left ventricular endocardium at the level of chorda tendinae at end diastole.

**LVEDS:** The distance between left side of IVS and posterior left ventricular endocardium at the level of chorda tendinae at end systole.

**DIVST:** Measured as distance between anterior edge of right and left ventricular septal endocardial surface at diastole.

**DLVPWT:** Measured as vertical distance from anterior edge of endocardial surface to anterior edge of epicardial surface of left ventricular posterior basal wall at end diastole and at end systole.

**Doppler Echocardiography**

Systolic function

Fractional shortening (FS %): calculated by the formula =  $\frac{LVIDd - LVIDs}{LVIDd}$

$\frac{LVIDd - LVIDs}{LVIDd}$   
Ejection fraction (EF%) :  $\frac{EDV - ESV}{EDV}$

Diastolic function  
Peak E (cm/sec): Early transmitral flow velocity.  
Peak A (cm/sec): Late transmitral flow velocity.  
E/A Ratio:  
IVRT (msec) : Isovolumetric relaxation time.

**RESULTS**

**Table 1:** Distribution of study subjects as per their findings of systemic examination

Systemic examination finding	Number	Percentage
Cardiomegaly	04	13.3
Diminished heart sounds	03	9.99
Woltman sign	20	66.66
Proximal muscle weakness	06	20

On systemic examination, Cardiomegaly and diminished heart sound was found in 13.3% and 9.99% patients. CNS examination revealed delayed ankle jerk in 66.66% followed by proximal muscle weakness in 20% of patients.

**Table 2:** Distribution of study subjects as per their ECG findings

ECG Changes	Before treatment		After treatment	
	Number	Percentage	Number	Percentage
Normal	11	36.66	20	66.66
Sinus bradycardia	06	20	02	6.66
Low voltage complexes	05	16.66	03	9.99
QT Prolongation	03	9.99	02	6.66
ST changes	05	16.66	02	6.66
Heart block	01	3.33	00	00
Right bundle branch block	01	3.33	01	3.33

Normal ECG is found in 36.66% of patients before treatment and 66.66% after treatment. Bradycardia is most common finding seen in 6 patients counting for 20%, followed by low voltage complexes and

STT changes in 16.66% patients respectively before treatment.

After treatment sinus bradycardia, STT changes, QT prolongation was seen in 6.66%, whereas low voltage complexes accounted for 9.99% of patients.

**Table 3:** Distribution of study subjects as per their ECG findings

ECHO	Before treatment		After treatment	
	Number	Percentage	Number	Percentage
Normal	13	43.33	20	66.66
Systolic dysfunction	06	20	03	9.99
Diastolic dysfunction	08	26.66	03	9.99
Peri cardiac effusion	08	26.66	04	13.3

Echo findings are normal in 43.33% cases before treatment and 66.66% after treatment. Pericardial effusion and Diastolic dysfunction are the common findings seen in 8 cases each accounting

to 26.66% cases, which reduced to 13.3% and 9.99% respectively after management. Systolic dysfunction was found in 9.99% of patients after treatment.

## DISCUSSION

### General Examination

On general examination, most common findings are weight gain and dry skin was found in around 49.99% and 83.33% of patients respectively. Goiter was found in 16.6% and pallor in 26.66% of patients.

BP above 140/90 mmHg was found in 3.33% of patients only, on contrary to study by Sharath Kumar et al<sup>[3]</sup> and Kral et al<sup>[4]</sup>, who documented hypertension in 25% & 35% of patients respectively.

### Systemic Examination

Delayed relaxation of the ankle jerk is the most common finding present in 66.66% of the patients which correlates well with the description in Williams's textbook of endocrinology<sup>[2]</sup> and in various studies by Lambert and Underdahl.<sup>[5]</sup> On cardiovascular examination cardiomegaly is found in 13.3% of the patients, diminished heart sound in 9.99% of the total indicating probability of pericardial effusion.

### ECG changes and Hypothyroidism

ECG is normal in 11 patients (36.66%). Among the abnormal ECG's which constitutes 63.34% of total, sinus bradycardia was present in 20% of patients. The next common findings were sinus bradycardia and non specific STT changes in 16.66 % of patients respectively. Right Bundle Branch Block was seen in one male patient, an ECG finding that persisted throughout follow up period. QT prolongation was documented in 3 patients in the present study. This finding is consistent with other studies like by Varma et al, Mulki et al.<sup>[6]</sup>

Normal ECG is found in 66.66 % after treatment. Sinus bradycardia, STT changes, QT prolongation was seen in 6.66%, whereas low voltage complexes accounted for 9.99% of patients after Levothyroxine Therapy.

### 2D Echocardiography

Echo findings are normal in 43.33% cases before treatment and 66.66% after treatment. Pericardial effusion and Diastolic dysfunction are the common findings seen in 8 case each accounting to 26.66% cases.

Pericardial effusion is reported to occur in 30 % to 80% of patients with hypothyroidism. Study by Rawat et al showed striking correlation between severity of disease and pericardial effusion.<sup>[7]</sup> This is in accordance with findings of Verma et al.<sup>[6]</sup> Following institution of thyroid hormone replacement therapy, PE has been reported to resolve within a few months. In our study PE disappeared in 4 cases after treatment for 12 weeks. In terms of structural changes, various studies have shown alteration in myocardial wall thickness in

patients of hypothyroidism. In the present study, IVS and LVPW thickness decreased while ejection fraction and fractional shortening improved after treatment. Rawat et al<sup>[7]</sup> also showed a relatively decreased thickness of IVS and LVPW as compared to treated patients or control subjects, but demonstrated no significant change in parameters of systolic function while Monzani et al<sup>[8]</sup> observed that fractional shortening and thus systolic function of LV significantly improved after treatment. Framingham heart study showed that TSH concentration was not associated with LV structure in either sex, but was inversely related to LV contractility, consistent with the known inotropic effects of thyroid hormone.<sup>[9]</sup>

There was increase in E wave velocity and E/A ratio and a significantly higher isovolumic relaxation time after treatment showing only 9.99% of diastolic dysfunction after treatment. Rajan et al also found significant differences in IVRT in the hypothyroid. Tielen et al observed an increase in 'E' wave velocity, whereas Virtanen et al found a significant increase in E/A ratio.<sup>[9]</sup>

## CONCLUSION

In this study consisting of 30 new hypothyroid patients, bradycardia is the most common abnormal finding followed by low voltage complexes and STT changes in ECG. Pericardial effusion and Diastolic dysfunction are most common abnormal finding in ECHO. The changes in cardiovascular system are directly proportional to their return to euthyroid state. Thus hypothyroid state, which has significant impact on cardiac structure/function associated with increased CVS morbidity and mortality is reversible with treatment. Any unexplained pericardial effusion should be screened for hypothyroidism.

## REFERENCES

1. Jameson JL, Weetman AP. Disorders of the thyroid gland. Harrison's Principles of Internal Medicine, 18th edition. 2012. 2918-22.
2. Gregory AB, Terry FD. Hypothyroidism and Thyroiditis. Williams Text Book of Endocrinology, 12th Edition. 2011. 878-99.
3. Sharath DS, Mounika K, Neelesh KS. Cross sectional study of cardiovascular manifestations of hypothyroidism. J Evolution Med Dental Sciences. 2013;2(27):5021-9.
4. Kral J, Hradec J, Limanova J. Heart in thyroid disease. Corvasa. 1992; 34(2):108-14.
5. Lambert EH, Underdahl LO, Beckett S, Mederos LO. A study of the ankle jerks in myxedema. J Clin Endocrinol. 1951;11:1186.
6. Verma R. Heart in hypothyroidism. J Assoc Physicians India. 1996;44:390-3.
7. Rawat B, Satyal. An echocardiographic study of cardiac changes in hypothyroidism and the response to treatment. Kath Uni Med J. 2003;2(3):182- 7.

8. Monzani F, Di Bello V, Caraccio N, Bertini A, Giorgi D, Giusti C et al. Effect of levothyroxine on cardiac function and structure in sub clinical hypothyroidism: a double blind, placebo-controlled study. *J Clin Endocrinol Metab.* 2001;86:1110-5.
9. Elizabeth NP, Qiong Yang, Emelia. Thyroid function and left ventricular structure and function in the Framingham heart study. *Thyroid.* 2010;20(4): 369–73.

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