Original Research Article

A study of cardiovascular involvement in Hypothyroidism

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Abstract

Background: Cardiac abnormalities associated with hypothyroidism attracted great deal of investigational effort. There are only few studies done in our country to asses CVS parameters in hypothyroid patients. Hypothyroidism is known to cause reversible cardiac dysfunction in humans.
Aim: This study was aimed at studying the cardiovascular involvement in hypothyroidism.
Materials and methods: The data for this study was collected from 40 hypothyroid patients by clinical examination and by performing ECG and Echocardiogram who came to Malla Reddy Medical College and Hospital, Hyderabad which included both outpatients and inpatients.
Results: On systemic examination, diminished heart sound was found in 25 % patients. Lipid analysis showed increase of TOT.CHOL, LDL, VLDL, TGL and decrease of HDL. Normal ECG was found in 30% of patients, Bradycardia was most common finding seen in 16 patients counting for 40%. Low voltage complexes were seen in 35% patients. Echo findings were normal in 32.5% cases. Pericardial effusion was next common finding seen in 11 cases accounting to 27.5%. Diastolic dysfunction was seen in 27.5%, majority of them being mild dysfunction. No cases were found to have severe diastolic dysfunction. IVS thickness was found only in 2 cases.
Conclusion: Among 40 new cases of hypothyroidism, pericardial effusion was found in 27.5% patients. Diastolic dysfunction was seen in 27.5 % patients. All the patients diagnosed with hypothyroidism are to be screened for pericardial effusion and other cardiac complications.

Key words

Hypothyroidism, Electrocardiogram (ECG), Echo.

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 [1]. Hypothyroidism is fairly common in that it 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 [2].

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/diastolic dysfunction to overt failure and coronary artery disease [3].

The completely reversible nature of these complications is well known. Hence, this study aimed at studying the cardiac manifestations of hypothyroidism, there by reassessing the need for early recognition and more aggressive management of the disease, aiming at preventing the aforementioned complications.

Materials and methods

The present study was carried out at Konaseema Institute of Medical Sciences, Amalapuram, Andhra Pradesh and Shadan Institute of Medical Sciences, Hyderabad. The patients attended medical OPD/ admitted in medical ward and having symptoms suggested of hypothyroidism and, thyroid function suggested of hypothyroidism was included in present study. This study was carried out between September 2011 and august 2013. Total number of 47 patients had clinical and biochemical evidence of hypothyroidism. Out of 47 patients, only 40 patients became the part of study while 7 refused to participate in the study. These 40 patients were further screened for evidence of cardiovascular involvement.

Inclusion criteria

Hypothyroid patients which include

- Newly diagnosed patients.
- Detected hypothyroid patients not on treatment.
- Patients on L-thyroxine for less than 4 months.

Exclusion criteria

- Patients with known cardiac disease.
- Patients with COPD, severe anemia, diabetes mellitus or any other endocrinal disorder.
- Patients taking medications that alter the thyroid function like beta blockers, lithium, OCP's, steroids and alcohol.

Detailed history was taken, followed by clinical examination to detect various signs of hypothyroidism, as per proforma attached. All the patients in this study had some or other clinical features of hypothyroidism and diagnosis of which was proved by thyroid function tests. Following investigations were done in all the cases included in present study i.e. Hemoglobin, TC, DC, ESR, peripheral smear examination, Urine routine, sugar, albumin, microscopy, Random blood sugars, Blood urea , Serum creatinine, Lipid profile, A standard 12 lead ECG, T3, T4, TSH, ECHO - colour Doppler study.

Statistical methods

- Measures of central tendency
- Measures of dispersion

Results

Most cases fell in the age group of 31-40 years. The mean age was 35 years. The female population constituted about75% of the total. Female preponderance was seen in the age group of 31-40 years. Female to male ratio was 3:1.

Most common symptoms were of weight gain (72.5%), lethargy (65%) and dry skin (62.5%). Constipation and cold intolerance was found in 50% of the patients and menstrual symptoms in 40% of the female patients. None of the patients had history suggestive of proximal muscle weakness. On general examination, most

common findings were weight gain and dry skin found in around 67.5% and 62.5% of patients respectively. Goiter was found in 10% of patients, bradycardia was found in 40% of patients and hypertension above 140/90 mmHg was found in 22.5% of patients.

Prevalence rate of cardiovascular involvement in 40 hypothyroidism patients was 675 per 1000 (**Table – 1**).

Table – 1: Prevalence of cardiovascular involvement in Hypothyroidism.

Cases	**No. of patients (2 years of study)**
No. of patients with hypothyroidism	40
No of patients with cardiovascular involvement	27

On systemic examination, diminished heart sound was found in 25% patients. CNS examination revealed delayed ankle jerk in 67.5% followed by hoarse voice in 40% (**Table – 2**).

Table – 2: Systemic examination findings.

Systemic examination	**Number (n=40)**	**%**
Cardiovascular system (CVS)		
Cardiomegaly	3	7.5
Diminished Heart sound	10	25
Central nervous system (CNS)		
Hoarse voice	16	40
Delayed relaxation phase of ankle jerk	27	67.5

Among total patients, 6 had elevated total cholesterol, 11 and 30 had elevated LDL and VLDL respectively. All the patients had elevated triglycerides. In 33 patients, HDL was decreased (**Table - 3**). Normal ECG was found in 30% of patients. Bradycardia (**Figure – 1**) was most common finding seen in 16 patients accounting for 40%. Low voltage complexes (**Figure – 2**) were seen in 35% (**Table – 4**).

Table – 3: Lipid profile abnormalities in Hypothyroidism.

Parameter	**No. of patients**			
	Normal	**Increased**	**Less than normal**	**Total**
Total Cholesterol	34	6	00	40
HDL	7	00	33	40
LDL	29	11	00	40
VLDL	10	30	00	40
TG	0	40	00	40

Figure - 1: ECG showing bradycardia.

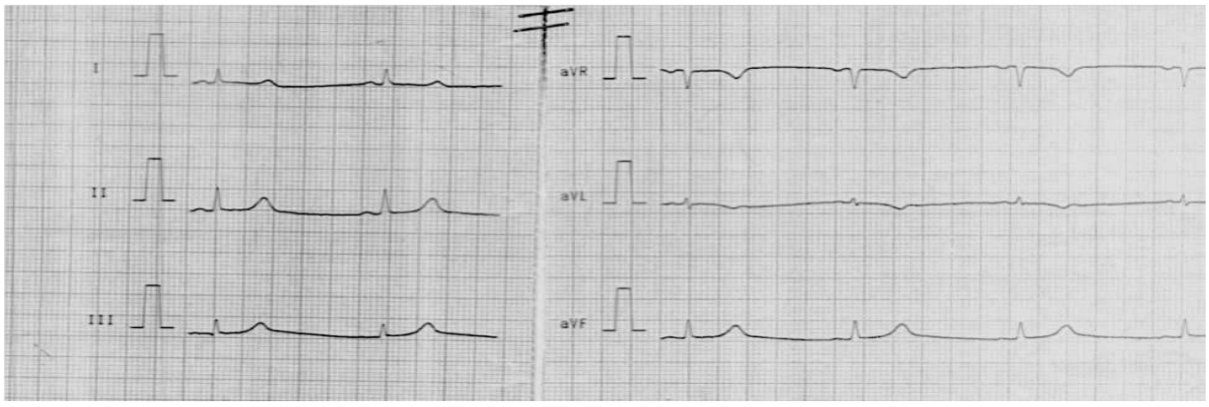
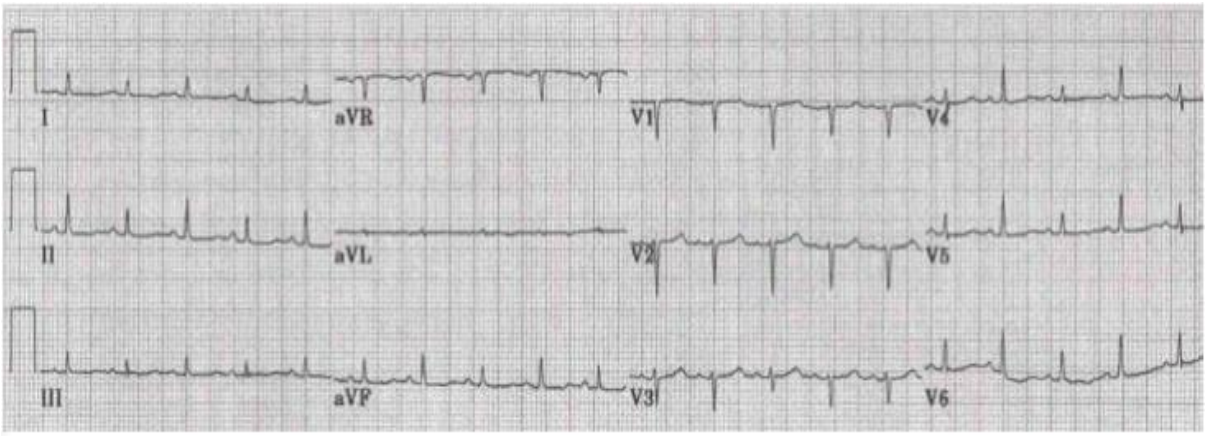


Figure – 2: ECG changes include low voltage complexes and electrical alternans. Echo of this patient showed pericardial effusion. TSH of this patient was 52 units.



Echo findings were normal in 32.5% cases. Pericardial effusion (**Figure – 3**) was next common finding seen in 11 cases accounting to 27.5%. Diastolic dysfunction was seen in 27.5%, majority of them being mild dysfunction. No cases were found to have severe diastolic dysfunction. IVS thickness was found in only in 2 cases (**Table – 5**).

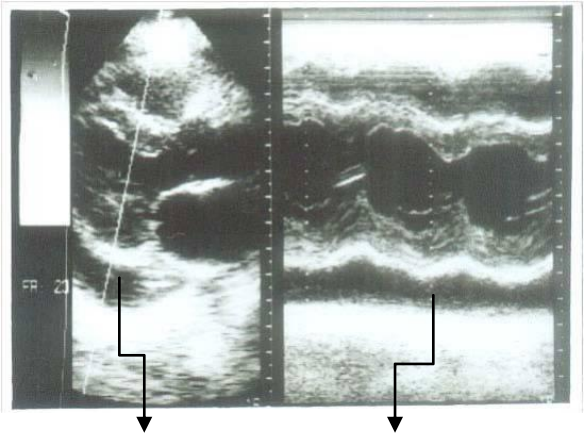
Table – 4: ECG changes.

ECG	Number (n=40)	%
Normal	12	30
Bradycardia	16	40
Low voltage complexes	14	35
STT changes	10	25
LBBB	2	5
RBBB	3	7.5

Table – 5: Echo findings.

Echo findings	Number (n=40)	%
Normal	13	32.5
Systolic dysfunction	3	7.5
Diastolic dysfunction		
Mild	9	22.5
Moderate	2	5
Severe	nil	0
IVS thickness	2	5
Pericardial effusion	11	27.5

Figure – 3: Pericardial effusion in echo. (2D Echo in parasternal long axis – M mode)



Echoluicense in the pericardial space

In our study, cardiovascular involvement incidence was high with the serum TSH of ≥ 56 µiu/l compared to the levels between 5-30µiu/l, however a larger sample size is needed to support the findings.

Discussion

The observations made in 40 new cases of hypothyroidism who presented to the Department of Medicine, Malla Reddy Medical College, Suraram, Hyderabad, from September 2011 to august 2013 is discussed here and results have been compared with other similar studies.

Overall incidence of Hypothyroidism was 0.375 per 1000 and Incidence of Cardiovascular

involvement in these patients was 67.5%. In 99% of the patients, Hypothyroidism is usually due to the Thyroid Disorders [4]. In our study, all the patients were with primary hypothyroidism. The age range of the study was between 21-60 years. Most patients belonged to the age groups of 31-40 years. Female preponderance was seen in between 31 - 40 years. The female population constituted about 75% of the total [1]. The most common symptoms included were weight gain (72.5%), lethargy (65%), dry skin (62.5%), constipation and hoarseness of voice (50%) [5].

On general examination, most common findings were weight gain and dry skin found in around 67.5% and 62.5% of patients respectively. Goiter was found in 10% of patients, bradycardia was found in 40% patients and hypertension above 140/90 mmHg in 22.5% of patients. Klein in his study of 907 patients found the incidence of Hypertension to be 21% [6]; some authors [7] studied 19 patients of hypothyroidism, documented hypertension in 35% patients. Bradycardia and decreased stroke volume both account for decreased cardiac output in Patients of hypothyroidism.

Delayed relaxation of the ankle jerk was the most common finding present in 67.5% of the patients which correlates well with the description in most standard textbooks of endocrinology [1] and in various studies by Lambert and Underdahl [8]. On cardiovascular examination, cardiomegaly was found in 7.5% of the patients, diminished heart sounds in 10 patients accounting for 25% of the total, indicating probability of pericardial effusion. There was increase of total cholesterol (15%), LDL (32%), VLDL (75%), triglycerides (100%) and decrease of HDL (82.5%) [5].

ECG was normal in 12 patients (30%). Among abnormal ECG which constitutes 70% of the patients, low voltage complexes present in 35% of patients. On ECG, the most common findings were sinus bradycardia, present in 40% of cases. LBBB and RBBB found in 5% and 7.5% respectively. This finding is consistent with other studies like by R. Varma, et al. [10] except conduction disturbances. M.H. Nikoo [9], also documented sinus tachycardia QT prolongation and also ventricular tachycardia which are not found in our study.

Echo findings were normal in 32.5% cases. Pericardial effusion was next common finding seen in 11 cases accounting to 27.5%. The study by R. Verma, et al. [10] in 1995 showed the prevalence of effusion to be 45%. Pericardial effusion is reported to occur in 30% to 80% of patients with hypothyroidism [3]. In this study, relatively low incidence of pericardial effusion may be due to selection of new hypothyroid cases.

Diastolic dysfunction was seen in 27.5%, majority of them being mild dysfunction (9 among 11 patients). In a study by R. Verma in 1995 it was seen that 27% of patients had diastolic dysfunction. Systolic dysfunction was seen in 7.5% of patients. Forfar JC, et al. [11] and others have described low systolic function indices in hypothyroid patients. However, Smallridge, et al. have argued that this could be related to relatively elderly patients included in the above studies and they also found no such alterations in systolic function in their younger patients (aged 20- 48 years). This was further supported by Frofar JC, et al. [11], Yamada H, et al. [12] and R. Verma, et al. [10] who did not find any evidence of systolic dysfunction in hypothyroid patients. Rawat and Satyal [3] showed no systolic dysfunction. IVS thickness was found only in 2 cases in our study and above studies showed increased numbers in both subclinical and overt hypothyroidism. There was no evidence of LVPW thickness in our cases. Rawat and Satyal reported LVPW to occur. Bello, et al. [13]; Monzani, et al. [14]; and Bernstein, et al. [15] did not find similar incidences.

As per our study, patients with higher serum TSH levels (severe hypothyroidism) had more number of patients with cardiovascular involvement (40%). Involvement of various

systems in hypothyroidism depends on duration, onset and severity of hypothyroidism. In our study sample of patients is less, so definite conclusion cannot be drawn. In order to show relation between levels of TSH and Involvement of cardiovascular system a study should be done in larger number of patients.

Conclusion

In this study consisting of 40 new hypothyroid patients, most common symptoms were the weight gain, lethargy, dry skin and bradycardia was the most common abnormal finding followed by low voltage complexes in ECG. Involvement of cardiovascular system in hypothyroidism depends on the severity and duration of elevation of TSH. In our study, involvement of cardiovascular system was increased with increasing levels of TSH; however a larger sample size is needed to support these findings. Pericardial effusion and diastolic dysfunction are the most common abnormal findings in ECHO. So it can be concluded that all the patients diagnosed with hypothyroidism are to be screened for pericardial effusion and other cardiac complications.

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