ORIGINAL RESEARCH PAPER

Volume-7 | Issue-2 | February-2018 | PRINT ISSN No 2277 - 8179

INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

E.C.G. CHANGES IN HYPOTHYROIDISM

General Medicine

Dr. Anima Ranjni Xalxo Assistant Professor, Department of Radiodiagnosis, Central Institute of Psychiatry, Ranchi, Jharkhand, India-834006

Dr. Leo Minkan Khoya* Senior specialist, Department of Medicine, Central Coal field Ltd, Gandhi nagar hospital, Ranchi, Jharkhand, India-834006 *Corresponding Author

ABSTRACT

AIMS: Cross sectional observational study in a tertiary care hospital on prevalence of ECG changes among patients of hypothyroidism.
MATERIALAND METHODS: 30 subjects (8 male and 22 female) were selected for the study and evaluated with ECG.
RESULTS: Result shows that 80% of patients had abnormal ECG while 20% had normal ECG. There was ST-T wave changes, like flattening, depression with/without low voltage and T-Wave changes, like flattening, inverted, low amplitude was found among 70% patients. Low voltage complexes with ST-T changes was found among 50%.
CONCLUSION: ST flattening was the commonest abnormality in ECG seen in hypothyroidism, ECG abnormality was more common in patients with more than than 40plU/ml of TSH.

KEYWORDS

ECG, Hypothyroidism, ECG Changes.

INTRODUCTION

Thyroid hormone has innumerable physiological effects causing alteration is essentially all metabolic pathways and organs. The thyroid hormone effects myocardium by its direct effect as well as by its peripheral action. Interaction with catecholamine is also responsible for its action. Thyroid hormone has important physiological effects on the cardiovascular system [1]. Cardiovascular effects of hypothyroidism can include electrocardiographic changes, such as bradycardia, right bundle branch block, flattened or inverted T waves, QRS prolongation and even torsades de pointes ventricular arrhythmia [2]. Whereas The thyroid hormone is excess have a cardiac stimulatory effect. In hypothyroidism QT interval prolongation and ever QT dispersion can occur and lead to ventricular arrhythmias, such as torsade de pointes ventricular tachycardia which can be resolved withT4 treatment alone [2,3]. Increases in the QTc interval have been described in hypothyroidism and that this increase is directly related to the severity of hypothyroidism [4]. TSH levels have also been shown to be directly related to QT prolongation and QT dispersion [5]. QT dispersion is the interlead variability of the QT interval on the surface ECG that reflects regional variation in myocardial repolarization and an increased QT dispersion has been found to bestrongly associated with an increase in ventricular arrhythmias and sudden cardiac death. Lastly, improvements in heart rate variability have also been documented in treated hypothyroidism [2].

AIMS & OBJECTIVES

The present study was undertaken in hypothyroid patients with following aims & objectives to find out E.C.G. changes in hypothyroid patients.

MATERIALS & METHODS

Patients presenting with signs and symptoms of hypothyroidism were randomly selected for the study from department of Medicine Rajendra Institute of Medical Sciences, Ranchi. The exclusion criteria included - patients with significant valvular abnormalities, congenital heart disease, significant arrhythmias, patients with pacemaker, patients with systemic disease likes Diabetes mellitus or Systemic lupus erythematosus.

RESULT

We included 30 patients of hypothyroidism, diagnosis of hypothyroidism was done primarily by measuring TSH, 13. & T4 levels. Euthyroid and hypothyroid patients have been taken into separate groups each consisting of thirty subjects. Hypothyroid patients have mean TSH of 25plU/ml. T3 &T4 were decreased to mean of 0.49ng/ml & 3.15pg/ml in hypothyroid patients.

Unexplained tiredness & lethargy was the commonest presenting feature in hypothyroid patients on initial examination (70%). Weight gain, goitre & cold intolerance were also commonly seen in 50% patients. Menstrual abnormality was also present in 50% of females reproductive age group, other symptom were less than 50% frequency (Table-1).

There was ST-T wave changes, like flattening, depression with/without low voltage and T-Wave changes, like flattening, inverted, low amplitude was found among 70% patients. Low voltage complexes with ST-T changes was found among 50%, and sinus bradycardia and other ECG abnormality was found approximately 10 % of patients and 20% was normal ECG (Table -2)

There was 50% low voltage complexes with ST-T * changes, 20% ST-T changes without low voltage and abnormalities other than ST-T change & low voltage was 10%. Where as normal ECG was 20%. (Table – 3).

Result shows that 80% of patients had abnormal ECG while 20% had normal ECG as a whole. Increasing level of TSH shows increasing incidence of abnormal ECG. Explained by the fact that ECG is 100% abnormal when TSH level is more than 40plU/ml while it is abnormal in 33% only when TSH level is <10plU/ml (Table -4).

DISCUSSION

Hypothyroid patents have mean TSH of 25plU/ml whereas in Euthyroid control it was well within limit (<7plU/ml). None of the patient had barely measurable level of T4 as studied by previous workers nor did they had sub-clinical hypothyroidism - a well studied [6] entity now a days, which defines asymptomatic state associated with raised TSH but normal T3 &T4 with or without TRH stimulation [7]. Ours study shows the commonest symptoms of hypothyroidism with above 50% prevalence are unexplained tiredness, lethargy weight gain, goiter, cold intolerance and menstrual abnormality.

Ours study shows the commonest ECG finding was ST-T flattening without comparable ST displacement. Twenty out of thirty patients i.e. 70% of all patients had his ECG finding. Of these twenty-one patients with ST-T flattening, low voltage QRS complexes were present in fifteen patients (50%). It is hypothesized that ECG in adult in absence of pericardial effusion may be due to premature atherosclerosis secondary to hypothyroidism. As all subjects were below forty years, age related atherosclerosis is not a possibility.

Ours study shows that only ST-T flattening without comparable ST-displacement and without low voltage was present in six out of twenty-one subjects (20%), all of them adult patients again explain that these ECG changes were due to hypothyroidism. Coronary atherosclerosis occurs with twice the frequency in patients with myxedema compared with age and sex matched controls [8].

Bradycardia has been considered a common finding in severe hypothyroidism as described by Braunwald et al [9] but in our stud it was seen in only three out of thirty (10%) patients. Similar observations were seen by Marriot et al. [10]. The absence of bradycardia in our study may be explained due to myocardial ischemia (evident by ST-T flattening in 70%) leading to tachycardia in most (90%) of our patients a i also because our patents were not of severe hypothyroidism.

Low voltage ECG was invariably associated with ST-T changes in fifteen (50%) patients while only three patients (10%) had low voltage without ST-T changes. This suggests that low voltage ECG as observed by previous workers may be a late phenomenon. As our subjects were not severely hypothyroid .i.e. (TSH level more than 50plU) rather our subjects were mild to moderate hypothyroid. From this observation we can say that ST-T changes come much earlier than low voltage & bradycardia.

Low voltage QRS complexes has been described by previous workers [11]. lt is seen only in three (10%) out of thirty patients. Earlier presentation of disease may be the cause of normal QRS duration in our study.

QR prolongation is a common finding in hypothyroid patients but this may be due to faulty measurement of QT segment, as T wave may be too small to be visualized. This may be the cause of fewer incidence of prolong QT (3 out of 30 i.e. 10%) because of an attempt was made to avoid this fault during its measurement.

On correlation between TSH level and abnormal ECG, there is increase in number of abnormal ECG with increased level of TSH level is >40plU/ml has abnormal ECG. This observation concludes that more severe is the hypothyroidism more is the abnormal ECG.

Conclusion:

ST flattening was the commonest abnormality in ECG seen in hypothyroidism, while low voltage QRS complexes were seen in 50% cases. Conduction defect & bradycardia was seen only in 10% cases. ECG abnormality was more common in patients with higher level of TSH, and it was abnormal in all patients whose TSH was more than 40plU/ml.

Table – 1. Showing clinical profile of hypothyroid patients on initial examination.

Clinical features	No. of Pt.	Percentage (%)
Unexplained tiredness & lethargy	21	70
Weight gain	15	50
Goitre	15	50
Cold intolerance	15	50
Menstrual abnormality in females (n=22)	11 out of 22	50
Oedema(pedal/periorbital)	12	40
Hoarseness of voice	6	20
Personality changes & impaired memory	6	20
Shortness of breath	6	20
Infertility (n = 22)	3 out of 22	14
Angina	3	10
Siqns of heart failure	- 3	10
Delayed relaxation of ankle jerk	3	10
Skin changes	3	10
Decreased hearing	None	-

Table 2 - showing incidence of various electrocardiographic changes seen in hypothyroid patients.

Specific E.C.G. abnormality	No. of cases with abnormalities.	Percent age (%)
"ST-T wave changes: Flattening, depression with/without low voltage	21	70
T-Wave changes: flattening, inverted, low amplitude.	21	70
Low voltage complexes with ST-T changes	15	50
Sinus bradycardia	3	10
Low voltage complexes without ST-T changes	3	10
Conduction defect	3	10
Increase QT interval	3	10
Normal E.C.G.	6	20

Table- 3. Showing incidence of co-existence of common ECG abnormality in hypothyroid patients.

Specific E.C.G. abnormality	No. of cases with abnormalities	Percentage (%)
Low voltage complexes with ST-T * changes	15	50
ST-T changes without low voltage	6	20
Abnormalities other than ST-T change & low voltage	3	10
Normal E.C.G.	6	20

Table - 4 showing incidence of abnormal ECG with relation to TSH level in hypothyroid patients.

TSH level plU/ml	No. of patient	Abnormal E.C.G.	Percentage (%)
<10	3	1	33
10-20	7	4	57
20-30	10	10	100
30-40	8	7	87
>40	2	2	100
Total	30	24	80

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