

Electrocardiographic Changes In Primary Hypothyroid Patients

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Abstract: Background: Slight change in level of thyroid hormones can lead to vast effects on very sensitive cardiovascular system. This study was done to assess the changes in electrocardiographic parameters in newly diagnosed primary hypothyroid patients. Materials & Methods: The present study included 50 patients and 50 controls, and it was conducted at B.J. Medical college, Ahmedabad. Patients under the study were investigated for Thyroid function tests, Lipid profile and Electrocardiogram. A 12 lead resting ECG was recorded via the ECG machine (Allengers Pisces A-103i) of all patients and control group. Hypothyroid patients with major ECG changes who were symptomatic for any Cardiovascular diseases were subjected for further investigations. Results: In hypothyroid patients, ECG changes observed were Sinus bradycardia in 40%, Low voltage complexes in 18%, T Wave inversion in 12%, RBBB in 6%, ST depression in 4%, PR interval prolongation in 8% and QTc prolongation in 18% cases. Conclusion: ECG during routine investigations of hypothyroid patients is very much important for early detection of cardiovascular complications, so further measures can be taken to reduce it. [Amin R Natl J Integr Res Med, 2020; 11(2):80-82]

Key Words: Primary Hypothyroidism, Electrocardiogram, Cardiovascular diseases

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Introduction: Thyroid hormones have major effect on hemodynamics and cardiovascular system of our body. Hypothyroidism is a common endocrine disorder in which there occurs the deficiency of thyroid hormones. Primary hypothyroidism is the most common and it is due to disease in thyroid gland and TSH levels are high while secondary and tertiary hypothyroidism is due to pituitary and hypothalamic disease and TSH levels are low. Hypothyroidism can lead to increased cholesterol level, dyslipidaemia, oxidative stress, and arrhythmias. All these can lead to increased risk of cerebrovascular and cardiovascular thromboembolic incidents.

High LDL levels due to decreased clearance are responsible for hypercholesterolaemia in hypothyroidism. Thyroid hormones increase heart rate, cardiac contractility and cardiac output. They also promote vasodilation, which leads to enhanced blood flow to many organs. In hypothyroidism all these effects will be adversely affected. Common abnormal ECG findings in primary hypothyroidism are sinus bradycardia, low voltage QRS complexes, ST segment depression, QT interval prolongation, inversion of T wave, QRS prolongation, PR interval prolongation and right bundle branch block. Early recognition and treatment of underlying thyroid disorder can prevent these abnormal ECG changes and cardiovascular complications. Present Study is aimed to find out adverse cardiovascular changes in newly diagnosed

primary hypothyroid patients using Electrocardiogram.

Objectives: To do thyroid function tests and lipid profile of patients under study. To do an ECG in those who are diagnosed with primary hypothyroidism.

Material and Methods: 50 primary hypothyroid patients (detected by thyroid function tests) as cases and 50 normal healthy individuals as controls were taken in this case control study. Electrocardiographic changes were studied in these both the groups. Ethical committee permission was taken for this study. An informed consent was also taken from the patients and control group prior to inclusion in the study.

Inclusion Criteria: Newly diagnosed primary hypothyroid male and female patients whose age were greater than 20 years were included in this study.

Exclusion Criteria: Patients having cardiovascular diseases. Patients having diabetes, severe Anaemia, metabolic syndrome, any other endocrinal disorder. Some drugs can alter thyroid function so, patients taking drugs like beta blockers, OC pills, steroids and alcohol were also excluded. Investigations included T3, T4, free T3, free T4, thyroid stimulating hormone, fasting lipid profile. A 12 lead resting ECG was recorded via

the ECG machine (Allengers Pisces A-103i) of all patients and control group.

Results: The present study included 50 primary hypothyroid patients and 50 controls aged 20 years and above and was conducted at B.J. medical college, Ahmedabad. ECG changes observed were Sinus bradycardia in 40%, Low voltage complexes in 18%, T Wave inversion in 12%, RBBB in 6%, ST depression in 4%, PR interval prolongation in 8% and QT prolongation in 18% cases.

Table: 1 ECG Changes In Primary Hypothyroid Patients.

	Cases (50)	
	Total	In %
SB	20	40
LVC	9	18
T wave inversion	6	12
RBBB	3	6
ST depression	2	4
PR Prolongation	4	8
QT _c Prolongation	9	18

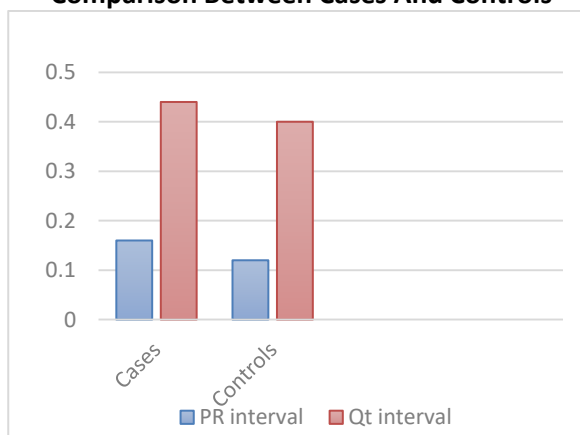
Where SB- Sinus Bradycardia, LVC- Low voltage complexes, RBBB- Right bundle branch block.

Table: 2 Comparison Of ECG Parameters Between Cases And Controls

	Cases		Controls		P value
	Mean	±SD	Mean	±SD	
Heart Rate	68	5.5	82	6.7	0.0004
PR Interval	0.16	0.03	0.12	0.024	0.003
QT _c Interval	0.44	0.04	0.4	0.018	0.01

(p value <0.05 is considered significant.)

Graph 1: PR Interval And QT Interval Comparison Between Cases And Controls



Discussion: In the present study, we have taken 50 cases and 50 controls who were matched in age and sex. For comparison between cases and controls we have taken mainly three parameters into consideration: Heart rate, PR interval and QT interval.

Mean Heart rate per minute of the cases was found to be 68 compared to 82 of controls. In fact, sinus bradycardia is the most common finding in primary hypothyroid patients(40%). In Crowley et al studies⁽²⁾ sinus bradycardia is found in 13.7% patients.

Physiological Basis: Thyroid hormones are responsible for increase in heart rate, cardiac contractility and cardiac output. In Primary hypothyroidism low level of circulating thyroid hormones are responsible for sinus bradycardia.

Mean PR interval of the patients is 0.16s compared to 0.12s of controls which is prolonged and this prolongation PR interval is also statistically significant(p value<0.05). similar results were found in Venkatesh et al studies.⁽⁴⁾

Mean QT_c interval is also prolonged in cases 0.44s than controls 0.4s and also statistically significant(p value<0.05).QT prolongation in satpathy et al studies⁽³⁾ was found to be in 18.18% of patients.

Physiological basis: Mean PR and QT interval prolongation in primary hypothyroidism are due to decreased level of triiodothyronine and thyroxine which leads to decreased cardiac contractility and decreased conduction of stimuli in heart muscle fibres.

Other important ECG findings in cases were Low voltage QRS complexes in (18%), T wave inversion in (12%), Right bundle branch block in (6%), ST depression in (4%). Similar results were also found in presant et al ⁽¹⁰⁾ studies and satpathy et al⁽³⁾ studies. In presant et al study low voltage complexes were found in 16.6%, RBBB were found in 4.4% and T wave inversion were found in 7.8% of the patients. While in satpathy et al study low voltage complexes were found in 18.18% and ST wave depression were found in 34% of the patients.

Physiological Basis: Dyslipidaemia is also very common finding in hypothyroid patients in which there occurs increase in total cholesterol , LDL and triglycerides levels which may be

physiological basis behind ECG findings (ST/Tchanges) suggesting atherosclerotic changes.

Conclusion: Early ECG screening should be promoted in primary hypothyroid patients for early detection and prevention of cardiovascular disease and associated complications.

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