

A Prospective Study of Evaluation of Cardiac Involment in Patients with Primary Hypothyroidism

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Abstract

Introduction: The cardiovascular system is one of the major targets of thyroid hormone action, and is a reliable marker of peripheral thyroid hormone action. It is sensitive enough to detect the effects of thyroid hormone deficiency at tissue level, not only in patients with overt thyroid failure but also in individuals with milder one (Biondi and Klein, 2004).

Materials and Methods: The study was conducted on patients attending general medicine outpatient department of Area Hospital. Patients with clinical symptoms and signs of hypothyroidism were segregated from the patients attending the general medicine outpatient department and were subsequently made to undergo a thyroid function test. The patient group comprised of forty one (n = 41) individuals who were proven hypothyroid biochemically and with clinical symptoms. Asymptomatic patients were not taken for the study. The age and sex matched (n=20) healthy volunteers are taken as controls.

Results: 78% of the patients in this study group were females, showing female preponderance in hypothyroidism. 64% of the hypothyroid patients fall in the age group of 40 – 60 years. Most of the patients were symptomatic in relation to cardiovascular symptoms with the most common clinical presentation was fatigue (68%), followed by dyspnoea, chest pain, palpitation and pedal oedema. 48% of the patients were found to be overweight but not obese (table-3).

Conclusion: Thyroid hormone has significant actions on the heart, and thyroid dysfunction can cause significant adverse cardiovascular effects. The early detection and initiation of treatment of hypothyroidism may revert the changes in the heart caused by hypothyroidism, stressing stronger emphasis on the role of preventive medicine.

Key Words: thyroid hormone, hypothyroidism, fatigue, dyspnoea, chest pain, palpitation.

Date of Submission: 20-09-2020

Date of Acceptance: 04-10-2020

I. Introduction

The cardiovascular system is one of the major targets of thyroid hormone action, and is a reliable marker of peripheral thyroid hormone action. It is sensitive enough to detect the effects of thyroid hormone deficiency at tissue level, not only in patients with overt thyroid failure but also in individuals with milder one (Biondi and Klein, 2004).¹ Hypothyroid patients, even those with subclinical hypothyroidism, have impaired endothelial function, normal/depressed systolic function, left ventricular diastolic dysfunction at rest, and systolic and diastolic dysfunction on effort, which may result in poor physical exercise capacity. There is also a tendency for the diastolic blood pressure to rise as a result of increased systemic vascular resistance (Biondi and Klein, 2004).²

Thyroid hormone is necessary for normal cardiovascular function, so when not enough thyroid hormone is present neither in the heart nor the blood vessels function normally.³ In hypothyroidism, the heart muscle is weakened in both contraction phase and also in the relaxation phase. This indicates that the heart cannot pump as forcefully as it should, and the amount of blood it ejects with each heartbeat is reduced.⁴

In addition, because heart muscle does not relax normally in between heartbeats, diastolic dysfunction may result.⁵

The main objective of the study was to evaluate cardiovascular manifestations with the thyroid hormone levels of the hypothyroid patients.

II. Materials And Methods

The study was conducted on patients attending general medicine outpatient department of Area Hospital Patients with clinical symptoms and signs of hypothyroidism were segregated from the patients attending the general medicine outpatient department and were subsequently made to undergo a thyroid function test.

The patient group comprised of forty one (n = 41) individuals who were proven hypothyroid biochemically and with clinical symptoms. Asymptomatic patients were not taken for the study. The age and sex matched (n=20) healthy volunteers are taken as controls.

Exclusion criteria

1. Asymptomatic patients.
2. Patients with co-existent primary cardiac disorder.
3. Patients with hypertension or diabetes mellitus.
4. Patients with chronic illness.
5. Patients on drugs like carbimazole, propylthiouracil, amiodarone, lithium, beta blockers, oral contraceptives, glucocorticoids, etc.
6. Patients with collagen vascular disorder.
7. Patients who are pregnant.
8. Patients who are known hypothyroid and on thyroxine.

A detailed history regarding age, sex, past history of hypothyroidism, diabetes mellitus, hypertension, other endocrine diseases, any cardiac disease or any chronic illness were obtained. The detailed general examination was performed. Thyroid status was assessed by estimation of FT3, FT4, TSH. ECG was also done systematically. A complete hemogram, urine routine examination, random blood sugar, urea, creatinine, electrolytes, lipid profile, liver function test, serum protein were also done.

STATISTICAL ANALYSIS

All the above test were done on age and sex matched twenty (20) healthy volunteers. All the results were statistically analysed by students 't' test, and 'P' values of <0.05 were taken as significant.

III. Results

78% of the patients in this study group were females, showing female preponderance in hypothyroidism. 64% of the hypothyroid patients fall in the age group of 40 – 60 years (table-1,2).

Most of the patients were symptomatic in relation to cardiovascular symptoms with the most common clinical presentation was fatigue (68%), followed by dyspnoea, chest pain, palpitation and pedal oedema. 48% of the patients were found to be overweight but not obese (table-3).

22% of the patients had bradycardia, of which group 2 and 3 had 90% of the patients. This shows the relationship of bradycardia with increasing severity of hypothyroidism. 19% of the study group had systolic BP > 140 mmHg, which was newly detected during the study. Table 4 shows subgrouping of patients according to TSH level. Table 5 shows ECG abnormalities in hypothyroid patients.

50% of the hypothyroid patients had ECG changes. The most common abnormality noted was sinus bradycardia (22%). Other ECG abnormalities noted were atrial ectopics, RBBB, ventricular ectopics. Diastolic dysfunction was seen in 51% of the hypothyroid patients characterized by altered E/A ratio, prolonged DT and prolonged IVRT. The pattern of diastolic dysfunction was predominantly the stage of impaired relaxation. It has been documented that 30 – 40% of heart failure syndromes are secondary to impaired diastolic dysfunction (table-6). Therefore, the diastolic dysfunction observed in this study could be the prelude to more serious limitation of cardiac function and physical performance.

S.No	Age	Number of Patients	Percentage
1	Below 40	4	10
2	41-50	15	36
3	51-60	14	32
4	Above 61	8	22
5	Total	41	100

Table 1: Age Distribution of hypothyroid patients

S.No	Gender	Number of Patients	Percentage
1	Male	9	22
2	Female	32	78
3	total	41	100

Table 2: Sex Distribution of hypothyroid patients

S.No	Symptoms	Number of Patients	Percentage
1	Dyspnea	28	68
2	Chest Pain/Tightness	5	12
3	Palpitation	1	3
4	Cough	1	3
5	Oedema	4	10
6	Fatigue	36	88
7	Syncope	1	3

Table 3: Main cardiovascular symptoms seen in hypothyroid patients

S.No	Sub Group	Number of Patients	Percentage
1	Group 1 TSH level >6 less than 10	10	25
2	Group 2 TSH level between 10-20	17	41
3	Group 3 TSH level more than 20	14	24
4	Total	41	100

Table 4: Sub grouping of patients according to TSH level

S.No	ECG Abnormalities	Number of patients	Percentage
1	Atrial Ectopics	1	2
2	Low Voltage Complex	5	12
3	RBBB	2	4
4	Ventricular Ectopics	1	2
5	ST segment change	2	4
6	T Wave change	2	4
7	ST and T wave change	6	14
8	Sinus bradycardia	7	16
9	Axis Deviation	1	2
10	LVH	1	2
11	QTC Prolongation	0	0
12	RBBB with T wave changes	1	2
13	No abnormality	21	50

Table 5: ECG abnormalities in hypothyroid patients

S.No	Parameter	Value for controls	Value for hypothyroid patients	T Value	P Value	
1	BMI	21.25±1.52	24.05±2.59	2.86	0.01	
2	Systolic BP	117.10±6.07	124.27±19.65	1.55	0.027	
3	Diastolic BP	77.50±4.44	81.95±10.75	1.32	0.02	
4	Cholesterol	157.3±12.5	239.6±38.0	7.98	0.001	
5	Triglycerides	139.4±19.2	185.2±41.95	3.50	0.02	
Echocardiographic Changes						
1	left ventricular posterior wall at end diastole (LVPW) thickness	5.81±0.35	7.76±1.06	6.947	0.001	
2	interventricular septum (IVS) Thickness	6.85±0.3	9.42±1.2	7.475	0.001	
3	EF	57.95±4.49	54.93±2.76	0.197	0.18	
4	Diastolic Dysfunction	Deceleration time	183.3±4.22	192.7±14.39	2.998	0.007
		Isovolumic relaxation time (IVRT)	80.6±6.47	98.17±6.57	8.048	0.001
		E/A RATIO	1.56±0.17	1.06±0.17	9.824	0.001

Table 6: Comparison of BMI, BP, Cholesterol, triglycerides and echocardiographic changes with control group and hypothyroid patients

IV. Discussion

64% of the hypothyroid patients fall in the age group of 40 – 60 years. 78% of the hypothyroid patients in this study are females. This proves that hypothyroid is more incident in older females. This is also similar to the studies conducted by Mahmood et al. at Al-Kahdmiya teaching hospital, Baghdad.⁶

The clinical diagnosis of hypothyroidism can be difficult because of the non specific nature of the symptoms and signs and the marked diversity of findings. Most of the patients were symptomatic in relation to cardiovascular symptoms. The important symptoms pertaining to cardiovascular system seen in the study group

were fatigue (88%), dyspnoea (69%), chest pain / tightness (12%), oedema (10%), palpitation (3%), cough (3%), syncope (3%). The most common presenting symptom in the hypothyroid study group was fatigue (88%), dry, coarse skin (50%), and weight gain (48%). Fatigue is the most common symptom of hypothyroidism as stated by Kavtheret al.⁷

TSH level in this study, 25% of the patients had TSH levels between 6 – 10 μ Iu/ml, 41% of the patients had TSH levels between 10 – 20 μ Iu/ml and 24% of the patients had TSH levels more than 20 μ Iu/ml. TSH levels correlate to the severity of hypothyroidism as per journal of Mayo clinic Proceedings.⁸

In this study group of 41 hypothyroid patients, 50% (n = 20) had notable ECG abnormalities. The most common abnormality noted was sinus bradycardia in 16% (n = 7), ST segment and T-wave depression in 14% (n = 6). The next common abnormality was low voltage complexes in 12% of patients (n = 5).

One of the classical findings of hypothyroidism is weight gain, despite a poor appetite. In this study, 48% of the hypothyroid patients were overweight with BMI between 25 – 30 kg/m². But none were in obese level.

Systolic / diastolic Blood Pressure in this study, 8 hypo thyroid patients who are in group3 had systolic BP > 140, and 8 patients had diastolic BP > 90. There is a serial increase in patients with systolic and diastolic suggests the association of both systolic and diastolic hypertension with increasing severity of hypothyroidism.⁹

In this study, n = 19 patients had cholesterol > 250 mg%. This proves that there is a serial increase in the number of patients with cholesterol > 250 mg% with increasing severity of hypothyroidism similar to studies by Elder et al.¹⁰

V. Conclusion

Thyroid hormone has significant actions on the heart, and thyroid dysfunction can cause significant adverse cardiovascular effects. The early detection and initiation of treatment of hypothyroidism may revert the changes in the heart caused by hypothyroidism, stressing stronger emphasis on the role of preventive medicine.

References

- [1]. Biondi B, Klien I. Hypothyroidism as a risk factor for cardiovascular disease. *Endocrine* 2004; 24: 1-13
- [2]. Klein I, Braunwald's heart disease- A textbook of cardiovascular Medicine, 9th edition, chapter86 part X, page 1838-1839.
- [3]. Kabadi UM. Natural course of subclinical hypothyroidism during a prolonged follow up. *Archives internal medicine* 1993; 153: 952-961
- [4]. Varma R, Jain AK, Ghose T. Heart in hypothyroidism- an echocardiographic study. *JAPI* 1996. 44(6): 390-392.
- [5]. Al fartoosi AJM, Abdul-Ghafour AS, Al-Zaidi AS. Cardiovascular manifestations of primary hypothyroidism. *IPMJ* 2012; 9(2): 113-118.
- [6]. Kerber RE, Sherman B. Echocardiographic evaluation of pericardial effusion in Myxedema. *Circulation*, 1975; vol. 52: 823-827.
- [7]. Biondi B, Fazio S, Palmeiri EA, Carella C, Panza N, Cittadini A, Bone F, Lombardi G, Sacca L. Left ventricular diastolic dysfunction in patients with subclinical hypothyroidism. *J Clin Endo M.* 1999; 84: 2064-2067.
- [8]. Rawat B, Satyal A. an echocardiographic study of changes in hypothyroidism and the response to treatment. *KUMJ* 2003; vol. 2 no. 3: 182-187.
- [9]. Smallridge RC, Goldman MH, Raines K, Nostrand JS: Rest and exercise left ventricular function in hypothyroidism- *American Journal Cardiology.* 1987; 60: 929-931.
- [10]. Mishra TK, Routray SN, Behera M. Left ventricular dysfunction in patients with subclinical hypothyroidism and its reversibility after hormone therapy. *JAPI* 2005, 53: 943-946.

Dr. Sridhar Reddy Konuganti, et. al. "A Prospective Study of Evaluation of Cardiac Involment in Patients with Primary Hypothyroidism." *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)*, 19(10), 2020, pp. 44-47.