

Original Articles

The Prevalence of Cardiovascular Abnormalities in Thyrotoxicosis – A Cross Sectional Study

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Abstract

Background: In this Cross sectional study over a period of one year, conducted in the Division of Cardiology, Dept. of Medicine, Govt. Medical College Hospital Jammu, a total of 50 cases were studied for cardiovascular abnormalities occurring in thyrotoxicosis.

Aims: We investigated the prevalence and clinical importance of cardiovascular abnormalities in patients with thyrotoxicosis.

Settings and Design: This is a cross sectional study conducted over a period of one year in a tertiary care hospital offering specialty and super specialty including cardiology. We studied 50 cases of whom 11 were males and 39 were females. The study covered age group with a range of 16 years to 85 years.

Methods and Material: All newly diagnosed cases of thyrotoxicosis were included in the study and were evaluated on a protocol which includes: history, general physical examination, cardiovascular examination and investigation: bio chemical profile, hormonal assay, chest radiography, twelve – lead electrocardiogram (ECG), Echocardiography (ECHO) (M-Mode/2 dimensional/Colour Doppler).

Statistical Analysis: Descriptive analysis including calculation of percentages as deemed fit for qualitative variables. For quantitative variables, mean and standard deviation were calculated and reported.

Results: 50 patients (Mean [\pm SD] age, 45.7 yrs, range 16-85 yrs; 78% females) were included. Weakness and fatigability was present in every patient (100%), followed by palpitation, shortness of breath and weight loss (94%). We found ventricular hypertrophy (40%), congestive heart failure (CHF) (36%), cardiomegaly (24%), arrhythmias (24%) and bundle branch block (18%) of the patients.

Conclusion: Cardiovascular abnormalities in thyrotoxicosis should never be overlooked, prognosis and outcome of the heart disease depends on early institution of treatment and control of the hormone levels.

Key words: Thyrotoxicosis, hyperthyroidism, cardiovascular abnormalities.

Introduction

Thyrotoxicosis is a state of thyroid hormone excess. Thyroid hormones have profound effects on the metabolism of all tissues of the body, including the heart.^{1,2} Thyrotoxicosis not only can aggravate preexisting cardiac disease but also by itself can lead to cardiac disease.³ These cardiovascular abnormalities occurring in thyrotoxicosis are secondary to the direct action (positive chronotropic

and inotropic) of thyroid hormone on the heart.⁴ Most frequently encountered cardiovascular abnormalities are: arrhythmias {atrial fibrillation (AF), atrial premature contraction, paroxysmal atrial tachycardia, atrial flutter, atrio-ventricular block (A-V block), ventricular fibrillation}, congestive heart failure (CHF), mitral regurgitation (MR), mitral valve prolapsed (MVP), tricuspid regurgitation (TR), pulmonary hypertension, angina pectoris, myocardial infarction (MI), familial hypertrophic cardiomyopathy. Patho physiological basis for these complications is not clear since almost all reports find enhanced left ventricular function accompanying thyrotoxicosis. The present study was done to study and describe the prevalence and clinical importance of cardiovascular abnormalities in patients with thyrotoxicosis.

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Material and Methods:

After hospital ethical committee approval and informed written consent, this cross sectional study was undertaken in the division of cardiology and endocrinology, department of medicine, Govt. Medical College (GMC) Jammu (J & K) India. Present study was done over a period of one year between January 2011 - January 2012. All the patients attending OPD of Medicine/Endocrinology 2 days of a week and patients detected during pre-anesthesia checkup in the Dept. of Anesthesiology were eligible to be undertaken in the study.

All the patients fulfilling eligibility criteria (vide infra) were detailed about the purpose of the study. All newly diagnosed cases of thyrotoxicosis by various parameters were included in the study. Patients already known to be of thyrotoxicosis, on treatment or having sub-clinical hyperthyroidism were excluded from the present study.

Patients were evaluated on a protocol decided before the study, which included-history, general physical examination, cardiovascular examination and investigations like bio chemical profile, hormonal assay, chest radiography, twelve - lead electrocardiogram (ECG), echocardiography (ECHO) (M-Mode/2dimensional/ Colour Doppler). Descriptive analysis including calculation of percentages as deemed fit for qualitative variables. For quantitative variables mean and standard deviation were calculated and reported.

Results:

Table-I

Demographic Characteristics of the patients with Thyrotoxicosis

	Male	Female
No. of Patients	11 (22%)	39 (78%)
Age		
<30yrs	2	11
30-60 yrs	7	22
>60 yrs	2	6

Out of 50 patients, 39 were females and 11 were males. The mean age of study group was 45.7 yrs with range of 16 yrs to 85 yrs. Mean age for males was 47.45 yrs and for females was 44.15 yrs.

Table-II

Clinical Manifestations of Patients with Thyrotoxicosis (n=50)*

No.	Symptoms	Signs
1.	Fatigability - 50 (100%)	Sinus Tachycardia 35 (70%)
2.	Palpitation-47 (94%)	Tremors - 35 (70%)
3.	Shortness of Breath -47 (94%)	Thyromegaly - 25 (50%)
4.	Weight loss - 47 (94%)	Murmur - 25 (50%)
5.	Heat intolerance - 42 (84%)	Basal Crepts - 20 (41%)
6.	Tremors - 40 (80%)	Increased JVP - 18 (36%)
7.	Increased Sweating -35 (70%)	Eye - 18 (36%)
8.	Polyphagia - 32 (64%)	Pedal oedema - 10 (20%)
9.	Thyromegaly -30 (60%)	Hepatomegaly - 7 (14%)
10.	Cough - 27 (54%)	Splenomegaly - 7 (14%)
11.	PND - 25 (50%)	Reflexes - 7 (14%)
12.	Bowel Symptoms - 22 (44%)	Proximal Weakness-5 (10%)
13.	Polyuria - 17 (34%)	
14.	Leg swelling - 15 (30%)	
15.	Menstrual Symptoms - 8 (16%)	
16.	Abdominal Swelling - 5 (10%)	
17.	Eye Symptoms - 3 (6%)	

* More than one signs/symptoms were present in one patient. PND-Paroxysmal Nocturnal Dyspnoea. JVP – Jugular Venous pressure

Almost every patient presented with weakness and fatigability as predominant symptom followed by palpitation ,shortness of breath ,weight loss and others.Commenest clinical signs were tremors, sinus tachycardia, thyromegaly and cardiac murmurs.

Table-III

ECG findings of Thyrotoxicosis Patients (n-50)

Findings	No. of Patients	% age
ECC		
Axis Deviation		
Normal	47	94%
Left	2	4%
Right	1	2%
Ventricular Hypertrophy		
Left	17	34%
Right	3	6%
Bundle Branch Block		
Left	3	6%
Right	5	10%
A-V Block		
1st Degree	1	2%
Arrhythmias		
Atrial Fibrillation	12	24%
ST-T Wave Changes	10	20%

34% of the patient had normal ECG. 40% of the patients had ventricular hypertrophy. Bundle Branch Block was seen in 16% of the patients and AF was seen 24% of the patients.

Table-IV
ECHO findings of Thyrotoxicosis Patients (n-50)

Findings	No. of Patients	%age
ECHO		
Increased LA—size	18	36%
LV Systolic dysfunction	7	14%
LV Diastolic dysfunction	5	10%
MR (Mild)	20	40%
MV Prolapse	7	14%
TR	10	20%

LA-Left atrium, LV-Left ventricle

LA size was increased in 36% of patients; mean LA size was 4.3 cms. The mean LV dimensions in diastole were 5.3 cms and 3.1 cms respectively. Mean left ventricular ejection fraction (LVEF) was 57.95% in our patients. 12 patients had LV dysfunction but none of them had severe LV dysfunction. Few patients had mild MR and TR in our study.

Table-V
X-ray Chest findings of Thyrotoxicosis Patients (n-50)

Findings	No. of Patients	%age
X-Ray Chest		
Cardiomegaly	12	24%
Pleural effusion	5	10%
Congestive Cardiac Failure	19	38%

CHF and Cardiomegaly were the commonest X-ray chest finding in the thyrotoxicosis patients in our study.

Discussion:

Thyroid hormone has profound effects on number of metabolic processes in all organs and can produce dramatic cardiovascular effects. Its action on heart can be direct cardiac effects, effects mediated by sympathetic nervous system and effects secondary to hemodynamic changes. Prevalence of disease in our study was much higher in females (78%) than males (22%) (table 1), which is consistent with study by Singh G et al.⁵

Sinus tachycardia was seen in 70% (table 2) of thyrotoxicosis patients in our set up consistent with other studies which showed it in 74% and 63.5% of patients.^{6,7} Tremors were a significant finding in our clinical study with an incidence of 70% (table 2) consistent with a study by Bhadada et al, who

observed it in 78.2% of patients⁸. 50% (table 2) of our patients had systolic murmur which was either because of MR or TR which is in contrast to the study by Bhadada et al.⁸ Basal creptations and increased JVP of CHF were seen in 41% and 36% (table 2) of patients respectively in our study whereas Singh G et al observed these in almost every patient⁵. But other authors have documented only 5.4% incidence of CHF which might be due to timely intervention in their setup.⁹

Eye symptoms were present in 35% (table 2) of patients in our study which are comparable with the study by Zargar et al⁷ and Bhadada et al.⁸

About 34% (table 3) of our patients showed normal E.C.G which is similar to the study by Gordon et al.¹⁰ Axis deviation was seen in 6% of our patients, out of which 4% had left axis deviation (LAD) and 2% had right axis deviation (RAD) (table 3) which is in contrast to the study by Gupta S et al⁶. Left ventricular hypertrophy (LVH) by voltage criteria was seen in 34% and right ventricular hypertrophy (RVH) in 6% of our patients (table 3). We had an increased incidence of LVH as compared to other studies,^{6,7} reason may be the late presentation of the cases to the hospital. RBBB was present in 10% (table 3) of our patients whereas Gupta S et al, observed it in 3.6% of patients.⁶ None of our patient had complete heart block but a case of complete heart block in thyrotoxicosis, which reverted back to normal after restoration of euthyroid state have been reported.¹¹ AF is the most common arrhythmia with thyrotoxicosis.¹² AF is associated with significant mortality and morbidity resulting from embolic events.¹³ Incidence of AF was 24% (table 3) in our study where as Zargar et al⁷ observed it in 8%, Jayaprasad N et al¹⁴ observed it in 10-15% and Auer J et al¹⁵ noticed it in 13.8% of patients.

72% (table 4) of our patients showed normal LA size on ECHO whereas rest of patients showed increased LA size with mean LA size being 4.3 cms which is slightly more than what Singh G et al observed⁵. Mean LVEF was 58% in our study whereas Merce J et al showed LVEF of $69 \pm 9\%$.¹⁶ None of our patients had pericardial effusion and LA/LV clot; where as Gupta S et al noticed pericardial effusion in 26% of his patients.⁶

Mild MR was seen in 40% (table 4) of our patients out of which 14% had MVP i.e. anterior mitral leaflet prolapse. None of our patients had moderate or severe MR. 20% of patients had mild TR which is contrast to Merce J et al who observed high prevalence of pulmonary hypertension and A-V regurgitation.¹⁶

Cardiomegaly on x-ray chest was seen in 24% of our patients and C.H.F was seen in about 38% of patients (table 5).

Whereas Zargar AH et al observed cardiomegaly in 10% and CHF in 7% of their patients.⁷ According to a very old study by Sandler et al, cardiomegaly and CHF was seen in 32% of patients, some what nearer to our observation.¹⁷

Londhey VA et al reported irreversible dilated cardiomyopathy (DCM) due to thyrotoxicosis in a young female.¹⁸ Another study by Dhadke SV reported a case of irreversible DCM in a middle aged male who presented with severe LV systolic dysfunction with EF- 30% on 2 D Echo.¹⁹ None of our patients showed DCM. Studies have also found an increased risk for coronary heart disease and mortality in thyrotoxicosis patients.²⁰ In conclusion we would like to impress upon the fact that the cardiovascular anomalies in thyrotoxicosis should never be overlooked and where possible proper checkup by a cardiologist should be made mandatory. Prognosis and outcome of the heart disease in thyrotoxicosis is affected by the early institution of the treatment and control of the hormone levels. Thus, examination of the patient in toto helps in complete detection and treatment thereby improving the morbidity.

Conflict of Interest: None

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