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Dilated Cardiomyopathy & Wilson's syndrome – A prospective study

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Authors Contribution
AKN –Designed the study, performed the laboratory tests and drafted the manuscript
MKV–Analyzed the data and drafted the manuscript
JJM – Designed the experiments and reviewed the manuscript
SMM– Contributed to the study design
SMA–Contributed to the study design designed the experiments and reviewed the manuscript

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ABSTRACT

Thyroid abnormalities are common in chronic heart failure. Severity of heart failure rises by several fold in patients with thyroid dysfunction. The purpose of this prospective study is to determine the correlation between low T3 (Wilson's syndrome) and dilated cardiomyopathy & predicting the severity of chronic heart failure. In this descriptive, prospective, cross sectional study, all patients who presented to the department of medicine with dilated cardiomyopathy during this study period were included. Divided into three groups viz, 1.Hypothyroid DCM, 2.Low T3 DCM, 3. DCM only groups. Mean age of low T3 dilated cardiomyopathy patients was higher [60.50±6.15(SD) years].. Diastolic blood pressure was higher in low T3 dilated cardiomyopathy group [84.6±12.4 (SD) mm of

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Hg]. S3 heart sound was present in more number of patients with low T3 dilated cardiomyopathy (60%), mean ejection fraction was seen in more number of patients with low T3 dilated cardiomyopathy [36.78±5.08 (SD) %]. Mean ejection fraction was lower in low T3 dilated cardiomyopathy [34.8±3.293 (SD) %]. There is significant percentage of dilated cardiomyopathy patients having low T3 alone as biochemical parameter. It is important to recognize this condition in patients with chronic heart failure as it is associated with increased severity of heart failure, increased in evidence of renal failure which may need additional support of thyroid hormone administration to have a better outcome in patients with chronic heart failure.

Keywords: Chronic heart failure, dilated cardiomyopathy, low T3, heart failure, pulmonary arterial systolic pressure.

1. INTRODUCTION

A typical pattern of altered thyroid hormone metabolism characterized by low T3 circulating levels has been described in patients with acute myocardial infarction and heart failure. A new study in rats is giving researchers hope that more aggressive treatment of hypothyroidism and borderline hypothyroidism will result in a reduction of chronic heart failure in human beings (Mullis-Jansson et al, 1999). While further research is needed, results from a recent study entitled, "Low thyroid function leads to cardiac atrophy with chamber dilation, impaired myocardial blood flow, loss of arterioles, and severe systolic dysfunction," suggest that low thyroid function has the potential to cause heart failure (Franklyn et al., 1984).

2. MATERIALS & METHODS

2.1. Study Design

Prospective, cross sectional study.

2.2. Sample Size

50 cases over a span of 6months from April 2012- April 2013 in Mysore Medical College & Research Institute, Mysore, Karnataka, India.

2.3. Method of Collection of Data

The data for the purpose of the study was collected in a predesigned and pretested proforma which include various socioeconomic parameters like age, sex, occupation, religion, etc. About 50 cases were selected on the basis of the simple random sampling method. The statistically data was analyzed with the help of software SPSS.16.0, ANOVA, factor analysis and Chi-square test.

2.4. Inclusion Criteria

Patients with dilated cardiomyopathy- chronic heart failure

2.5. Exclusion Criteria

1. Included clinical evidence of sepsis or cachexia or
2. Concomitant presence of any predominant severe systemic disease including severe anemia Hb% < 5g%.
3. Other major surgical procedures performed before or within 6 months after the time of thyroid sampling.

Routine investigations to assess thyroid function, clinically and investigational diagnose dilated cardiomyopathy-chronic heart failure.

Investigations are as follows:

The thyroid function profile: After rapid centrifugation of a venous sample,

1. Total T3 (TT3),
2. fT3, Total T4 (TT4),
3. fT4 and TSH will be measured.

Questionnaires, physical, radiographic examination, echocardiography for diagnosing & characterizing chronic heart failure.

All these methods, however, have major limitations when used independently. Scoring systems that combine several of the measures discussed below have been developed for use in population-based studies for chronic heart failure.

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Table 1

Table showing correlation between age and etiology in low T3 DCM (n=10) group in present study

Age group In years	IHD	HHD	RHD	Cardiomyopathy	Idiopathic
	No (%)	No (%)	No (%)	No (%)	No (%)
45-50	-	-	-	-	-
50-55	-	1 (100%)	-	-	-
55-60	-	-	-	-	3 (50%)
60-65	-	-	-	-	3 (50%)
65-70	1 (100%)	-	-	2 (100%)	-
Total	1(10%)	1(10%)	-	2(20%)	6(60%)

Table 2

Table showing presence of S3 for patients with dilated cardiomyopathy in present study

Group	S_3 Present (%)
Hypothyroid DCM (n=29)	3 (10.3%)
Low T3 DCM (n=10)	6 (60%)
DCM Only (n=11)	6 (54.5%)
Total (n=50)	15 (30%)

($p<0.002$)

3. RESULTS

A descriptive, prospective, cross sectional study comprising of 50 dilated cardiomyopathy patients admitted to KR hospital, Mysore. Who are studied under three groups namely Hypothyroid DCM, Low T3 DCM & DCM only. Among 50 dilated cardiomyopathy patients, 29 patients (58%) are hypothyroid dilated cardiomyopathy, 10 patients (20%) have low T3 dilated cardiomyopathy alone and 11 patients (22%) are dilated cardiomyopathy only in present study.

Majority of dilated cardiomyopathy patients are in the age group of 55-60yrs (32%) followed by 60-65 yrs (22%) & 50-55 yrs (18%) in the present study. Majority of patients (90%) with low T3 dilated cardiomyopathy are within the age group 55-70 yrs. The male: female ratio of patients in the present study was 3.56:2. The male: female ratio of patients' with hypothyroid dilated cardiomyopathy in the present study was 4.4: 2. The male: female ratio of patients with dilated cardiomyopathy only in the present study was 2.4: 2. The male: female ratio in patients with Low dilated cardiomyopathy was 3:2. This shows that male domination is seen in patients with low T3 dilated cardiomyopathy, hypothyroid dilated cardiomyopathy & dilated cardiomyopathy only groups.

Cardiomyopathy formed most common etiology (42%) followed by IHD & idiopathic (22%), HHD (14%) in patients with dilated cardiomyopathy, the cardiomyopathy was more in the age group of 55-60 yrs (38%). Idiopathic etiology was more common in the age group of 60-65yrs (63.7%). Hypertensive heart disease as an etiology was more common in the age group of 45-50yrs (42.8%). IHD as an etiology was more common in the age group between 55-60yrs (36.3%). Cardiomyopathy formed most common etiology (48.2%) followed by IHD (27.58%), HHD (17.24%) & idiopathic (6.8%) in patients with hypothyroid dilated cardiomyopathy in present study. Thus cardiomyopathy was more in the age group of 55-60 yrs (42.8%). Idiopathic etiology was more equally common in the age group of 50-55yrs (50%) & 60-65yrs (50%). Hypertensive heart disease as an etiology was more common in the age group of 45-50yrs (40%). IHD as an etiology was more common in the age group between 50-60yrs (70%).

Table 1 shows that idiopathic etiology formed most common etiology (60%) followed by cardiomyopathy (20%), IHD (10%) & HHD (10%) in patients with low T3 dilated cardiomyopathy in present study. IHD and cardiomyopathy was seen only in the age group of 65-70yrs. Idiopathic etiology was equally seen in 55-60yrs (50%) and 60-65yrs (50%) and hypertensive heart disease as etiology was seen only in 50-55yrs (100%) in the present study. Cardiomyopathy formed most common etiology for DCM only patients (45.45%) followed by Idiopathic (27.27%), IHD (18.18%) & HHD (9.09%) in patients with dilated cardiomyopathy only in present study. Cardiomyopathy was seen in more number of patients at 55-60yrs (40%). Idiopathic etiology was seen only in 60-65yrs. Hypertensive heart disease etiology was seen only in age group of 45-50yrs.IHD etiology was seen equally in age group of 55-60yrs (50%) and 65-70yrs (50%) age group. Pallor and edema were present in all patients with dilated cardiomyopathy of all the three groups. Skin changes were seen in 60% of low T3 dilated cardiomyopathy group which was higher when compared to 9.1% in DCM only group & 6.9% in hypothyroid dilated cardiomyopathy group which was not statistically significant ($p < 0.63$). Mean pulse rate of patients with dilated cardiomyopathy was 95.8± 6.5 (SD) beats/minute in the present study. The

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Table 3

Table showing mean PR Interval in different groups in present study

PR Interval	Mean PR interval (in seconds)
Hypothyroid DCM (n=29)	0.16± 0.027 (SD)
Low T3 DCM (n=10)	0.21± 0.023 (SD)
DCM Only (n=11)	0.15± 0.022 (SD)

(p <0.000)

Table 4

Table shows comparative study of S3 on clinical examination in dilated cardiomyopathy

	Previous studies	Present study
S3	26%	30%

mean pulse rate was higher in Low T3 dilated cardiomyopathy group [104± 6.9 (SD) / min] when compared to hypothyroid dilated cardiomyopathy group which was 94 ± 4.3(SD) min & mean pulse rate in DCM only group was 90.9 ± 4.2(SD) / min in present study which is statistically significant (P< 0.000). Diastolic blood pressure in was higher in Low T3 dilated cardiomyopathy group [84.6 ± 12.4(SD) mm of Hg], when compared to 84.1 ± 8.0 (SD) mm of Hg in DCM only group & 78.5 ± 8.0 mm of Hg in hypothyroid dilated cardiomyopathy which was statistically not significant (p< 0.093).

Table 2 shows that S3 was present in 60% of patients with low T3 dilated cardiomyopathy patients when compared to 54.5% of DCM only patients & 10.3% of hypothyroid dilated cardiomyopathy patients in the present study. Which was statistically significant (p<0.002). All patients with low T3 dilated cardiomyopathy had microcytic hypochromic anaemia when compared to 82.7% of hypothyroid dilated cardiomyopathy and 72.73% of DCM only group in the present study which is statistically not significant (P<0.226). The estimated creatinine clearance in Low T3 dilated cardiomyopathy group is 25.8± 8.5 (SD) ml/min which is lower when compared to hypothyroid dilated cardiomyopathy group which was 51.4 ± 18.6 (SD) ml/min & DCM only group 52 .9 ± 20.6 (SD)ml/min and in present study which was statistically significant (P<0.000). Renal dysfunction was common in Low T3 dilated cardiomyopathy group compared to the other two groups, with high mean blood urea [74.2±18.9 (SD) mg/dl] high mean serum creatinine [2.5±0.3 (SD) mg/dl], higher mean serum potassium [3.9±0.2 (SD) mEq/l] and lower estimated creatinine clearance [25.8±8.5 (SD) ml/min] as estimated by MDRD formula.

Table 3 mean PR Interval is more prolonged in Low T3 dilated cardiomyopathy patients [0.21± 0.023(SD) sec] when compared 0.16± 0.027(SD) sec in hypothyroid dilated cardiomyopathy group & 0.15 ± 0.022 (SD) sec in DCM Only group in present study which was statistically significant (P<0.000). Systolic dysfunction was seen in more number of patients of hypothyroid dilated cardiomyopathy group (31.03%), when compared to 20% in low T3 dilated cardiomyopathy group & 9.09% in DCM only group in present study, which was statistically not significant (p<0.333). Diastolic dysfunction was seen in more number of patients in low T3 dilated cardiomyopathy group (30%), when compared to hypothyroid dilated cardiomyopathy group in whom it was 17.24%, and DCM only group in whom it was 9.09% in present study, which was statistically not significant (p<0.455). Pericardial effusion was seen in more number of patients in low T3 dilated cardiomyopathy group (10%), when compared to 9.09% in DCM only group & none in hypothyroid dilated cardiomyopathy group in present study, which was statistically not significant (p<0.236).

Global hypokinesia was seen in more number of patients in hypothyroid dilated cardiomyopathy group (48.28%), when compared to 45.45% in DCM only group and 30% in low T3 dilated cardiomyopathy group in present study, which was statistically not significant (p<0.6). Segmental hypokinesia was seen in more number of patients with hypothyroid dilated cardiomyopathy group (51.72%), when compared to 45.45% in DCM only group and 30% in Low T3 dilated cardiomyopathy group in present study, which was statistically not significant (p<0.490). High pulmonary artery systolic pressure in low T3 group dilated cardiomyopathy group was seen in more number of patients (70%), when compared to 10.34% in hypothyroid dilated cardiomyopathy group and 9.09% in DCM only group in present study, which was statistically significant (P<0.000). This shows that pulmonary hypertension was seen in more number of patients with low T3 dilated cardiomyopathy. Low T3 dilated cardiomyopathy had a low mean EF of [34.8± 3.293 (SD) %] when compared 36.66± 5.563 (SD) % in hypothyroid dilated cardiomyopathy group & 38.91± 4.592 (SD)

Medical Science

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% in DCM Only group in present study, which was statistically not significant (p<0.178). The mean EF of patients with dilated cardiomyopathy in present study was 36.78 ± 5.08 (SD) %.

Majority of patients with hypothyroid dilated cardiomyopathy were within the age group of 55-60yrs (34.48%) and patients with hypothyroid dilated cardiomyopathy had low mean EF 36.6± 5.5 (SD) % with age group of 60-65yrs in the present study. There was equal distribution of patients with low T3 dilated cardiomyopathy in age group 55-60yrs (30 %), 60-65yrs (30%) & 65-70yrs (30%), patients with low T3 dilated cardiomyopathy had low mean EF 32± 2.3(SD) % with age group of 50-55yrs in the present study. Majority of patients with dilated cardiomyopathy only are within age group of 60-65yrs (36.36%). The patients with DCM only had low mean EF 34±3 (SD) % with age group of 65-70yrs in the present study. The mean EF of patient with low T3 was lower [34.8± 3.2 (SD) %] when compared to 36.66± 5.5 (SD) % in hypo thyroid dilated cardiomyopathy and 38.9± 5 (SD) % in DCM alone in the present study which was statistically not significant (p<0.178).

4. DISCUSSION

Low thyroid hormone concentrations, in particular low serum T3 concentrations, are a common finding in patients with non thyroidal illnesses, including cardiac disorders. Its pathophysiological role is not well understood, although the common belief is in favor of an adaptive mechanism to preserve energy. Nonetheless, based on the knowledge of the fundamental actions of T3 on both the heart and vessels, a direct relationship between low circulating levels of T3 and adverse prognosis of cardiac patients has represented an attractive hypothesis in the last few years. In this respect, it has been postulated that the low T3 state may produce a hypothyroid-like syndrome that contributes to the worsening or exacerbation of the intrinsic cardiac disease (Klein and Ojamaa, 2001).

The low T3 circulatory levels were found in 20% of patients with chronic heart failure-dilated cardiomyopathy in the present study. Mean age for low T3 dilated cardiomyopathy patients was 60.50 ± 6.15(SD) years which was higher when compared to mean age of dilated cardiomyopathy only patients which was 59.91± 5.99 (SD) years and 54.9± 5.49 (SD) years for hypo thyroid dilated cardiomyopathy patients in the present study which shows that low T3 dilated cardiomyopathy occurs in more elderly patients with chronic heart failure. The mean age of dilated cardiomyopathy patients in the present study was 58.43±5.87 (SD) years which was comparable to Franklyn et al., (1984), Wiersinga et al., (1981).

Mean duration of symptoms in the hypothyroid dilated cardiomyopathy patients was shorter i.e. 2.80± 2.24(SD) months. The mean duration of symptoms was longer for dilated cardiomyopathy only patients which was 5.64± 6.63(SD) months. The mean duration of symptoms for low T3 dilated cardiomyopathy which was in between i.e. is 3.85± 1.63 (SD) months. Male: female ratio of patients with hypothyroid dilated cardiomyopathy in the present study was 4.4: 2. The male: female ratio in patients with Low T3 dilated cardiomyopathy was 3:2. The male: female ratio of patients with dilated cardiomyopathy only in the present study was 2.4: 2. This shows that hypothyroid dilated cardiomyopathy had more male predominance when compared the other two groups. The male: female ratio of patients in the present study was 3.56:2. Cardiomyopathy was most common etiology for dilated cardiomyopathy (42%) and was comparable to Franklyn et al., (1984), Wiersinga et al., (1981).

Cardiomyopathy was common in age group of 55-60 years (38%) in the present study. Idiopathic etiology was more common with age group of 60-65 years (63%). Hypertensive etiology was common with age group of 45-50 years (42.8%). IHD etiology was common in the age group of 55-60 years (36.3%). Cardiomyopathy was common etiology in patients with hypothyroid dilated cardiomyopathy (48.2%) in the present study, 42% of which were in the age group of 55-60 years. Idiopathic etiology was common etiology in patients with low T3 dilated cardiomyopathy (60%) and all patients were seen in the age group of 55-65 years. Cardiomyopathy formed common etiology in patients with dilated cardiomyopathy only group (45.45%) and 40% of patients was seen in the age group of 55-60 years.

Skin changes on general examination were seen in 60% of patients with low T3 dilated cardiomyopathy. The mean pulse rate was 95.8±6.5 (SD) beat/minute which was comparable to Veronique L.Roger. Mean pulse rate was higher in low T3 dilated cardiomyopathy patients [104±6.9 (SD) beats/min] when compared to other two groups. Mean diastolic BP in dilated cardiomyopathy patients in present study was 81±9.3 mm of Hg, which was comparable to previous studies, the diastolic BP was also higher in low T3 dilated cardiomyopathy group [84.6±12.4 (SD) mm of Hg] when compared to the other two groups. This shows that higher blood pressure both systolic and diastolic was common in patients with low T3 dilated cardiomyopathy. Third heart sound was present in more number of patients with low T3 dilated cardiomyopathy (60%) when compared to other two groups. This showed that low T3 dilated cardiomyopathy had severe degree of heart failure. Third heart sound was present in 30% of patients in dilated cardiomyopathy in present study which was comparable to Chopra, (1997); De Groot, (1999); Moruzzi et al., (1996).

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Table 4 shows mean PR interval is more prolonged in low T3 dilated cardiomyopathy [0.21±0.023 (SD) sec] when compared to other two groups. The mean PR interval in dilated cardiomyopathy in present study was 0.17±0.034 sec which was comparable to Chopra, (1997); De Groot, (1999); Moruzzi et al., (1996).

Systolic dysfunction on 2D Echo was more in low T3 dilated cardiomyopathy (20%) when compared to dilated cardiomyopathy only group (9.09%) but was lesser than hypothyroid dilated cardiomyopathy group (31.03%). The diastolic dysfunction was more in low T3 dilated cardiomyopathy (30%) when compared to other two groups. Pericardial effusion was seen in more number of patients with low T3 dilated cardiomyopathy (10%) when compared to other two groups. The global hypokinesia was seen in less number of patients with low T3 dilated cardiomyopathy group (30%) when compared to other two groups. The segmental hypokinesia was seen in less number of patients with low T3 dilated cardiomyopathy group (30%) when compared to other two groups. The mean ejection fraction of patients with dilated cardiomyopathy in the present study was [36.78± 5.08 (SD) %] which was comparable to Chopra, (1997); De Groot, (1999); Moruzzi et al., (1996). Current study shows mean ejection fraction was lower in patient with low T3 dilated cardiomyopathy [34.8±3.293 (SD) %] when compared to other two groups. This showed that the severity of heart failure was higher in patients with low T3 dilated cardiomyopathy and incidence of IHD in the form of global hypokinesia and segmental hypokinesia was lesser in patients with low T3 dilated cardiomyopathy. The high pulmonary artery systolic pressure was seen in more number (70%) of patients with low T3 dilated cardiomyopathy group when compared to other two groups, this shows increase in severity of right heart failure in patients with low T3 dilated cardiomyopathy in the present study.

KEY NOTES

- Mean age of low T3 dilated cardiomyopathy patients was higher [60.50±6.15 (SD) years] when compared to other two groups.
- Male and female ratio of patients with dilated cardiomyopathy was 3.56:2.
- Cardiomyopathy was most common etiology for dilated cardiomyopathy patients (42%) and was common in the age group of 55-60 years (38%) in present study.
- Mean pulse rate was higher in low T3 dilated cardiomyopathy group [104±6.9(SD) beats/min]
- Diastolic blood pressure was higher in low T3 dilated cardiomyopathy groups [84.6±12.4(SD) mm of Hg]
- S 3 heart sound was present in more number of patients with low T3 dilated cardiomyopathy (60%).
- Microcytic hypochromic anemia was seen in all patients with low T3 dilated cardiomyopathy which was more than other two groups.
- The estimated creatinine clearance was lower in low T3 dilated cardiomyopathy group [25.8±8.5 (SD)ml/min]
- Mean PR interval is more prolonged was low T3 dilated cardiomyopathy group [0.21±0.023(SD)sec].
- Systolic dysfunction on 2D Echo was more in low T3 dilated cardiomyopathy group (20%)
- Diastolic dysfunction on 2D Echo was more in low T3 dilated cardiomyopathy group (30%)
- Mean ejection fraction was seen in more number of patients with low T3 dilated cardiomyopathy [36.78±5.08(SD)%].
- Mean ejection fraction was lower in low T3 dilated cardiomyopathy [34.8±3.293 (SD) %].
- The high pulmonary artery systolic pressure was seen in more number of patients in low T3 dilated cardiomyopathy (70%).

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