Prognosis of Hypertensive Cardiomyopathy and Diabetes Induced Myopathy-a Comparative Study Using HRV as a Tool

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Abstract: Diabetes mellitus is one of the most common non-communicable diseases in India which has been found to have an increasing prevalence rate day by day. Hypertension is the other major disease which along with diabetes being a major cause of morbidity in old age group. Cardiomyopathy may be a complication in both of these diseases. Aim: This study aimed to compare the prognosis of hypertensive cardiomyopathy and diabetic cardiomyopathy using Heart Rate Variability with respect to development of infarction and reinfarction. *Materials*: 30 subjects with Diabetes mellitus and 30 subjects with Hypertension from the Cardiology and Hypertension OPD respectively, from Government Stanley Hospital were recruited for this study. *Methods*: RMS Polyrite 2.2 (India) was used to record the heart rate variability. R-R interval obtained using Finland software. HRV variables with time and frequency domains were analyzed. *Results*: By using sympathovagal ratio (LF/HF) analysis, it was found that 32% of hypertensive cardiomyopathy patients may probably go in for infarction and reinfarction whereas, 21% of diabetic cardiomyopathy patients may probably go in for infarction and reinfarction. *Conclusion*: Hypertensive cardiomyopathy is more prone for infarction and reinfarction compared to Diabetic cardiomyopathy.

Key words: Diabetes Mellitus · Hypertension · Cardiomyopathy · Heart Rate Variability · R-R Interval · Time-Domain · Frequency-Domain

INTRODUCTION

Diabetes induced cardiomyopathy is one of the serious metabolic disorder in India where people of middle age and old age groups suffer. The causative factor for this is the changing food habits, life style changes, stress in the working conditions and the environmental changes [1, 2]. Adolescents and young adults are also prone for this condition. The major changes that occur in this condition are that the cardiac myocytes undergo changes and results in pathophysiological changes of the heart musculature and blood vessels. Not only diabetes leads to cardiac myopathic changes but also produces drastic changes in the coronary vasculature [3].

Hypertension is another disease with an increasing trend among the young age group and the middle age group for the various reasons mentioned above. Ultimately the changes that occur affect predominantly the heart muscle resulting in cardiac myopathy. As stated above the cardiac vasculature is also affected by the deposition of cholesterol in the intima of the vessels resulting in decreased elasticity and increased rigidity of these vessels [5]. Hence in this study, the prognosis of hypertensive and diabetic cardiomyopathy were analyzed and compared by using Heart Rate Variability (HRV) as a tool with respect to the development of infarction and reinfarction.

MATERIALS AND METHODS

After obtaining institutional Ethical Committee approval; Stanley Medical College, Chennai, 30 cases of diabetic cardiomyopathy in the age group of 30-50 years of both sexes were recruited from Cardiology OP Government Stanley Hospital, Chennai. Similarly 30 cases of hypertensive cardiomyopathy of the same age and

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gender matched group were recruited from the Hypertension clinic, Government Stanley Hospital, Chennai. After obtaining proper ethical approval from the patients, general and clinical examination of all the systems was carried out. Their ECGs (Lead II) were recorded using RMS Polyrite 2.2 (India) for 5minutes at supine position and instantaneous R-R interval were obtained using Finland software [7]. HRV variables with time and frequency measures were analyzed.

Inclusion Criteria: Diabetic patients in the age group of 30-50 with cardiomyopathy of both genders were recruited for the study. Similarly age and gender matched hypertensive cardiomyopathy patients were recruited.

Exclusion Criteria: Patients with other metabolic disorders were excluded. Similarly patients with other cardiac disorders were excluded. Tobacco smokers and alcohol addictors were excluded.

RESULTS

By using HRV analysis in lead II ECG, instantaneous R-R interval was obtained using Finland software. HRV variables with time and frequency domains were analyzed. The occurrence of reinfarction probability was analyzed for the above said cases by using sympathovagal ratio LF/HF [8]. It was found that, 32% of hypertensive cardiomyopathy patients has more chances to go in for infarction and reinfarction whereas, 21% of diabetic cardiomyopathy patients probably has more chances to go in for infarction and reinfarction.

DISCUSSION

The hypertensive cardiomyopathy patients when analyzed with the above said method, it was found that there is a chance of 32% of them going in for infarction and reinfarction. While 21% of diabetic cardiomyopathy patients were found to have chances for infarction and reinfarction. It is clear from this study that, hypertensive cardiomyopathy patients have more chances to go in for infarction and reinfarction [9], rather than diabetic cardiomyopathy. Probable reason for this may be that in hypertension the heart as well as the peripheral vessels (Cardiac and vascular system) are more disturbed due to the direct action on the heart by means of pathophysiological changes that occur in the myocytes as well as the peripheral vessels especially the intima being affected by excessive deposition of cholesterol

Table 1: Analysis of Diabetes Induced Myopathy

S.NO	Patients Name	LF	HF	LF/HF
1	SUB D101	59.1	40.9	1.444
2	SUB D102	62	38	1.632
3	SUB D103	49.3	50.9	0.969
4	SUB D104	68.8	31.2	2.205
5	SUB D105	46.3	53.3	0.869
6	SUB D106	63.6	36.4	1.747
7	SUB D107	63.9	36.2	1.765
8	SUB D108	54.3	45.7	1.188
9	SUB D109	81.2	18.8	4.319
10	SUB D111	35.9	64.1	0.560
11	SUB D112	76.4	23.6	3.237
12	SUB D113	61.8	38.4	1.609
13	SUB D115	72.8	27.2	2.676
14	SUB D116	69.8	30.2	2.311
15	SUB D117	53.4	46.6	1.145
16	SUB D118	60.9	39.1	1.556
17	SUB D119	26.2	73.8	0.355
18	SUB D120	86.4	13.6	6.342
19	SUB D121	76.2	24.3	3.13
20	SUB D122	12.9	83.9	0.154
21	SUB D123	84.6	15.4	5.5
22	SUB D124	77.8	22.2	3.5
23	SUB D125	79.4	20.6	3.857
24	SUB D126	81.1	18.2	4.448
25	SUB D127	82.5	17.5	4.72
26	SUB D128	77	23	3.344
27	SUB D129	78.1	22.6	3.452
28	SUB D131	38.8	61.3	0.634
29	SUB D132	59.9	40.1	1.492
30	SUB D133	73.2	26.8	2.727

LF value is 86.4, HF value is 13.6, which gives the maximum value of LH/HF is 6.342(sympathovagal rat

resulting later in plaque formation [10] and calcification leading to increased peripheral resistance which is the major factor that affects the functioning of the heart. Moreover the coronary vessels per se may also be damaged because of all these processes [11]. Hence, the pathophysiology affecting the heart and the peripheral vessels is more predominant in the case of hypertension.

This HRV analysis studies will go a long way in the near future as an eye opener in the prediction of reinfraction occurrence. The sympathovagal ratio (LF/HF) will be a simple parameter to assess the various cardiovascular conditions and their prognosis [12]. It has been proved in the study that there is a clear cut correlation between the reduction in the LF/HF ratio and various cardiovascular conditions discussed above [7, 13]. Thus a new avenue has been opened for further studies to detect possibilities of reinfraction related to hypertensive cardiomyopathy and diabetes induced cardiomyopathy.

Table 2: Analysis of Hypertensive cardiomyopathy

S.NO	Patients Name	LF	HF	LF/HF
1	SUB H601	43.7	56.3	0.776
2	SUB H602	86.7	15.6	5.571
3	SUB H603	84.2	15.8	5.333
4	SUB H604	83.3	16.7	5.0
5	SUB H605	30.8	66.7	0.4617
6	SUB H606	83.5	16.5	5.051
7	SUB H608	85.4	14.6	5.833
8	SUB H609	14.3	85.7	0.167
9	SUB H610	12	88	0.1363
10	SUB H611	79.7	20.3	3.921
11	SUB H612	64.3	35.7	1.8
12	SUB H613	47.8	52.2	0.916
13	SUB H614	84.3	15.7	5.351
14	SUB H616	22.2	77.8	0.2853
15	SUB H617	58.3	40.3	1.448
16	SUB H619	67.9	32.1	2.116
17	SUB H620	78.4	21.6	3.639
18	SUB H621	80.6	19.4	4.15
19	SUB H622	31.4	70	0.449
20	SUB H623	64.7	35.3	1.833
21	SUB H624	63.9	36.1	1.767
22	SUB H625	14.3	85.7	0.167
23	SUB H627	70.5	29.5	2.392
24	SUB H628	17.2	82.8	0.2077
25	SUB H629	83.1	16.2	5.12
26	SUB H630	32.2	67.8	0.475
27	SUB H632	65	35	1.855
28	SUB H633	32.1	67.9	0.473
29	SUB H634	87.7	12.3	7.156
30	SUB H635	88.8	11.3	7.889

LF value is 88.8, HF value is 11.3, which gives the maximum value of LH/HF is 7.889 (sympathovagal ratio)

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