

Study of Parasympathetic Activity in Newly Diagnosed Patients of Moderate Depression Using High Frequency of HRV

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Abstract

Introduction: - Heart Rate Variability (HRV) is a noninvasive technique to measure parasympathetic activities of heart. In this study, we measured the Parasympathetic activity in newly diagnosed patients of moderate depression by High Frequency (HF) parameter of HRV. Depression is the leading cause of mental disability and by the year 2020, depression is projected to reach 2nd place of the ranking of disease disability-adjusted life year (DALY).

Objective: Parasympathetic activity in newly diagnosed patients of moderate depression.

Method:- this study was planned on 40 newly diagnosed male patients of moderate depression according to ICD-10 (the international classification of diseases-10) taken from department of Psychiatry PGIMS Rohtak and 40 healthy males subjects of same age group. High Frequency (HF) parameter of HRV was recorded by using RMS polyrite machine.

Result: - The HF (ms²) component in frequency domain of HRV in patients of moderate depression in group II (166.55±41.48) compared to normal subject in group I (179.48±41.68) which reduced but not significantly. The HF expressed in normalized unit (HFnu) and group II (35.30±12.58) were compared to Group I (38.74±12.76) and which reduced but not significantly. And HF expressed in power percent (HFpp) and values of group II (18.83±5.04) were compared to the Group I (20.58±5.02), the reduction was not significant.

Conclusion:-We found that Parasympathetic activity was not reduced significantly in patients of moderate depression. So the parasympathetic activity is not a problem to cause cardiac disease in patients of moderate depression.

Keywords: patients of moderate depression, Heart rate variability, parasympathetic activity.

Introduction

The psychological disorder is multifaceted and it affects an individual's mental and physical health.² Depression is the leading cause of mental disability and the 4th leading contributor to the global burden of disease disability-adjusted life year (DALY) in 2000.³ At this rate of increase, by the year 2020, depression is projected to reach 2nd place of the ranking of DALYs calculated

for all ages, both sexes, after heart disease.⁴ According to the international classification of diseases-10 (ICD-10), depression is generally ranked in terms of severity as mild, moderate and severe.¹ The main typical symptoms are depressed mood, loss of interest, reduced energy leading to increased fatigability and diminished activities. Other symptoms are reduced concentration, reduced self-esteem, idea of guilt, pessimistic views of the future, idea of self harm or suicide, disturbed sleep and diminished appetite. In moderate depression, at least two typical symptoms and three of the other symptoms must be present.¹⁴ It has been reported that major factors associated with depressive disorders were female sex,

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middle age, low level of education, financial constraints and relationship problems. It was also found that there was an increasing trend in the prevalence of depression with increasing age in both genders.^{5,10,11} There is a linear rise with age of self-reported symptoms of depression.⁶ The older individuals are more vulnerable to depression.⁷ In 1992, in USA, the depression reaches its lowest level in the middle age at about age 45, with a rise in later life (80 years). In India, instead of decline in the middle age, there was a steady increasing trend seen with age.⁸ Women have higher depression rates than men.^{9,10} In Pakistan, the prevalence of depression is high. At its worst, depression can lead to suicide. There is loss of about 850000 lives every year.¹²

The human heart beat in a healthy individual is not absolutely regular. It varies as a result of interplay of many factors including respiration (Respiratory sinus arrhythmia), stress (both physical and mental), exercise, blood pressure, Renin-angiotensin system, circadian rhythm and other unknown complex mechanisms. Hence heart rate normally fluctuates around a mean heart rate. This fluctuation of heart rate is called as Heart rate variability (HRV). In a normal person the increase in heart rate is due to dominant effect of efferent sympathetic activity and decrease is due to dominant parasympathetic activity. From the above reason and by pharmacological experiments now it is proved that the heart rate variability indicates the balance between parasympathetic and sympathetic function of autonomic nervous system.¹⁴

HRV analysis provides a quantitative marker of the autonomic nervous system (ANS) because the regulation mechanisms of HRV originate from the sympathetic and parasympathetic nervous systems.¹⁵ Furthermore; patients with mood disorders such as depression have an imbalance in cardiac autonomic tone with excessive sympathetic excitation, which results in decreased HRV.

Review of Literature

The HF component is correlated with the parasympathetic dominance, resting vagal tone and cardiac vagal control (CVC).¹⁷

Julian et al (1998) observed that non depressed male subjects had greater HF than depressed male subjects; however, non-depressed female subjects had less HF than depressed female subjects. He quoted Yeragani et al (1991) who did not find a difference in HF between depressed patients and healthy subjects, Ryan et al

(1994) observed higher HF in female than male subjects and Carney et al (1995) suggested decreased in HF in psychiatric populations having depression and decrease HF is a risk factor for cardiac events.¹⁸

Jonathan Rottenberg has done a critical analysis of role of cardiac vagal control in relation to HF and cited that physical activity level is positively associated with CVC (Mølgaard et al.1994), depression is associated with reduced physical activity and impaired exercise performance (Hollenberg et al 2003), Agelink et al. (2001) studied patients of major depression and found no relation between change in depression score and HF power.¹⁹

Material and Method

The present study was conducted in Department of Physiology in collaboration with Department of Psychiatry at Pt. B. D. Sharma, PGIMS, Rohtak. Forty male patients of moderate depression according to ICD-10 (the international classification of diseases-10) in the age group of 18-40 years were drawn from the psychiatry department of this institute. Forty normal age matched male subjects were drawn from our staff members, medical students and healthy attendants accompanying the patients to the Institute. They were arranged into two groups GROUP I- 40 normal healthy male subjects. And GROUP II- 40 male patients of moderate depression.¹³

Inclusion Criteria

Patients of moderate depression according to the international classification of diseases-10 (ICD-10) in which moderate depression has at least two typical symptoms and three of the other symptoms were subjected for the study. The main typical symptoms are depressed mood, loss of interest, reduced energy leading to increased fatiguability and diminished activities. Other symptoms are reduced concentration, reduced self-esteem, idea of guilt, pessimistic views of the future, idea of self harm or suicide, disturbed sleep and diminished appetite. Subject having two typical symptoms and three other symptoms were included.¹³

Exclusion Criteria:

The following patients were excluded from the study if having:-

- History of any other major illness in the previous one year.

- History of drug intake for any other ailments in last one month.
- Co-morbid psychiatric disorder.
- Patients with severe depression or with suicidal tendencies
- Unwilling to undergo the procedure.
- Patients having endocrine disorders.

Informed and written consent was taken from every patient and subject for undergoing the whole procedure. All experiments were conducted between 10am to 1pm to avoid diurnal variations. The whole procedure was explained in detail to each subject in their own language in order to alley any fear or apprehension. The machine used was RMS digitalized polygraph, “Polyrite-D” system (RMS India Pvt. Ltd, Chandigarh). By this machine wide variety of physical phenomena can be recorded simultaneously and individual customization can be done. Along with automatic analysis, the data can be stored in hard disk and auto-regeneration of report is possible at the time of requirement.

The subject was asked to lie down on a couch in front of the POLYRITE D system. Then 3 disposable adhesive electrodes were attached to left arm, right arm, and left leg respectively and 3 electrodes for ECG were attached to them for measuring HRV. Then the basal recording of E.C.G (lead II) was done for 5 minutes.

The artifacts produced due to the movement may cause a discrepancy in the result which is a major limitation in the interpretation of the same.¹⁶ For which in our study we have taken utmost care to keep the subject absolute immobile to eliminate the movement factor.

Result

Table 1: Comparison of High Frequency (power percent) in normal subjects (Group I) and patients of moderate depression (Group II)

Parameter	Group I Mean ± SD	Group II Mean ± SD	p Value
HF p%	20.58±5.02	18.83±5.04	NS

HF expressed in power percent (HFpp) and value of the Group I (20.58±5.02) and group II (18.83±5.04) were compared. HF decrease in Group II but not significantly (Table 1)

Table 2: Comparison of High Frequency (normalized unit) in normal subjects (Group I) and patients of moderate depression (Group II)

Parameter	Group I Mean ± SD	Group II Mean ± SD	p Value
HF(nu)	38.74±1276	35.30±12.58	NS

HF expressed in normalized unit (HFnu) in the Group I (38.74±1276) and group II (35.30±12.58) were compared. HF decrease in Group II but not significantly (Table 2)

Table 3: Comparison of High Frequency (millisecond square) in normal subjects (Group I) and patients of moderate depression (Group II)

Parameter	Group I Mean ± SD	Group II Mean ± SD	p Value
HFms2	179.48±41.68	166.55±41.48	NS

HF expressed in millisecond square in group I (179.48±41.68) and group II (166.55±41.48) were compared. HF decrease in Group II but not significantly (table 3)

Discussion

The HF (ms²) component in frequency domain of HRV in patients of moderate depression in group II (166.55±41.48) and normal subject in group I (179.48±41.68) were compared (table 3), the HF expressed in normalized unit (HFnu) and the Group I (38.74±1276) and group II (35.30±12.58) were compared (Table 2) and HF expressed in power percent (HFpp) and value of the Group I (20.58±5.02) and group II (18.83±5.04) were compared (Table 1). In all these different units of expression of HF of both groups, no statistically significant change was seen.

In our study, the decrease in HF was not statistically significant as we have used male patients only (avoided gender difference) and patient of moderate depression

(not major depression) thus the decrease in HF have shown that there is insignificant alternation of vagal tone in patient of moderate depression.

Conclusion

As per the above discussion we saw that the major depression is associated with various co-morbid conditions of cardiac origin. In case of moderate depression the autonomic imbalance is not a problem to cause cardiac disease.

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