

Evaluation of Cardiovascular Autonomic Function in Patients with Rheumatoid Arthritis

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Abstract

Background: Rheumatoid arthritis is common inflammatory arthritis arising throughout the world. A chronic systemic inflammatory autoimmune disorder is known as Rheumatoid arthritis (RA).

Aim and objectives: The aim of this study was to evaluate cardiac autonomic function in RA and compare with healthy individuals

Materials and Methods: A total of 100 patients were included in the study. The included individuals were divided into two groups with equal participants in each group. One group was taken as control group with all individuals included were healthy. The other group was study group that included the 50 patients who were diagnosed with RA.

Results: Heart rate when compared between the study and control group in standing position and lying down position showed Non significant changes. Systolic blood pressure and diastolic pressure in Valsalva maneuverer and sustained hand grip when compared in study group and healthy group showed changes but the difference was found to be non-significant.

Conclusion: Cardiac autonomic nervous system dysfunction (both sympathetic and parasympathetic) occurs in Rheumatoid arthritis when compared to control. Therefore cardiovascular autonomic function tests in routine clinical examination helpful in early detection of autonomic dysfunction in this disease. Cardiac autonomic neuropathy can lead to sudden cardiac death, various arrhythmias, in elderly further aggravating the morbidity.

Keywords: ANS, Functional Capacity, Heart Rate, Rheumatoid Arthritis

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Introduction

The ultimate outcome of the visceromotor control is exerted by the division of nervous system called autonomic nervous system. Except for the skeletal muscle which is innervated by somatomotor nervous system, all other organs are innervated by ANS such as the cardiac muscle, smooth muscle and glands [1]. Although survival is possible without ANS, the ability to regulate the body's internal environment is severely compromised. The ANS can be

assessed by several tests including cardiovascular sweating, papillary reflex and skin tests. However, cardiovascular reflex tests have been most widely used as they are noninvasive and results are easy to reproduce [2,3]. The autonomic nervous system (ANS) plays a critical role in the normal regulation of cardiovascular disease through its effects on the heart, peripheral vasculature and kidneys. The ANS is broadly comprised of the sympathetic and

parasympathetic branches that work independently or in counter-balance to ensure homeostasis is maintained. Accumulating evidence indicates that altered ANS function contributes to the pathogenesis of cardiovascular disease and is an important predictor of cardiovascular mortality [4,5].

Rheumatoid arthritis is common inflammatory arthritis arising throughout the world. A chronic systemic inflammatory autoimmune disorder is known as Rheumatoid arthritis. Principally it affects the joints and usually accompanied by one or more of extra-articular manifestations as rheumatoid nodules, neuropathy and normochromic normocytic anemia such as weight loss, anemia, rheumatoid nodules, rheumatoid vasculitis, etc. Rheumatoid arthritis can start at any age, but has maximum between 35 to 55 years of age. The prevalence of RA is about 1% worldwide whereas India is 0.9% with women suffering 3-5 times more than men [6,7].

Although in RA patients' cardiac involvement is not always symptomatic, it has shown, due to cardiovascular events there was a significantly increased mortality ratio. In 1999 Louthrenoo W, Ruttanaupawan *et al* showed 47% of RA patients had symptoms suggesting ANS dysfunction without any correlation with disease duration, or raised ESR [8,9]. The aim of the present study was to evaluate cardiac autonomic function in RA and compare with healthy individuals

Materials & Methods

The present study is the cross sectional analysis that was carried in the department of physiology, in the medical college and the associated hospital. Both males and females with the age range of 30 to 70 years were included in the study. The purpose was to study the cardiac autonomic function in the patients with rheumatoid arthritis. A total of 100 patients were included in the study.

The included individuals were divided into two groups with equal participants in each group. One group was taken as control group with all individuals included were healthy. The other group was study group that included the 50 patients who were diagnosed with RA, on the basis of criteria developed by American College of Rheumatology along with sex matched controls. Both the groups contained 50 patients equally. The ethical committee of the institute was informed about the study and the ethical clearance certificate was obtained prior to the start of the study.

Special care was taken so that any relevant history will not miss. Details of history and examination were recorded on Performa. Patients were examined for signs and symptoms of possible Autonomic Nervous System (ANS) dysfunctions including orthostatic hypotension (blurred vision, sensation of weakness and unsteadiness, light headedness, fainting or syncope on standing), perspiration, palpitations and Raynaud's phenomenon. The written consent of subjects was taken on inform consent form in local language. Collected data was enrolled in Microsoft excel and analysed in term of mean and standard deviation.

Inclusion and Exclusion criteria were as per below.

Inclusion criteria

1. Study Group: Patients diagnosed with RA on the basis of Criteria developed by American College of Rheumatology.
2. Control Group: Healthy subjects not having RA or not on any Medication

Exclusion criteria

Subjects with chronic history of any tobacco habit, Subjects with chronic history of tobacco consumption in any form, Subjects having cardiac and respiratory disorders, Any disease condition affecting the autonomic nervous system were excluded from the study.

Results

Demographic data were recorded in terms of age, sex and weights and compared in between the groups. In individuals with the study group, the diastolic blood pressure in standing position was significantly lower (<0.05) than control group whereas Systolic blood pressure in standing position was non-significant when compared between the study and healthy group.

Heart rate when compared between the study and control group in standing position

and lying down position showed Non significant changes. Systolic blood pressure in Valsalva maneuverer and sustained hand grip when compared in study group and healthy group showed changes but the difference was found to be non-significant. Diastolic blood pressure in Valsalva maneuverer and sustained hand grip when compared in study group and healthy group showed changes but the difference was found to be non-significant.

Table 1: Demographics data recorded in both the groups

Demographics data	Group A	Group B	P value
Age	48.46 \pm 3.64	41.65 \pm 9.24	0.62
Weight	69.23 \pm 3.87	61.48 \pm 5.21	0.92
Sex	29/21	31/19	0.65

Table 2: Difference between the two groups

	Mean HR	Mean S/L	Mean exp/Insp	Mean Valsalva
Study group	72.9 \pm 6.2	2 \pm 0.4	2.6 \pm 0.5	2.4 \pm 0.1
Healthy group	68.4 \pm 4.2	2.2 \pm 0.6	2.9 \pm 0.9	2.0 \pm 0.1
P value	> 0.05	< 0.002	< 0.002	> 0.05

Discussion

Rheumatoid arthritis (RA) is a chronic multisystem disease of autoimmune aetiology. The characteristic feature of the rheumatoid arthritis is the persistent inflammatory synovitis usually involving peripheral joints in a symmetric distribution [10,11]. Though it is considered a disease predominantly involving the joints it can cause a variety of extra articular manifestations. One of the important extra articular manifestations is the involvement of nervous system [12,13].

Neurological manifestations may be due to the involvement of central nervous system, peripheral nervous system or autonomic nervous system. They may be either due to the vascular involvement, direct compression or immune mediated mechanism [14]. It can effect parasympathetic only or sympathetic only or both. Most common is the parasympathetic involvement. An important adverse effect of autonomic neuropathy is cardiac autonomic

neuropathy, as it can lead to increase in morbidity and mortality [15].

Cardiac autonomic neuropathy can lead to sudden cardiac death, various arrhythmias, in elderly further aggravating the morbidity. Cardiac autonomic function was done by parameters which include heart rate response to standing, heart rate response to lying down position, blood pressure response to standing, BP response to Valsalva Maneuverer & BP response to sustained hand grip. In comparison with healthy individuals, Diastolic blood pressure in standing position was significantly lower (<0.05) in RA individuals,

Similar finding was observed in study of P. Deshpande et al. in 2018. This may be due to lower peripheral resistance, which leads to a drop in the percentage change in diastolic blood pressure and abnormally diminished sympathetic ANS function [6]. Other parameters like heart rate response to standing & heart rate response to lying

down position, SBP in standing position, both BP response to Valsalva Maneuverer & both BP response to sustained hand grip showed non-significant changes in RA group compared to control group.

Correlating with other study, Louthrenoo W, Ruttanaupawan *et al* showed 47% of RA patients had symptoms suggesting ANS dysfunction without any correlation with disease duration, or raised ESR in 1999. Study confirmed autonomic dysfunction occurs in autonomic dysfunction occurs in patients with rheumatoid arthritis.

Conclusions

In summary, study confirmed cardiac autonomic nervous system dysfunction (both sympathetic and parasympathetic) occurs in Rheumatoid arthritis when compared to control. Therefore cardiovascular autonomic function tests in routine clinical examination helpful in early detection of autonomic dysfunction in this disease.

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