

Assessment of Cardiovascular Autonomic Function in Individuals with Rheumatoid Arthritis

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Abstract:

Background: People all over the world suffer from inflammatory arthritis, such as rheumatoid arthritis (RA). Systemic inflammatory arthritis (RA) is a long-term autoimmune illness. It mostly affects the joints and is often associated with extra-articular symptoms such normochromic normocytic anemia, neuropathy, and rheumatoid nodules. This study aimed to assess cardiac autonomic function in rheumatoid arthritis patients and compare it to that of healthy individuals.

Methods: From January to June of 2023, a cross-sectional study was conducted at the ANMMC, Gaya, Bihar, at the Department of Physiology. The investigation of autonomic functioning in RA was conducted on a group of 45±10-year-old males and females. There were fifty people in all; twenty-five were controls—healthy people not taking medication—and twenty-five had been diagnosed with RA using standards set by the American College of Rheumatology, along with matched pairs of controls based on sex. The history and examination details were entered into Performa. Patients were assessed for indications of potential dysfunctions of the autonomic nervous system (ANS).

Result: This study involved 50 participants, divided into two groups: the Study group (Group – A) and the Control group (Group – B). Group A comprised twenty-five patients who received a rheumatoid arthritis diagnosis based on standards established by the American College of Rheumatology. Twenty-five healthy people made up Group B, who were not taking any medication to account for typical fluctuations. The valsalva maneuver and 30:15 ratio showed a lesser decline in the RA patients as compared to the control group, although the difference was not statistically significant ($p>0.05$). When comparing groups A to control, there was a substantial ($P<0.01$) decrease in the diastolic blood pressure change upon standing the blood pressure response.

Conclusion: Cardiovascular autonomic function tests are useful in the early identification of autonomic dysfunction in this disease during normal clinical examinations. The overall assessment of all the tests conducted may yield more thorough information on autonomic function. In order to lower the cardiovascular autonomic morbidity in RA, evaluating autonomic function may be a routine clinical evaluation component.

Keywords: Cardiovascular, Rheumatoid Arthritis (RA), ANS dysfunction.

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Introduction

Worldwide, rheumatoid arthritis is a prevalent type of inflammatory arthritis that affects humans. [1] An autoimmune, systemic, inflammatory, and chronic disease is rheumatoid arthritis (RA). The condition mostly affects the joints, but it can also cause neuropathy, including weight loss, anemia, rheumatoid nodules, rheumatoid vasculitis, and normochromic normocytic anemia, in addition to extra-articular symptoms. [2,3]

Although rheumatoid arthritis can strike anyone at any age, it most commonly strikes those between the ages of 35 and 55. [4] India has a 0.9% prevalence of RA, compared to 1% globally, where women are

affected three to five times more frequently than men. [5] Sympathetic and/or parasympathetic nerve fibers can become damaged in autonomic neuropathy, causing symptoms such as palpitations, cold, cyanotic extremities, syncopal episodes, peripheral vasospasm, sexual dysfunction, and orthostatic hypotension. [6,7]

The sympathetic and parasympathetic nervous systems have been linked to both primary and secondary vasculitis, as well as systemic vasculitis illnesses such as SLE and RA. [8] Patients with RA have significantly higher sympathetic nervous system activity, according to research on Western

populations. [9] Patients with RA primarily target the peripheral nervous system; infrequently, the central nervous system (CNS) is impacted.

While cardiac involvement is not usually evident in people with RA, there is a significantly higher mortality rate from cardiovascular events. [10–12] This study aimed to evaluate cardiac autonomic function in patients with RA and compare it to normal individuals.

Material and Methods

From January to June of 2023, the Department of Physiology at Anugrah Narayan Magadh Medical College and Hospital in Gaya, Bihar, conducted this cross-sectional study. The investigation of autonomic functioning in RA was conducted on a group of 45±10-year-old males and females.

A total of fifty people were included; twenty-five of them were controls—healthy people not taking medication and twenty-five of them had been diagnosed with RA using the standards set by the American College of Rheumatology [13]. The

controls were matched for gender. Extra care was used to ensure that any pertinent past was not overlooked. The history and examination details were entered into Performa. Patients were checked for orthostatic hypotension (blurred vision, feeling weak and unsteady, light-headedness, fainting or syncope on standing), sweat, palpitations, and Raynaud's phenomenon, among other probable Autonomic Nervous System (ANS) dysfunction indicators. Subjects' written consent was obtained using an inform consent form in the local tongue.

Result

This study involved 50 participants, divided into two groups: the Study group (Group – A) and the Control group (Group – B). Group A comprised twenty-five patients who received a rheumatoid arthritis diagnosis based on standards established by the American College of Rheumatology. Twenty-five healthy people made up Group B, who was not taking any medication to account for typical fluctuations. It was noted what their age and sex were in the demographic profile.

Table: 1 Showing Difference in group I and group II

	Mean HR ± SD	Mean 30:15 Ratio ± SD	Mean S/L Ratio ± SD	Mean Exp/Insp Ratio ± SD	Mean Valsalva Ratio ± SD
Group A	75.5±9.1	1.2±0.2	1±0.1	1.2± 0.1	1.9± 0.6
Group B	72.8±6.8	1.1±0.1	1.1±0.1	1.3±0.1	1.1±0.2
P value	>0.01(NS)	>0.01(NS)	<0.001(HS)	<0.001(HS)	>0.01 (NS)

HR – HeartRate, S/L - Standing/Lying, Exp/Insp - Expiration/Inspiration, S-Significant, HS-Highly Significant, NS-Not Significant

Table 2: showing SBP, DBP in both groups

	Mean % change in SBP from lying to standing position	Mean % change in DBP from lying to standing position	Mean % change in SBP from resting to after Handgrip test	Mean % change in DBP from resting to after handgrip test	Mean % change in SBP from resting to valsalva	Mean % change in DBP from resting to valsalva
Group A	4.4±2.8	2.2±3.1	8.6±5.7	9.0±5.6	15.6±14.2	15.5±11.7
Group B	5.01 ±3.4	5.6±2.1	11.2±6.6	13.3±6.7	14.4±5.2	12.0±2.6
P value	>0.01(NS)	≤0.01(S)	>0.01 (NS)	≤0.01(S)	>0.01 (NS)	>0.01 (NS)

DBP – Diastolic Blood Pressure, SBP –Systolic Blood Pressure, S - Significant, HS – Highly Significant, NS-Not Significant

Discussion

Both the sympathetic and parasympathetic autonomic function tests revealed a substantial difference between the patient series and the control group. Patients with systemic lupus erythematosus and rheumatoid arthritis have reported autonomic dysfunction; an immunological component may possibly be involved. [14] Six non-invasive standardized tests were used to evaluate cardiac functions: the 30:15 ratio, the expiration/inspiration ratio, the standing/lying ratio, the valsalva ratio, the blood pressure reaction to standing, the blood

pressure response to the hand grip test, and the valsalva maneuver. The parasympathetic and sympathetic ANS divisions were assessed by these assays. Test results were compared with the control group using the unpaired t-test. According to this study, there was a substantial decrease in the parasympathetic function when compared to the control group in the expiration to inspiration ratio ($p<0.01$) and the standing to lying ratio ($p<0.001$). This study also demonstrates a decline that suggests a compromised vagal function in the group. As seen in Table No. 1, the 30:15 ratio and valsalva maneuver showed a reduced reduction in the Rheumatoid Arthritis patients as compared to the control group, however the difference was not statistically significant ($p>0.05$). Table No. 2 illustrates how the diastolic blood

pressure change was considerably ($P < 0.01$) lower in groups A than in the control group upon standing the blood pressure response. This finding suggests a reduction in peripheral resistance, which in turn results in a reduction in the percentage of change in diastolic blood pressure and a hypofunctional sympathetic nervous system that leaves things unchanged.

This study found that patients' heart rate variation to the 30:15 ratio, Valsalva ratio, and deep breathing were lower in the patient group than in the control group, and the 'p' values were found to be almost about less significant. These findings are almost similar to those of other studies that found no abnormalities in the CVS and ANS, including those of Geenen et al., Toussirof et al., [15] studies of Bekkelund et al., [16] and Piha et al.

Conclusion

Finally, compared to controls, the study verified that cardiac autonomic nervous system dysfunction (both sympathetic and parasympathetic) occurred in rheumatoid arthritis. Cardiovascular autonomic function tests are therefore useful in the early diagnosis of autonomic dysfunction in this disease during normal clinical examinations. The overall assessment of all the tests conducted may yield more thorough information on autonomic function. In order to lower the cardiovascular autonomic morbidity in RA, evaluating autonomic function may be a routine clinical evaluation component.

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