

Study of Audio - Visual Reaction Time in Rheumatoid Arthritis Patients

Rangrao Maroti Bhise¹, Sunita G Nighute², Kiran H Buge³

Abstract

Introduction: Rheumatoid arthritis (RA) is a chronic inflammatory disorder which affects the joints and is associated with swelling, stiffness and pain. Advanced disease stages can lead to substantial loss of functioning and mobility. As RA causes functional limitations in the joints, this might affect the movements or the movement patterns of the damaged and inflamed joints. The prevalence of rheumatoid arthritis in India is about 1 to 1.5 %. The primary targets of inflammation are synovial membranes and articular structures but other organs also affected. Reaction time is a time interval between the presentation of stimulus and initiation of muscular response to that stimulus. *Aim:* To study audio-visual reaction time in Rheumatoid Arthritis. *Material and Methods:* 50 Rheumatoid Arthritis patients and 50 controlled subjects were randomly selected from the Medicine & Orthopedics OPD. Age group of the subject from 25 to 75 years and it includes both male & female. Reaction Time Apparatus by Anand Agencies Pune was used to record audio-visual reaction time. Study was carried out in research lab, dept. of Physiology, GMC Mumbai. *Result:* Comparison of the results for the patients with RA and for the healthy controls indicated that the reaction times were longer in the patients with RA than in the controls on both sides. *Conclusion:* Result shows that audiovisual reaction time is longer in RA patients than healthy subject. This could be due to impaired motor functions in RA patients.

Keywords: Rheumatoid arthritis (RA); RT (Reaction Time); Auditory Reaction Time (ART); Visual Reaction Time (VRT); OPD (Out Patient Department).

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Introduction

Rheumatoid Arthritis is a chronic systemic disease of unknown etiology. It is characterized by peripheral symmetrical polyarthrititis. It has a progressive course with exacerbation and remissions being part of its natural history. Its onset could be at any age, although it usually starts

in the fourth decade of life. Overall, there is a 3:1 female preponderance, but this excess is greater in young people and the age related incidence is approximately equal in elderly people. The prevalence of rheumatoid arthritis in India is about 1 to 1.5 %.^{1,2}

It begins with pain, stiffness and swelling of specific joints such as proximal interphalangeal,

metacarpophalangeal, wrist and knee joints. The diagnosis is based routinely on the persistence of arthritic symptoms over a time. Important factors associated with RA are the possibility of infectious triggers, genetic predisposition and autoimmune responses. The primary targets of inflammation are synovial membranes and articular structures but other organs are affected as well.³

Rheumatoid arthritis (RA) is a chronic inflammatory disorder which affects the joints and is associated with swelling, stiffness and pain. Advanced disease stages can lead to substantial loss of functioning and mobility.

RA is diagnosed on clinical, serological and radiological grounds. The American Rheumatism Association (ARA) first proposed classification criteria for RA in 1956 and then revised them in 1958.^{4,5} Although, these criteria were widely used to diagnose RA for many years, they were heavily criticized for their lack of sensitivity and specificity.

The ARA published revised classification criteria for RA in 1988, based on cross-sectional data from a large group of patients with rheumatoid and other types of inflammatory arthritis.⁶

Rheumatoid arthritis causes reduced functional capacity, which leads to difficulties in activities of daily living. Inflammatory and destructive changes of the joints may cause pain and decrease the range of motion in joints, and inflict periods of immobilization, resulting in muscular atrophy.

Many previous investigators have studied the muscle strength of patients with RA, and the impaired muscle strength and functions of patients with RA compared with those of healthy controls. In one of the motor performance studies dealing with patients with RA, Ginsburg *et al.* studied cognitive functions (including switching attention and hand-eye coordination tasks) in patients with RA and noticed that the patients with RA had poorer motor performance. As RA causes functional limitations in the joints, this might affect the movements or the movement patterns of the damaged and inflamed joints.⁷⁻¹³

Audio - Visual Reaction Time

Reaction time is the interval of time between the application of a stimulus and appearance of appropriate voluntary response in subjects. Being voluntary in nature, the response is primarily governed by the ability of an individual to concentrate and to establish a muscular attitude of readiness. The reaction time thus indicates the time lost between the application of stimulus and

the appearance of its end effect. Different types of stimulus can be tried to elicit the particular response such as sound, light, pain, heat, etc. it varies with complexity of the reflex and interrelated sensory pathway associated with the course of impulse as it travels to the center. For example factors which facilitate the reaction time are alertness, training, concentration and inhibits the reaction time are advancing age, distraction, muscular weakness etc.⁷⁻¹⁰

Aim: To study audio-visual reaction time in Rheumatoid Arthritis.

Material and Methods

After clinical evaluation and laboratory investigation, those patients satisfying the Modified American Rheumatology Classification Criteria (1987) were included in the study. 50 Rheumatoid Arthritis patients and 50 controlled subjects were randomly selected from the Medicine & Orthopedics OPD, who comes for routine health check up. Age group of the subject from 25 to 75 years and it includes both male & female.

Inclusion Criteria

- Diagnosed Rheumatoid Arthritis Patients

Exclusion Criteria

- Hemoglobin <10 gm/dl
- Pregnant Women
- Suffering from Diseases like diabetes mellitus, Parkinson's disease, cardiovascular diseases like hypertension, ischaemic heart disease, congestive heart failure, valvular heart disease, cardio-myopathy and cardiac arrhythmia. Neurological diseases like multiple sclerosis, polyneuropathy or Guillain-Barre Syndrome.

Procedure

The subject was instructed to place her/his hand near to the press button of instrument, which was situated on one side of instrument. The test subject then heard a beeps sound, which was the sign to be ready for response. as soon as the subject listen the beep sound ask him to press the button for auditory reaction time, then for visual reaction time as soon as he/she saw the light (red or green) ask him to press the button.

Reaction time was expressed in milliseconds, as the time from initiating a light stimulus or sound stimulus to the time when the subject press the button. The subjects were performed three trials.

Instruments Used: Research Reaction Time Apparatus by Anand Agencies, Pune

Results

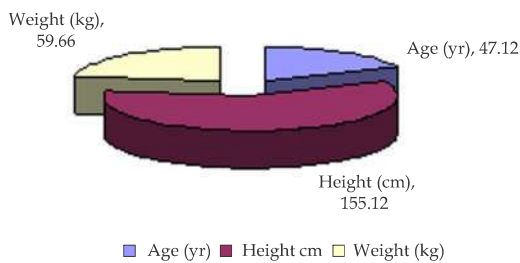
The results indicated that the Mean of ART for RA patients was 207.6 ± 55.40 ms of right hand and 215.26 ± 57.71 ms of left hand.

For controls it was 164.8 ± 25.64 ms of right hand and 173.86 ± 30.05 ms of left hand. It also shows that ART was longer in left hand than right hand for both patients and controls.

Mean of VRT for RA patients was 220.18 ± 60.55 ms of right hand and 236.88 ± 68.25 ms of left hand. For controls it was 177.94 ± 23.22 ms of right hand and 183.16 ± 24.99 ms of left hand. It also shows that VRT was longer in left hand than right hand for both patients and controls. There was high statistically significant difference between the patients and controls ($p=0.001$). (Tables and Graphs 1-4).

Table 1: RA Patient Details.

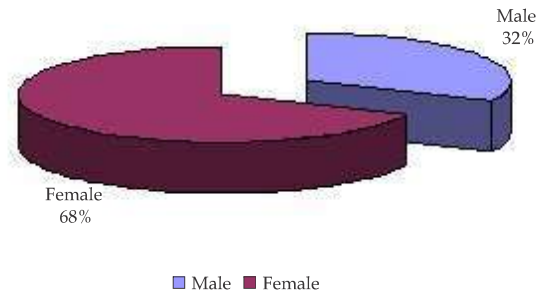
	N	Mean \pm SD
Age (yr)	50	47.12 \pm 8.62
Height (cm)	50	155.12 \pm 7.39
Weight (kg)	50	59.66 \pm 8.77
Duration of Disease (yrs)	50	3.09 \pm 1.70
Hb gm/dl	50	12.44 \pm 1.52
ESR	50	15.00 \pm 11.95



Graph 1: Age, Height and Weight of RA Patients.

Table2: Gender distribution of RA patients.

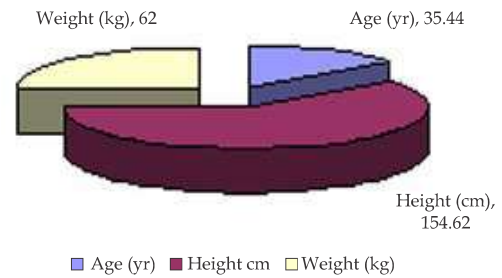
Gender	No	%
Male	16	32
Female	34	68
Total	50	100



Graph 2: Gender Distribution of RA Patients:

Table 3: Control Details:

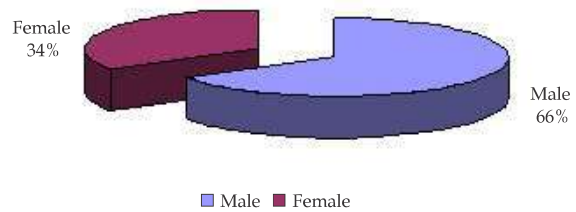
	N	Mean \pm SD
Age (yr)	50	35.44 \pm 7.62
Height (cm)	50	154.62 \pm 6.09
Weight (kg)	50	62 \pm 10.70



Graph 3: Age, Height and Weight of Controls:

Table 4: Gender Distribution of Controls:

Gender	No	%
Male	33	66
Female	17	34
Total	50	100



Graph 4: Gender Distribution of Controls

Discussion

In Previous Studies

Motor performance of the hand in patients with rheumatoid arthritis by Kari Kauranen, Pekka Vuotikka, Markku Hakala⁷¹ found that there was

statistically significant differences in the results between the patients with RA and the controls, and hence the groups were comparable and equal in these respects. The results indicated that the reaction times were longer in the group of patients with RA than in the control group on both sides.

In Present Study

The purpose of the study was to examine the

motor performance of the hand in a sample of patients with RA and controls. Comparison of the results for the patients with RA and for the healthy controls indicated that the reaction times were longer in the group of patients with RA than in the controls on both sides. The observations of present study were nearly comparable to the study performed by Kari Kauranen, Pekka Vuotikka, Markku Hakala [Table 5].

Table 5: Reaction Time in RA Patient and Control.

Group		N	Mean	Std. Deviation	T	DF	P-value
Auditory Reaction Time (ART)							
Right Hand	RA	50	207.60	55.406	4.957	98	0.001
	Control	50	164.80	25.647			
Left Hand	RA	50	215.26	57.712	4.499	98	0.001
	Control	50	173.86	30.054			
Visual Reaction Time (VRT)							
Right Hand	RA	50	220.18	60.551	4.606	98	0.001
	Control	50	177.94	23.220			
Left Hand	RA	50	236.88	68.252	5.226	98	0.001
	Control	50	183.16	24.990			

*P < 0.001 statistically highly significant

Conclusion

The motor functions of patients with RA were impaired in both ART and VRT. The reason for these differences may be explained by the neuromuscular problems of the patients with RA. Previous studies have shown an association between RA and nerve functions impairment, and it seems that RA accelerates muscle fiber degeneration, especially in fast-twitch muscle fibers. In addition, one reason for the poorer performance of patients with RA may be that the destructive and inflammatory changes in joints and pain or fear of pain prevent the subjects from performing fast movements as quickly as normal. The pain or fear of pain may delay these movements.

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