Correlation of Functional Ability of the Hand with Upper Limb Function and Quality of Life in Patients with Rheumatoid Arthritis

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Abstract
Background/ Objectives: Rheumatoid arthritis (RA) is associated with significant pain and deformities, where individuals continue to perform activities with reduced abilities. Fatigue and functional disability ensues with the progressive nature of the disease. The study was designed to observe the correlation between the Functional Ability of the Hand with Upper Limb function and Quality of Life in patients with Rheumatoid Arthritis.

Methods: 75 patients diagnosed with RA who were classified in Class I, II, III as per the revised criteria for Classification of Functional Status as given by the American College of Rheumatology were asked to perform the Grip Ability Test to calculate the Hand function. They were then asked to grade their Upper limb function on the Disabilities of Arm, Shoulder and Hand Questionnaire and Quality of Life on the Health Assessment Questionnaire- Disability Index. The scores were analyzed and statistical analysis was done using the Spearmann Rho Correlation.

Results: A total of 75 patients (68 females, 7 males) were included. The mean age of the patients was 41.10 years, with the range being from 19 to 55 years. The Hand function, upper limb function and Quality of life was affected in varying degrees amongst the patients.

Conclusion: We concluded that, there is a moderate positive correlation between the functional ability of the hand and upper limb function, a moderate positive correlation between the functional ability of the hand and quality of life and a strong positive correlation between the upper limb function and quality of life. Thus we need to incorporate newer techniques and approaches to assessment and treatment for enhancing functioning of the upper extremity, thus reducing disability.

Editorial Viewpoint
• RA is associated with pain and deformities in hand leading to deterioration in quality of life.
• This study finds a strong positive correlation between upper limb function and quality of life.
• This underlines incorporation of newer techniques and treatments for enhancing functioning of upper extremity.

Introduction
Rheumatoid Arthritis (RA) is the most common chronic autoimmune systemic inflammatory arthritis, characterized by symmetrical joint synovitis and pain, commonly affecting the wrists and smaller joints of the hand, in about 0.5- 1% of the general population.¹,²

The hand is the principle means by which an individual interacts with people and objects in the external environment. The Grip Ability Test (GAT) is an Activity of Daily Living (ADL) specific tool to evaluate hand function in patients with RA.³ The GAT hand function test has three tasks which evaluate 4 grips: lateral pinch, 5 finger pinch, pulp pinch and transverse volar grip.³

The International Classification of Functioning, Disability and Health (ICF) gives a classification of health and health related domains, describing changes in body function and structure.⁴ It gives a Biopsychosocial model which is an interaction of the medical and social models (Figure 1).

The WHO defines ‘disability’ as an “umbrella term covering

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Impairments, activity limitations and participation restrictions. Disability is a consequence of pain, active synovitis and joint damage and ultimately affects the Quality of life (QoL) which can be assessed by self-reported questionnaire; the Health Assessment Questionnaire-Disability Index (HAQ-DI). Functionally, patients with RA can also be categorized as per the revised criteria for Classification of Functional Status as given by the American College of Rheumatology. The 30 item Disabilities of Arm, Shoulder and Hand questionnaire (DASH) Outcome Measure is a self-reported questionnaire designed to measure physical function and symptoms in patients with musculoskeletal disorders of the upper limb.

Despite pain and deformities, individuals with RA continue to function, causing secondary consequences on the overall functioning of the individual. Hence, we need to evaluate the correlation between a bimanual dexterity hand function task and upper limb function, and to find the association between hand function and disability. This can provide valuable insight on the impact of hand dysfunction on disability in RA. Hence, there is a need for exploring the relationship between hand function and its effect on Upper limb function and Quality of life in an Indian population diagnosed with Rheumatoid Arthritis.

**Aims and Objectives**

The aim of the study was to observe the correlation between the Functional Ability of the Hand with Upper Limb function and Quality of Life in patients with Rheumatoid Arthritis.

The objectives of the study were to assess and correlate the functional ability of the hand with upper limb function, the functional ability of the hand with quality of life and upper limb function with quality of life in patients with Rheumatoid Arthritis.

**Methodology**

**Study Design**: Observational Correlational Study

**Setting**: Physiotherapy Rheumatology OPD of Seth GS Medical College and KEM Hospital, Mumbai.

**Inclusion Criteria**

Patients of either sex in the age group of 18-55 years diagnosed with Rheumatoid Arthritis as per the 1987 revised criteria of the American College of Rheumatology, who were under DMARDs as prescribed by the rheumatologist and who were categorized as Class I, II and III as per the revised criteria for Classification of Functional Status in RA by American College of Rheumatology (ACR).

**Exclusion Criteria**

Patients with any recent history of trauma and surgery, any neurological involvement, visual and hearing deficit and significant secondary cardiovascular and respiratory involvement.

**Study Procedure**

A total of 75 patients were included as calculated by the census method. The study was approved by the Institutional ethics committee and a written informed consent was taken from each patient. After taking a brief history and a routine physiotherapy examination, the patients were asked to:

- Perform the Grip Ability Test (GAT), which was subsequently timed.
- Fill the Disabilities of Arm, Shoulder and Hand (DASH) Questionnaire to grade their upper limb functional ability.
- Fill the Health Assessment Questionnaire-Disability Index (HAQ-DI) for grading overall quality of life.

The above three scores were calculated and the data collected was statistically analyzed using appropriate tests. Using SPSS software version 16.0, Spearman’s rho correlation coefficient (two tailed) was used to find out the association between the variables.

**Results**

A total of 75 patients were included. The mean age of the patients was 41.10 years, with the range being from 19 to 55 years. Out of 75, 68 were females and 7 were males.

Amongst them, 35 patients (46.66%) were in Class I (Completely able to perform usual activities of daily living: self care, vocational and avocational), 26 patients (34.66%) in Class II (Able to perform usual self care and vocational activities, but limited in avocational activities) and 14
patients (18.66%) in Class III (Able to perform usual self care activities, but limited in vocational and avocational activities) as per the revised Classification of Functional Status.

Overall, females were affected more than males.

GAT scores were seen affected in 95% of the patients studied. Amongst these, 8% showed severely affected scores.

The DASH scores were affected in 83% of the patients. Amongst these, 33% were moderately and 49% were severely affected.

The HAQ-DI scores were varyingly affected. 32% showed mild affection, 53% showed moderate affection and 14% showed severely affected HAQ-DI scores.

Of the 75 patients studied, we observed

• A moderate positive correlation between the functional ability of the hand (using GAT) and upper limb function (using DASH). (Figure 2) The Spearman’s rho correlation coefficient was 0.530 with the correlation being significant at 0.01.

• A moderate positive correlation between the functional ability of the hand (using GAT) and quality of Life (using HAQ-DI). (Figure 3) The Spearman’s rho correlation coefficient was 0.531 with the correlation being significant at 0.01.

• A strong positive correlation between the upper limb function (using DASH) and quality of Life (using HAQ-DI) (Figure 4) The Spearman’s rho correlation coefficient was 0.801 with the correlation being significant at 0.01.

Discussion

Rheumatoid Arthritis is a disease associated with considerable impairments, activity limitations and participation restrictions which cause disability and affect
the individual’s Quality of life.

Figure 2 shows the correlation between functional ability of the hand (using GAT) and upper limb function (using DASH) with the two variables showing a moderate positive correlation.

In a study by Vliet Vlieland and Van der Wijk TP in 1996, 78% of the variance of the combined hand function factor could be explained by pinch strength, stiffness of the hands, and the presence of Z deformity and ulnar deviation. We observed the GAT scores to be delayed in patients with RA. The reasons for it could be the associated hand deformities. Studies have shown reduced motor performance function with an increase in the reaction time, speed of movement and reduction in co-ordination in individuals diagnosed with RA. Also, muscle wasting is seen in RA, which reduces grip and pinch strength. In a study by Kristina Calder et al, they concluded that women with hand RA have axonal loss of sensory fibers in the median, ulnar and radial nerves. All these along with pain could contribute to reduced hand functioning and increase in GAT scores in patients with RA.

Shoulder function is typically affected in RA. Gleno-humeral (GH) joint synovitis, tendinitis involving the rotator cuff and tendon tears in the rotator cuff are common. Muscle strength weakness especially the gleno-humeral rotators contribute to upper limb limitations in ADLs. Radiologically, joint space narrowing and destruction is seen, and pain ensues from upward migration and medialisation of humeral head which reduces subacromial space. In our study, patients reported reduced capability to use their shoulder in functional activities, which increased their overall DASH scores.

Slungaard B et al in 2013 in a study concluded that active motion deficit along with reduced passive ROM, poor muscle strength and pain, explained about one-third of the limitations in shoulder function in daily life.

At least 70-75% of individuals diagnosed with RA have wrist and hand symptoms, 67–91% individuals have shoulder pain, and more than one in five present moderate or severe glenohumeral (GH) joint destruction during the first 15 years from the disease onset. These values are consistent with the results of our study. Along with this, the RA elbow presents with pain, swelling, flexion and valgus deformity.

Thus it can be undoubtedly said that hand dysfunction can hugely impact upper limb function in this population.

These results concur with a study done in 2004 by J Adams and J Burridge in UK on 36 RA patients. A study in 2007 concluded that RA patients were weaker, had poorer upper limb functional performance, hand grip strength and proprioceptive acuity than the healthy subjects. Thus, the correlation can be justified.

Figure 3 shows the correlation between the functional ability of the hand (GAT) and the QoL (HAQ-DI) and the two variables show a moderate positive correlation.

Disability is a complex phenomenon reflecting the interaction between features of a person’s body and features of the society in which they live. Overcoming the difficulties faced by people with disability requires intervention to remove the environmental and social barriers. Disability related to RA can be described in terms of impairment, activity limitation and participation restriction. The WHO ICF component assessed with the HAQ-DI is activity limitation.

A number of factors affect the HAQ-DI like age and sex. Joint damage, disease duration, serum rheumatoid factor, disease activity (ESR, CRP levels) and bodily fatigue are directly related to the scores on the HAQ-DI, whereas education and socioeconomic status are indirectly related.

HAQ-DI is a patient perceived quality of life measure which assesses the individual’s performance and disability over the past one week. As hand function deteriorates, the individual dependence on aids and help by another person increases. These directly contribute to increased HAQ-DI scores.

The common factors affecting GAT and HAQ-DI are disease duration, joint damage, disease activity, fatigue along with pain and poor muscle strength. A study by Berit Dellhag and Anders Bjelle mentions that the development of dependence in ADL was explained by reduction in hand function. Also a study by Eva Hallert et al in 2012 concluded that HAQ-DI values could significantly be predicted by GAT values. Thus, the correlation between hand function and QoL and can be justified.

The results explained in Figure 3 are supported by two studies, by Berit Dellhag et al in 1999 and by Mathilda A. Bjork et al in 2007.

Figure 4 shows the correlation between the upper limb function (DASH) and QoL (HAQ-DI) and the two variables show a strong positive correlation.

RA has an important impact on health that can be related to the WHO’s International ICF framework. The physical consequences of RA for the individual relate to body functions and structures in the ICF framework. The functional consequences of RA are related to activity in the ICF framework, and the impact of RA on society relates to participation in the ICF framework. Despite conventional treatment, early RA continues...
to result in significant physical consequences for most patients. From the patient’s perspective this primarily results from persistent pain, although symptoms such as fatigue and depression are also relevant.

In the thirty item DASH Outcome Measure, which is concerned with upper limb disability and symptom, twenty one items reflect the degree of difficulty in performing various physical activities due to arm, shoulder or hand problems, 5 items represent the severity of each symptom of pain, activity-related pain, tingling, weakness and stiffness and 4 items reflect the effect on social activities, work and sleep. The HAQ Disability Index measures the QoL by assessing difficulties in performing activities of daily living.

The upper extremity is central to performing most skilled tasks, used principally for reaching, grasping and manipulation, sometimes for lifting the body mass as well as other weights, and at periods of postural stability for preserving balance. Effective functional use of the upper limb is absolutely dependent on functional hand grasp and release. Motor impairment of the upper extremity has a considerable impact on an individual’s ability to complete activities of daily living, hobbies and work which affects the quality of life and is associated with a low level of subjective well being.

Both the DASH and the HAQ-DI target the psychosocial element and are patient perceived scores grading their performance in their daily environment. The HAQ-DI has more items involving the use of upper extremity as compared to lower extremity. Also, both the scales measure the subjective scores of the individual in ADLs in the same time frame. Thus, the correlation between upper limb function and quality of life can be justified. These results are supported by studies done by Annelie Bilberg and Tomas Bremell and Aktekin et al.

Thus, in an Indian population diagnosed with RA, the functional ability of the hand correlates positively with upper limb function and quality of life. The limitation of the study was not having included the disease activity as one of the indices. Further research involving the disease duration, deformities, disease activity and functional outcome measures in relation to upper limb can be carried out.

Conclusion

In our study, we conclude that, in patients with RA, there is a moderate positive correlation between the functional ability of the hand and upper limb function, a moderate positive correlation between the functional ability of the hand and quality of life and a strong positive correlation between the upper limb function and quality of life.

The impact of hand dysfunction on the functioning of an RA patient can lead to grave disabilities. Hand function disability poses as one of the greatest obstacles to independent living, thus leading to the need of incorporating newer techniques and approaches to assessment and treatment for enhancing functioning of the upper extremity. Assessment using the GAT, DASH and HAQ-DI can provide us a quick and early insight on the debilitating effects of RA on functioning and disability. Early intervention can then be initiated which will help limit joint damage and thereby improve functional outcomes.

References

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