


RESEARCH ARTICLE (ORIGINAL) 

Pain and wrist joint in rheumatoid arthritis: The impact on functional capacity

Dor e articulação do punho na artrite reumatoide: O impacto na capacidade funcional

Dolor y articulación de la muñeca en la artritis reumatoide: El impacto en la capacidad funcional

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Abstract

Background: Rheumatoid arthritis (RA) is a chronic, autoimmune, and inflammatory disease. Symptoms include polyarthritis, chronic pain, and difficulty in joint mobilization, which lead to functional disability in patients.

Objectives: To assess the influence of wrist joint mobility and pain on the functional capacity of patients with RA.

Methodology: Quantitative, descriptive, and correlational study in a sample of 105 patients. Health Assessment Questionnaire - Disability Index (HAQ-DI) and Visual Analog Pain Scale (VAS) were applied, and the wrist joint range of motion was measured with a goniometer.

Results: Joint wrist mobility is representative of functionality ($p < 0.05$). However, wrist joint extension and flexion do not directly influence pain ($p > 0.05$). Pain was observed to impact the functional capacity in patients ($p = 0.010$).

Conclusion: Joint wrist mobility and pain affect the daily activities of patients with RA, expressed through the functional capacity for health assessment.

Keywords: arthritis, rheumatoid; autoimmune diseases; patient reported outcome measures

Resumo

Enquadramento: Artrite reumatoide (AR), doença autoimune, inflamatória e crónica. Caracteriza-se por poliartrite, dor crónica e dificuldade em mobilizar as articulações, que levam à incapacidade funcional dos doentes.

Objetivos: Avaliar a influência da mobilidade articular do punho e da dor, na capacidade funcional de doentes com AR.

Metodologia: Estudo quantitativo, descritivo e correlacional, constituído por uma amostra de 105 doentes, com aplicação do Índice de Incapacidade - Questionário Avaliação de Saúde (HAQ-DI); Escala Visual Analógica da Dor (EVA) e medição da amplitude articular do punho, com goniómetro.

Resultados: A mobilidade articular do punho é representativa na funcionalidade ($p < 0,05$), no entanto, a sua extensão e flexão, não influenciam diretamente a dor ($p > 0,05$). Observou-se que a dor é impactante na capacidade funcional dos doentes ($p = 0,010$).

Conclusão: A mobilidade articular do punho e a dor afetam as atividades diárias dos doentes com AR, expressas através da capacidade funcional de avaliação de saúde.

Palavras-chave: artrite reumatoide; doenças autoimunes; medidas de resultados relatados pelos doentes

Resumen

Marco contextual: Artritis reumatoide (AR), una enfermedad autoinmune, inflamatoria y crónica. Se caracteriza por la poliartritis, el dolor crónico y la dificultad para movilizar las articulaciones, lo que provoca la incapacidad funcional de los pacientes.

Objetivos: Evaluar la influencia de la movilidad articular de la muñeca y el dolor en la capacidad funcional de los pacientes con AR.

Metodología: Estudio cuantitativo, descriptivo y correlacional, compuesto por una muestra de 105 pacientes, en el que se aplicó el Índice de Discapacidad - Cuestionario de Evaluación de la Salud (HAQ-DI); la Escala Visual Analógica del Dolor (EVA) y la medición de la amplitud articular de la muñeca, con un goniómetro.

Resultados: La movilidad articular de la muñeca es representativa en la funcionalidad ($p < 0,05$), sin embargo, la extensión y la flexión no influyen directamente en el dolor ($p > 0,05$). Se observó que el dolor tiene un impacto en la capacidad funcional de los pacientes ($p = 0,010$).

Conclusión: La movilidad articular de la muñeca y el dolor afectan las actividades diarias de los pacientes con AR, expresadas a través de la capacidad funcional de evaluación de la salud.

Palabras clave: artritis, reumatoide; enfermedades autoinmunes; medidas de resultado informadas por el patient



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Introduction

Rheumatoid arthritis (RA) is an autoimmune, chronic disease characterized by joint inflammation, causing joint and periarticular tissue destruction and several extra-articular changes. An effective treatment leads to a good vital and functional prognosis (Sociedade Portuguesa de Reumatologia [SPR], 2020). The etiology of RA is complex and multifactorial, with approved pathogenic theories based on the combination of multiple genetic risk factors, environmental factors, and abnormal immune responses (Mohammed & Bansal, 2021).

The disease brings along symptoms and associated comorbidities. A severe complication is chronic musculoskeletal pain, with a negative physical, mental, and social impact on people's lives. Recent studies suggest that the impact of chronic pain can be partially explained by psychosocial factors and is associated with decreased quality of life (Paananen et al., 2011).

Given the challenging case abovementioned, this study aims to understand how pain and joint mobility of the wrist affect the functional capacity of patients with RA.

Background

The hand joints (metacarpophalangeal and proximal interphalangeal) and the wrist joint are related to the most common inflammatory arthritis (Mohammed & Bansal, 2021). The onset of the disease manifests itself through an inflammation of the little hand joints, which gradually lose agility. Pain worsens during the night and upon awakening and increases while executing some daily activities. Over time, signs and symptoms extend to other joints and may lead to deformation. Inflammatory symptoms such as pain, edema, and joint stiffness are directly related to the loss of movement of the wrist joint in the early phase of the disease. Bray (2017) describes that progressive loss of movement occurs as the disease advances and represents joint destruction, leading to decreased movements, poor aesthetic appearance, and difficulty performing activities of daily living (ADL). The primary clinical evidence of RA in the wrist joint is palpable synovial hypertrophy or synovitis. Advanced synovitis of the wrist joint, which causes pain and fixed deformity, can seriously impact patients' daily functional activity. Commonly experienced functional difficulties include lifting, transport, and sustained or repetitive grip. Difficulty opening doors and turning keys and the simple act of receiving change when shopping. According to Escalante et al. (2005), the association between joint inflammation and joint deformity directly influences ADL and functional limitations, contributing to increased functional dependence in individuals with RA. Tenosynovitis usually occurs in the extensor tendons of the wrist. Tenosynovitis and tenosynovial effusions of the flexor tendons in the wrist joint can lead to compression of the median nerve in the carpal tunnel, leading to symptoms of carpal tunnel syndrome. The joint range of motion can be evaluated by flexion/extension and pronation/

supination of the wrists (Mohammed & Bansal, 2021). RA harms patients' functional capacity, specifically ADL, including professional and domestic tasks and health-related quality of life, contributing to increased mortality (Singh et al., 2016). According to Andersson et al. (2017), individuals with a recent diagnosis of RA, who received more active medical treatment, present lower inflammatory parameters, with lower disease activity, reflecting on the impact of the disease, namely on pain and functional dependence. Suppression of inflammation in the early stage of the disease can substantially improve the long-term prognosis due to early diagnosis and treatment (SPR, 2020).

Research question

How do joint mobility of the wrist and its amplitude influence pain intensity and functional capacity in patients with rheumatoid arthritis?

Methodology

A quantitative, descriptive, and correlational study was conducted in a sample of 105 patients, attending the External Consultation (CE) of the Clinical Immunology Unit (UIC) of the Centro Hospitalar do Porto - Hospital de Santo António (CHUP-HAS), diagnosed with RA for 12 months or more. Potential participants in the study were contacted by telephone – the institutional telephone in the CE of the UIC of CHUP - HSA. All participants signed an informed consent at the beginning of the study under the principles of the Declaration of Helsinki 2013 and the Oviedo Convention 1997, which have been in force in Portugal since 2001. The rights of those involved in this study and the confidentiality of their responses were ensured.

Inclusion criteria were: adults (18-65 years); patients with RA diagnosed for 12 months or more; and stable therapeutic dose for at least 3 months. All patients undergoing wrist surgery were excluded, as it influences joint wrist mobility and the possible intensity of pain felt.

The study was approved by the Department of Education, Training, and Research of the Hospital de Santo António - DEFI in October 2019. Data were collected between October 2019 and September 2020 in the EC of the UIC. The study instruments, in the form of a questionnaire, were completed in person and individually by each patient. The wrist joint range of motion was measured on the same day using a goniometer.

The Health Assessment Questionnaire-Disability Index (HAQ-DI) was applied to assess the functional capacity of RA. HAQ-DI is the most used instrument to assess functional capacity in individuals with RA (Fries et al., 1980). It was developed by the Arthritis, Rheumatism, and Aging Medical Information System of Stanford (ARAMIS) and is recommended by the American College of Rheumatology (ACR) to measure physical functionality in studies on RA (Felson et al., 1993). This questionnaire was developed three decades ago by James Fries and his

collaborators at Stanford University to represent a results evaluation model with different versions. The Frail Study group validated it for the Portuguese context due to its relevance in evaluating functional capacity, which significantly impacts the response to biological therapies or predicts the disease's evolution (Gonçalves, 2019).

This questionnaire is an assessment tool with comprehensive and validated results for patients with rheumatic diseases. It has been widely used in international studies and observational clinical trials, demonstrating reliability and validity as an assessment index for functional capacity (Gonçalves, 2019). HAQ-DI was designed to be self-applied by the patient without the help of a doctor or any other health professional. The 20-item questionnaire is divided into eight categories, with four previously scored answer possibilities: *without any difficulty* (0); *with some difficulty* (1); *with much difficulty* (2); and *unable to do* (3). The patient should choose the most appropriate response according to his/her ability to perform each of the activities evaluated. The activities evaluated include dressing and grooming; arising; eating; walking; hygiene; reach; grip; and common daily activities (house chores, shopping, and errands). The final score is the mean of the eight categories and can be interpreted in three categories: 0 to 1 (Mild difficulty to moderate disability); 1 to 2 (Moderate to severe disability), and 2 to 3 (Severe to very severe disability). The 105 participants in this study answered all the questions in their entirety.

Regarding the evaluation of pain intensity, the Visual Analog Pain Scale (VAS), validated for the Portuguese context and recommended by the Directorate-General for Health (DGS), was used. The patient was educated immediately before to ensure that he/she correctly understood the meaning and use of the scale, with simple and accessible language. According to the DGS (2011), pain intensity is always reported by the patient, and the evaluation time is recorded. VAS - converted to numerical scale for registration purposes - consists of a horizontal or vertical line, 10 centimeters long, with one end marking *no pain* and the other *maximum pain*. Using a numerical scale, which consists of a ruler divided into eleven equal parts, numbered, successively, from 0-10, the patient matches the intensity of his/her pain to the numerical classification (DGS, 2011).

The goniometer was used to measure the wrist joint range of motion to evaluate the flexion and extension angles of the wrist at rest. At the moment of evaluation, the patient was seated, with elbow flexed at 90 degrees, wrist on the edge of a table, forearm in pronation. The hand movement was parallel to the longitudinal axis of the fifth metacarpal. The expected range of motion in the wrist extension can go from 0-70°, while in the wrist flexion, it can range from 0-80/90° (Norkin & White, 2016).

Data were analyzed using the software *RStudio*, version 1.2.1335. The software has an associated error of $1,110223 \times 10^{-16}$.

Results

The 105 patients with RA participating in this study are aged between 30 and 80 years, 80.95% female and

19.05% male. The majority (44.76%) have completed the first cycle of studies (1st-4th year), and 73.33% are married or in a de facto union. Regarding arm dominance, it was found that, in 98.10% of the sample, the right side is the dominant one.

The functional capacity assessment using HAQ-DI (Table 1) allowed verifying the degree of disability of the sample. Thus, 76.19% of the 105 patients reported having *mild difficulty to moderate disability* in performing ADL. Only three individuals were in category III, which corresponds to a severe/very severe functional disability.

Table 1

Functional disability through HAQ-DI

HAQ-DI assessment					
I		II		III	
<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
80	76.19	22	20.95	3	2.86

Note. HAQ-DI = Health Assessment Questionnaire - Disability Index.

The Flexion and Extension of the doming wrist were measured to evaluate its range of motion. Regarding the extension, the minimum value found was 10, and the maximum was 80, with a mean of 46.43 ($SD = 18.84$). With regard to flexion, the minimum value recorded was 10, and the maximum was 90, with a mean of 59.9 ($SD = 19.57$).

The variables extension and flexion were analyzed individually to study the relationship between Functional Disability using simple linear regression. There is a statistically significant relationship for both variables, as the *p*-values obtained are lower than the significance level usually used as a reference ($\alpha = 0.05$; Table 2). The coefficient is, for both variables, less than 0, which indicates that the higher the value of Flexion and/or Extension, the lower the value of the HAQ-DI score, that is, the lower the degree of functional disability of patients.

Table 2

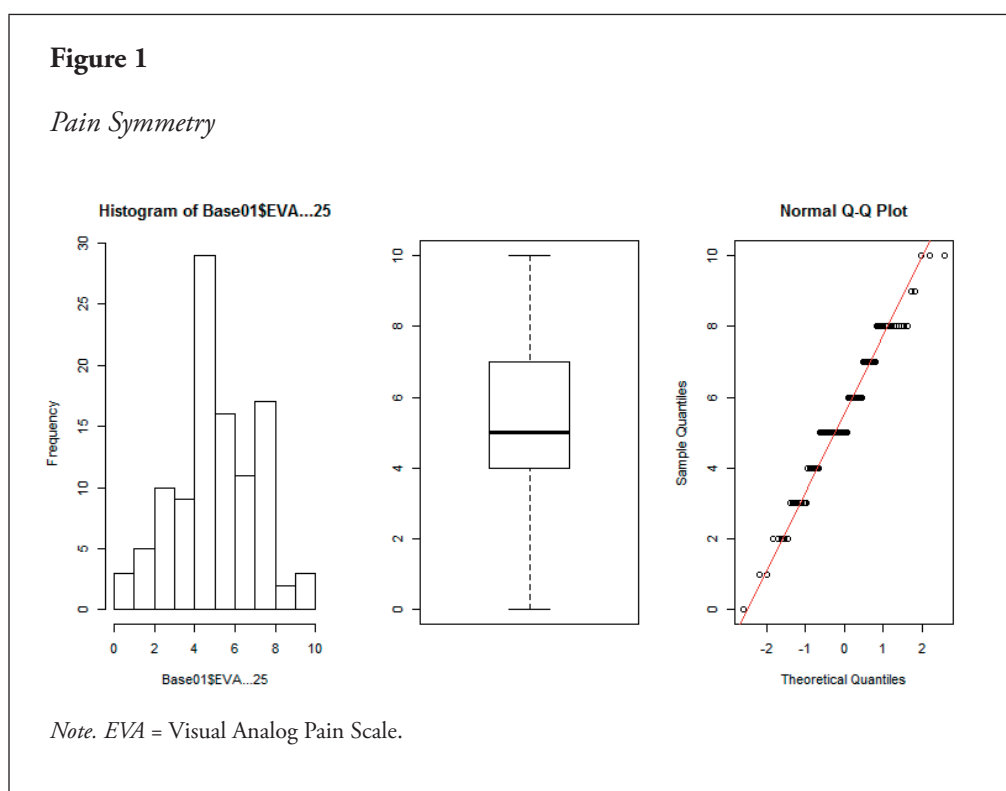
Functional Disability vs. Wrist Joint Mobility

Simple regression models results			
Variable	<i>p</i> -value		
Extension	0.9845	-0.0067	0.0122
Flexion	1.0666	-0.0065	0.0148

Regarding the variable pain and its relationship between joint range of motion and functional disability in patients with RA, pain intensity was assessed using the Pain VAS, whose results ranged from a minimum of zero (0) to a maximum of ten (10), with a mean of 5.52 ($SD 2.06$). Statistical analysis was performed to evaluate the symmetry of this variable and understand the differences in its distribution. The results were presented in a histogram, boxplot, and function 'QQNorm'

(Figure 1). The variable pain shows some symmetry, but it is not a symmetric variable since the range between the second

and the third quartiles is greater than the range between the first and second quartiles.



The simple linear regression model was used to describe the behavior of the pain variable based on the variables Extension and Flexion. The results are presented in Table 3. The p -values obtained are considerably higher than the reference value $\alpha = 0.05$, so there is no evidence of an association between flexion/extension and pain intensity.

Table 3

Joint Range of Motion vs. Pain

Simple regression models results			
Variable			p -value
Extension	6.3648	-0.0182	0.0943
Flexion	6.6867	-0.0194	0.0759

Given the impact of pain intensity on the functional capacity of patients with RA, the following results demonstrate the behavior of functional capacity based on the variable pain: $\beta_0 = 0.2244$, $\beta_1 = 0.0798$, and $p = 0.0010$. Of all the variables studied, pain intensity alone better explains the behavior of the variable related to the functional disability of patients (HAQ-DI score). This result is clear in the data presented, reflected by the $p = 0.0010$, substantially lower than $\alpha = 0.05$. Based on the coefficient ($\beta_1 = 0.0798$), the higher the pain intensity, the higher the HAQ-DI score, that is, the higher the disability of patients with RA in performing ADL.

Discussion

In this study, which aimed to understand the influence of joint wrist mobility and pain intensity on the functional capacity of patients with RA, it was found that most of the participants have a dominant right side, which explains the selection of the upper limb under study. Data analysis regarding joint wrist mobility revealed that this variable influences the functional capacity of patients with RA, with a significant association between a greater capacity of extension/flexion of the dominant wrist and an increase in the capacity of patients to perform ADL. This is consistent with a study by Escalante et al. (2005), which observed a strong influence of joint inflammation and deformity on the increase of limitations, that is, on the increase in functional dependence of individuals with RA. Concerning the intensity of pain felt by patients with RA, no direct relationship between the range of motion and mobilization capacity of the wrist joint and pain intensity was found in patients with RA. Musculoskeletal pain is known to be associated with multiple adaptations in motion control. Mista et al. (2016, p. 1116) state that it "and is thought to serve a protective function to reduce threat to the painful/injured region where the resolution of pain is not necessarily associated with a return to the original motor pattern". One possible explanation is that changes in movement during pain are achieved through an initial increase in movement variation to find a new strategy, and when this beneficial strategy is found, the movement variation decreases to maintain this new stra-

tegy (Hodges & Tucker, 2011).

On the other hand, according to the results above, pain intensity directly influences the functional capacity of patients with RA. There is a direct proportionality between pain intensity and patients' functional capacity to perform ADL, meaning that functional disability increases as pain felt increases and vice versa. Oostinga et al. (2020) report that musculoskeletal diseases accompanied by pain are highly prevalent and significantly impact physical capacity and quality of life. As one of the leading causes of pain described, physical dysfunction produces side effects such as decreased mobility, loss of bone mass, loss of muscle mass, and poorer cognitive and cardiovascular health, which contribute, without exception, to the reduction of quality of life.

This study encountered SARS-CoV-2 pandemic-related limitations (since March 2020), including the cancellation of external consultations and, consequently, the suspension of data collection at CHUP-HSA for about four months. Thus, the data collection period of October 2019-September 2020 included a 4-month interregnum between March and July. As an autoimmune, rheumatic/musculoskeletal disease, RA may present different evaluation results throughout the year, depending on the season in question. Ziadé et al. (2021, p. 212) found in their study a clear seasonal trend in pain perception in chronic rheumatic diseases, with "a statistically significant, negative correlation between CRD [chronic rheumatic diseases] and temperature ($p < 0,001$)."

Another limitation of the study is that there was no control group whose population was not diagnosed with RA. Further research is recommended for more data on the research question and its uniqueness in other populations.

Conclusion

It was observed that although wrist mobility capacity, concerning extension and flexion, influences the everyday activities of each patient, pain is considered to be one of the most influencing variables in the functional disability of patients with RA.

Many patients with chronic pain adapt to it, but greater focus should be placed on treatment, the fifth vital sign that influences everyday activities. Pain assessment and management still constitute a significant challenge in public health.

Increased access to health care for patients with RA, regular assessment of the activity index of RA disease and functional capacity to perform ADL, health education, and provision of resources to support disease self-management can be essential tools to reduce the frequency and intensity of pain. We believe that greater autonomy in everyday activities translates into a better quality of life.

Author contributions

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