



Can hand involvement in osteoarthritis be as devastating as rheumatoid arthritis?

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Abstract

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Aim: Rheumatoid arthritis (RA) and osteoarthritis (OA) lead to pain and function loss in the hand joints. Common clinical symptoms include reduction in the range of motion in joints, muscle strength and hand functions. The present study aimed to compare hand involvement in RA and OA patients based on functionality, and to investigate the correlation between hand functions, radiological scores, and other disease parameters in RA and OA patients.

Materials and Methods: The study was conducted with 56 RA patients and 51 hand OA patients. Hand functions were determined with hand grip strength, finger grip strength and Duruöz Hand Index in RA patients. Health Assessment Questionnaire (HAQ), Rheumatoid Arthritis Quality of Life Scale (RA-QoL) Short Form-36 (SF-36), Nottingham Health Profile (NHP), and Hospital Anxiety and Depression (HAD) scale were applied to all patients. Radiographic analysis of the hand joints was conducted with Modified Larsen and Modified Sharp scores in RA patients and the Kellegren-Lawrence score in OA patients.

Results: Hand grip strength was lower in the RA group when compared to the OA patients ($p < 0.05$). There was no significant difference between the physical function analysis of the groups ($p > 0.05$). There were significant correlations between Duruöz Hand Index, radiological scores, and other clinical parameters in both groups.

Conclusion: Although RA could lead to serious deformation in hand joints, it was concluded that hand osteoarthritis could lead to disabilities induced by the loss of hand functions similar to RA and affect daily living activities.



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Introduction

Osteoarthritis (OA) and rheumatoid arthritis (RA) diseases affect the hand joints. RA is an autoimmune inflammatory joint disease [1], while OA is characterized by the imbalance between cartilage degeneration and regeneration, as well as a certain degree of synovial inflammation [2]. Osteoarthritis most commonly affects the knee joint [3]. Despite their different etiologies, OA and RA could lead to a comparable disease and pain in the hand joints. Common clinical symptoms include reduction in range of motion in the joints, muscle strength and hand functions [2,4,5].

In RA, metacarpophalangeal (MCP), proximal interphalangeal (PIP), and wrist joints are the most frequently and

first affected joints. Symmetrical fusiform swelling in the PIP and accompanying swelling in the MCP joints are the typical prognosis in RA. Involvement of the distal interpharyngeal (DIP) joints is almost never seen alone and is not the first site of involvement. DIP joint involvement could be due to a concomitant osteoarthritis, especially in elderly RA patients [6].

Hand osteoarthritis is a degenerative hyaline cartilage disease that affects the hand joints. It is often associated with generalized OA and could lead to significant disability [7]. The typically involved joints include DIP, PIP, 1st and 2nd MCPs, and the carpometacarpal joint. Heberden and Bouchard nodules and bone expansions are another clinical symptom that distinguishes hand OA and other arthritis. These could be accompanied by various deformities such as lateral deviation in the interphalangeal joints (IF), subluxation or adduction at the base of the thumb [8,9].

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It was observed that pain and radiographic changes in osteoarthritis lead to hand dysfunctions [10]. Leeb et al. [11] suggested that the dysfunctions associated with hand OA could be as serious as those observed in RA. There are limited numbers of studies on the topic in the literature.

The present study aimed to compare hand involvement in RA and OA patients based on hand functions, and investigate the correlations between hand functions, radiological scores, and other disease parameters in RA and OA patients.

Materials and Methods

Our study was carried out in accordance with the principles of the Declaration of Helsinki, after receiving approval from the Firat University Ethics Committee (31.12.2013-10/03). Informed voluntary consent forms were obtained from all participants. The study was conducted with 56 RA patients and 51 hand OA patients. Patients with no known infection, malignancy, cardiovascular disease, renal failure, chronic lung and liver disease, carpal tunnel syndrome, hand bone traumatic fracture history, or muscle, tendon, nerve injury, or hand surgery were included in the study. The study data included routine check-up biochemistry, complete blood count, ESR and CRP and Rheumatoid factor (RF) results.

An electronic hand dynamometer (Electronic Hand Dynamometer (HS-005), China) was employed to determine the hand grip strength of all patients, finger grip strength was measured with a manual pinch-meter (Sammons Preston, Inc. Bolingbrook, IL 60440-4989), and the findings are presented in kilograms. Three hand grip and finger grip strength measurements conducted with a break between each measurement and the mean measurements were recorded.

Hospital Anxiety and Depression Scale (HAD) has been used to determine the anxiety and depression levels of all patients [12]. The general health of the patients was determined by the patient and the physician with the Visual Analog Scale (VAS) [13]. Then, the disease activity was calculated based on the Disease Activity Score (DAS-28) in RA patients [14]. The number of tender and swollen joints, serum ESR level, and VAS measurements were employed in the calculation. Joint sensitivity was determined with the Ritchie Articular Index (RAI) in RA patients [15]. Short Form-36 (SF-36) [16] and Nottingham Health Profile (NHP) [17] were employed to measure the functional capacity of the patients. Health Assessment Questionnaire (HAQ) [18] that scores daily life difficulties, Rheumatoid Arthritis Quality of Life Scale (RAQoL) [19] that determines the quality of life, and Duruöz Hand Index [20] that analyzes manual skills which evaluates manual ability were applied to RA and OA patients.

The AUSCAN Osteoarthritis Hand Index [21] that analyzes pain, stiffness, and daily life difficulties and the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) [22] were used in osteoarthritis patients. Radiographic analysis was conducted with the Modified Larsen [23] and Modified Sharp scores [24] and standard hand-wrist direct radiographs of the last 6 months in RA patients. Bilateral anterior-posterior (AP) hand radiographs of the hand osteoarthritis patients that were taken

in the last 6 months were analyzed. DIF, PIP joints and 1st carpometacarpal joints were examined with AP hand radiographs. Radiological analysis was conducted based on the Kellegren and Lawrence radiological staging system [25].

Statistical analysis

Statistical data were analyzed with the 'Statistical Packages for Social Sciences Version 21.0 for MS Windows' software. Correlations between the two numerical variables were analyzed with Spearman and Pearson correlation test. Inter-group comparisons were conducted with the Mann-Whitney U test. The three groups were compared with the Post Hoc test and analysis of variance was conducted with the one-way ANOVA. Independent samples t-test was employed to compare the pairs. Repeated measures ANOVA was employed to compare more than two independent variables, and paired samples t-Test was employed to compare the dependent variables. Continuous variables are presented in means \pm standard deviations, and categorical data are presented in percentages. $P < 0.05$ was accepted statistically significant.

Results

Among the RA patients included in the study, 47 (83.9%) were female and 9 (16.1%) were male, 47 (92.2%) OA patients were female and 4 (7.8%) were male. The mean age was 49.9 ± 11.2 in RA patients, and it was 60.2 ± 8.7 in OA patients. The mean disease duration was 9.2 ± 6.5 (0.25-32) years in RA patients, and it was 1.2 ± 1.9 (0.3-10) years in OA patients. The mean BMI was 26.78 ± 4.99 kg/m² in RA patients, and it was 30.34 ± 4.68 kg/m² in OA patients. In routine laboratory examinations, ESR, white blood cell, and platelet counts were significantly higher in the RA group (Table 1).

Table 1. Participant demographics and laboratory findings.

	RA	OA	P
Gender (Female, %)	47 (83.9%)	47 (%92.2)	0.193
Age (yars)	49.9 ± 11.2	60.2 ± 8.7	0.000
BMI (kg/m ²)	26.78 ± 4.99	30.34 ± 4.68	0.000
Disease duration (years)	9.29 ± 6.53	1.21 ± 1.95	0.000
ESR (mm/h)	29.51 ± 19.14	20.03 ± 14.07	0.006
CRP (mg/dl)	10.5 ± 12.2	5.42 ± 4.48	0.054
RF (IU/mL)	85.28 ± 124.11	11.7 ± 9.6	0.000
Hemoglobin (g/dL)	13.14 ± 1.69	13.1 ± 1.27	0.965
Hematocrit (%)	40.2 ± 4.48	39.73 ± 3.22	0.629
White cell (mcL)	8.57 ± 2.77	6.03 ± 1.41	0.000
Platelet ($\times 10^3/\mu\text{L}$)	311.44 ± 84.51	262.21 ± 78.04	0.001

(RA: Rheumatoid Arthritis, OA: Osteoarthritis, BMI: Body Mass Index, ESR: Erythrocyte Sedimentation Rate, CRP: C-reactive protein, RF: Rheumatoid Factor) $p < 0.05$ was considered significant.

HAQ, RA-QoL and Duruöz Hand Index scores were similar in both groups. VAS Fatigue level and NHP fatigue score were significantly higher in the RA group. The hand grip strength was significantly lower in the RA group; however, the difference between finger grip strength findings was

Table 2. Clinical activation parameters, functional capacity measures, anxiety and depression scores in RA and OA groups.

	RA	OA	P
VAS Pain	49.43±21.26	53.53±17.38	0.352
VAS Patient Global Assessment	47.23±21.16	47.45±15.82	0.881
VAS Physician Global Assessment	46.25±21.36	44.71±16.59	0.844
VAS Fatigue	51.79±21.6	36.67±25.72	0.002
Right hand grip (kg)	15.39±6.47	17.03±4.24	0.030
Left hand grip (kg)	14.58±6.56	16.18±4.01	0.046
Right hand finger grip (kg)	4.86±2.02	5.19±1.32	0.161
Left hand finger grip (kg)	4.63±2.08	4.88±1.18	0.195
DAS-28	5.04±1.79	-	-
Ritchie Artricular Index	25.38±21.57	-	-
HAQ	1.3±0.73	1.44±0.49	0.287
RAQoL	14.64±8.42	12.76±6.41	0.215
Duruöz Hand Index	36.57±20.54	34.31±15.39	0.713
NHP Pain score	57.14±29.56	53.67±17.72	0.313
NHP Physical Activity Score	44.41±23.34	52.3±15.02	0.107
NHP Fatigue Score	42.85±40.55	26.14±36.7	0.024
NHP Sleep Score	36.42±36.8	36.86±34.72	0.935
NHP Social Isolation Score	34.15±35.17	23.92±29.12	0.144
NHP Emotional Reaction Score	34.91±30.8	25.48±24.57	0.151
NHP Total Score	250.26±152.81	216.44±124.72	0.305
SF-36 Physical Function	36.69±30.35	32.15±22.11	0.680
SF-36 Physical Role Restriction	31.25±44.27	30.39±42.81	0.983
SF-36 Body Pain	49.57±24.69	46.72±21.17	0.491
SF-36 General Health	35.91±22.25	53.37±24.51	0.000
SF-36 Vitality	52.23±26.71	64.21±24.9	0.023
SF-36 Social Function	62.93.57±32.24	67.15±26.57	0.556
SF-36 Emotional Role Restriction	42.85±46.15	65.36±43.18	0.011
SF-36 Mental Health	64.35±21.77	73.88±20.18	0.27
HAD Depression	7.75±6.07	4.98±4.87	0.011
HAD Anxiety	6.3±4.36	3.59±3.85	0.001

(RA: Rheumatoid Arthritis, OA: Osteoarthritis, VAS: Visual Analog Scale, DAS-28: Disease Activity Score, HAQ: Health Assessment Questionnaire, RAQoL: Rheumatoid Arthritis Quality of Life Scale, NHP: Nottingham Health Profile, SF-36: Short Form-36) p<0.05 was considered significant.

Table 3. AUSCAN and WOMAC scores in the OA group.

	OA Group
AUSCAN Pain Score	8.98±3.55
AUSCAN Stiffness Score	1±0.72
AUSCAN Physical Function Score	20.59±7.1
AUSCAN Total Score	30.59±11.05
WOMAC Pain Score	3.4±1.67
WOMAC Stiffness Score	1.83±1.33
WOMAC Physical Function Score	3.6±1.58
WOMAC Total Score	8.86±4.11

(OA: Osteoarthritis) p<0.05 was considered significant.

not significant. HAQ score, RAQoL, and Duruöz Hand Index scores on functional capacity were similar in both groups. SF-36, general health, vitality, and emotional role limitation scores were significantly higher in the OA group, HAD depression and HAD anxiety scores were significantly higher in the RA group (Table 2).

Osteoarthritis-specific functional measures, AUSCAN and WOMAC scores were analyzed (Table 3).

The correlations between functional and radiological scores

and clinical parameters were compared in RA patients. A negative correlation was determined between Duruöz Hand Index score and grip strength. Positive correlations were observed with other clinical parameters. Positive correlations were observed between RAI, clinical activation parameter, and radiological scores (Table 4).

There was negative correlation between Duruöz Hand Index score and grip in osteoarthritis patients. Positive correlations were observed between the Duruöz Hand Index

Table 4. The correlations between Duruöz Hand Index Score, Total Larsen Score, Total Sharp Score and Various Clinical Parameters in RA patients.

	Duruöz Hand Index Score		Total Larsen Score		Total Sharp Score	
	R	p	r	P	R	p
DAS-28	0.762	0.000*	0.290	0.030	0.273	0.042
RAI	0.856	0.000	0.411	0.002	0.394	0.003
HAQ	0.945	0.000	0.325	0.015	0.314	0.018
RAQoL	0.798	0.000	0.255	0.058	0.225	0.095
HAD Anxiety	0.625	0.000	0.189	0.163	0.146	0.283
HAD Depression	0.668	0.000	0.268	0.046	0.226	0.095
Right Hand Grip	-0.773	0.000	-0.428	0.001	-0.404	0.002
Left Hand Grip	-0.733	0.000	-0.408	0.002	-0.377	0.004
Right Hand Finger Grip	-0.787	0.000	-0.491	0.000	-0.471	0.000
Left Hand Finger Grip	-0.775	0.000	-0.474	0.000	-0.455	0.000

(DAS-28: Disease Activity Score, RAI: Ritchie Articular Index, HAQ:Health Assessment Questionnaire, RAQoL: Rheumatoid Arthritis Quality of Life Scale) p<0.05 was considered significant.

Table 5. The correlations between Duruöz Hand Index Score, Kellegren-Lawrence Score, and Various Clinical Parameters in OA patients.

	Duruöz Hand Index Score		Kellegren-Lawrence	
	R	p	r	P
WOMAC Total	0.573	0.000*	0.362	0.009
AUSCAN Total	0.872	0.000	0.472	0.000
HAQ	0.878	0.000	0.546	0.000
RAQoL	0.736	0.000	0.440	0.001
HAD Anxiety	0.326	0.019	-0.033	0.820
HAD Depression	0.434	0.001	0.051	0.724
Right Hand Grip	-0.723	0.000	-0.552	0.000
Left Hand Grip	-0.753	0.000	-0.497	0.000
Right Hand Finger Grip	-0.613	0.000	-0.34	0.015
Left Hand Finger Grip	-0.604	0.000	-0.296	0.035

(HAQ:Health Assessment Questionnaire, RAQoL: Rheumatoid Arthritis Quality of Life Scale) p<0.05 was considered significant.

score and other clinical parameters. Negative correlations were observed between hand grip, finger grip, and radiological scores (Table 5).

Discussion

It could be suggested that OA leads to disabilities by impairing the quality of life and functions of the patients, there were correlations between radiological scores that indicated joint damage and hand function scores, and quality of life and hand functions were similar across OA and RA. Rheumatoid arthritis is a chronic disease and a significant cause of disability. Disability is prevalent in hand and wrist joints, where the disease is actively involved. Involvement in these joints, which play a key role in performing daily activities, could lead to both short- and long-term disability due to various factors and problems [26-29]. OA is the most common degenerative joint disease characterized by focal and progressive loss of articular cartilage and destruction of subchondral bone and periarticular structures [30]. Involvement in large joints such as knees and hips is often induced by the hands, and PIP, DIF and CMC are accompanied by joint involvement [31]. It is one of significant health problems in countries with a large elderly

population, leading to social and economic problems, and is the most important reason for workforce loss.

In the present study, the Duruöz Hand Index scores that measure hand functionality were similar in the RA and OA groups, similar to the findings reported by Poiraudau et al. [31] It was demonstrated that RA leads to serious hand deformities, whereas OA also restricts hand functions to a degree similar to RA. Since no significant difference was determined between the HAQ and RAQoL scores of both groups, it could be suggested that hand OA significantly impaired the quality of life of the patients, similar to RA.

Since RA and OA induce pain, they could have psychological outcomes. Mella et al. [32] reported higher depression scores in RA patients when compared to the OA group; however, the difference was not statistically significant between the anxiety scores of the two groups. In the present study, HAD depression and anxiety scores were statistically significantly higher in the RA group when compared to OA. This finding could be associated with systemic RA involvement.

Fatigue is common in RA, and its absence indicates disease remission [33]. In a study where fatigue was compared be-

tween RA and OA patients, it was emphasized that fatigue was associated with depression, not with pain, disease activity, disability or erosion in RA patients [34]. In the present study, VAS fatigue score was significantly higher in the RA group. This finding could be associated with systemic RA involvement of RA and higher depression scores in the RA group.

In the present study, positive correlations were determined between Duruöz Hand Index scores and the DAS-28, HAQ, and VAS scores in RA patients. There was a negative correlation between hand grip and finger grip. Dedeoglu et al. [35] also reported similar findings. Birtane et al. [36] reported a correlation between DAS-28 and Duruöz Hand Index score; however, they did not determine correlations between radiological and Duruöz Hand Index scores and suggested that hand functions were independent of radiological scores. In the present study, a negative correlation was determined between hand grip, finger grip, and radiological scores. Furthermore, there were positive correlations between radiological scores and disease activation parameters such as VAS, DAS-28 scores, and RAI. It could be suggested that hand functions were particularly affected by disease activity and radiological scores were associated with hand functions.

In the study, positive correlations were determined between radiological scores and HAQ, RAQoL, total WOMAC, and total AUSCAN scores in OA patients. Negative correlations were observed between radiological scores and hand grip. Similarly, a negative correlation was observed between Duruöz Hand Index and grip strength. Guler et al. [37] observed a positive correlation between radiological stage and HAQ score, and unlike our study, they did not report a correlation between radiological stage and hand grip and finger grip. Ceceli et al. [38] reported a negative correlation between radiological hand score and hand and finger grip strength scores, similar to our study. It could be suggested that hand functions were affected by disease activity and radiological hand function scores in OA.

The relatively small number of patients is among the limitations of the study.

Conclusion

Although RA leads to serious hand joint deformities, it could be suggested that hand osteoarthritis could also lead to disabilities by creating similar hand function problems and affect daily activities. Hand functions should be monitored in clinical OA follow-ups. It could be concluded that radiological scores could assist the physician in monitoring the functions.

Ethical approval

Our study was carried out in accordance with the principles of the Declaration of Helsinki, after receiving approval from the Firat University Ethics Committee (31.12.2013-10/03).

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