EVALUATION OF HAND FUNCTION IN RHEUMATOID ARTHRITIS PATIENTS USING ABILHAND QUESTIONNAIRE AND CORRELATION WITH SOME CLINICAL DATA

THESIS

Submitted in Partial Fulfillment of MD. Degree of Rheumatology & Rehabilitation

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2016

ABSTRACT

Rheumatoid arthritis (RA) patients with active disease usually develop progressive deleterious clinical and radiological damage that may influence hand function. This thesis aimed to test the relations between hand function and clinical and radiological characteristics of RA.

In this study 60 RA patients were subjected to full history taking, clinical examination, radiological evaluation, disease activity assessment by DAS28, objective hands function assessment by testing for power, pinch, and pulp to pulp grips, gross manual dexterity testing by Box and Block Test (BBT), and manual ability assessment by the ABILHAND questionnaire.

Radiological damage was linearly correlated to the DAS28 score and disease. The hand function as evaluated by the ABILHAND questionnaire was inversely correlated to the DAS 28, disease duration, and radiological damage. Measures of hands ' strength for power, key pinch, and pulp-to-pulp grips tests of both hands were all found to be significantly correlated. BBT for each hand correlated to power and key pinch grips strength but not to the pulp-to-pulp grip.

ABILHAND questionnaire scores could be predicted DAS28 scores and morning stiffness duration while BBT could be predicted by power and pulp-to-pulp grips strengths. Age, disease duration, radiographic findings could not predict ABILHAND and BBT scores.

The degree of the disability of manual abilities could depend on the complex interaction between the task to be done, the patient's motivational status, and his or her compensatory behaviors as radiological damage, disease duration, deformities, and limited ROM did not always experience worse hand functions.

Keywords: rheumatoid arthritis, arm, activities of daily living, disability evaluation, outcome assessment.

ACKNOWLEDGMENTS

First and foremost thanks are due to 'ALLAH', the most beneficial and merciful.

I would like to give my sincerest gratitude to Prof. Dr. Basel El-Zorkany, Prof. of Rheumatology & Rehabilitation, Cairo University, for graciously supervising this thesis, his invaluable advice, patience, endless assistance and continuous encouragement which were essential to for this study to be finally achieved.

I wish particularly to express my deepest gratitude and appreciation to Prof. Dr. HananKotb, Ass. Prof. of Rheumatology & Rehabilitation, Cairo University, for her endless help and support and for her friendly guidance. She patiently supervised every bit of detail in all the chapters of this thesis.

I also thank the members of Rheumatology & Rehabilitation department, Cairo University, my colleagues for their help, and all patients participated in this study.

Mahmoud Mohammed El-Naggar

Cairo, 2016

Aim of the work

The purpose is to assess the impact of rheumatoid arthritis disease on hand function by using the ABILHAND questionnaire and correlation with some clinical and radiological characteristics.

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ABBREVIATIONS

ACR	American college of rheumatology
AIMS	Arthritis impact measurement scale
AIMS-SF	Arthritis impact measurement scale short form
ANOVA	One-way analysis of variance
BBT	Box and block test
C:MC	Carpo-metcarpal ratio
CDAI	Clinical disease activity index
CLINHAQ	Clinical health assessment questionnaire
CMC	Carpometacarpal
CRP	C reactive protein
DAS	Disease activity score
DIP	Distal interphalangeal joint
DMARDs	Disease-modifying anti rheumatic drugs
EULAR	European league against rheumatism
HAQ	Health assessment questionnaire
HAQ-DI	Health assessment questionnaire disability index
ICF	International classification of functioning
IP	Interphalangeal
IU	International units
M1	Primary motor cortex
MC	Midcarpal
MCP	Metacarpophalangeal
MRI	Magnetic resonance imaging
MTX	Methotrexate
P-A	Posterior-anterior
PIP	Proximal interphalangeal joint
QOL	Quality of life
RA	Rheumatoid arthritis
RADAI	RA disease activity index
RADAR	Rapid assessment of disease activity in rheumatology
RC	Radiocarpal
RF	Rheumatoid factor
ROM	Range of motion
RU	Radioulnar
SD	Standard deviations
SDAI	Simplified disease activity index
SENS	Simple erosion narrowing score
SES	Short erosion scale
SF-36	Medical outcome study short form-36
TNF	Tumor necrosis factor
ULN	Upper limit of normal
VAS	Visual analogue scale
VPT	Vibrotactile perception thresholds
WHO	World health organization

THE FUNCTIONAL ANATOMY AND BIOMECHANICS OF THE UPPER EXTREMITY

The upper extremity is interesting from a functional anatomy perspective because of the interplay among the various joints and segments necessary for smooth, efficient movement. Movements of the hand are made more effective through proper hand positioning by the elbow, shoulder joint, and shoulder girdle. Also, forearm movements occur in concert with both hand and shoulder movements. These movements would not be half as effective if the movements occurred in isolation (Magermans et al., 2005).

The functional structure of the hand and wrist

The hand is primarily used for manipulation activities requiring very fine movements incorporating a wide variety of hand and finger postures. Consequently, there is much interplay between the wrist joint positions and efficiency of finger actions. The hand region has many stable yet very mobile segments, with complex muscle and joint actions (Joseph and Kathleen, 2007).

The bony structure

The bones of the wrist consist of the distal radius, scaphoid, lunate, triquetrum, pisiform, trapezium, trapezoid, capitate, and hamate. Five metacarpals and 14 phalanges make up the hand and the five digits (Figure 1)(Weissman and Sledge, 1986).

The most important carpal bone is the scaphoid because it supports the weight of the arm, transmits forces received from the hand to the bones of the forearm and it's also a key participant in wrist joint motions. It transmits forces when the hand is fixed and the forearm weight is applied to the hand (Hamill and Knutzen, 2010). Because the scaphoid interjects into the distal row of carpals, it sometimes moves with the proximal row and other times with the distal row (Moritomo et al., 2000).

The pisiform is categorized as a carpal bone and is aligned volar to the triquetrum in the proximal row of carpals. It is not part of the wrist joint per se but functions as a sesamoid bone in the flexor carpi ulnaris tendon (Kaewlai et al., 2008).

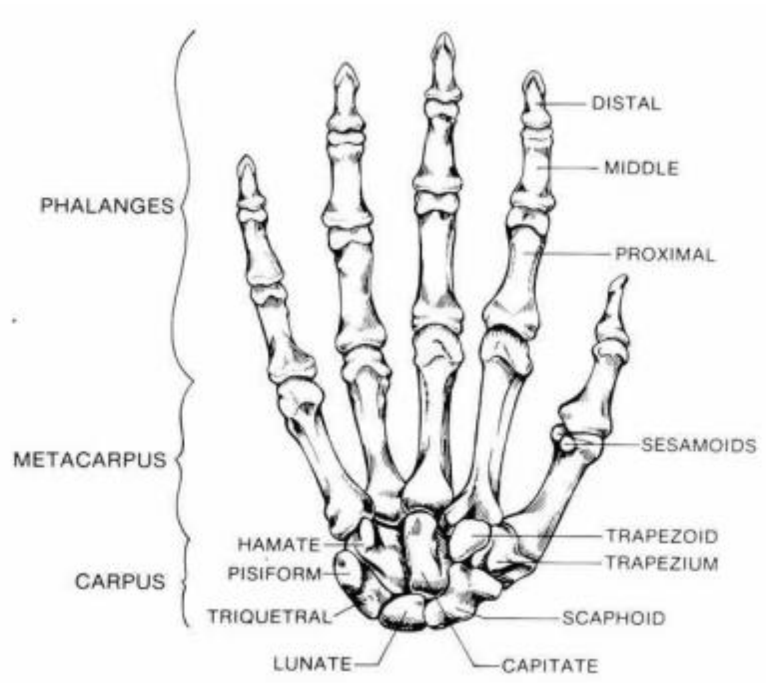

Figure 1. Bones of hand and wrist**(**Carolyn and Wadsworth, 1983)

The articulating surfaces of the capitate and hamate are convex and slide on the concave articulating surfaces of a portion of the scaphoid, lunate, and triquetrum so with flexion and extension, as well as radial and ulnar deviation, their combined surfaces slide opposite the physiological motion. The articulating surfaces of the trapezium and trapezoid are concave and slide on the convex distal surface of the scaphoid so with flexion and extension their combined surfaces slide in the same direction as the physiological motion. Because the trapezoid is bound to the capitate, they cannot slide in opposite directions during radial and ulnar deviation. The trapezii (the trapezium and trapezoid) therefore slide in a dorsal direction on the scaphoid during radial deviation and in a volar direction during ulnar deviation (Figure 2) (Moojen et al., 2002).

Because the concave trapezii slide in a dorsal direction on the scaphoid and the convex capitate and hamate slide in a volar direction on the lunate and triquetrum during extension and radial deviation, the resulting motion is a supination twist of the distal row on the proximal row. A pronation twist occurs during flexion and ulnar deviation as the trapezii slide volarly and the capitate and hamate slide dorsally (Figure 2) (Moojen et al., 2002).

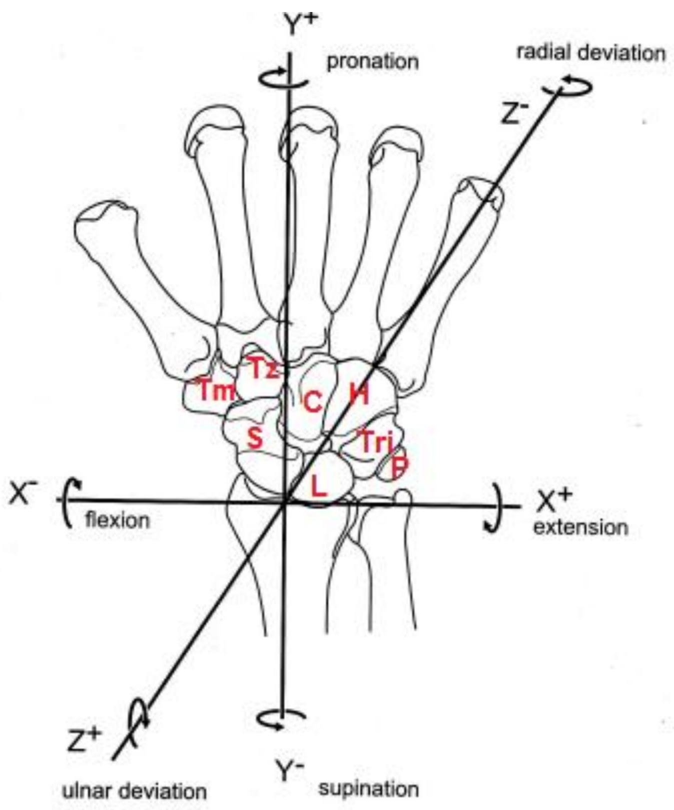

Figure 2. XYZ Coordinate system used to describe screw axis orientation and position, viewing the carpus from a posterior position. The direction of the carpal rotation is indicated by flexion, extension, pronation, supination, and radial and ulnar deviation. The direction of carpal translation is indicated by positive and negative signs. **(**Moojen, 2002**)**

Joints of the wrist

The wrist joint is multiarticular and is made up of two compound joints; radiocarpal (RC) and midcarpal (MC) joints . It is biaxial, allowing flexion (volar flexion), extension (dorsiflexion), radial deviation (abduction), and ulnar deviation (adduction). Stability is provided by numerous ligaments: the ulnar and radial collateral, the dorsal and volar (palmar) radiocarpal, the ulnocarpal, and the intercarpal ligaments (Figure 3) (Resnick, 2002).

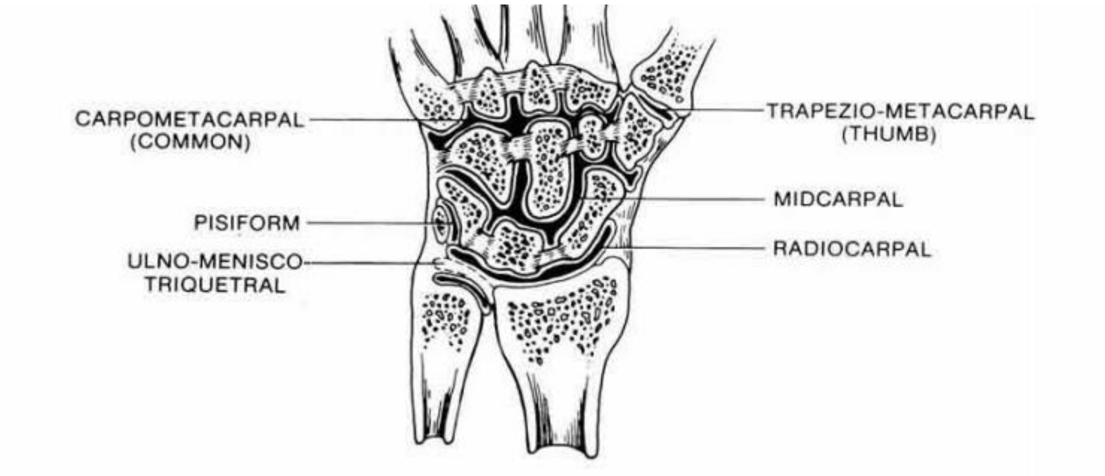

Figure 3. Joints of the wrist**(**Carolyn and Wadsworth, 1983**)**

The RC is enclosed in a loose but strong capsule that is reinforced by the ligaments shared with the MC joint. Proximally the biconcave articulating surface is the distal end of the radius and radioulnar disk; it is angled slightly volarward and ulnarward. Distally the biconvex articulating surface is the combined proximal surface of the scaphoid, lunate, and triquetrum. The triquetrum primarily articulates with the disk. These three carpals are bound together with numerous interosseous ligaments (Resnick, 2002).

The MC joint is a compound joint between the two rows of carpals. It has a capsule that is also continuous with the intercarpal articulations. The combined distal surfaces of the scaphoid, lunate, and triquetrum articulates with the combined proximal surfaces of the trapezium, trapezoid, capitate, and hamate (Resnick, 2002).

The distal radioulnar (RU) joint is not part of the wrist joint, although pain and impairments in this forearm articulation are often described by the patient as wrist pain (Shaaban et al., 2004).

When the hand flexes at the wrist joint (Figure 4), the movement begins at the MC joint. This joint accounts for 60% of the total range of flexion motion, and 40% of wrist flexion is attributable to movement of the scaphoid and lunate on the radius. The total range of motion (ROM) for wrist flexion is 70◦ to 90◦, although it is reported that only 10◦ to 15◦ of wrist flexion is needed for most daily activities involving the hand. Wrist flexion ROM is reduced