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RESEARCH ARTICLE

RHEUMATOID HAND: CLINICAL, RADIOLOGICAL AND GRIPSTRENGTH ASSESSMENT

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Abstract

Background: Rheumatoid arthritis is a systemic autoimmune disorder of unknown etiology. Grip force and strength are a common measurement used in the assessment of the hand function

Methodology: Patients of at least two years duration history of rheumatoid arthritis, attending rheumatology unit in the period from October 1995 to April 1996, were included in this descriptive study. Patients with a history of trauma or operation in the hand or wrist joint were excluded.

Results: Female were 83 patients (83%) and males were 17 patients (17%). Deformities in 200 hands were reported which showed. Flexor tenosynovitis was more in the middle (56) and index (53) fingers than in other fingers, and more in the right (103) than the left (75) hand. The grip strength was impaired in all patients. Mild impairment reported in 14%, moderate impairment in 27% and severely impaired hand grip was seen in 59% of patients.

Conclusion: Flexor tenosynovitis and subluxation of metacarpophalangeal joints were seen more in the right than the left hand and more in the index and middle fingers than in other fingers. Grip strength assessment is frequently used in clinical trials and is a sensitive indicator of disease activity.

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Introduction:-

Rheumatoid arthritis is a systemic autoimmune disorder of unknown etiology. Its major distinctive feature is chronic symmetric and erosive synovitis of peripheral joints. An elevated titer of serum Rheumatoid factor was found in 85% of patients. Associated extra-articular manifestations may include subcutaneous nodules, vasculitis, pericarditis, pulmonary interstitial fibrosis, episcleritis and scleritis⁽¹⁾.

Its prevalence among Iraqi people is 1%⁽²⁾.

The articular manifestations of RA can be placed into two categories, reversible signs and symptoms related to inflammatory synovitis and irreversible structural damage brought by synovitis⁽³⁾.

Among the factors contributing to the development of deformities of the hand are the articular and periarticular structural changes of RA together with forces involved in the use of the hand⁽⁴⁾⁽⁵⁾.

Hakstain and Tubiana emphasized the importance of tissue destruction in the production of deformity and stated that external forces of hand use only have a secondary effect⁽⁵⁾.

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Teno-synovitis may often accompany synovitis and spontaneous Rheumatoid tendon rupture may occur which is due primarily to the effect of tenosynovitis on the tendon and secondarily to the effect of tenosynovitis on the bone⁽⁶⁾.

Patients with RA in whom articular bone lesions confined to the wrist and/or carpal joints in X-ray films may follow milder disease activity than do the patients with hand and finger joint lesions.

The former patients are milder in disease activity and fewer in No. of affected joints as well as milder in clinical course and have a better prognosis⁽⁷⁾.

Grip force and strength are a common measurement used in the assessment of the hand function⁽⁸⁾⁽⁹⁾.

The grip can be measured in a variety of ways, the most satisfactory and reproducible being using a rubber bag attached to a sphygmomanometer⁽¹⁰⁾.

The quality of the information gained from grip strength measurement and its interpretation depends on the established reliability of the instruments, and the consistency of test administration⁽¹¹⁾.

Grip force can be used as an indicator of improvement, for comparing the effectiveness of various treatment procedures and for the assessment of a patient's ability to return to home activities and previous employment⁽⁹⁾.

Aim of The Study:

To shed some light on the relationship between clinical and radiological changes of the rheumatoid hand and its function based on grip strength test.

Patients and methods:-

One hundred patients, 83 females and 17 males with a diagnosis of RA according to (ARA revised 1987 criteria for classification of RA)⁽¹²⁾⁽⁹⁾. Patients of at least two years duration, attending rheumatology unit in Baghdad teaching hospital in the period from October 1995 to April 1996, were included in this descriptive study. All patients except one were right-handed. Patients with a history of trauma or operation in the hand or wrist joint were excluded.

Two hundred hands were examined for:

1. Dislocation of the ulnar styloid.
2. Dislocation of the carpal bones.
3. Subluxation of the metacarpophalangeal joints.
4. Correctable ulnar deviation.
5. Uncorrectable ulnar deviation.
6. Swan - neck deformity.
7. Boutonniere deformity.
8. Z-deformity of the thumb.
9. Dropped finger (ruptured extensor tendon).
10. Flexor tenosynovitis: is said to be present if two of the following three criteria are present⁽¹³⁾:
11. Pain, swelling or tenderness along flexor tendon or sheath.
12. Snapping, crepitation, or locking of finger.
13. Difficulty in flexion or extension of finger.

Grip strength of the dominant hand was evaluated for all patients, using a sphygmomanometer and they were grouped into mild, moderate and severe impairment (< 45, 45-100, 100-180) mmHg for female and (< 55, 55-140, 140-250) mmHg for male⁽¹⁴⁾.

Postero-anterior X-ray films of both hands (including wrists) were taken for 85 patients, and their changes were read by two observers blindly and assigned by Steinbrocker radiographic stage⁽¹³⁾.

Stage I: No destructive changes, but periarticular osteoporosis may be present; stage II: osteoporosis and slight cartilage and/or subchondral bone destruction may present; stage III: osteoporosis and cartilage and/or bone destruction; stage IV: stage III finding plus fibrous or bony ankylosis.

Rheumatoid factor (Latex fixation test) and Erythrocytes sedimentation rate (wester green) was done for all patients.

Statistical analysis:

Chi-square test used to find the relationship between different variables: clinical deformities, radiographic changes, and grip strength impairment.

Results:-

Characteristics of patients were shown in table-1, where females were 83 patients (83%) and males were 17 patients (17%) with a male to female ratio of 1:4.9. Patients with positive Rheumatoid factors (RF) constituted 69% of the total patients. The prevalence of positive RF among the two genders was close to each other (69.9% and 64.7% respectively).

Table 1:- Characteristics of patients in the study (n = 100).

Variables	Female	Male	Total
	n(%)	n(%)	n
Gender	83(83)	17(17)	100
Inpatients	51	12	63
Outpatients	32	5	37
Patients with positive Rheumatoid factor	58(69.9)	11(64.7)	69
	mean	mean	
Mean age (year)	45.9	49.2	--
Mean diseases duration (year)	8.6	8.4	--
Mean Erythrocyte Sedimentation rate	63	58	--

Hand deformities:

Deformities in 200 hands were reported in table 2 which showed a dropped finger was seen only in one patient involving the left middle and ring fingers and the right little finger. Flexor tenosynovitis was more in the middle (56) and index (53) fingers than in other fingers, and more in the right (103) than the left (75) hand. Correctable and uncorrectable ulnar deviation and subluxation of metacarpophalangeal joints were seen only in female patients.

According to table-3 dislocation of ulnar styloid was observed in 81 hands (48%), while dislocation of carpal bones was seen in 10 hands (5%).

Table 2:- Rate of occurrence of different types of deformities in fingers of rheumatoid arthritis hands.

Deformity		Thumb	Index	Middle	Ring	Little	Total
Dropped finger	Rt	--	--	--	--	1	1
	Lt	--	--	1	1	--	2
Swan neck deformity	Rt	--	11	11	6	9	37
	Lt	--	7	7	7	7	28
Boutonniere deformity	Rt	--	--	1	4	4	9
	Lt	--	--	2	4	2	8
Flexor tenosynovitis	Rt	4	29	34	26	10	103
	Lt	1	40	22	18	10	75
Correctable ulnar deviation	Rt	--	10	9	7	6	32
	Lt	--	9	7	8	8	32
Uncorrectable ulnar deviation	Rt	--	13	15	14	12	54
	Lt	--	11	13	13	13	55
Subluxation of MCP joint	Rt	--	20	20	18	13	71
	Lt	--	17	15	10	10	52
Z deformity of thumb	Rt	14	--	--	--	--	14
	Lt	10	--	--	--	--	10

Table 3:- Prevalence of dislocation of ulnar styloid and carpal bones in study patients.

Deformity	Right hand	Left hand	Total
Dislocation of ulnar styloid	43	38	81
Dislocation of Carpal bones	5	5	10

Radiographic finding:

Out of the 85 patients, only four did not show periarticular osteoporosis two were males, one of them had erosion in one site and two were females both of them had erosions in multiple sites. Radiographic stage III was the commonest, seen in 31.7%. Radiographic stage I, II and IV were seen in 25.8%, 15.2% and 27% of the patients respectively as shown in (table 4).

Table 4:- Radiographic staging of rheumatoid arthritis patients’ hand.

Radiographic stage (n=85)	No of patients	%
Stage I	22	25.8
Stage II	13	15.2
Stage III	27	31.7
Stage IV	23	27
Total	85	100

Hand grip strength:

The grip strength was impaired in all patients. Mild impairment reported in 14%, moderate impairment in 27% and severely impaired hand grip was seen in 59% of patients.

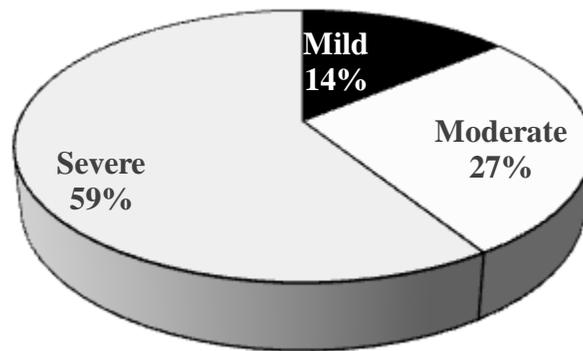


Figure-1:- Hand grip strength impairment.

Severe radiographic destructive changes (stage IV) was seen in 23 patients (27%), 15 of these patients had severe impairment of handgrip strength. The study shows a significant relationship between the hand radiographic stage and severity of grip strength impairment as shown in table-5.

Table 5:- Relationship between radiographic changes stages and severity of hand grip strength impairment.

Radiographic stage (N=85)	Hand grip strength impairment				Chi-square test P-value
	Mild	Moderate	Severe	Total	
Stage I	7	7	8	22	X ² = 54.21 P-value < 0.005*
Stage II	1	6	6	13	
Stage III	1	5	21	27	
Stage IV	3	5	15	23	
Total	12	23	50	85	

*Significant value

The study also showed no significant relationship between hand deformities and severity of handgrip strength impairment (table 6).

Table 6:- Relationship between hand deformities and handgrip strength impairment.

Types of deformity	Hand grip strength impairment				Chi-sq test P-value
	Mild	Moderate	Severe	Total	
Dislocation of ulnar styloid	6	15	27	48	X ² = 23.87

Dislocation of carpal bones	--	3	2	5	P> 0.05*
Dropped finger	--	--	1	1	
Flexor tenosynovitis	5	14	25	44	
Correctable ulnar deviation	3	4	5	12	
Uncorrectable ulnar deviation	1	2	12	15	
Swan neck deformity	3	2	14	19	
Boutonniere deformity	1	2	8	11	
Z-deformity of thumb	3	3	8	14	
Subluxation of MCP joint	2	2	18	22	
*Not Significant, MCP Metacarpophalangeal					

Discussion:-

Grip strength assessment is frequently used in clinical trials and is a sensitive indicator of disease activity⁽⁸⁾. Varying the position of the forearm altered the strength of the grip⁽¹¹⁾. Patients with rheumatoid arthritis had approximately a 75% reduction in maximum grip strength⁽⁸⁾.

Ulnar styloid dislocation was the commonest deformity observed (4%) followed by flexor tenosynovitis (44%). Only one patient had a dropped finger. The patient was female, with the seropositive disease for 12 years. Flexor tenosynovitis and subluxation of metacarpophalangeal joints were seen more in the right than the left hand and more in the index and middle fingers than in other fingers and this possibly due to excessive use of these two fingers during hand function and so greater muscles pull on the metacarpophalangeal joints of these fingers⁽⁴⁾.

The prevalence of correctable and uncorrectable ulnar deviation swan-neck deformity, boutonniere deformity and flexor tenosynovitis in this study was compared with Mody et al. study⁽⁴⁾, correctable and uncorrectable ulnar deviation and subluxation of metacarpophalangeal joints were seen only in female patients. The possible explanations are a relatively little number of male patients in this study and probably excessive use of the hand in homework by female patients.

Radiographic stage III was the commonest in the current study group while stage IV was the commonest group 33.3% in Regn-Smith et al. study, stage I was higher in our study than that reported by Regn-Smith et al. which was 14.8%⁽¹⁵⁾.

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