

Hand Deformities in Patients with Rheumatoid Arthritis

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Abstract:

Objective: To estimate the types of hand deformities in patients with rheumatoid arthritis (RA).

Methods: A group of 100 patients who had been admitted to the department of rheumatology and rehabilitation center in Sulaimany general hospital and those who had been attended to the rheumatology and rehabilitation center between June 2006 and January 2007 were included in this study.86% were females and 14% were males . Patients who had undergone articular surgery and patients below 16 years had been excluded.

Results: Hand deformities recorded in 47% of cases. The frequency of deformities was as follow; swan neck deformity (48.90%), boutonniere deformity (43.04%), Z deformity(59.5%), ulnar deviation of the metacarpophalangeal joints (MCPJ) (78.7%), radial deviation of the wrist (91.48%), subluxation of the wrist (27.6%), and subluxation of the MCPJ(36.17%).There was a significant correlation between disease duration and development of deformities,other factors that had been studied but had no effect on the development of deformities were rheumatoid factor positivity ;occupation of the patients ;effect of weather;and geographical distribution of the patients.

Conclusion: Rheumatoid arthritis is an important disease that affects the hands and cause deformities. Understanding these deformities is necessary for the proper management of these patients. This study is representative for RA related hand deformities and factors that contribute to their development.

Key Words: Rheumatoid Arthritis ,Hand deformity.

Introduction:

Rheumatoid arthritis (RA) is the most common connective tissue disorders ,with variable degree of severity and disability ⁽¹⁾.It is a chronic inflammatory disease characterized by progressive damage of the synovial-lined joints and variable extra-articular manifestations. Tendon and bursal involvement are frequent and often clinically dominant in early disease ⁽²⁾. RA has a worldwide prevalence of approximately 1% ⁽³⁾. The disorder occurs three times as often in women and has a peak onset of between 40 to 60 years of age ⁽⁴⁾.

Generally , signs and symptoms of RA begins insidiously and are additive over weeks to months ,they commonly include fatigue ,malaise, generalized stiffness, and generalized arthralgias and myalgias. Synovitis usually develops gradually , frequently involving the hands ,wrist ,knees, or feet ,often symmetrically .However ,in 10% to 15% of patients ,the onset of the disease may be explosive ,with polyarthritis, fever ,lymphadenopathy and splenomegaly developing over days to weeks⁽⁵⁻⁶⁾.

Although there is a bundant evidence that RA is immune mediated disease, it is still not clear whether it is primarily an autoimmune disease; whether the initiating agent is infective, self antigen, or both; to what extent the course of the disease depend on systemic or joint specific

events; or how the cells within the rheumatoid joint interact to produce the invasive and destructive environment observed in the disease⁽⁷⁾.

Hand deformity is a typical feature of the RA. The disease not only involves the synovial membrane of the joint but many other structures ,such as tendons, muscles, capsules ,and ligaments⁽⁸⁾.With persistence inflammation ,a variety of characteristics joint changes develop. These can be attributed to a number of pathologic events including laxity of the supporting soft tissue structures ;damage or weakening of ligaments ;tendon and joint capsule; cartilage degradation ;muscle imbalance ;and unopposed physical forces associated with the use of the affected joints⁽⁹⁾.

In RA, functional impairment is a composite of disease activity and damage⁽¹⁰⁻¹³⁾.While disease activity is responsive to treatment ,damage is considered irreversible and occurs over time⁽¹⁴⁾.Structural damage in the typical patients begins sometimes between the first and second year of the disease⁽¹⁵⁾. In fact, RA rarely remits spontaneously after the first year⁽¹⁶⁾.

The wrist is the most common joint involved in the upper extremity in RA⁽¹⁷⁾. Typical deformities include shortening of the wrists ,scapho-lunate dissociation , carpal supination ,translocation of the carpus in a lunar and volar direction ,radial deviation of the carpus and dorsal subluxation of the ulna ,the extensor carpi-ulnaris tendon often subluxes volarly ,the clinical result of these problems are pain ,loss of function and cosmetic changes⁽¹⁸⁾.So characteristic changes include ;radial deviation at the wrist with ulnar deviation of the digit often with palmar subluxation of the proximal phalanges (Z deformity)⁽⁹⁾ ,flexion and extension contracture in the proximal and distal interphalangeal joint of the fingers that lead to characteristic swan-neck deformity (flexion contracture at the distal interphalangeal joint and hyperextension at the proximal interphalangeal joint) or boutonniere deformity (flexion contracture at the proximal interphalangeal joint and hyperextension at the distal interphalangeal joint)⁽¹⁹⁾ .The pathology of swan-neck deformity is initiated at the level metacarpophalangeal joint⁽²⁰⁾ , while the pathology of the boutonniere deformity begins with synovitis of the proximal interphalangeal joint , followed by elongation of the central slip , subluxation of the lateral bands , and contracture of the retinacular ligament⁽²¹⁾ . thumb involvement include hyperextension of the first interphalangeal joint and flexion of the first metacarpophalangeal joint with a consequent loss of thumb mobility and pinch⁽⁹⁾

With the introduction of potent therapeutic for RA in recent years , attention has once again turned toward joint damage in this condition over the years , data from a number of groups have demonstrated clearly that there is an inexorable linear progression of joint damage in patients with RA⁽²²⁻²⁴⁾

Patients and Methods:

One hundred patients fulfilling the American college of rheumatology (ACR) criteria were enrolled. the patients were those who had been admitted to the general hospital, department of rheumatology in Sulaimany city and those who attended the Sulaimany rheumatology and rehabilitation center from June -2006 to January-2007.

A protocol was designed to record age, gender, residence, occupation of the patient, duration of the disease, rheumatoid factor, and types of deformities.

A detail history was taken and full clinical examination was done .The hands were examined to detect the presence of swan-neck deformity, boutonniere, Z deformity of the thumb, radial deviation of the wrist joint, ulnar deviation of the metacarpophalangeal (MCP) joints , subluxation of the wrist and subluxation of the MCP joints.

Serology for detecting rheumatoid factor had been done for all the patient . Daily weather data were obtained from the meteorological service in Kurdistan region (25), greater attention was paid to the months on which the temperature dropped dramatically as a result of cold waves. .78% of cases were living in cold weather and 22% were living in hot weather .The temperature of the cold

regions was ranging from (-3 to 5 C°), while the temperature of the hot regions was ranging from (15 to 20 C°).

All data were arranged and distributed in number, percentage, mean, and standard deviation by using statistical functions in Microsoft Excel. Comparison between the discrete variables were done by using t-test, chi-square test, p-value<0,05 were considered as significant

Results:

One Hundred patients comprising 86 females (86%) and 14 males (14%) with a mean age of 51.24 years were enrolled, female to male ratio was 6.14:1 as shown in table(1).

Of the patients, 75% were seropositive (n=75) and 25% were seronegative (n=25) as shown in table (2).Figure (2) show the rheumatoid factor in male and female patients.

Table-1:-Case distribution of rheumatoid arthritis according to demographic character.

<i>Sex</i>	<i>No.</i>	<i>%</i>
<i>Male</i>	14	14%
<i>Female</i>	86	86%
<i>Total</i>	<i>100</i>	<i>100%</i>

Table-2 :- Rheumatoid factor distribution

<i>RF</i>	<i>Frequency</i>	<i>Percentage</i>
<i>Positive</i>	75	75%
<i>Negative</i>	25	25%
<i>Total</i>	<i>100</i>	<i>100%</i>

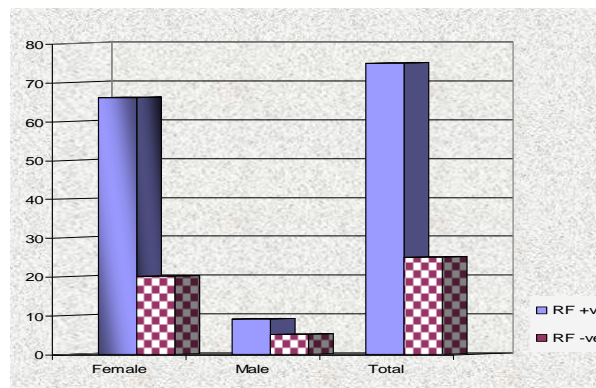


Figure (2) : Rheumatoid factor in male and female patients with RA

Age of the patients was divided into three classes ,larger number was the class of age between 35 and 55 years and the class above 55 years as shown in table (3).

Forty seven percent of cases have one or more deformities and 53% have no hand deformity as shown in table (4).

There was no significant difference in age and gender distribution between those with and without deformities as shown in table (5).

Among 47 patients with hand deformities, 39(82.97%)patients were seropositive and 8 (17.02%) patients were seronegative, while 36(67.92%) patients were seropositive and 17(32.07%) patients were seronegative in 53 patients without hand deformities as shown in table (6),therefore, the correlation between rheumatoid factor and hand deformity was not significant, p-value =0.08

Duration of the disease in patients with hand deformities range from 3 months to 40 years, mean duration (SD) was 12.94 (8.27), compared to disease duration in patients without hand deformities in which the range was 3 months to 34 years, mean duration (SD) was 6.05(6.67) . Table (7) shows the classes of duration of the disease , we found that the duration of the disease positively correlate with development of hand deformities p-value=0.000006

Table-3 :- Age distribution in rheumatoid arthritis

<i>Age classes</i>	<i>No.</i>	<i>%</i>
<i>< 35 years</i>	17	17%
<i>(35-55) years</i>	41	41%
<i>> 55 years</i>	42	42%
<i>Total</i>	100	100%

Table-4 :-Hand deformity distribution in rheumatoid arthritis

<i>Variables</i>	<i>No.</i>	<i>%</i>
<i>Hand deformity +ve</i>	47	47%
<i>Hand deformity -ve</i>	53	53%
<i>Total</i>	100	100%

Table -5 :- Gender distribution in those with & without deformities

<i>Gender</i>	<i>Hand deformity</i>	
	<i>Positive</i>	<i>Negative</i>
<i>Female</i>	40	46
<i>Male</i>	7	7
<i>Total</i>	47	53

Table-6 :- Rheumatoid factor in patients with and without hand deformity

	<i>Hand deformity</i>	
	<i>Positive</i>	<i>Negative</i>
<i>RF +ve</i>	39(82.98%)	36(67.90%)
<i>RF -ve</i>	8(17.02%)	17 (32.10%)
<i>Total</i>	47(100%)	53(100%)

Table (7)- Duration of the disease in cases with and without deformities in Rheumatoid arthritis.

<i>Duration of disease</i>	<i>Hand deformity</i>	
	<i>Positive</i>	<i>Negative</i>
<i><5 years</i>	10(21.30%)	31(58.5%)
<i>5-10 years</i>	8(17.00%)	14(26.40%)
<i>>10 years</i>	29(61.70%)	8(15.10%)
Total	47(100%)	53(100%)

Table (8) lists the numbers and percentages of different deformities that were present. Some patients had more than one deformities. Swan neck deformity was present in 48.90 % of the patients,43.04% had boutonniere deformity,59.5% had Z deformity of the thumb ,91.48% had radial deviation of the wrist joint,78.7% had ulnar deviation of the MCP joints ,27.6% had subluxation of the wrist joint and 36.17% had subluxation of the MCP joints.

The frequencies of hand deformities had been demonstrated in the right and left hand and in bilateral sides, bilateral affection was more common than affection of each side separately as shown in table (8)

Table-8: Categories of hand deformity in rheumatoid arthritis.

Hand deformity	Right Hand	Left Hand	Both Hands	Total
Swan neck	8	4	11	23(48.90%)
Boutonniere	2	4	9	19(43.04%)
Z deformity	5	3	21	29(59.5%)
Radial deviation of the wrist	3	0	40	43(91.48%)
Ulnar deviation of the MCPJ	2	0	35	37(78.7%)
Subluxation of of the MCPJ	1	0	16	17(36.17%)
Subluxation of the wrist	0	0	13	13(27.6%)

Seventy six percent of cases were from the center of the city compared to 24% of patients who were from the rural area. Among those who were from the city center, 43.4% (33 cases)were those with hand deformity and 56.6% (43 cases)were those without deformity ,while those from rural area, 58.33% (14 cases)were having hand deformities and 41.66% (10 cases) had no any hand deformity as shown in table (9).

Distribution of the cases had been done according to the occupation of the patients ,38 cases of those with hand deformities were housewives ,1 patients was teacher, 2 patients were students ,4 patients were workers ,and patients were retired. While in those without hand deformities ,42 cases were housewives,1 patient was teacher ,1 patient was student ,6 patients were workers ,and 3 cases were employers, as shown in table (10).

Table (9):- Geographical distribution of the patients

Hand deformity	City center	Rural area	Total
Negative	43(56.6%)	10(41.66%)	53
Positive	33(43.4%)	14(58.33%)	47
Total	76(100%)	24(100%)	100

P-Value =0.2 (not significant)

Table (10):- distribution of the patient according to occupation

Occupation	Hand deformity		Total
	Positive	Negative	
Housewife	38	42	80
Teacher	1	1	2
Student	2	1	3
Worker	4	6	10
Retired	2	0	2
Employers	0	3	3
Total	47	53	100

Table (11):-classification of the cases according to the weather

<i>Hand deformity</i>	<i>weather</i>		<i>Total</i>
	<i>Cold</i>	<i>Hot</i>	
<i>Positive</i>	34(43.5%)	13(59.1%)	47
<i>Negative</i>	44(56.5%)	9(40.9%)	53
<i>Total</i>	78(100%)	22(100%)	100

P-value=0.2 (not significant)

Seventy eight percent of cases were living in cold weather compared to 22% of cases living in hot weather.43.5% (34 cases) of those living in cold weather were having hand deformities and 56.5%(44 cases) had no any hand deformity , while 59.1%(13 cases)of those living in hot weather had hand deformity and 40.9%(9 cases) of them had no any hand deformities as shown in table (11)

Although the relation between the duration of the disease and development of deformities was statistically significant as mentioned previously, but the number of the deformities not affected by the duration of the disease as shown in the figure (4) which show the relation between the number of deformities and duration of the disease.

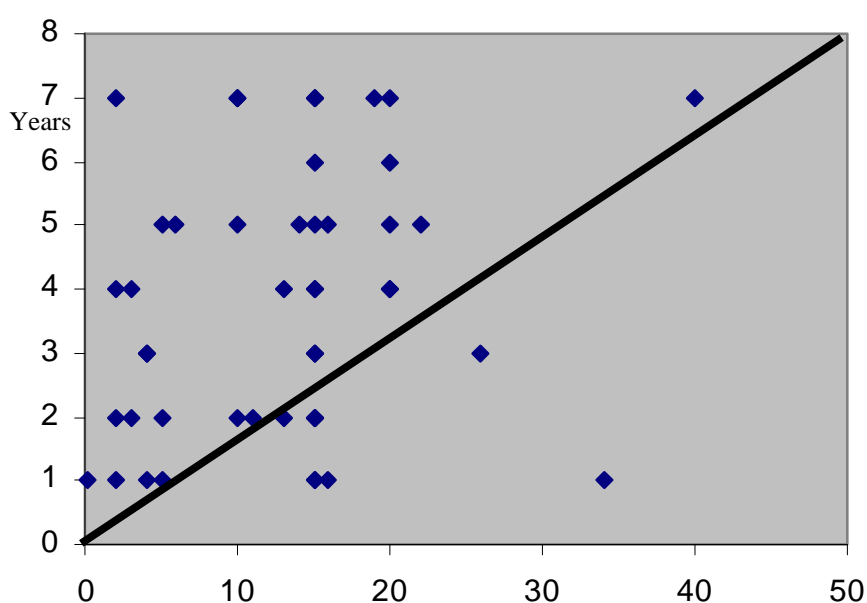


Figure (4) Relation between the number of deformities and duration of disease

Discussion:

Rheumatoid arthritis is a progressive, chronic systemic disease ,and it affects various organs but joint damage is the most prominent feature .Especially ,wrist and small joints of the hand are the most affected sites ,so, hand involvement and hand function are one of the major determinents of disease outcome (26)

47% had at least one form of hand deformities and 53% had no any deformities .Eberhardt et al (27), evaluated 89 patients and reported that one –third of the cases had developed hand deformities after 2 years of follow-up ,while in another study ,100 patients had been evaluated

and also one-third of them developed hand deformities after 20 months of the disease (8). Estimated from these figures, it seems that a considerable proportion of hand deformities develop in an early stage of the disease (8). Ercan et al (28), reported hand deformities in 81.5% in a study evaluating 87 patients with classical RA. This difference between these results and our results may be related to longer disease duration in our study which was 12.94 years (SD=8.27).

76% cases were from the city center, 33 cases (43.4%) were those with hand deformities, and 43 cases (56.6%) were those without deformities, compared to 24% of cases from rural area, 14 cases (58.33%) were those with hand deformities and 10 cases (41.66%) without deformities, this result is statistically not significant (p -value= 0,2), this means that geographical distribution of the patients does not affect the development of hand deformities, and this is due to migration of the patients from the rural area to the urban area in the last 15 years which had led to the overlap in the results. Kemble JV (34), investigated sixty-one rheumatoid patients relates their hand function to measured hand deformity, he found that certain deformities are related to a reduction in the function; other are not, and he reported that the dominant hand, used more frequently, deteriorates more quickly than the non-dominant hand. When patients with hemiplegia or poliomyelitis develop RA, the paralysed muscles are either spared or less severely involved (37-38). The most likely explanation for the asymmetrical involvement is the relative lack of use of the paralysed limb (37). Physical rest or immobilization is a beneficial form of treatment and has been shown to have a potent anti-inflammatory effect (38-40). The factors which contribute to the development of deformities of the hands are the structural changes of RA together with the forces involved in the use of the hands (34-41-42). Hakstian 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 (43). In our study, 86% of the cases were females, 38 cases were housewives and having hand deformities while 42 cases were housewives without deformities, therefore, there is no relation between the occupation of the patients and development of hand deformities (p -value=0.35), since most of our patients were females and were not employed.

Rheumatic pain is widely believed to be related to weather conditions. Although rheumatologic diseases are recognized as autoimmune disorders, it is believed that weather influences rheumatic pain (35). However, the effect of weather on rheumatic pain is still controversial according to various studies (36) carried out in Europe and United States. Eberhardt K (8) suggest that joint inflammation may contribute to the development of a deformity, however, additional pathogenetic factors probably related to the severity of the disease seem to be involved. We found that the exposure to cold does not affect development of the deformities because among the 78 cases who were living in cold weather, 34 cases were those with hand deformities and 44 cases had no deformities, therefore the relation between the development of hand deformity and the weather is statistically not significant (p -value =0.2).

Flatt AE (17), reported that the wrist is the most common joint involved in the upper extremities in patients with rheumatoid arthritis. Approximately 75% of RA patients develop wrist symptoms (17). During the course of the disease, up to 95% of these cases will have bilateral involvement (29) and this is approximately similar to our results, we found that the most common hand deformities was radial deviation of the wrist joint (91.48%) and bilateral involvement was (93.02%). Other hand deformities were swan neck deformity 23 cases (48.90%), boutonniere deformity 16 cases (43.04%), Z deformity of the thumb 29 cases (59.5%), ulnar deviation of the MCP joints 37 cases (78.8%), subluxation of the wrist joint 13 cases (27.6%), and subluxation of the MCP joints 17 cases (36.17%).

A previous study of established RA patients reported ulnar deviation , botounniere deformity ,and swan neck deformity in 33%,36%,and16% respectively (30).Eberhardt et al (8) reported the ratio of deformities as 13% ,16%, 8% ,respectively .Hatic et al (31) ,reported the ratio of these deformities as 10.5%,8.6%,and 10.5% respectively ,and another study reported the deformities as 39.5%,29.8%, and 27.5% (28).

The most common type of deformities in a study done by Ercan et al (28) was flexor tenosynovitis ,but non of our cases had flexor tenosynovitis .It had been claimed that there is a relationship between wrist and finger deformity according to the principle of intercalated zigzag (32) ,Read et al (33), found that the wrist deviation preceded the finger deviation ,and this is also reported by Eberhardt et al (27) ,in which one case in their study developed radial deviation of the wrist and this was occurred prior to ulnar deviation of the digit .In ours, 43 cases had radial deviation of the wrist , although the study was not designed to follow up the patients ,but the presence of 5 patients having only radial deviation of the wrist and in 7 patients ,the radial deviation of the wrist was associated with ulnar deviation of the fingers , therefore ,this finding is approximately similar to that of Read et al (33) and Eberhardt et al (27).

Seropositive patients are known to have destructive disease pattern compared to seronegative patients (31) .We found that 82.98% of our cases with hand deformities were seropositive compared to 67.90% seropositive patients without hand deformities , the difference between the two groups is statistically not significant and this finding is similar to that of Hetice et al (31).

The duration of the disease in those with hand deformities was longer than in those without hand deformities , we found a significant correlation between hand deformity and duration of the disease and this finding is also reported by Ercan et al(28),but there was no relation between the number of deformities and disease duration as shown in figure (4).

There was no significant difference in gender distribution between patients with and without deformities (see table 5) and this result also was claimed by Eberhardt et al(8). We conclude that the duration of the disease is the most important factor in the development of hand deformities in RA.

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