Hand function and total locomotion status in rheumatoid arthritis

An epidemiologic study

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The effects of destructive rheumatoid arthritis (RA) on hand function, as well as total locomotion status, were assessed in a Swedish population sample. In a community of 12,707 inhabitants, 82 were found with RA fulfilling ARA criteria 5–8, i.e., a prevalence of 0.7 percent. Seventy-seven of the 82 cases were evaluated with Sollerman's hand function test and our total locomotion score.

The mean hand score (max. 80) was 61 (0–78), with no difference between the right and the left hand or between men and women. Hand function worsened with increasing age of the patient, as well as with increasing disease duration. It was highly correlated with the total locomotion status of the patient.

A high correlation was found between hand function and hospital care. However, total medical or social costs for these patients were not related to hand function, but merely to the status of the lower extremities.

We have evaluated an epidemiologically representative subset of patients with classic and definitive rheumatoid arthritis using Sollerman's hand function test (1). The result was related to the total locomotion status of the patients evaluated with our multifactorial locomotion score (2) and the economic consequences of the disease (3).

Patients and methods

In an epidemiologic study of all 12,707 individuals living in the community Åtvidaberg, 82 patients with rheumatoid arthritis fulfilling ARA criteria 5–8 (prevalence 0.7 percent; Table 1) were identified (4). Three refused to participate in our study and 2 were unable because of illness, leaving 77 patients (46 women and 31 men) with a mean age of 65 (30–92) years. The age at the onset of the disease was 47 (7–91) years and the mean disease duration 19 (1–65) years, with no difference between men and women. All the patients were right-handed. All the patients underwent Sollerman's hand function test (1), which is a standardized and objectively defined system with good reproducibility. It consists of the main daily ADL tasks with prescribed hand grips. A quantitative value is obtained as an index of the individual hand profile. It distinguishes better between the separate functions of the hand and the arm giving a better evaluation of each item when compared with other available tests (5, 6). In addition, a clinical evaluation was made of the general orthopedic status with our detailed and total locomotion score assessed by orthopedic specialists (2). The assessment obtained with the more elaborate Sollerman's hand score was compared with our "ability score for the upper extremity," which is included in the total locomotion score.

The total costs and the medical costs, as well as the costs of previous hospital treatments, were analyzed separately. The information was obtained from medical records and from local and official health authorities (3).

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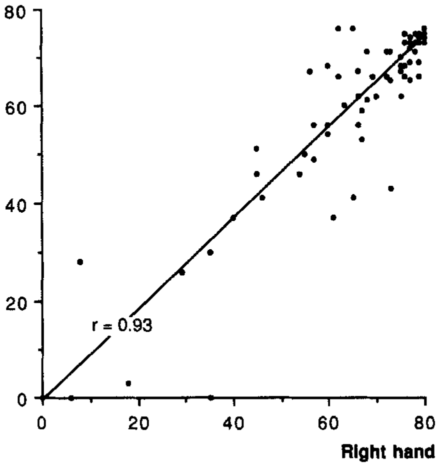
Table 1. Observations in 82 patients with rheumatoid arthritis

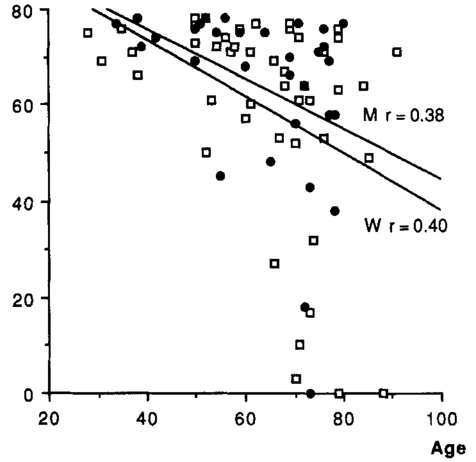
A	B	C	D	E	F	G	H	I	A	B	C	D	E	F	G	H	I
1	1	74	18	218	64	40	46	41	42	2	82	20	203	33	9		
2	2	65	39	0	84	54	62	76	43	2	72	28	238	31	6	18	3
3	1	60	16	208	72	46	77	74	44	2	68	34	0	54	34		
4	2	66	14	231	54	37	57	49	45	1	71	16	101	68	49		
5	1	70	25	113	92	65	65	76	46	1	78	3	0	77	55	60	56
6	1	67	45	167	70	49	73	65	47	2	71	23	63	49	29	55	50
7	2	62	6	51	69	48	67	53	48	2	79	16	53	46	30		
8	1	71	16	154	64	51	57	56	49	2	80	62	436	30	5	0	0
9	2	75	21	103	55	35	35	30	50	2	77	3	0	58	25	65	41
10	2	58	5	43	82	60	72	71	51	2	74	35	188	46	6	35	0
11	2	62	38	64	63	40	60	54	52	1	74	44	125	54	5	0	0
12	1	51	20	0	62	49	68	71	53	2	92	1	80	63	47	75	67
13	1	55	1	31	83	63	79	73	54	1	72	3	0	87	67	80	75
14	1	70	7	29	84	65	70	62	55	2	73	21	0	71	58	60	68
15	2	57	10	41	71	55	73	71	56	2	71	51	223	42	21	6	0
16	2	54	13	0	78	62	66	56	57	2	51	6	0	94	65	80	75
17	1	66	19	130	60	42	45	51	58	2	55	4	0	67	49	79	66
18	2	78	65	32	70	34	29	26	59	1	73	41	2	24	2	8	28
19	1	51	23	0	83	62	79	75	60	2	51	28	0	89	67	80	76
20	1	81	10	0	85	60	79	75	61	1	61	1	8	89	58	75	62
21	2	63	15	65	78	47	79	75	62	2	86	30	0	66	43	61	37
22	2	62	3	36	83	52	72	71	63	2	60	10	54	87	62	79	73
23	2	72	17	42	68	53	76	73	64	2	80	3	0	74	52	79	74
24	2	48	22	56	74	60	77	69	65	1	76	12	0	71	38	68	61
25	1	69	30	0	71	46	77	65	66	1	43	4	39	80	67	78	71
26	1	65	10	24	85	61	76	75	67	1	35	16	0	84	60	80	74
27	1	73	28	57	73	46	62	66	68	2	36	3	38	90	65	78	75
28	2	53	16	0	56	26	54	46	69	1	77	3	16	89	67	79	74
29	1	79	35	6	79	60	40	37	70	1	40	10	0	75	60	75	70
30	1	53	6	0	96	67	80	76	71	2	69	17	0	91	67	80	73
31	2	77	6	18	82	65	75	68	72	1	39	6	0	91	67	80	76
32	1	55	32	0	75	60	77	73	73	2	29	5	24	90	67	78	73
33	2	57	12	0	93	65	77	72	74	2	38	2	0	80	67	76	66
34	1	77	6	25	84	63	76	68	75	2	32	26	0	84	53	72	66
35	2	69	40	0	71	46	69	66	76	2	39	26	89	63	46	66	67
36	2	53	14	0	91	65	80	76	77	1	80	14	0	74	56	73	43
37	2	72	41	37	59	45	56	67	78	1	57	1	0	95	67	80	76
38	2	74	1	26	65	42	63	60	79	2	80	52	0	74	41	67	59
39	1	68	17	40	84	60			80	2	85	16	0	83	60	66	62
40	1	56	3	96	53	38	45	46	81	2	69	3	0	86	61	79	75
41	2	89	8	46	58	41	0	0	82	2	79	3	0	87	65	79	69

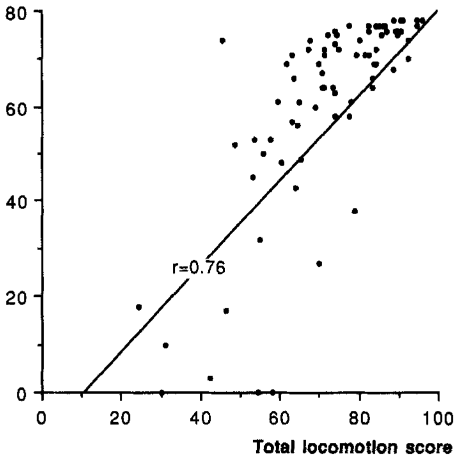
A Case
B Sex: 1 male, 2 female
C Age
D Disease duration
E Total in-hospital days
F Total locomotion score
G Ability score of the upper extremities
H Hand score for right hand
I Hand score for left hand

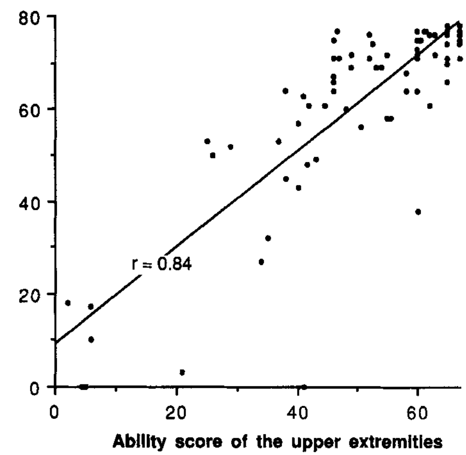
Table 2. Means of the total locomotion score, the hand score, and the ability score of the upper extremities in the total population of RA patients. All the differences between score categories are significant

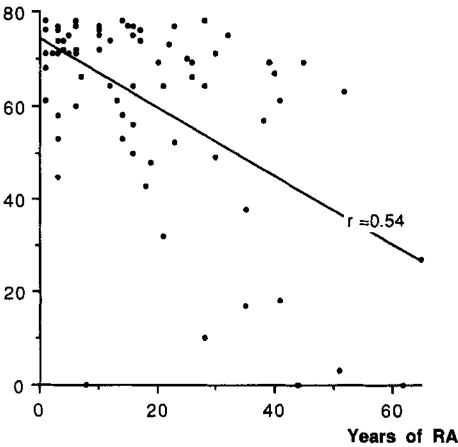
	Disability stages in RA				
Total locomotion score classes	0–50	51–69	70–90	91–100	max.
Total locomotion score observed	43	61	79	92	100
Hand score (Sollerman's)	16	51	69	76	80
Ability score, upper extremities	13	40	57	66	67
Number of patients	8	23	42	9	











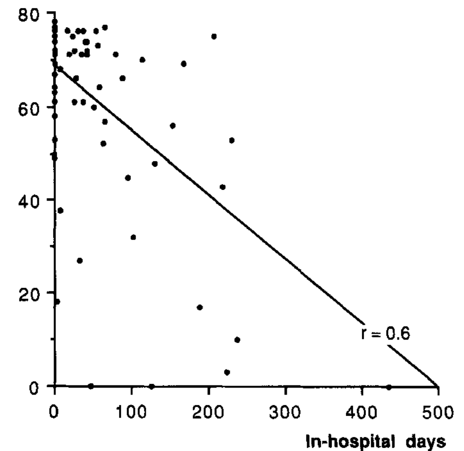


Figure 1–6. Hand function (Sollerman's score) in relation to other indeces in rheumatoid arthritis. ● men and □ women (Fig. 2).

The Student's t-test and regression analyses with two-tailed probability tests were used with $P < 0.05$ regarded as significant. A computer (DEC-20, University of Linköping) was used for monitoring the data.

Results

Mean hand scores in the Sollerman's test were 59 (0–78) for women and 64 (0–78) for men, equal for the right and left hands (Figure 1). With increasing age of the patients, lower scores ($P < 0.01$) were found for both men and women (Figure 2).

A highly significant correlation was found between Sollerman's hand score and general locomotion status (total locomotion score) for both the men and women (Figure 3), and also between the hand score and the separate scores included in our total locomotion score as total subjective and total objective score, as well as total upper extremity score separately (Table 2). The ability score of the upper extremities was related to Sollerman's hand score (Figure 4).

In the present population, 26 of the patients had had a total of 51 different hand operations performed. Their mean hand score was 59 (10–76) and total locomotion score 70 (33–92), as compared with 62 (0–78) and 72 (24–96) for those who had never had hand surgery.

Hand function was related to disease duration (Figure 5) and totally consumed in-hospital days (Figure 6). However, there was no relation between hand function and total costs for the disease, neither direct nor indirect costs.

Discussion

Our study represents a total population study as to the hand function in relation to the total locomotion status in patients with definitive RA found in an epidemiologic survey of a population representative of that of the whole of Sweden (4). We have found no similar study in the literature.

Grip strength, range of joint motion, radiographic appearance, as well as laboratory tests, are not easily evaluated as parameters of a patient's hand function (7–12).

The total locomotion score represents a total assessment of patients with varying degrees of joint involvement (2). We found a good correlation between the impairment of hand function examined by Sollerman's hand score and our ability score for the upper extremity included in our total locomotion score and, further, the total locomotion score assessing the condition of the total locomotion apparatus. In fact, these results constitute the current locomotion status of the disease. This may be determined again in future evaluations of new therapies for RA.

The function of the right and left hand was found to be impaired to the same extent with no sex difference, which accords with radiographic findings reported by Allander (13). He found up to 85 percent symmetry as to all extremity joint involvement in adult patients confirming Ragan and Farrington (14), who reported 86 percent symmetry.

Our findings further indicated worsened hand function with increasing age and disease duration. Obviously, hand function undergoes successive impairment similar to that of the total locomotion apparatus that we have reported previously; women having more pronounced symptoms and signs than men after the age of 65 (4). The age-related diminished functions seem to be due to the deleterious effects of the long-term disease process rather than to diminished ability with age to adjust to handicap.

We found good agreement between the impairment of hand function and reduced functional ability of the total locomotion system causing subsequent impairment of the activities of daily living. Very few patients with low locomotion score had good hand function and vice versa, and the impairment involved the upper and lower extremities to the same extent (2). Most of the patients with total locomotion score below 70 needed walking aids. These may cause a high load to the involved upper extremities, with accelerated joint deterioration and worsened symptoms. Endoprosthetic replacement of the major joints of the lower extremities is very important also in this respect and should be well timed with consideration also of the condition of the upper extremities and hands.

Hand function status was found to correlate well with the total consumption of in-hospital days, i.e., patients with severe involvement of their hands had a more aggressive general-disease activity that needed more advanced treatment. Somewhat surprisingly, hand function showed no relation to the costs for the disease. This is in contrast to the good correlation we found between the cost burden of the disease and the status of the total locomotion apparatus (3). The limitation of social activity level (handicap) from the disease is obviously most dependent upon the condition of the larger joints of the lower extremities. This stresses further the importance of a

close cooperation in a team of rheumatologist, orthopedic and hand surgeons, as well as physiotherapist, occupational therapist, and social assistant, when operation priorities are established.

One third of our patients had undergone hand surgery—such as nerve decompressions, synovectomies, tenosynovectomies, tendon repairs, small joint arthrodesis, wrist arthrodeses, ulnar head prostheses of silicon, and MCP prostheses—on the dominating hand. In retrospect, their hand function was found to be comparable to that of the nonoperated on patients. Unquestionably, specific surgical interventions had prevented further deterioration of function that then remained at a level of moderate impairment, which was representative for the rheumatoid hand in general.

Acknowledgements

This work was supported by grants from the Lions, LIC Research Foundation, and Östergötland County. We thank the chief occupational therapist Ms Alva Joost-Davidsson and her coworker Ms Jane Lindstrand for their devoted and skilled work with the testing of the hand function.

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