Hand deformities are important signs of disease severity in patients with early rheumatoid arthritis

Pia M. Johnsson¹ and Kerstin Eberhardt¹

Introduction

Hand deformity is a typical feature of RA. Due to disease manifestations in structures of the hand, e.g. tendons, capsules, bone and ligaments, different deformities can occur. The pathogenesis of hand deformities and the development over time are, however, not fully known. Most prevalent deformities are ulnar deviation of the MCP joints, button hole deformity (BHD) and swan neck deformity (SND). It is not uncommon that the same hand develops different deformities simultaneously [1]. Deformities together with other deficits such as reduced grip strength and pain can have a major impact on hand function and subsequently the ability to perform activities of daily life [2]. It may also lead to distress or depression [3]. Knowledge about prevalence and importance of hand deformities in RA patients is limited and based on the data from cross-sectional studies of patients with established RA [4–6].

A prospective study of RA patients followed from an early stage with standardized assessment also included evaluation of hand deformities [7]. In a preliminary report, we have described the occurrence of hand deformities and their significance after 2 years follow-up for the first 100 patients that were included in the prospective study [8]. In the present study, we wanted to investigate incidence and prevalence figures for different hand deformities during the first 10 years for the entire cohort comprising 183 patients. Furthermore, in our previous report, we described that patients who had developed deformities had a more severe disease. A second aim of the present study was to try to establish the significance of hand deformities for disease severity in a longer time perspective.

Methods

Patients

The study population consisted of patients with recent onset of RA taking part in a longitudinal study initiated at Lund in 1985 (Lund early RA cohort) [7]. The study was approved by the Ethical Committee at the Lund University.

The baseline characteristics, clinical and laboratory assessments and also follow-up details have been described in a previous report [9]. Briefly, 183 patients with early RA symptoms were included between 1985 and 1989. There were 116 (63.7%) women; mean ± s.d. of age was 51.4 ± 12.4 years and mean ± s.d. of duration of symptoms before inclusion was 12 ± 7 months. All patients fulfilled the 1958 ARA diagnostic criteria for definite RA [10].

Assessment

The patients were assessed at least once a year at a team care unit. Treatment was administered at the same unit according to common principles. Hand function (range of motion) was measured with a performance test: signals of functional impairment (SOFI) [11]. This consists of four items assessing opening grip of the hand, finger flexion, pinch grip and thumb opposition. Each item has three scale steps (0, no impairment; 1, slight to moderate impairment; and 2, severe impairment), and the total range of SOFI hand score for right and left hand is, thus, 0–16. Grip strength was measured by a sphygmonanometer.

The occurrence of hand deformities was assessed. Ulnar deviation of the MCP joints was measured with a goniometer and the values obtained were compared with established normal values [8]. SND and BHD were considered to be present when two independent observers were in agreement.

Disability was assessed by a validated Swedish version of the Stanford HAQ Disability Index [12]. Hand disability was studied in more detail at the 10-year follow-up by applying a special hand HAQ. This test comprised seven items from the original HAQ as shown in Table 1. The total sum for hand HAQ can add up to between 0 and 21. Disease activity was estimated by ESR and radiographic changes by the Larsen method.

Results

One hundred and eighty-three early RA patients were included in the study during 1985–89. Mean ± s.d. of age at onset was 51.4 ± 12.4 years and mean duration of symptoms before inclusion 12 ± 7 months; 64% were women. The patients were followed annually. Assessment of hand deformities was standardized. Hand mobility was measured by signals of functional impairment (SOFI), disability by HAQ and hand HAQ, disease activity by ESR and radiographic changes by the Larsen method.

Conclusions

More than half of the patients in this early RA cohort had developed hand deformities after 10 years. Most deformities occurred during the first year of the disease. Presence of hand deformities had an impact on daily life function and added useful prognostic information, being an early sign of a more severe disease.

Key words: RA, Hand deformity, Hand disability, Longitudinal study, Prognosis.

References

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Radiographic damage was evaluated according to Larsen and Dale. The scoring procedure has been described in detail elsewhere [13]. In short, 32 joints in hands and feet were evaluated. A joint damage score (JDS) was calculated by adding all scores, the wrists multiplied by five, resulting in a range of 0–200.

**Pharmacological treatment**

No patient had received DMARDs before inclusion. Throughout the study, patients with active disease were offered treatment with such drugs. In the early years, d-penicillamine and anti-malarials were the most frequently used and subsequently MTX became the most commonly used DMARD. During the study time, 75% of the patients had received at least one DMARD and 46% received oral corticosteroids.

**Statistical analyses**

Differences between groups were assessed with Mann-Whitney U-test or chi-square test when appropriate. Correlations were evaluated using Spearman’s rank coefficient method. The association between presence of hand deformities at Year 1 or 2 and future radiographic damage at Year 5 was assessed by 4-field cross-tabulations. The median value was used as grouping level for the JDS scores at Year 5. Cross-tabulation of RF status against occurrence of hand deformity or not at study finish was also performed.

**Results**

One hundred and eight (59%) patients developed at least one hand deformity during the study time. Figure 1 shows the number of patients developing their first deformity each year of the 10-year follow-up time. Sixteen patients had developed a deformity already at study start. They were included in the Table 1. Questions included in the Hand Disability Index

<table>
<thead>
<tr>
<th>Question</th>
<th>n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cut your meat?</td>
<td>183 (100)</td>
</tr>
<tr>
<td>Lift a full cup or glass to your mouth?</td>
<td>183 (100)</td>
</tr>
<tr>
<td>Prepare your own meal?</td>
<td>183 (100)</td>
</tr>
<tr>
<td>Open car doors?</td>
<td>183 (100)</td>
</tr>
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<td>183 (100)</td>
</tr>
<tr>
<td>Turn taps on and off?</td>
<td>183 (100)</td>
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The 19 patients who dropped out did not differ in any clinical, laboratory or radiographic variable at inclusion compared with those who completed the study.

Patients with deformities had more disease activity during the first 5 years. They showed more hand impairment, more general disability and higher JDSs throughout the study time. Hand disability was markedly worse after 10 years. JDS scores refer to changes in both hands and feet. Our intention was to compare disease severity, and we therefore chose to use total scores. Almost all patients had changes in both hands and feet [13].

JDS for the whole patient group after 5 years was median 9.5 (S.D. 5.7) months after onset of symptoms. The 19 patients who dropped out did not differ in any clinical, laboratory or radiographic variable at inclusion compared with those who completed the study.

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JDS for the whole patient group after 5 years was median (IQ range) of 41 (15–62). Presence of a deformity both at Years 1 and 2 was significantly associated with a JDS above median after 5 years (P < 0.05 and <0.01, respectively). Odds ratios (95% CI) were 2.1 (1.023, 4.385) and 2.255 (1.176, 4.324), respectively.

**Discussion**

This is, to our knowledge, the first study observing the development of hand deformities longitudinally in an early RA cohort. It is notable that most deformities occurred at an early stage of the disease, which makes our findings of hand deformity as a sign of

**TABLE 1. Questions included in the Hand Disability Index**

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<td>183 (100)</td>
</tr>
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<td>Cut your meat?</td>
<td>183 (100)</td>
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**FIG. 1. The rate of primary hand deformities each year in patients with early RA followed for 10 years.**
disease severity clinically useful. Numerous features associated with the prognosis of different consequences of the disease have been identified [14]. These include genetic, clinical, biological and radiological factors, which can be complex to measure. In this context, hand deformity is a simple marker that could be detected at a clinical examination. Presence of hand deformities seems to be a neglected feature in the assessment of RA patients.

Patients with deformities at the different observation points had consistently more joint damage. Furthermore, after only 1 year, there was an association between presence of hand deformities and more joint damage after 5 years. This might have prognostic implications as progression of joint damage is most rapid during the first 5 years [13].

Others have reported the associations between joint damage and deformity in long-standing RA [15, 16]. Highton et al. [17] showed that measurements of hand dimensions reflecting mobility and deformity were related to radiographic scores. They could also demonstrate that their hand dimension test showed some sensitivity to change [17].

Hand deformities had a much impact on both hand function and general function. Hand mobility measured by SOFI was much more impaired in the deformity group throughout the study time. When comparing HAQ and hand HAQ, the level of significance indicates that a great deal of loss of daily life function depended on hand function. Vliet Vlieland et al. [2] stated that ulnar deviation was an important determinant of hand function and that SND was of greater importance for hand function than BHD. One of the authors of this paper (P.M.J.) has found that hand deviation combined with difficulty in fully extending the MCP joints as well as SND had a great impact on the ability to grip and hold objects. These deformities cause loss of contact surfaces between the object and the palm and fingers, thus greatly affecting the ability to perform daily activities (unpublished material). The relationship between disability and hand deformity has also been demonstrated in other studies [5, 6].

It was more difficult to control disease activity in patients with deformities at least for the first 5 years. Our study may therefore serve as a reference for future investigations of patients treated according to the current standard.

After 10 years, 59% of the patients had developed one or more deformities. Prevalence data for ulnar deviation, BHD and SND were 44, 24 and 23.5%, respectively. These figures are in keeping with two other cross-sectional studies [4, 5], whereas a third study had much lower prevalence of all hand deformities [6]. The diverging results may be due to differences in study population and study design. Mutations deformities were rare, occurring in only one patient; a finding in accordance with others [18].

To conclude, in this cohort, most hand deformities were developed early in the disease course. Presence of a hand deformity is a simple measure at site, which has impact on daily life function and adds useful prognostic information, being a sign of a more severe disease.

Rheumatology key messages

- Hand deformities occurred early in the disease course.
- Presence of deformities had major impact on daily life function.
- Presence of deformities is also a warning sign of a more severe disease.

Acknowledgements

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References

Clinical Vignette

Phytophotodermatitis due to Ruta graveolens prescribed for fibromyalgia

A 48-year-old female with FM presented with extensive ‘burns’ that appeared after exposure to the sun following previous application of an infusion of Ruta graveolens, recommended by her physician to relieve pain. Clinical examination revealed erythema and oedema with tense vesicles and blisters grouped in the centre and lateral areas of her back (Fig. 1A). There were no lesions on the area covered by the bathing suit or on the anterior torso, which had not been exposed to the sun. The patient was prescribed treatment with oral antibiotics, corticoids, analgesics and local healing with antibiotic ointment. At 2 weeks, the clinical symptoms had resolved, leaving extensive residual hyperpigmented areas (Fig. 1B).

Ruta graveolens is a bush that is native to the Mediterranean area but distributed worldwide as a cultivated plant and used in popular medicine to treat various rheumatological and skin diseases. It contains various photosensitizing substances (furocoumarins), which are excited by ultraviolet radiation type A via a phototoxic [1] mechanism, inducing the formation of reactive oxygen species that damage epidermal, dermal and endothelial cells. The application of a high concentration of rue infusion and subsequent sun exposure causes the acute onset of symptoms, since furocoumarins are fat soluble and penetrate more readily if the skin is humid.

FM is a common syndrome with no effective treatment, and many patients report to have used one or more alternative treatments that are not exempted from adverse events. Patients should be warned of this type of reaction by their homeopathic doctors.

Disclosure statement: The authors have declared no conflicts of interest.