Hand function tests are important and sensitive tools for assessment of treatment response in patients with rheumatoid arthritis

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Objectives: To assess the usefulness of hand function measurements in a study of treatment effects of tumour necrosis factor (TNF) blockers and to define the relationship between different hand function tests and also relate hand function to general disability and disease activity.

Methods: The study group consisted of 49 patients with established rheumatoid arthritis (RA) who were followed for 1 year while on TNF inhibitors. Evaluation of hand function included Signals of Functional Impairment (SOFI), grip and pinch grip force, and the Grip Ability Test (GAT). General disability was assessed by the Health Assessment Questionnaire (HAQ) and disease activity by the 28-joint Disease Activity Score (DAS28). The standardized mean response (SMR) method was used to evaluate sensitivity to change for all hand tests using DAS28 and HAQ as external indicators of change.

Results: HAQ, DAS28, grip and pinch grip force, and GAT showed a highly significant improvement over time (p < 0.001). The improvement in SOFI was also significant (p < 0.01). The correlations between the different hand tests varied between 0.45 and 0.72. All hand function tests were significantly related to HAQ but showed only weak correlations to DAS28. SOFI, grip force, and pinch grip force showed large sensitivity for improvement in DAS28 and HAQ (SMR = 0.8–0.9). GAT showed modest sensitivity (SMR = 0.6–0.7).

Conclusions: Patients with advanced RA attained considerable improvement in hand function that was only partly reflected by measures of general disability and disease activity. Focused assessment of hand function is therefore important for optimal evaluation of treatment response.

Finger and wrist involvement is typically present in patients with rheumatoid arthritis (RA), and is often apparent in the early stage of the disease (1–3). This frequently results in disturbed hand function. Hand function is a composite of several components such as joint structure, mobility, muscle strength, and coordination. Because many activities of daily living (ADL) require hand use, hand function is an important component of disability (1). Thus, assessment of hand function is crucial in studies of treatment effects, and, ideally, instruments should be used that evaluate the different components of hand function.

Tumour necrosis factor (TNF) inhibitors are known to markedly diminish disease activity in the majority of patients with RA, and these would therefore be suitable for evaluation of instruments that measure treatment responses.

In the present investigation we report on comprehensive hand function assessment in a group of patients starting therapy with TNF blockers followed up for 1 year. We used four well-established tests assessing mobility, grip force, pinch grip force, and performance of ADL. We wanted to define the relationship between the different measures and also relate hand function to overall disability and disease activity. We also wanted to evaluate the sensitivity to change of the different hand tests.

Patients and methods

Patients

Forty-nine consecutive RA patients were included in the present pilot study. The patients were part of a large ongoing clinical observational study of patients receiving anti-TNF therapy in southern Sweden (4). The patients who were selected for the observational study should have received at least two disease-modifying anti-rheumatic drugs (DMARDs), including methotrexate, with unsatisfactory response.
The pilot study group consisted of 12 men and 37 women. The mean (SD) age was 54.9 (12.2) years and the mean (SD) disease duration was 15.0 (10.0) years. The patients fulfilled the diagnostic criteria for RA according to the American College of Rheumatism (5). Twenty-seven patients were treated with etanercept and 22 with infliximab.

Clinical evaluation

The patients were examined according to a standard protocol in the outpatient clinic. Disease activity was measured with the 28-joint Disease Activity Score (DAS28), which is a composite index involving swollen and tender joints, erythrocyte sedimentation rate (ESR), and patient’s global assessment of disease activity (6). Disability was evaluated by the validated Swedish version of the Health Assessment Questionnaire (HAQ) (7). This index is self-administered and daily function is divided into eight categories, each consisting of 2–3 activities. The total score can range from 0 to 3.0.

Two experienced occupational therapists (OTs) performed the hand function assessments. We selected hand function tests with well-established and satisfactory measurement properties especially regarding inter- and intra-observer reliability (8–11). Impairment was evaluated by the following three instruments. Mobility was assessed by range of motion movements included in Signals Of Functional Impairment (SOFI) (8). The patient performed four standardized movements: finger flexion, opening grip, pinch grip, and opposition of the thumb. The performance of each movement is scored from 0 to 2, giving a maximal total score of 16 for both hands. A higher score denotes more impairment.

Grip force was measured with an electronic instrument, Grippit (9). Maximal strength during 10 s was recorded. Pinch grip force (tip pinch grip) was measured by a gauge (10). Mean values for right and left hands were used for both grip force and pinch grip force. The measuring instruments were calibrated regularly.

The Grip Ability Test (GAT) was used to evaluate hand disability (11). This test includes three practical tasks: putting a flexi-grip stocking on the nondominant hand, putting a paper clip on an envelope, and pouring water from a jug. The time in seconds used to perform each task was recorded and ranged from 10 to 276 s.

Statistical analyses

Comparisons of changes over time of the different clinical tests were assessed by the paired t-test. The relationship between the tests (i.e. assessment of construct overlapping) was evaluated by the Spearman correlation coefficient method. Standardized mean response (SMR; mean change/standard deviation of change) was used to assess the responsiveness of the different hand tests. SMR was classified as medium (>0.5) or large (>0.8) (12). DAS28 and HAQ were used as external indicators of change. Limit values for detection of clinically important changes were set at 1.2 for DAS28 and 0.22 for HAQ (13, 14).

Results

Both disease activity and disability improved significantly over time (p<0.001). Mean (SD) HAQ changed from 1.55 (0.57) at study start to 1.13 (0.57) at study end. The corresponding values for DAS28 were 6.06 (1.08) and 3.67 (1.36).

Table 1 shows the improvements in the four hand function tests between study start and finish. After 1 year, 36/49 patients had less disability and 38/49 less disease activity using the predefined limit values (HAQ reduction >0.22 and DAS28 reduction >1.2). Responsiveness (SMR) for the different hand tests to detect this improvement is also shown in Table 1. SOFI, grip force, and pinch grip force showed large sensitivity for improvements using both DAS28 and HAQ. GAT showed medium sensitivity. Only 2/49 patients had increased HAQ >0.22 and DAS28 did not increase >1.2 in any of the patients. Sensitivity to worsening could therefore not be assessed.

Table 2 shows correlations between the four hand function tests, HAQ and DAS28 at the end of the study. All hand tests were correlated significantly.
Grip and pinch grip force showed the strongest correlation. All hand tests were also significantly associated with HAQ but not DAS28. The results were similar for correlations at baseline (data not shown).

Discussion

The most important finding in this study was that large treatment effects on hand function could be obtained by TNF-blockers. It is noteworthy that the improvements occurred even though our study group consisted of patients with long-standing disabling RA.

Furthermore, we could clearly demonstrate the usefulness of hand function assessment as an integrated measure of evaluating drug interventions in RA patients. The established instruments assessing hand impairment and disability selected in this study were sensitive to clinically relevant improvements in both disease activity and general disability (13, 14). Notably, SOFI, which was originally developed to identify early impairment, demonstrated the same level of sensitivity to change as the other impairment tests; that is, SOFI was also a good assessment tool for improvement.

There was only a moderate construct overlapping between the hand different tests, underlining the significance of comprehensive assessment of hand function. Similar relationships between different hand function tests have previously been reported both in early and established RA (1, 2, 3, 15). Vlieland et al (15) have shown that grip force and pinch grip force were major determinants of impaired hand function. Mobility also played part.

Measures of hand impairment were only partly able to explain hand function in daily life. It is therefore important to include an ADL-based performance test such as GAT in the assessment protocol (1). We also found that a generalized measure of disability such as HAQ did not fully reflect what patients could do with their hands in daily life. This result in accordance with other reports (1, 3, 15).

The relationship between hand function and DAS28 was very weak. The main reason for this is probably that the majority of the patients in this study already had seriously disturbed hand function. However, changes in disease activity in our patients were nevertheless reflected by changes in hand function. Others have reported a stronger association, at least between grip force and disease activity (2).

Measures of general disease activity and disability (i.e. DAS28 and HAQ) are of course almost mandatory in clinical studies. However, the weak to moderate correlations between DAS28, HAQ, and the different hand tests support the importance of hand function assessment for evaluation of treatment response. Furthermore, from the patients' perspective it can be very useful to receive specific information about hand function and the possibilities of improvement as hand function plays such an important part in daily life. In a busy clinical setting with no OT available, grip force measurement would probably be the easiest and most reliable way to obtain at least some information about hand function.

In conclusion, large treatment effects of biological therapy on hand function were demonstrated in this study. Hand function was only partly reflected by measures of disease activity and general disability. The hand function tests were proven sensitive to small but clinically relevant improvements. Assessment of hand function is therefore important for optimal evaluation of treatment response.

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References