Concise report

Individualized outcome measures of daily activities are sensitive tools for evaluating hand surgery in rheumatic diseases

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Abstract

Objectives. To explore the ability of six outcome measures to capture clinically important changes in patients with rheumatic diseases undergoing hand surgery and to study predictors of changes in activity performance in different patient and surgery strata.

Methods. A total of 172 patients (median age 59 years, disease duration 18 years) were stratified into subgroups: diagnosis, age, general function, type of surgery. Performance of daily activities and satisfaction were assessed by the Canadian Occupational Performance Measure (COPM). Clinically important improvement was defined as a two-step improvement in COPM. Hand function was assessed by reference to grip strength (Grippit), pinch strength (pinch gauge), hand pain (visual analogue scale) and grip ability (Grip Ability Test). Responsiveness was calculated as effect size (ES) at 6-month follow-up compared with baseline.

Results. Clinically important improvement was reached by 25–69% depending on outcome measure and type of surgery. Improvement was smaller in patients with multiple simultaneous procedures. Regardless of diagnosis, age, general function and type of surgery, patients improved significantly in all measures, with the largest changes in COPMperformance and COPMsatisfaction (ES 0.7–1.9). The ES of pain ranged from 0.2 to 0.7, Grippit from 0.1 to 0.5 and pinch gauge from 0.4 to 0.8. Hand pain was the only significant predictor of clinically important improvement of COPMperformance: odds ratio 0.71, 95% CI 0.51, 0.98 (P = 0.041).

Conclusion. COPM was the most sensitive instrument to capture clinically important improvement, and hand pain was a significant predictor of improvement, irrespective of diagnosis, age, general functional level and type of surgery.

Key words: rheumatic arthritis, occupational therapy, hand, surgery, outcome measures.

Introduction

Hand surgery is commonly performed in patients with various rheumatic diseases. Important indications for hand surgery are pain, impaired hand function and increasing disability [1, 2]. To meet patients' needs and expectations and quality control, there is a need for relevant outcome measures [3–5]. Instruments should be valid, reliable, sensitive to change and feasible [6], and should ideally also facilitate the selection of patients for surgery and the choice and timing of surgery.

The process of selecting and implementing outcome measures in clinical practice is crucial. Nordenskold [7] proposes a combination of outcome measures including body function, body structures and activity and participation according to the different domains of the International Classification of Functioning (ICF) [8]. In a previous pilot study [9] we identified a core set of valid, reliable and feasible outcome measures for evaluating hand surgery in RA and PsA. This core set measures pain, grip and
pinch strength, grip ability and performance of activities and satisfaction with performance [9]. The present study was an extension with the aim of studying the ability to capture clinically important changes in patients with inflammatory rheumatic diseases undergoing hand surgery in clinical practice, and to explore possible predictors of clinically important changes and responsiveness of individual instruments in different patient and surgery strata.

Materials and methods

Study design

Data were gathered in a single university hospital centre study at one rheumatology department in cooperation with hand surgeons from the orthopaedic department between January 2002 and June 2009. Assessment at baseline and at 6-month follow-up was by any of three experienced occupational therapists. The intervention was normal practice and the inherent element of quality control characterizing this study met the legislative documentation required in Sweden, therefore no formal approval from the ethics committee was necessary.

Subjects

Consecutive patients hospitalized at the rheumatology department for hand surgery and with a need for occupational therapy intervention, with definite diagnoses determined by rheumatologist, were included. Diagnoses included RA, JIA, PsA, palindromic arthritis, OA, SLE and SSc. Altogether 215 patients fulfilled the inclusion criteria. HAQ [10] was used to stratify for overall functional ability at baseline.

Instruments

Previously identified relevant core set instruments were used [9]. Hand pain was evaluated on a visual analogue scale (VAS) ranging from 0 mm = no pain to 100 mm = maximal pain. Grip strength was measured by the Grippit instrument, which registers both maximum force (peak) and average force in Newtons (N) over 10 s. The average value was used in the current analysis. The instrument has good validity in relation to the Jamar instrument [11] and has high test-retest scores [12]. Pinch strength was measured by the pinch gauge instrument. Force in pounds (lb) measured in two-point pinch grip was used. Normative data are available in different age groups for male and female individuals, for both right and left hands [13]. Both treated and non-treated hands were measured with these instruments.

Grip ability was measured with the Grip Ability Test (GAT), consisting of three items: (i) put a flexi grip stocking over the non-dominant hand; (ii) pick up a paper clip from the table with the dominant hand and put it on an envelope and (iii), lift a jug with 1 l of water with the dominant hand and pour water into a mug. The score (10–276) is based on the time consumption of the three items. Unable to perform is maximized to 60 s per item. Mean value (range) for normal hand function is 16.5 s (11.0–20.0). GAT has been developed especially for patients with RA, with the purpose of measuring the outcome of therapeutic programs. The instrument has high reliability and internal consistency in patients with RA [14].

Individualized outcome was measured with the Canadian Occupational Performance Measure (COPM) [15], a semi-structured interview used to assess occupational performance and identify activities in self-care, productivity and leisure. Patients define important activities and rate them according to their ability to perform the activity (COPMperformance) and satisfaction with performance (COPMsatisfaction). A 10-point Likert scale is used for ratings, ranging from 1 (not able to perform and not at all satisfied) to 10 (perform extremely well and extremely satisfied). Scores of performance and satisfaction are summed separately and divided by the number of prioritized activities (maximum five) given by each patient. COPM has good construct validity and concurrent validity against HAQ [16, 17] and has a good correlation with the Disabilities of the Arm, Shoulder and Hand Outcome [18] form [9]. To optimize the relevance of the instrument in this study, the patients were asked to identify activities involving the hand eligible for surgery.

Data analyses

Parametric analyses were used when appropriate. Independent sample t-test and $\chi^2$ test were used to test for differences at baseline. Differences between treated and non-treated hands at the follow-up were analysed with Wilcoxon’s signed rank test. Responsiveness (sensitivity to change) was calculated as effect size (ES) by dividing the mean change in scores (delta values) between baseline and follow-up evaluations divided by the s.d. of the baseline scores (Cohen’s d). Overall higher ES indicates greater responsiveness as long as the instruments compared are within the same ICF domain. ES is usually grouped as small (0.20–0.49), moderate (0.50–0.79) and large ($\geq 0.80$) [19].

To evaluate the responsiveness of instruments in different strata, subgroups were formed. These consisted of diagnosis (RA, other erosive arthritis, OA, systemic disease), age (tertiles 23–56, 57–64 and 65–85 years), general function according to baseline HAQ (mildly disabled 0–1.0, moderately disabled 1.01–2.0, severely disabled 2.01–3.0) [20] and type of surgery. Wilcoxon’s signed rank test was used to test for differences between baseline and follow-up, and Kruskal–Wallis test was used to test for differences between the different subgroups. A change of two or more points on the COPM score is considered clinically important [21], and the cohort was divided accordingly. Logistic regression models were created to predict a clinically important improvement of COPMperformance and COPMsatisfaction. Variables included in all models were age and disease duration. Univariate models were created for baseline HAQ, VAS pain, Grippit, pinch gauge, COPMperformance and COPMsatisfaction. Owing to multicollinearity between the variables, no multivariate models were used.
Results

Patients and improvement in the total study group

Of the 215 patients fulfilling the inclusion criteria, 43 patients did not perform the follow-up assessment because of travel inconveniences and other practical reasons. The final study group included 172 patients (80%) (supplementary Fig. 1, available as supplementary data at Rheumatology Online). Characteristics of the study group and 6-month dropouts were similar (supplementary Table 1, available as supplementary data at Rheumatology Online). Stratification according to complexity of surgery and according to component of the hand involved in the surgery is shown in supplementary Table 2, available as supplementary data at Rheumatology Online.

All measures improved significantly at follow-up, although GAT had a small numerical improvement as well as low ES. CPMperformance and CPMsatisfaction showed the largest responsiveness measured by ES (supplementary Table 3, available as supplementary data at Rheumatology Online). Because ES was below 0.2 for GAT, and COPM within the same ICF domain had a large ES, GAT was analysed separately (supplementary Table 4, available as supplementary data at Rheumatology Online). In the non-treated hand, there was also a significant improvement of Grippit and pinch gauge (P < 0.01), but not for pain (supplementary Table 3, available as supplementary data at Rheumatology Online).

Clinically important improvement of COPM and its predictors

The clinically important improvement of two or more scale steps in COPM was reached by 42% in CPMperformance and by 51% in CPMsatisfaction, but varied between the different types of surgery (Table 1). In the group with multiple simultaneous procedures, only 25% of the patients reached a clinically important improvement, while the corresponding figure for wrist surgery was 59%. Overall, CPMsatisfaction was higher than CPMperformance. In the logistic regression analyses, only baseline hand pain VAS was found to be a significant predictor of clinically important improvement in COPMperformance—odds ratio 0.71, 95% CI 0.51, 0.98 (P = 0.041), i.e., patients with more hand pain are less likely to achieve clinically important improvement in COPMperformance. No variable in the regression model was found to be a significant predictor for CPMsatisfaction.

Subgroup analyses of baseline characteristics

Patients with severe disability (high HAQ) values had significantly less improvement in all measures (P < 0.01) (data not shown) and had long-standing disease (10 of 12 patients had RA, and 9 patients had disease duration more than 14 years). Younger patients tended to have more soft tissue surgery (P = 0.053). Otherwise no differences were found between the diagnostic groups, HAQ strata or types of surgery.

<table>
<thead>
<tr>
<th>Procedure</th>
<th>COPM performance, % (n)</th>
<th>COPM satisfaction, % (n)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soft tissue surgery (n = 48)</td>
<td>48 (23)</td>
<td>60 (29)</td>
</tr>
<tr>
<td>Joint surgery (n = 75)</td>
<td>49 (37)</td>
<td>55 (41)</td>
</tr>
<tr>
<td>Multiple simultaneous procedures (n = 49)</td>
<td>25 (12)</td>
<td>39 (19)</td>
</tr>
<tr>
<td>MCP surgery (n = 23)</td>
<td>52 (12)</td>
<td>65 (15)</td>
</tr>
<tr>
<td>Wrist surgery (n = 17)</td>
<td>59 (10)</td>
<td>59 (10)</td>
</tr>
<tr>
<td>Soft tissue surgery excluding MCP recentralization (n = 39)</td>
<td>46 (18)</td>
<td>59 (23)</td>
</tr>
<tr>
<td>Surgery in the thumb (n = 22)</td>
<td>46 (10)</td>
<td>55 (12)</td>
</tr>
<tr>
<td>Wrist and DRU surgery (n = 22)</td>
<td>46 (10)</td>
<td>46 (10)</td>
</tr>
<tr>
<td>Total study group (n = 172)</td>
<td>42 (72)</td>
<td>52 (89)</td>
</tr>
</tbody>
</table>

DRU: distal radioulnar; MCP: metacarpophalangeal.

Multiple simultaneous procedures were more frequent in systemic disease (43.8%) compared with RA (28.3%) and other erosive arthritis (19.4%). The most common combination of procedures (35%) was arthrodesis of the wrist and arthroplasty in carpometacarpal or metacarpophalangeal joints.

Responsiveness of instruments in subgroups

In all subgroups, the measures improved. CPMsatisfaction reached a large ES in all groups independently of general function, diagnosis or age. CPMperformance generally had large ES in all strata, while ES in general was moderate in pinch gauge and VAS hand pain and small in Grippit (supplementary Table 5, available as supplementary data at Rheumatology Online).

ES after stratification according to complexity of surgery and according to component of the hand involved in surgery are shown in Fig. 1. ES was consistently lower in the group with two procedures. ES for CPMsatisfaction and CPMperformance was large in most surgical strata groups.

Discussion

This study demonstrates that clinical changes following hand surgery in patients with rheumatic diseases can be measured in routine clinical care by using a core set of four measures of function. Also of interest is that the individualized COPM instrument showed the largest responsiveness regardless of diagnostic entity, age, general function and type of surgery. The results are in line with our previous study [9] and emphasize the importance of including an individualized measure that captures daily activities important to the individual as a goal for the intervention.
Pain relief is traditionally one of the most prominent indications for surgery, but we only found a moderate improvement of pain in all types of surgery except for the wrist. However, there is no obvious correlation between body functions and performance of daily activities. The poor responsiveness in GAT is difficult to explain, but it may be influenced by non-dominant hand surgery in about 40% of the patients. Although GAT is a bi-manual test, the performance of the items is mainly performed with the dominant hand. Furthermore, speed may not be the most relevant or sensitive measurement after hand surgery. Therefore we suggest that GAT not be part of the core set of instruments.

Poor improvement of grip and pinch strength in patients with severe disability was not surprising, as surgery addresses one of perhaps several problems in the hand. Interestingly, both COPM measures showed good responsiveness also in this group.

In the group with multiple simultaneous procedures, only 25% of the patients reached a clinically important

![Fig. 1](https://example.com/fig1.png) Responsiveness of the instruments according to complexity of surgery and according to component of the hand involved in surgery.
improvement, which is remarkably low. Taken together with poor improvement of grip and pinch strength, this implies a more complicated recovery, strengthening the need for the surgeon and occupational therapist to help the patient understand the complexity of surgery, to set realistic goals and to have relevant expectations of the outcome [22, 23]. The results also raise the question of whether one short-term follow-up at 6 months is appropriate, but we could not find any significant change in the responsiveness of the instruments between the 6- and 12-month follow-ups [9].

Our study entails some limitations. We did not measure the patients’ overall satisfaction after hand surgery, neither did we evaluate the importance of aesthetics. As studies have shown that pain and patient’s overall satisfaction are related [24], it could be valuable to include this parameter. However, satisfaction contains many dimensions that may be connected with personal factors, hospitalization as a whole, complications of surgery, as well as the postoperative treatment needed, e.g. splinting and exercise regimes [25]. Variance in overall satisfaction after hand surgery has been reported to be largely unexplained [26].

This study demonstrated that COPM was the most sensitive instrument for capturing clinically important improvement after hand surgery, irrespective of diagnosis, age, general functional level and surgical intervention. However, a comprehensive assessment should also include measures of pain, grip strength and, perhaps, overall satisfaction.

### Rheumatology key messages

- The Canadian Occupational Performance Measure is a sensitive outcome measure after hand surgery in rheumatic diseases.

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### Supplementary data

Supplementary data are available at *Rheumatology* Online.

### References


