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Concise report

Self-reported painful joint count and assessor-reported tender joint count as instruments to assess pain in hand osteoarthritis

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Abstract

Objectives. To evaluate self-reported and assessor-reported joint counts for pain and their value in measuring pain and joint activity in hand OA patients.

Methods. A total of 524 patients marked painful joints on hand diagrams. Nurses assessed tenderness upon palpation. Pain was measured with a visual analogue scale pain and the Australian/Canadian hand OA index subscale pain. Synovitis and bone marrow lesions in right hand distal/proximal interphalangeal joints on MRI served as measure of joint activity. Agreement was assessed on the patient (intraclass correlation coefficient, Bland–Altman plot) and joint level (percentage absolute agreement). Correlations with measures of pain and joint activity were analysed, and joint level associations with synovitis/bone marrow lesions were calculated.

Results. Self-reported painful joint count (median 8, interquartile range 4–13) was consistently higher than assessor-reported tender joint count (3, 1–7). Agreement between patients and nurses on overall scores was low. Percentage absolute agreement on the joint level was 61–89%. Joint counts correlated similarly but weakly with measures of pain and joint activity ($r = 0.14$–0.38). On the joint level, assessor-reported tenderness was more strongly associated with synovitis/bone marrow lesions than self-reported pain.

Conclusion. In hand OA, self- and assessor-reported joint counts cannot be used interchangeably, and measure other pain aspects than questionnaires. Assessor-reported tenderness was most closely related to MRI-defined joint activity.

Key words: hand osteoarthritis, outcomes research, pain

CLINICAL SCIENCE

Rheumatology key messages

- In hand osteoarthritis, self-reported painful and assessor-reported tender joint counts cannot be used interchangeably.
- In hand osteoarthritis, joint counts measure different aspects of pain than frequently used questionnaires.
- Assessor-reported tenderness best represents MRI-defined joint activity, but composite scores are warranted for hand osteoarthritis.

Introduction

Pain is a major symptom in hand OA and is considered a core domain to assess [1]. Frequently used patient-reported instruments to measure pain are the visual analogue scale (VAS) and the Australian/Canadian OA Hand Index (AUSCAN) [2]. These measure pain on the patient or hand level, without considering the number or distribution of painful joints. Therefore, joint counts could be useful, as these incorporate information on pain on the joint level, the distribution of painful joints and the severity of overall hand pain.

Joint counts can be self-reported, where the patient marks which joints are painful on a diagram, or assessor-reported, where a physician or nurse evaluates which joints are tender. Assessor-reported joint counts are often used in rheumatology, especially in RA, where it is an important component of the DAS [3]. In addition, self-reported joint counts have some advantages, in

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particular regarding feasibility and reduced inter-observer variability [4]. While some studies have investigated metric properties of assessor-reported joint counts in hand OA [5–8], often summarized in the Doyle Index [9], these have not been compared with self-reported joint counts before. It is also unclear whether these joint counts are useful in evaluating the domain pain compared with more frequently used questionnaires.

Besides a possible measure of pain, assessor-reported tenderness upon palpation has been proposed as an instrument to measure the domain joint activity in hand OA, a domain that has been scarcely researched in the absence of a validated measurement instrument [1, 10]. 'Joint activity' reflects the activity of the underlying osteoarthritic process, and is therefore thought to include aspects of both pain and inflammation or bone turnover. The OMERACT Hand OA Working Group included validation of assessor-reported and self-reported tender/painful joint counts to measure joint activity on their research agenda [1, 10].

Our aims were to compare self-reported painful joint count with assessor-reported tender joint count, and to determine whether either instrument is useful in the assessment of the domains pain and joint activity in patients with symptomatic hand OA.

Methods

Analyses were performed in the Hand OSTeoArthritis in Secondary care (HOSTAS) cohort, an observational study of patients with primary hand OA diagnosed by their treating rheumatologist from Leiden University Medical Center outpatient clinic [11]. Participants who at baseline completed a self-assessment of painful hand joints and underwent physical examination were included in this analysis ($n = 524$). The study was approved by the Leiden University Medical Center medical ethics committee. Written informed consent was obtained from all participants.

Patients marked which hand joints were painful on hand diagrams (Fig. 1) before the baseline study visit. These diagrams included 30 joints: DIP/PIP joints 2–5, interphalangeal-1, MCP joints 1–5 and the thumb base. Trained nurses, unaware of patients' self-assessment, assessed the same joints for tenderness upon palpation by applying pressure on the lateral joint margin or by passive joint movement. Pain was graded 0–3 and dichotomized for analysis (0 *vs* 1–3). Additionally, patients completed the VAS hand pain (0–100) and AUSCAN pain subscale [2].

Hand radiographs were scored according to Kellgren–Lawrence (KL) (0–4 per joint in 30 joints) [12]. Contrast-enhanced MRI of the right DIP/PIP joints was performed using a 1.5 T extremity MRI scanner (GE, Milwaukee, WI, USA). MRI were made of all sequentially included patients without contraindications from the second year of the study onwards, until a sample of 100 MRI was reached, resulting in a quasi-random subset of patients with MRI data. Only data for patients with $\leqslant 3$ weeks between clinical and MRI examinations were used in this analysis ($n = 92$). MRI were scored for synovitis and bone marrow lesions (BML), according to the Oslo hand OA MRI scoring system [13].

Statistics

To assess whether self-reported painful joint count and assessor-reported tender joint count measure the same construct, we compared the prevalence and distribution of joint involvement. To assess overall agreement between the joint counts, the intraclass correlation coefficient was determined (single measure, absolute agreement) and a Bland–Altman plot with 95% limits of agreement was drawn [14]. To assess agreement on the joint level, we calculated percentage absolute agreement per joint.

To investigate whether these instruments can be used to measure the domains pain and joint activity, we compared Spearman correlation coefficients of both joint counts with VAS and AUSCAN pain and MRI scores. We also assessed associations between pain/tenderness and MRI scores on the joint level, using generalized estimating equations to correct for within-patient clustering of joints.

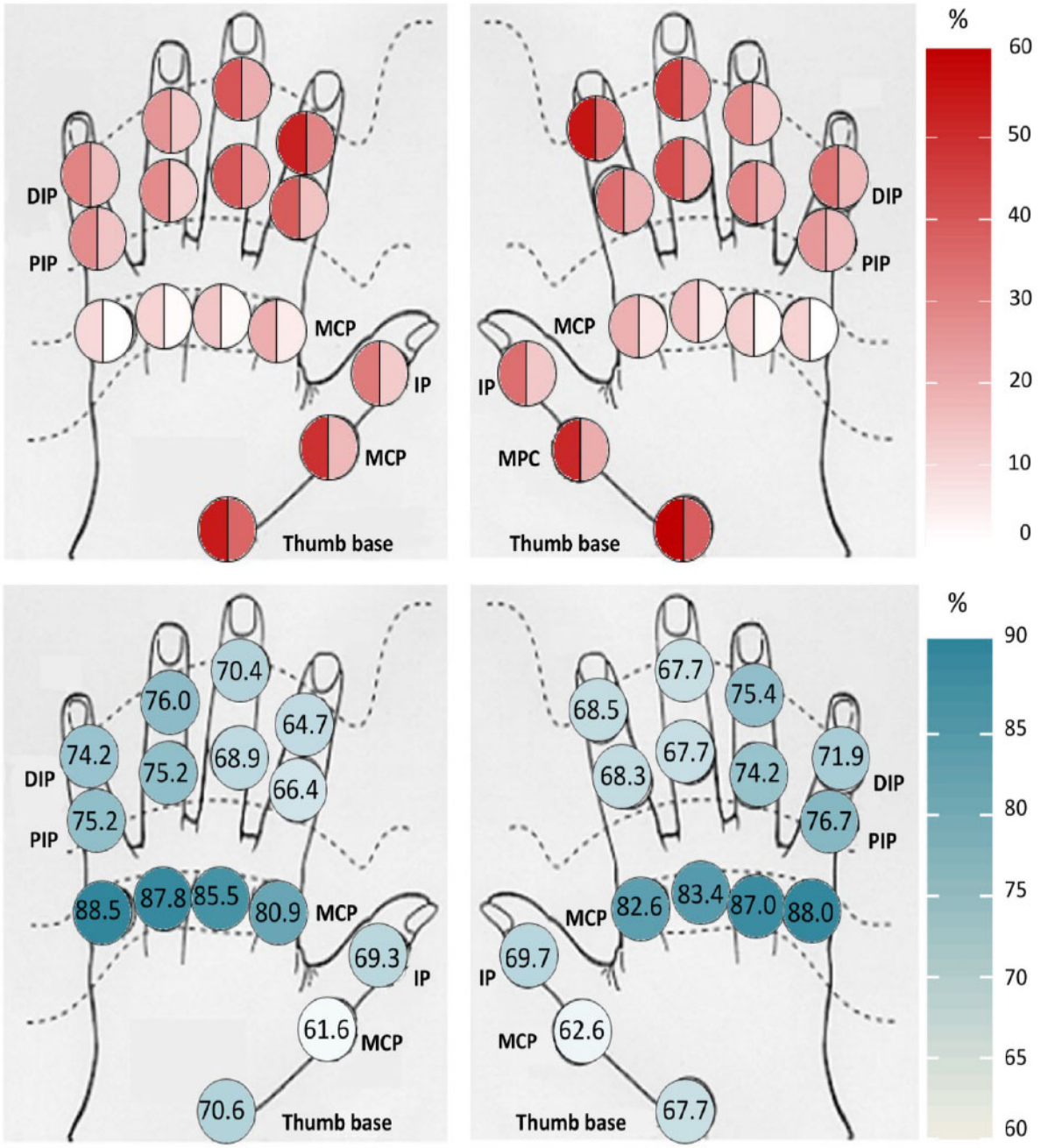
Data were analysed using SPSS 23.0 (IBM, Armonk, NY, USA).

Results

Table 1 presents baseline characteristics. In total, 506 (96.9%) patients reported one or more painful joint, while nurses reported one or more tender joint in 426 (81.3%) patients. There was a striking difference between the median number of self-reported painful joints (eight) and assessor-reported tender joints (three). The overall agreement between patients and nurses for number of painful and tender joints was low (intraclass correlation coefficient 0.28, 95% CI 0.08–0.45). The Bland–Altman plot of the joint counts (supplementary Fig. S1, available at *Rheumatology* online) shows that patients consistently scored higher than the nurses (mean difference 4.6). The 95% limits of agreement were −8.6 to 17.8 (mean ± 1.96 SD.). The plot also shows heteroscedasticity, or in other words, the influence of the number of affected joints: with increasing number of painful joints, the disagreement between patients and nurses increased.

The prevalence and distribution of self-reported painful joints and assessor-reported tender joints is depicted in a heat map (Fig. 1A). While patients more frequently marked joints as painful, the distribution was comparable. Joints were symmetrically involved. Most frequently reported as painful/tender were DIP 2–3, PIP 2–3, MCP 1 and thumb base joints, while MCP 2–5 were infrequently involved. Percentage absolute agreement ranged from 61.1 to 88.5% (Fig. 1B). Highest values of agreement were observed for MCP 2–5 and lowest for DIP 2–3, PIP 2–3, MCP 1 and thumb base joints. Comparison of Fig. 1A and B illustrates that, due to chance, in joints with low prevalence of pain/tenderness the absolute agreement was high, and vice versa. The presence of self-reported pain without concurrent tenderness as well as the presence of tenderness without self-reported pain were both observed, though the former occurred more often than

Fig. 1 Prevalence and absolute agreement of self-reported and assessor-reported painful/tender joints



(A) Heat map of prevalence of self-reported painful joints (left half of circle) and assessor-reported tender joints (right half of circle). (**B**) Heat map of percentage absolute agreement between self-reported painful joints and assessor-reported tender joints.

the latter (20.5 *vs* 5.3%; supplementary Fig. S2, available at *Rheumatology* online).

The self-reported joint count weakly correlated with other pain measures (VAS: $r = 0.37$, AUSCAN pain: $r = 0.37$), as did the assessor-reported joint count ($r = 0.38$ and $r = 0.37$). In contrast, the correlation between VAS and AUSCAN pain was $r = 0.63$.

On the patient level, the total joint counts both correlated weakly with measures of joint activity, such as MRI synovitis (self-reported joint count: $r = 0.22$, assessor-reported joint count: $r = 0.21$) and BMLs ($r = 0.14$ and $r = 0.22$) ($n = 92$). To assess whether a longer interval between clinical assessment and MRI may have resulted in weaker correlations, a sensitivity analysis was performed

Table 1 Baseline characteristics of 524 patients with hand OA of the HOSTAS study

Age, years	60.3 (55.2–66.8)
Women, *n* (%)	450 (85.9)
BMI, kg/m^2	26.3 (23.7–29.6)
Fulfilling ACR criteria for hand OA, *n* (%)	475 (90.6)
Self-reported painful joint count, 0–30	8.0 (4–13)
Assessor-reported tender joint count, 0–30	3.0 (1–7)
VAS pain[a], 0–100	35.5 (19.5–50)
AUSCAN	
Pain subscale, 0–20	10 (6–12)
Function subscale, 0–36	16 (9–22)
Kellgren–Lawrence sum score, 0–120	18 (8–30.5)
MRI synovitis sum score[b], 0–24	5 (1.25–8)
MRI BML sum score[b], 0–24	1 (0–3)

Data are presented as median (interquartile range) unless indicated otherwise. [a]VAS pain available from 383 patients; higher score indicates more pain. [b]MRI of DIP and PIP joints of right hand (eight joints per patient) from 92 patients. HOSTAS: Hand OSTeoArthritis in Secondary care; AUSCAN: Australian/Canadian OA Hand Index; BML: bone marrow lesion; VAS: visual analogue scale.

in 69 of 92 patients who underwent MRI examination within 48 h of clinical assessment, but this did not influence the results (data not shown). The joint counts did not correlate with the KL sum score ($r = 0.07$ and $r = 0.03$). However, on the joint level, KL score was associated with self-reported pain [odds ratio (OR) 1.66, 95% CI 1.57–1.75 per unit increase in KL score] and somewhat more strongly with assessor-reported tenderness (OR 1.88, 1.77–1.99). Analyses on the joint level ($n = 92$) also showed an association with MRI synovitis and MRI BMLs, again with stronger associations for assessor reported-tenderness (synovitis: OR 2.13, 1.73–2.61; BML: 2.56, 1.83–3.57, per unit increase in MRI-score) than for self-reported pain (ORs 1.71, 1.40–2.10 and 1.89, 1.45–2.47).

Discussion

This study compared self-reported painful joint count and assessor-reported tender joint count, and the value of these instruments as an outcome measure for pain and joint activity in hand OA.

Important differences between patients and nurses were noted in the evaluation of the number of painful/tender joints. Absolute agreement on the joint level was higher than overall agreement, particularly in joints where the prevalence of pain or tenderness was low, as expected due to chance. Studies in other rheumatic diseases comparing self-reported and assessor-reported joint counts reported moderate to strong correlations in RA [4], but poor correlations in PsA and AS [15, 16]. The fact that a stronger relationship between pain and tenderness was found in RA could be caused by the fact that a stronger interrelation between pain and inflammation exists in RA compared with hand OA, where we know that the experience of joint pain is not solely driven by inflammation. Patients systematically rated more joints as painful, in line with other studies [15–17]. Our results suggest that these two joint counts cannot be used interchangeably. This does likely not imply that either joint count is more truthful than the other, but rather that pain and tenderness are separate aspects of pain, and in this sense are both of interest.

As briefly alluded to above, the aetiology of pain in hand OA is multifactorial, influenced by diverse aspects such as joint damage, inflammation, increased bone turnover, central pain sensitization, coping and illness perception. Interestingly, both joint counts correlated weakly with questionnaires generally accepted to assess the domain pain. It seems that self-reported questionnaires measure different aspects of pain than these joint counts do. For example, self-reported pain may incorporate more aspects of central pain, and assessor-reported tenderness may include more aspects of inflammation. Furthermore, variation in painful/tender joint count may not directly impact the overall burden of the disease (as measured in a questionnaire), i.e. the burden of disease of one very painful/tender joint could be comparable to the burden of multiple affected joints. It is also possible that questionnaires respond more slowly to fluctuations in disease than these joint counts do. Therefore, our results likely do not suggest that questionnaires or joint counts are more truthful, but that these instruments measure different components of pain in this disease.

At the patient level, both joint counts correlated poorly with MRI features. Likewise, we previously found correlations of 0.29 between Doyle Index and US inflammation [8]. At the joint level, associations with MRI features were present, and strongest for assessor-reported tenderness. However, in both studies, associations of MRI features and painful/tender joint counts were modest at best, suggesting that joint activity is only partly reflected by these joint counts, although assessor-reported tender joint count seems to have most potential to assess joint activity. Because joint activity is thought to include aspects of both pain and inflammation or bone turnover, it may be better to measure this domain with a composite score of different instruments, including for example assessor-reported tenderness, pain while gripping, soft tissue swelling, and inflammation or subchondral bone activity on imaging, although including imaging will negatively impact the feasibility of such a score. Investigation of composite scores is warranted, and may lead to development of a joint or disease activity score similar to the well-known DAS or ASDAS [3, 18].

In conclusion, this study shows that in hand OA self- and assessor-reported joint counts cannot be used interchangeably, and measure other aspects of pain than frequently used questionnaires. Although assessor-reported tender joint count seemed to have most potential to evaluate the domain joint activity, future studies investigating composite scores are warranted to progress development of a satisfactory measurement instrument for joint activity in hand OA.

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Supplementary data

Supplementary data are available at *Rheumatology* online.

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