LONGITUDINAL VALIDITY OF USING DIGITAL PHOTOGRAPHS FOR ASSESSING PROGRESSION OF HAND OSTEOARTHRITIS OVER 7 YEARS IN COMMUNITY-DWELLING ADULTS

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Purpose: An atlas for scoring photographic hand osteoarthritis (OA) has been shown to be reliable and valid cross-sectionally, but its validity over time has not been investigated. The aim was to determine the longitudinal construct validity of assessing hand OA progression on digital photographs over a period of 7 years compared with hand OA progression determined from i) radiographs, ii) hand examination of the clinical features and iii) change in symptoms.

Methods: Participants were community-dwelling older adults (≥50 years) in North Staffordshire, UK with self-reported hand pain or hand problems in the last year who attended research clinics at baseline and 7 years. Digital hand photographs were taken at a set distance in a standardised position. The 2nd & 3rd distal and proximal interphalangeal joints (DIPs & PIPs) and carpometacarpal (CMC) joints on each hand were graded 0-3 by a single reader using the established atlas. At the joint- and person-level progression was defined as an increase of grade≥1. Posterior-anterior hand radiographs were graded for OA using the Kellgren and Lawrence grading system (0-4). The presence of clinical features (nodes, bony enlargement, deformity) (0-3) was determined on hand examination by trained assessors. Australian/Canadian Hand Osteoarthritis Index (AUSCAN) at baseline and 7 years and patients' global perception of change over 7 years was collected in self-complete questionnaires. Descriptive statistics were used to determine radiographic progression, an increase in the number of clinical features, and change in symptoms in those with and without photographic hand OA progression. Differences were examined using Analysis of Covariance and Chi-Square tests.

Results:
After exclusion for inflammatory arthritis and missing images, 253 individuals were included in the analysis (61% women, mean baseline age 63 years (SD=7.0). Overall DIP joints showed the most progression on the hand photographs followed by CMCs and PIP joints (DIPs=14.4-22.6%; CMCs=14.2-15.2%; PIPs=6.1-7.8%), and at the person-level, 37.4% had undergone photographic hand OA progression.

The proportion of participants with radiographic or clinical hand OA progression was higher in those who had undergone photographic hand OA progression compared to those who hadn't, with differences ranging from (radiographic 10%-37%; clinical 3-34%) with some exceptions (Figures 1A & B). Differences in proportions were statistically significant for radiographic progression in most joints and joint groups but not for an increase in the number of clinical features over 7 years. However, among joints with hand photographic progression, radiographic progression was not seen in 42% of DIP, 55% PIP and 35% CMC joints, whereas an increase in clinical features was not seen in 11% of DIP, 18% PIP and 36% CMC joints with hand photographic progression.

At the person-level, those who had experienced moderate photographic hand OA progression (change score ≥3) over 7 years had significantly higher mean scores for summed radiographic hand OA and summed number of clinical features at 7 years after adjustment for the baseline score, in comparison to those with no (change score ≤0) or mild (change score 1-2) photographic progression. Individuals undergoing moderate progression of

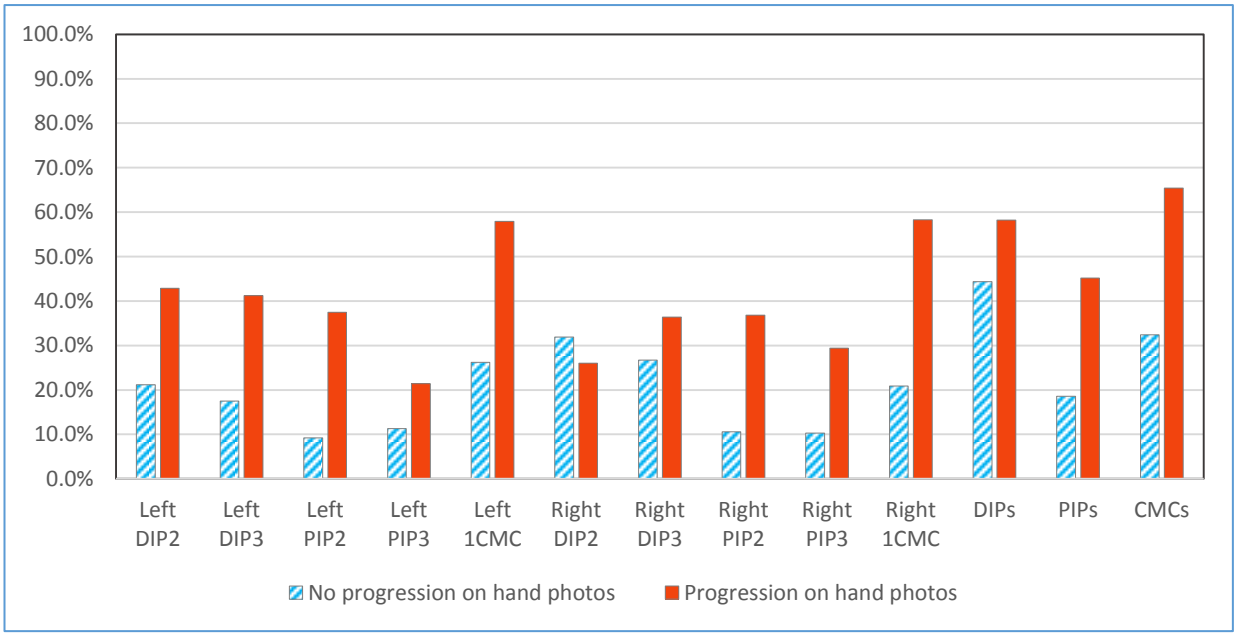
photographic hand OA over 7 years also had more pain, functional limitation and stiffness and reported global deterioration of their hand problem than those with no or mild progression. However, these differences were not statistically significant (Table 1).

Conclusion:

Photographic hand OA score does show longitudinal construct validity over 7 years in relation to change in radiographic OA and clinical features but in not in relation to change in symptoms. Overall, hand photographic progression missed fewer individuals with an increase in the number of clinical features than with radiographic change. However, the presence of OA photographic progression in joints was more strongly related with the proportion of individuals with radiographic change than the proportion with change in clinical features. Using hand photographs may be a reasonable method for determining change in hand OA over the long term when radiographic, other imaging or a hand examination is not feasible.

Figure 1.

A. Proportion of individuals undergoing radiographic progression over 7 years



B. Proportion of individuals with an increase in the number of clinical features over 7 years

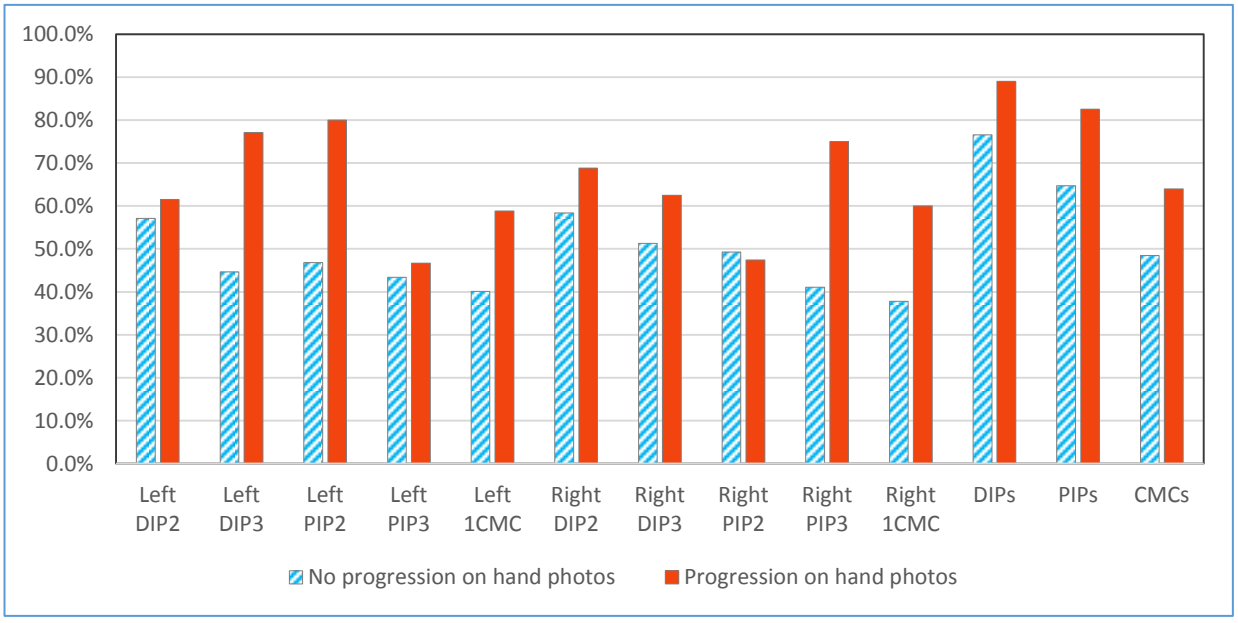


Table 1. Person-level associations between photographic hand OA progression and radiographic, clinical and symptomatic outcomes at 7 years

	Change in summed photographic hand OA score			
Mean (95%CI) 7-year score adjusted for baseline	**No Progression (change ≤0) (n=153)**	**Mild Progression (change 1-2) (n=59)**	**Moderate progression (change ≥3) (n=41)**	**ANCOVA p value**
Summed radiographic OA score (0-40)	7.2 (6.4, 8.0)	8.2 (6.9, 9.4)	10.4 (8.9, 11.9)	F=7.1 p=0.001
Summed number of clinical features (0-28)	10.6 (9.8, 11.5)	10.9 (9.6, 12.2)	14.4 (12.7, 16.0)	F=8.3 p=<0.001
AUSCAN Pain (0-20)	6.2 (5.5, 6.8)	6.6 (5.7, 7.6)	7.1 (5.9, 8.2)	F=1.0 p=0.366
AUSCAN Function (0-36)	9.9 (9.0, 10.8)	10.8 (9.3, 12.3)	10.5 (8.7, 12.3)	F=0.5 p=0.586
AUSCAN Stiffness (0-4)	1.0 (0.9, 1.2)	1.0 (0.8, 1.2)	1.2 (0.9, 1.5)	F=0.9 p=0.407
Summed total AUSCAN score (0-60)	17.0 (15.5, 18.5)	18.4 (16.0, 20.9)	18.6 (15.7, 21.5)	F=0.7 p=0.481
% (n)				**Chi Square p value**
Global perceived change in hand problem:				
Improved	23.0% (n=35)	8.6% (n=5)	9.8% (n=4)	X^2 =13.0
No change	25.7% (n=39)	27.6% (n=16)	24.4% (n=10)	p=0.369
Deteriorated	51.3% (n=78)	63.8% (n=37)	65.9% (n=27)	

AUSCAN, Australian/Canadian Hand Osteoarthritis Index; ANCOVA, Analysis of Covariance.