

Six-Year Longitudinal Assessment of Radiographic and Clinical Progression in Early Thumb Carpometacarpal Osteoarthritis

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INTRODUCTION: Thumb carpometacarpal (CMC) osteoarthritis (OA) is a common and disabling condition, but the natural history and correlates of radiographic progression remain unclear. This study aimed to evaluate six-year differences in radiographic and clinical outcomes in early CMC OA and identify features that distinguish progressing from stable OA and healthy controls.

METHODS: Ninety patients with early CMC OA and 22 healthy controls were prospectively enrolled. Both OA (44F, 42M) and control groups (13F, 9M) included females and males. IRB approval and informed consent were obtained. OA patients were stratified as stable or progressing based on trapezial osteophyte volume (progression defined as $>150 \text{ mm}^3$ at any visit or annual growth $>14.6 \text{ mm}^3/\text{year}$) using 3D CT methods. Assessments were performed at baseline and at 1.5-year intervals up to 6 years for OA patients; controls were assessed at baseline and year 6. Modified Eaton stage, Patient-Rated Wrist/Hand Evaluation (PRWHE), and Australian/Canadian Osteoarthritis Hand Index (AUSCAN) pain and function scores, and z-score normalized key pinch and grip strength were analyzed. Inter-group comparisons used Tukey's HSD.

RESULTS: Progressing OA patients showed the greatest increase in modified Eaton stage over six years, exceeding controls by 2.08 points and stable OA by 1.58 points at year 6 (both $p < 0.001$). At baseline, PRWHE and AUSCAN pain scores were higher in progressing OA compared to controls by 16.9 and 6.9 points, respectively ($p < 0.001$), and remained elevated at year 6 (PRWHE: 12.5 points, AUSCAN: 4.4 points, $p < 0.001$). Differences between stable and progressing OA were modest and inconsistent, with small increases for progressing OA at years 1.5 and 3, but no significant differences by year 6. Functional scores were also elevated in both OA groups relative to controls at baseline (PRWHE function: progressing +10.5, stable +8.6; AUSCAN function: progressing +10.2, stable +7.8), with minimal separation between stable and progressing OA throughout follow-up. By year 6, functional scores in progressing OA remained 8.6 points (PRWHE) and 7.8 points (AUSCAN) above controls, while differences between OA groups were small ($p > 0.05$). Pinch strength z-scores were significantly lower in the progressing OA group compared to controls at baseline (mean difference = -1.00, $p = 0.0068$), with no significant group differences at later time points. Grip strength z-scores were lower in progressing OA than stable OA at 1.5, 3, and 4.5 years (mean differences: -0.70, -0.48, and -0.68, all $p < 0.01$), but not at baseline or year 6.

DISCUSSION: Radiographic changes, as per modified Eaton staging, consistently separated progressing from stable OA, whereas pain, function, and strength measures showed limited discrimination. These findings suggest that radiographic imaging may offer a more robust marker of disease progression than subjective or strength-based measures.

SIGNIFICANCE/CLINICAL RELEVANCE: Radiographic changes over time in modified Eaton staging more reliably indicate CMC OA progression than pain or function measures and may help distinguish stable from progressing disease to guide treatment decisions.