# Osteophyte Volume and Growth Rate in Early Thumb CMC Osteoarthritis Fail to Predict Long-Term Outcomes: An Eleven-Year Prospective Study

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INTRODUCTION:

Early thumb carpometacarpal (CMC) osteoarthritis (OA) often begins with subtle radiographic findings but leads to highly variable clinical outcomes. Yet the critical question remains: which patients will go on to experience disabling symptoms or require surgery — and can we predict that trajectory early? Osteophyte formation is a hallmark of thumb CMC OA and has been shown to increase rapidly in volume and circumferential distribution during early disease.

In 2022, a quantitative framework was introduced to stratify early CMC OA progression using trapezial osteophyte volume and growth rate, with thresholds validated against healthy controls. Building on this model, we asked: can early radiographic markers identify which patients are most likely to experience long-term pain, functional decline, or ultimately require surgery?

METHODS:

A cohort of 59 participants (46 early CMC OA, 13 controls) from a prospective longitudinal study were evaluated 11 years after baseline enrollment. Early OA patients were previously stratified at the 6-year mark as fast or stable progressors based on trapezium osteophyte volume ($>150$ mm$^3$) and growth rate ($>14.6$ mm$^3$/year), using thresholds 3 SD above controls. By year 11, two early OA patients had died and seven had undergone CMC arthroplasty on the affected hand, leaving 37 early OA patients eligible for follow-up. Surveys were sent to these 37 eligible early OA patients, of whom 26 completed the survey (70.3%). Among the control group, 10 of 13 participants responded (76.9%).

Outcomes included PROMIS Upper Extremity, PRWHE Total, Pain, and Function subscales, a task-specific Thumb Pain Composite (assessing pain during grasping, twisting, pinching), and patient-reported symptom worsening or surgery. Group comparisons for continuous variables were performed using one-way Kruskal-Wallis tests, with Dwass-Steel-Critchlow-Fligner pairwise comparisons. Fisher's exact tests were performed for categorical outcomes.

RESULTS: PRWHE Total scores differed significantly across groups (Kruskal-Wallis $p = 0.005$, $\varepsilon^2 = 0.400$). Both fast ($14.3 \pm 9.56$) and stable OA patients ($15.2 \pm 10.0$) had markedly higher scores than controls ($1.44 \pm 2.52$; $p = 0.005$ and $p = 0.022$, respectively), but did not differ from each other ($p = 0.774$). PRWHE Pain scores were also higher in OA groups (fast: $9.88 \pm 6.41$; stable: $7.50 \pm 7.32$) than controls ($0.94 \pm 1.74$; $p = 0.005$ and $p = 0.087$, respectively), with no difference between OA groups ($p = 0.675$). PRWHE Function scores were significantly worse in both OA groups (fast: $4.45 \pm 4.27$; stable: $5.45 \pm 3.67$) compared to controls ($0.50 \pm 0.80$; $p = 0.036$ and $p = 0.025$), but again showed no difference between fast and stable OA ($p = 0.681$).

PROMIS scores also differed significantly across groups ($p = 0.019$), with lower scores in stable OA ($73.6 \pm 5.13$) than controls ($79.5 \pm 1.07$; $p = 0.022$). Fast OA scores ($75.8 \pm 4.89$) did not differ from either group ($p = 0.092$ vs. controls; $p = 0.557$ vs. stable). The Thumb Pain Composite was significantly higher in stable OA ($13.2 \pm 9.76$) than controls ($2.00 \pm 3.25$; $p = 0.007$). Fast OA patients also reported greater pain ($7.55 \pm 6.96$), but differences between OA groups were not significant ($p = 0.273$).

Patient-reported symptom worsening in the affected hand showed a trend toward significance (Fisher's exact $p = 0.057$), with 75% of stable OA and 66.7% of fast OA patients reporting worsening, compared to 25% of controls. Notably, some controls were diagnosed with CMC OA during the 11-year follow-up period, which may explain their reported symptom progression. When grouped dichotomously, stable OA patients were significantly more likely to report worsening than controls ($p = 0.032$), while fast OA vs. control ($p = 0.089$) and fast vs. stable ($p = 0.704$) were not significant. Surgery rates did not differ between fast and stable OA groups ($p = 0.685$).

In summary, at 11-year follow-up, patients with early CMC OA reported significantly worse outcomes than controls across all domains, but no significant differences were observed between fast and stable progressors.

DISCUSSION AND CONCLUSION:

Patients with early radiographic OA — irrespective of progression speed — reported significantly worse pain and function than controls, indicating that early radiographic OA carries meaningful long-term clinical impact. Despite stratification based on osteophyte volume and growth rate, no significant differences in pain, function, or surgical intervention were found between fast and stable progressors.

This is one of the longest longitudinal follow-ups of early CMC OA patients to evaluate structural predictors. While both early OA groups experienced meaningful functional decline, radiographic progression alone failed to predict patient experience or surgical intervention — indicating that current radiographic biomarkers are insufficient to capture clinical trajectory or guide early treatment decisions.