

Second Metacarpal Cortical Percentage Does Not Predict Distal Radius Fracture

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INTRODUCTION:

A distal radius fracture from low-energy trauma, such as falling from standing height, is a common presentation of osteoporosis. Currently, the gold standard for assessing bone mineral density (BMD), and consequently risk of osteoporotic fractures, is dual-energy x-ray absorptiometry (DEXA).¹ Several studies have demonstrated a relationship between bone mineral density (BMD) and hand/wrist cortical thickness as measured by CT or radiographs (x-ray).^{1,2} Given that more patients being seen in an upper extremity clinic commonly receive radiographs, this has the potential to be a more accessible method of screening to assess fracture risk and provide patients with appropriate care. More specifically, measurement of the cortical percentage of the second metacarpal (2MCP) is both readily visible on PA hand/wrist images and may serve as a possible indicator of hand strength given the bone's cylindrical shape and functional contribution to grasping and pinching.² Ultimately, the present study investigates 2MCP as a possible predictor of fragility fracture.

METHODS:

Patients over the age of 45 treated at a single institution in the last five years for a ground-level fall resulting in distal radius fracture were identified using ICD-9 codes. Cases with high-energy trauma and prior fragility fractures were excluded. Fracture patients were then matched for age, sex and BMI with those receiving treatment for non-upper extremity fracture purposes. Diameter of the second metacarpal (portion A) and the intramedullary component (portion B) were used in the formula $[(A-B)/A] \times 100$ to calculate Second Metacarpal Cortical Percentage (2MCP).² Univariate and multivariate regression accounting for age, BMI, sex, and year was then performed ($p < 0.05$ as significant).

RESULTS SECTION:

After inclusion and exclusion criteria were applied, 211 patients with adequate radiographs from 2018-2022 were analyzed. Average age of the population was 69.98 ± 10.7 , composed of 78% female and 66% white demographic. The fracture group had a cohort size of 84 patients, and the non-fracture a size of 127 patients. Both univariate and multivariate regression were nonsignificant, with mean cortical percentage of 49.2 ± 10.7 and 51.5 ± 11.2 in the fracture and non-fracture groups, respectively (OR:0.98, 95% CI:[0.96-1.01], $p=0.234$; aOR:0.99, 95% CI:[0.96-1.02], $p=0.509$).

DISCUSSION:

2MCP has been shown to be a more accurate estimate for predicting forearm BMD than a DXA-based femoral BMD measurement. Thus, it is reasonable to believe that 2MCP could be a valuable tool in preventative medicine, serving as a screening technique for forearm osteoporotic fractures, with possible referral for DEXA at low cortical percentages. The present study, however, demonstrated that cortical percentage did not significantly predict DRF, despite accounting for confounders. Such findings may be because the control cohort, while still at risk due to low BMD, has not experienced DRF due to lack of stimulus. Pursuing a longitudinal study of patients with low BMD by x-ray and reevaluating for fragility fracture at follow up may be an interesting path to direct further study into the role of 2MCP.

SIGNIFICANCE/CLINICAL RELEVANCE:

As most distal radial fractures are treated conservatively, with rates of malunion as high as 59%,² isolating a low cost, ubiquitous measurement system such as 2MCP to identify high risk patients and guide treatment is essential. While the present study demonstrates that 2MCP does not predict DRF, given the increasing prevalence of an aging population, the role of fragility fracture prediction and specifically its association with 2MCP warrants further investigation.

REFERENCES:

1. Schreiber JJ, Kamal RN, Yao J. Simple Assessment of Global Bone Density and Osteoporosis Screening Using Standard Radiographs of the Hand. *J Hand Surg Am.* 2017 Apr;42(4):244-249. doi: 10.1016/j.jhsa.2017.01.012. Epub 2017 Feb 24. PMID: 28242242.
2. Ghodasra JH, Yousaf IS, Sanghavi KK, Rozental TD, Means KR Jr, Giladi AM. Assessing the Relationship Between Bone Density and Loss of Reduction in Nonsurgical Distal Radius Fracture Treatment. *J Hand Surg Am.* 2021 May;46(5):377-385.e2. doi: 10.1016/j.jhsa.2021.02.002. Epub 2021 Mar 16. PMID: 33741214.