Early Changes In Bone Density, Micro-architecture Bone Resorption And Inflammation Predict Long-term Clinical Outcome Of Conservatively Treated Distal Radius Fractures.

Ursina Meyer, MSc¹, Chris Arts, PhD², Joost de Jong, MSc³, Sandrine Bours, MD³, Piet Geusens, PhD³, Bert van Rietbergen⁴, Joop van den Bergh, PhD⁵, Paul Willems².
¹Dept Human Movement Sciences, Maastricht University, Maastricht, Netherlands, ²Department Orthopaedic Surgery, Researchschool Caphri, Maastricht University Medical Centre, Maastricht, Netherlands, ³Department Reumatology, Researchschool Nutrim, Maastricht University Medical Centre, Maastricht, Netherlands, ⁴Eindhoven University of Technology, Eindhoven, Netherlands, ⁵Department of Internal Medicine, Viecuri Medical Center, Venlo, Netherlands.

Disclosures: U. Meyer: None. C. Arts: 2; Stryker, Olympus Biotech, Biomet. 3B; Stryker, Olympus Biotech. 5; Stryker. J. de Jong: None. S. Bours: None. P. Geusens: 2; Eli Lily, Merck. 3B; Eli Lily, Merck. B.V. Rietbergen: 3B; Scanco. J. van den Bergh: None. P. Willems: 5; Medtronic.

Introduction: Factors affecting patient-reported pain and disability after distal radius fractures are essential elements in understanding the process of fracture healing. High resolution peripheral quantitative computed tomography (HR-pQCT) combined with micro finite element analysis (µFEA) allows to assess changes in bone mineral density (BMD), micro-architecture and calculated biomechanical competence during fracture healing. We assessed the association between these early changes and wrist-specific pain and disability at 12 week post-fracture in postmenopausal women with a stable distal radius fracture.

Methods: 18 postmenopausal women (aged 68±8 years) with a stable, conservatively treated distal radius fracture were recruited and prospectively followed up. At four visits (1-2, 3-4, 6-8, 12 weeks post-fracture), patients rated their pain and disability using Patient Rated Wrist Evaluation (PRWE; range 0-100) and Quick Disabilities of the Arm Shoulder and Hand (QuickDASH; 0-100) questionnaires, and a visual analogue scale (VAS; 0-100) with higher values indicating worse status. At each visit, BMD, micro-architecture and mechanical parameters of the fracture region were assessed by HR-pQCT and µFEA, and serum bone markers [procollagen type-I N-terminal propeptide (P1NP) and carboxy-terminal telopeptide of type I collagen (ICTP)] were measured. Pain and disability at visit 4 were linearly regressed on changes in bone parameters from visit 1 to 2, adjusted for number of days post-fracture.

Results: No patients was lost to follow-up and all patients completed the follow-up schedule. PRWE correlated negatively with the change in trabecular BMD [β: -0.96 (95%CI: -1.75 to -0.16), R2=0.37] and in torsional stiffness [-0.14 (-0.28 to -0.004); R2=0.31] and positively with the change in trabecular separation [209 (15 to 402), R2=0.33] and ICTP [12.1 (0.0 to 24.1); R2=0.34]. Similar results were found for QuickDASH, but not for the VAS-score. Linear regression models were used to study the relationship between changes in bone parameters and CRP from visit 1 to 2 with pain and disability scores after 12 weeks. Adjusting for DXA T-score, fracture type, fracture at dominant side or serum vitamin D levels did not affect the results.

Discussion: Changes in the trabecular density, torsional stiffness and bone resorption during the first weeks after radius fracture were correlated with the pain and disability at 12 weeks post-fracture. These results suggest that assessment of changes in micro-architectural parameters during early stages of fracture healing could provide valuable information for predicting the clinical outcome of distal radius fractures.

Significance: Assessment of changes in micro-architectural bone parameters during early stages of fracture healing could provide valuable information for predicting the clinical outcome of distal radius fractures.

Acknowledgments: .

References: .

ORS 2014 Annual Meeting
Poster No: 0639