227 DEVELOPMENT OF A NOVEL IMAGING METHOD FOR TIBIAL BONE MINERAL DENSITY MEASUREMENT IN PATIENTS WITH KNEE OSTEOARTHRITIS

Callum Birch[1], David Hunter[2], Lindsey Cherry[3,4], Fiona Mellor[5] and Nigel Arden[6]
[1]*Radiology, Northern Devon Healthcare NHS Trust, Barnstaple,* [2]*Chromatic Innovation, Birmingham,* [3]*Podiatry, Solent NHS Trust,* [4]*Faculty of Health Sciences, University of Southampton, Southampton,* [5]*School of Applied Sciences, London South Bank University, London and* [6]*Orthopaedics, Rheumatology and Musculoskeletal Sciences, University of Oxford, Oxford, UK*

Background: Density fractionation and chemical analysis studies have demonstrated that subchondral bone is less highly mineralized in participants with knee OA than age-matched controls. It can be hypothesized, therefore, that BMD decreases around osteoarthritic joints. It has been reported however, that osteoarthritic subchondral bone may also increase in volume, by as much as 20%. DXA measures BMD per area of bone, meaning potential changes in bone depth are unaccounted for. This may be particularly problematic for longitudinal evaluation of subchondral BMD in patients with knee OA. As such, this study aimed to develop a method for measuring tibial depth at sites of DXA BMD measurement in patients with knee OA and to explore whether adjusting for bone depth has implications for BMD interpretation.
Methods: Participants with Kellgren–Lawrence grade $\geq$2 OA who were enrolled in a longitudinal parent epidemiological study of knee OA (the VIDEO study) were included in this analysis. Participant DXA and MRI data were retrospectively consecutively retrieved from the parent study until a sample size of 31 was achieved. Areal BMD (aBMD) was measured using DXA at the medial and lateral proximal tibia. MATLAB software was written to co-register DXA and MRI data in order to calculate tibial depth. A volumetric BMD (vBMD) score was calculated for both the medial and lateral tibial compartments. Paired samples *t*-tests were used to determine the difference between medial and lateral compartment scores. Pearson's correlation coefficient was used to test correlation between aBMD and vBMD scores.
Results: In both the medial and lateral compartments the mean aBMD was significantly higher than the vBMD [medial aBMD: 0.830 (S.D. 0.235), vBMD: 0.189 (S.D. 0.046); lateral aBMD: 0.774 (S.D. 0.220), vBMD: 0.185 (S.D. 0.050); $P < 0.001$]. In both medial and lateral compartments, aBMD and vBMD had a significant positive correlation, $r = 0.793$ and 0.910, respectively ($P < 0.001$). With a mean difference of 0.057 ($t = 4.432$), the medial compartment aBMD was significantly higher than the lateral compartment aBMD ($P < 0.001$). However, there was a non-significant difference of -0.003 ($t = -0.901$) between the medial and lateral compartment vBMD ($P = 0.375$). The difference between medial and lateral tibial depth was 0.390 ($t = 7.595$, $P < 0.001$).
Conclusion: This study provides preliminary evidence that differences in aBMD between the medial and lateral compartment of the subchondral tibia could be primarily due to tibial depth differences in patients with knee OA. Adjusting for tibial depth demonstrates a potential under-/overestimation in aBMD, and thus possibly fracture risk, in this patient group. vBMD is an alternate measure of tibial bone density for use in patients with altered bone morphology related to knee OA.
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