

Mechanical Axis and Bone Marrow Lesions in Knee Osteoarthritis

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Summary:

Edema-like bone marrow lesion size and location are not correlated with knee alignment in osteoarthritis

Abstract:

Objectives:

The goal of the present study was to assess bone marrow lesions (BML) present in knee osteoarthritis and determine if knee alignment influences their presence and severity.

Methods:

Data were taken from the progression subcohort of the Osteoarthritis Initiative. The Osteoarthritis Initiative (OAI) is a multi-center, four-year observational study of men and women focusing on OA incidence and progression. One hundred and forty patients were randomly sampled from the progression subcohort of the OAI. For each patient, the leg with the worst average KOOS Knee Pain Score was chosen for analysis. Using custom software written in MATLAB (The Mathworks Inc., Natick, MA), the mechanical axis and hip-knee-angle were identified on full-limb x-rays. Full-limb x-ray images were registered to coronal multiplanar reconstruction MR images using three control points. The location of the mechanical axis was mapped onto the knee MRI's. Using a separate custom software tool, BML's were marked by medial, lateral, superior and inferior borders on coronal and sagittal MRI. Area and volume of each BML were modeled as ellipses and ellipsoids respectively. The minimum distance between the center of each BML on the mechanical axis was also calculated.

Results:

Of the 140 patients sampled, 100 patients had full-limb radiographs and MRI's. Of these, 71 patients were noted to have bone marrow lesions. The average age of this group was 65 (SD: 9). In these patients, a total of 144 bone marrow lesions were identified. The average bone marrow lesion had a volume of 108.7 mm³ (SD of 233.4) and was 16.25 mm (SD: 11.2) from the mechanical axis. There was no statistically significant correlation between BML size, location and knee alignment.

Conclusions:

Our results suggest that there is little-to-no correlation between knee alignment and the presence and severity of bone marrow lesions in knee osteoarthritis. To our knowledge, this is the first quantitative study of the relationship between the mechanical axis, hip-knee-angle and bone marrow lesions presence and size. While it is surprising that we found no relationship between bone marrow lesion location/size and the position of the mechanical axis, it suggests that BML pathogenesis is more complex than previously thought. Further study into the influence of cartilage and meniscus status as well as time on this relationship is warranted.