Physical activity is a more recent addition to non-pharmaceutical interventions. In 2008, the US published federal guidelines recommending adults with arthritis participate in 150 minutes of moderate activity each week accumulated in sessions lasting at least 10 minutes. Physical activity benefits are supported by dose-response relationships with better physical function based on longitudinal cohort studies. RCTs demonstrate the effectiveness of both exercise interventions and resistance training to improve function and reduce disability in adults with knee OA. Recent RCTs provide insight into the synergy between weight loss and physical activity in knee OA. Exercise alone and weight loss alone were each effective to improve function; however weight loss plus exercise had the greatest effect.

These studies support interventions which increase moderate intensity activity. However, many adults are not candidates to engage in moderate intensity activities due to health limitations. What strategies are available to these adults? Recent work demonstrated sedentary behavior is a significant risk factor for functional loss in adults including those with knee OA. Importantly, this relationship is independent of obesity status and of time spent in moderate intensity activities. These findings support replacing sedentary time with light activity to improve health outcomes in adults with knee OA who cannot perform/increase moderate intensity activities.

Taken as a whole, life style interventions provide important strategies to prevent knee OA and mitigate its consequences. Weight control can reduce the risk of developing knee OA. For overweight adults with knee OA, weight loss can effectively improve function. Engaging in physical activity of moderate intensity can improve function and reduce disability. Weight loss combined with increased activity provides added benefits for overweight adults. While the benefits of physical activity are substantial, not all older adults are candidates to engage in moderate intensity activities. An alternative strategy is to replace time spent in sedentary behavior with light intensity activities to improve function.

I-10
BE IT RESOLVED: PLAIN RADIOGRAPHY OR MRI – WHICH IS BETTER IN ASSESSING OUTCOME IN CLINICAL TRIALS?

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Purpose: Imaging in clinical trials is commonly used to evaluate the efficacy of a therapeutic intervention, but also for subject eligibility and safety. The results of clinical trials can support decision making in DMOAD development, by ascertaining treatment effects on joint structure, potentially before these translate to clinical benefits. This debate will focus on the use of radiography and magnetic resonance imaging (MRI) in research trials and in clinical trials of knee osteoarthritis. Depending on the context, the strength and weaknesses of each imaging technique will be highlighted and performance will be compared.

Methods: The authors have performed a full-text literature on imaging of the knee, with a focus on bone and cartilage, adding primary experience in the implementation of imaging methods in clinical trials, and results presented at recent conferences.

Results: The authors will present summary data on the reliability (consistency, test-retest precision) of radiographic measurement of joint space width (JSW) and cartilage thickness with MRI. They will address the construct, concurrent and predictive validity of both methods, compare their sensitivity to change in knee OA in studies that examined JSW and cartilage thickness change in the same subjects, and highlight the specific potential and the limitations of each imaging technique. Finally, the correlation with clinical outcomes and the response to treatment will be addressed.

Conclusion: Current imaging methodologies provide powerful tools for evaluating morphological and compositional aspects of most articular tissues, capturing longitudinal change with reasonable to excellent sensitivity. Radiography and MRI are complementary imaging techniques; each has specific strengths and weaknesses that depend on the specific context of the questions asked. When employed properly, each of them involves potential for ascertaining treatment effects on joint structure, potentially over shorter time scales than required for demonstrating effects on clinical outcomes.

I-11
NON-CARTILAGE CHANGES VISUALIZED BY MRI AND RISK FOR OA DEVELOPMENT/PROGRESSION

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Non-cartilaginous tissues that may be affected in osteoarthritis (OA) include the subchondral bone, synovium, fibrocartilage, ligaments and muscles. Due to its capability to visualize pathology in different tissues with excellent contrast, magnetic resonance imaging (MRI) provides high-resolution and multiplanar assessment of the bone and soft tissues mentioned above. The use of semiquantitative and quantitative MRI biomarkers of non-cartilaginous tissues in clinical and epidemiological OA studies is reviewed. Bone marrow lesions (BMLs) are defined on MRI as non-cystic subchondral areas of ill-defined hyperintensity on fluid-sensitive spin-echo sequences, and were shown to be associated with incidence and progression of knee OA, including progression of MRI-detected cartilage loss and radiographically detected joint space narrowing (JSN). MRI is the best imaging method for the detection and grading of BMLs. The close relationship between BMLs and cartilage damage in the same region of the joint was extensively demonstrated in previous studies. BMLs represent a highly variable feature in patients with or at risk for development of knee OA, as their size may increase or decrease over time. This is of relevance since it was demonstrated that the fluctuation of BML size over time seems to have a direct effect on progression of disease assessed on a subregional basis. MRI is also capable to accurately assess the morphology of the subchondral bone, especially in the detection of any degree of subchondral flattening or depression, also known as subchondral bone attrition. A strong association exists between subchondral bone attrition and subchondral BMLs in the same region of the knee, and the association increases with BML size. Further, it was demonstrated that attrition represents a risk factor for progression of cartilage loss in the same compartment of the knee. Meniscal damage including tears and maceration, as well as meniscal extrusion, were shown to be independently associated with incidence and progression of OA, including progression of radiographically-detected JSN and MRI-detected cartilage loss. MRI is the method of choice in the assessment of meniscal damage and meniscal extrusion, with multiplanar spin-echo techniques being the most appropriate for their detection and grading. Although synovitis in OA is thought to be a secondary phenomenon related to cartilage deterioration, its importance in the OA process is well recognized. Several methods for detecting and quantifying synovitis with non-enhanced and contrast-enhanced MRI are available. Synovitis should be ideally assessed and quantified using gadolinium-enhanced MRI, although surrogate markers for synovitis on non-enhanced MRI are available and are widely utilized in published studies. There is little evidence that synovitis is not only a secondary phenomenon in patients with knee OA but may also play a role in progression of disease. This relationship remains to be demonstrated in large longitudinal studies. Alternatively, synovitis can be evaluated in combination with effusion on fluid-sensitive sequences but differentiation between inflamed synovium and joint fluid filling the joint cavity surrounded by synovium may be difficult. Ligament injury can be accurately depicted by multiplanar MRI assessment of joints. In the knee, it was demonstrated that cruciate ligament deficiency secondary to tears increase the risk for incidence or progression of OA. Further, it was shown that collateral ligaments at both distal and proximal interphalangeal joints may play a role in early stages of OA. The role of other non-cartilaginous tissues accurately assessed by MRI, such as the acetabular labrum (hip) and quadriceps muscle (knee), and their relationship with structural deterioration in these joints was also demonstrated in a few studies. This presentation reviews the role of non-cartilage structures, as well as pathology in these structures, in the development and/or progression of OA, focusing in the knee joint, based on the evidence in the literature.

I-12
GENETICS/GENOMICS IN OSTEOARTHRITIS

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In this year review recent developments in genetics/genomics of osteoarthritis (OA) are discussed to improve our understanding of OA pathophysiology. In OA genetics, a meta-analysis of genome wide association studies (GWAS) revealed novel loci for hip OA, among which