

Mechanisms of OA/ Imaging Appearance

G. E. Gold, M.D.¹

¹Stanford University, Stanford, CA, United States

Osteoarthritis (OA) is the most common form of arthritis, affecting about 15% of persons over 60 years of age. Osteoarthritis is the most common cause of disability and a major source of pain and functional limitations. Up to one-half of people aged 50 and over report knee pain during the course of the year, and a quarter have severe and disabling pain. With the aging population and increasing occurrence of obesity, the prevalence of OA may double between 2000 and 2020. Health care costs of osteoarthritis are up to \$200 billion annually in the U.S.

Risk factors for development of OA include joint trauma, obesity, and malalignment, but the initiating event in most patients is unclear. Osteoarthritis is slowly progressive, taking years to develop and show symptoms. There is currently no widely accepted disease-modifying treatment for OA. Initial symptoms are treated with anti-inflammatory and pain medication. End-stage OA is treated surgically with joint replacement, which is effective in many patients, but is an expensive and serious surgery.

X-ray has been used for many years in the diagnosis and study of OA. Despite its lack of soft tissue contrast, x-ray is currently the only imaging method accepted by the Food and Drug Administration for clinical trials of OA treatments. X-ray is insensitive to OA progression, demonstrating only joint space narrowing and bony osteophyte formation. Although research into the etiology and progression of OA has focused on the articular cartilage, there is increasing recognition that bone, synovium, and fibrocartilage play important roles.

Magnetic resonance imaging, with its excellent soft tissue contrast and three-dimensional capabilities, is the most promising imaging method to detect OA at an early stage. High-resolution proton MRI can demonstrate disease progression in one to two years by measuring cartilage loss in subjects with advanced OA. Recent advances in understanding of OA, however, suggest that loss of cartilage may be an irreversible finding in the disease process. New MRI contrast mechanisms and methods of quantification have shown potential to detect OA changes at a treatable stage before tissue loss occurs. MRI with metal artifact reduction also has tremendous potential to improve the diagnosis of complications of total joint replacement.

This lecture will review what is known about the initiation of OA and its imaging appearance. The current status of MRI methods to detect irreversible and reversible changes in OA will be discussed. This lecture will also discuss the potential for MRI to act as a surrogate marker for OA progression, which will be critical for development of new disease-modifying therapies.