170. BIOMARKERS AND MODERN IMAGING IN THE ASSESSMENT OF OSTEOARTHRITIS PROGRESSION

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Introduction. Osteoarthritis is a disease that affects more than 300 million people worldwide and is one of the most common causes of pain and disability. Current structural changes are detected by conventional radiographs mainly in advanced disease states. However, biochemical biomarkers and advanced imaging modalities such as MRI, compositional MRI, and ultrasound allow for earlier detection of changes in cartilage, bone, and synovial tissue that are not evident on conventional radiographs.

Aim of study. To assess the diagnostic and prognostic potential of biochemical markers and advanced imaging modalities in the early detection and progression of osteoarthritis.

Methods and materials. A narrative review of the literature was conducted using PubMed, MEDLINE and Google Scholar databases focusing on the period between 2020-2025.The analysis emphasized important biochemical markers of cartilage metabolism and inflammatory processes, as well as advanced imaging techniques such as MRI, compositional MRI (including T2 mapping and dGEMRIC), and ultrasound imaging.

Results. Biochemical markers such as COMP and CTX-II were significantly correlated with cartilage damage and progression, while inflammatory markers indicated the level of synovial activity and the severity of disease activity. MRI was useful in detecting cartilage thinning, bone marrow lesions, synovitis, and subchondral changes before radiographic abnormalities appeared. Compositional MRI was useful in detecting preclinical biochemical changes in cartilage, suggesting early degenerative changes in the joint. Ultrasound imaging was useful in detecting synovial hypertrophy, effusion, and increased vascularity in the joint. Combining biochemical markers with imaging was useful in detecting the disease process at an early stage and in obtaining a clear picture of disease activity. In addition, the combined approach was useful in stratifying patients according to their risk of progression and in identifying patients who could benefit from early therapeutic interventions.

Conclusions. The integration of biochemical biomarkers with modern imaging technologies can enable early diagnosis, proper monitoring, and risk stratification in the management of osteoarthritis. These techniques can enable the development of personalized treatment modalities, and enhance long-term disease management.

Keywords. Osteoarthritis, biomarkers, MRI, compositional MRI, ultrasound, cartilage degradation, disease progression.

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