Public Abstract

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Title:ASSESSMENT OF BIOMARKER PRODUCTION BY OSTEOARTHRITIC OSTEOCHONDRAL TISSUES AND CORRELATION TO THE BIOMECHANICAL, BIOCHEMICAL, AND HISTOLOGICAL PROPERTIES

Osteoarthritis (OA) is the most prevalent form of arthritis and is a significant cause of pain and disability worldwide. Treatment options available are only capable of controlling symptoms until progression to end-stage OA and qualifications for total knee replacement are met. To this regard, there is a strong need for the development of diagnostic tools and therapeutic interventions targeting earlier stages before irreversible damage occurs. . It is generally accepted that changes in the structural orientation, biochemical parameters, and biomechanical properties together with inflammation are the main contributors to the development and progression of OA. Early stages of OA are characterized by alterations in the microscopic structure and microenvironment of the cartilage progressing to irreversible macroscopic tissue damage. Paralleling and in response to these changes, chondrocytes become activated, increasing the production of proteins involved in the degradation and synthesis of extracellular matrix (ECM) components and those involved in inflammation, which could serve as relevant biomarkers.

In this body of research, we aimed to investigate relationships between the production of biomarkers and changes in biochemical, biomechanical, and structural properties of osteochondral tissue from patients undergoing total knee arthroplasty. We have identified interrelationships between chondrocyte viability, surface integrity measured by TPF, compressive and hydrostatic biomechanical properties, histopathology scores, and ECM content of OA cartilage tissue. Specifically, we show positive relationships between viable cell density, aggregate modulus, and TPF, and negative relationships between total histology score and viable cell density or aggregate modulus. Total histology score and TPF were associated with changes in collagen and proteoglycan content. Furthermore, we show that viable cell density, aggregate modulus, and TPF all had positive relationships with cytokine production and negative relationships with MMP production. We concluded that biomarkers of inflammation, degradation, apoptosis, and chondrocyte viability produced by osteoarthritic cartilage from various regions of the osteoarthritic joint show moderate to strong correlations to each other suggesting that there is a correlation to OA biomarker production and the severity of pathology. Utilizing these relationships, it may be possible to identify early changes in OA which may be potential targets for diagnosis and treatment in future studies.