CORRELATIONS AMONG ARTICULAR CARTILAGE BIOMECHANICAL PROPERTIES AND METABOLIC, BIOMECHANICAL AND HISTOMORPHOMETRIC CHARACTERISTICS OF SUBCHONDRAL BONE FROM OSTEOARTHRITIC KNEES

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INTRODUCTION: Osteoarthritis (OA) is a multifactorial disease often progressing from an initial injury to whole-joint inflammation and degeneration causing pain and dysfunction. This study was designed to determine how the biomechanical properties of articular cartilage correlate with various properties of the underlying bone. It was hypothesized that there would be important correlations among these assessments of articular cartilage and subchondral bone from osteoarthritic knees.

METHODS: With IRB approval, excised knee articular surfaces were collected from eight patients undergoing TKA. Explants were created, and the cartilage was separated from the bone, and biomechanical properties were determined. Bone explants were cultured, and media were used for biomarker analysis. Bone explant biomechanical and histomorphometric properties were determined. A spearman correlation was performed to determine relationships between cartilage and bone properties.

RESULTS: The data from this study indicate that as cartilage permeability increased and fiber modulus decreased, bone area increased. Additionally, as cartilage fiber modulus decreased and ground substance modulus increased, there were associated increases in release of degradative and pro-inflammatory biomarkers by underlying bone explants. Further, as cartilage fiber modulus decreased, the release of bone-turnover biomarkers increased.

CONCLUSION: The results of this study suggest that the relationships between cartilage and underlying bone in OA are complex and multifaceted. Ongoing studies in our laboratory are aimed at further characterization of these complex interactions during development and progression of OA towards better defining disease mechanism and targets for effective interventions.