Spencer Delucia

Kansas City, MO

Sp21-045

Junior

Biological Sciences; Ancient Mediterranean Studies

Faculty Mentor: Dr. Aaron Stoker, Orthopaedic Surgery; Dr. James Cook, Orthopaedic Surgery

Funding Source: Thompson Laboratory for Regenerative Orthopaedics

Relationships among Patient-Specific Variables and Osteoarthritic Chondrocyte Metabolism

Spencer DeLucia, Allyson Caisley, Anna Sullentrup, James Cook, and Aaron Stoker

Introduction

Osteoarthritis (OA) is a leading cause of disability worldwide. One factor that makes OA difficult to effectively treat is the considerable patient-to-patient variability in the development and progression of symptomatic OA. While patient factors (sex, age, BMI, smoking, diabetes) have been associated with increased OA rates, how these factors relate to OA pathophysiology are poorly understood. It was hypothesized that increased patient age, BMI, and pain at the time of total knee arthroplasty (TKA), as well as female sex, smoking, and diabetes, the production of pro-inflammatory and degradative biomarkers by OA chondrocytes will significantly increase.

Methods

With IRB approval and informed patient consent, cartilage tissue normally discarded was recovered from patients undergoing TKA. Chondrocytes were isolated form the cartilage and cultured until they reached ~90% confluency. A media sample was collected and tested for inflammatory and degradation related biomarkers. Data were analyzed using a spearman correlation to relate chondrocyte biomarker production to patient age, BMI, and VAS pain score, and significant differences in OA chondrocyte metabolism were determined using a Mann-Whitney Rank Sum test or Kruskal-Wallis with post hoc test and Bonferroni correction, based on the number of categories in the analysis ($p<0.05$).

Results

It was found that patients in the highest BMI group had the lowest production of biomarkers, female chondrocytes produced significantly higher levels of degradative enzymes MMP-7, 8, and 13, and chondrocytes from current smokers produced significantly higher levels of TNF-a. There were no significant differences when chondrocytes were based on age or diabetes status.

Discussion

The data from this study indicate that BMI, sex, and smoking status may contribute to the patient-to-patient variability in chondrocyte metabolic responses during knee OA. Correlating these changes in chondrocyte metabolism to clinical measures of disease may allow for the development and optimization of patient-specific diagnostic and therapeutic modalities.