Serum COMP and the Inflammatory Environment of the Knee Before and After Exercise-induced Load

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Introduction: Knee osteoarthritis (OA) is a degenerative joint disease that affects cartilage. Mechanical load likely influences cartilage condition and knee OA progression. Serum cartilage oligomeric matrix protein (COMP) is a biomarker that is thought to represent knee articular cartilage turnover due to load. Serum COMP, however, can originate from numerous anatomical locations, including the knee joint. Further, knee intra-articular inflammation is thought to be associated with knee cartilage degeneration. The purpose of this study was to determine how accurately serum COMP represents inflammation levels, within the knee, before and after exercise.

Materials and Methods: Using a cross-over design, six recreational runners (5 males and 1 female, 26 ± 7 years, 71 ± 6 kg, and 174 ± 8 cm) completed two laboratory sessions (Exercise and Control). Baseline blood (obtained to measure serum COMP concentration) and synovial fluid (obtained to measure knee intra-articular inflammation) samples were collected at the beginning of each session. During the Exercise Session, participants ran for 30 minutes at a speed between 3.0-4.0 m/s. During the Control Session, participants sat unloaded in a wheelchair for 30 minutes. A second blood sample was collected immediately after the 30-minute run or unloading period. Fifteen minutes later, a second synovial fluid sample was taken. Serum COMP and the concentration of eleven intra-articular knee inflammatory cytokines were quantified using enzyme-linked immunosorbent assays. Correlation analyses, using a mixed models linear regression, were used to evaluate potential relationships between serum COMP and the eleven cytokines before and after exercise, and the changes of both due to exercise (α = 0.05).

Results and Discussion: Serum COMP, before exercise, significantly correlated with only the IL6 inflammatory cytokine (p=0.04). After exercise, serum COMP showed no significant correlations was with any inflammatory cytokines although, MCP1 was trending towards significance (p=0.06). When comparing the change of serum COMP to the change of the inflammatory biomarkers, however, 5 inflammatory biomarkers were significantly correlated (GM-CSF: p<0.01; IL10: p=0.01; IL1a: p=0.01; MIP1a: p<0.01; MIP1b: p=0.02) and two others were nearly significant (IL15: p=0.07; IL1Ra: p=0.07).

Conclusions: Serum COMP does not appear to represent the inflammatory environment of the knee, before or after exercise. Change of serum COMP due to exercise, however, may be a good measurement of the change in the inflammatory environment of the knee, in response to exercise; change in COMP might be a valid surrogate for articular cartilage changes due to exercise. Further data should be collected to verify these results.