Prospective, Controlled, Pilot Study Of Serum Biomarkers In Patients Undergoing Hip Arthroscopy

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• I have financial relationships with the following companies:
  Salary...... Wake Forest Baptist Health
  Royalty.... None
  Consulting..... Smith & Nephew Endoscopy
  Grant & Research.... Bauerfeind
  Boards & Committees.....ISHA, AOSSM, AANA
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• Report no conflicts of interest.
Introduction

Premature hip osteoarthritis (OA) involves a progressive and often insidious inflammatory condition in which articular cartilage is mechanically degraded. Some studies have suggested elevated biomarkers in the presence of hip OA. The purpose of this study is to define the serologic phenotype expression of Vascular Cell Adhesion Molecule-1 (VCAM-1), Interleukin-6 (IL-6) and Cartilage Oligomeric Protein (COMP) in a human population of subjects undergoing arthroscopic hip surgery for prearthritic hip pain and to develop a clinical risk assessment model of hip arthritis based on these basic science findings.

Figure 2. Intraoperative photographs of the hip joint. A. Healthy acetabulum. B. Severe acetabular chondromalacia. C. Healthy femoral head. D. Severe femoral head chondromalacia.
Background

Recent studies suggest that serum levels of Vascular Cell Adhesion Molecule 1 (VCAM-1) are a significant predictor of number of joints affected by OA\textsuperscript{1} and a significant predictor of total joint replacement due to severe OA.\textsuperscript{2}

On a microscopic level, VCAM-1 mediates leukocyte and chondrocyte interaction and could contribute to chondral degradation and eventual synovial joint failure.

![Figure 1. X-ray crystallography-based image depicting the 3D structure of the N-terminal two-domain fragment of VCAM-1 that participates in ligand binding.\textsuperscript{3}](image-url)
Methods

- Prospective, case-controlled study
- 20 subjects electing to undergo hip arthroscopy
  - single joint pain and no history of non-hip joint injury
  - ages 18-40
  - non-smokers
  - radiographic Tönnis scores of 0-1
- 10 age and weight matched subjects
  - No history of hip pain or known OA
  - non-smokers
- Serum biomarkers of VCAM-1, IL-6, and COMP were assessed. Both cohorts of subjects completed outcomes questionnaires to determine the progression, or lack thereof of osteoarthritis. Statistical analysis included t-test (significance p<0.05) and Pearson Correlation Coefficients.
**Results**

- Ultimately, no statistically significant difference ($p>0.05$) was found between the hip arthroscopy subjects and controls in the biomarkers VCAM-1, IL-6, and COMP.

![VCAM and COMP graphs showing p=0.32 and p=0.68 respectively.](image)
Results (continued)

IL-6

p=0.26
Results continued

- IL-6 had a small to medium correlation with the overall joint chondromalacia load ($P=0.26$) and the acetabular chondromalacia load ($P=0.37$), respectfully.
- V-CAM-1 and COMP had no correlation with hip joint chondromalacia noted intraoperatively ($P=-0.05$ and $P=-0.03$).
- The mHHS had a medium correlation with COMP levels in the operative group ($P=0.30$).
- The VHS and NAHS had strong correlations with V-CAM-1 levels ($P_{VHS:VCAM}=0.55$ and $P_{NAHS:VCAM}=0.54$) and medium correlations with IL-6 and COMP levels in the operative group ($P_{VHS:IL6}=0.26$, $P_{VHS:COMP}=0.25$, $P_{NAHS:IL6}=0.27$, and $P_{NAHS:COMP}=0.38$). (see graphs below)
- The mHOT and patient’s BMI had a medium correlation with V-CAM-1 ($P_{mHOT:VCAM}=0.35$, $P_{BMI:VCAM}=0.33$) and COMP ($P_{mHOT:COMP}=0.31$ and $P_{BMI:COMP}=0.31$) levels and a small correlation with IL-6 ($P_{mHOT:IL6}=0.26$ and $P_{BMI:IL6}=0.23$) in the operative group.
- Age did not correlate with biomarker levels in the operative group ($P_{age:IL-6}=-0.09$, $P_{age:VCAM}=0.04$, $P_{age:COMP}=-0.05$).
Conclusion

This is a controlled, prospective, pilot study of serum biomarkers in a well-selected hip arthroscopy population. No statistical differences between groups were noted in three established biomarkers. Correlations between biomarker levels and clinical outcome scores were observed in the operative group; the strongest being between the Vail Hip Score/Non-Arthritic Hip Score and VCAM-1 serum levels at the time of surgery. More specific biomarkers are needed to assess and follow hip arthroscopy patients and surgical outcomes.
References

