

Synovial fluid biomarkers give a glimpse at the intra-articular environment after a meniscal injury

Matthew T. Kingery

Utkarsh Anil

Lena Kenny

Thorsten Kirsch

Eric J. Strauss

Video Abstract

Keywords: joint microenvironment, knee, meniscal tear, meniscal injury, meniscus, articular surface, osteoarthritis, synovial fluid, biomarker, cartilage injury, cartilage lesion, synovitis, arthroscopic surgery, inflammation, proinflammatory, anti-inflammatory, pathology, cytokine, growth factor, degradation

Posted Date: September 20th, 2019

DOI: <https://doi.org/10.21203/rs.2.15020/v1>

License: © ⓘ This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

Abstract

Meniscal tears are one of the most frequent knee injuries and the most common pathology leading to arthroscopic surgery in the United States. It's no surprise, then, that there's been a lot of research into how repairing these injuries affects joint kinematics and biomechanics. But meniscal injury also causes changes on the microscopic scale, in the joint microenvironment. Tracking these changes could provide important clues into the cellular processes that promote the development of conditions like post-traumatic osteoarthritis. Researchers from the NYU Langone Orthopedic Center are using synovial fluid biomarkers to take a closer look at this link. The team evaluated 41 patients undergoing arthroscopic surgery to treat a symptomatic, unilateral meniscal injury. Synovial fluid samples were collected at the time of surgery from both the operative and contralateral knee. The concentrations of 10 synovial fluid biomarkers were then compared between knees. The biomarkers included pro- and anti-inflammatory molecules, along with growth factors. The results showed that the biomarker levels tracked well with meniscal injury. When controlling for other variables like BMI and age, four proinflammatory biomarkers were significantly elevated in injured knees. The sequelae of meniscal injury also had a predictable effect on the intra-articular environment. The presence of synovitis was linked to a significant drop in one anti-inflammatory marker, and more severe cartilage damage was associated with higher levels of proinflammatory markers and the angiogenesis-inducing growth factor VEGF. Patient age also influenced the intra-articular environment, in both injured and uninjured knees. Concentrations of several of biomarkers went up with increasing age, regardless of the presence of injury, suggesting that older patients have a baseline high level of inflammation in the knee. It's important to note that the study gives only a glimpse at the changes occurring in the intra-articular environment following a meniscal injury. Longer-term profiling is needed of both injured and uninjured knees to determine the diagnostic and prognostic value of synovial fluid biomarkers. But the results do support the examination of synovial fluid characteristics to help identify early post-traumatic cartilage damage, which may reveal potential targets for arthritis-sparing interventions.