

Platelet Rich Plasma Decreases Anti-Inflammatory Markers in a Human Co-Culture Model for Osteoarthritis

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Summary:

This co-culture model demonstrated significant anti-inflammatory effects on gene expression of two different PRP methods over time on human OA cartilage and synovium.

Abstract:

Background:

Platelet-rich plasma (PRP) is thought to reduce inflammation involved in osteoarthritis through the action of growth factors, but it is unknown whether preparations of PRP with different concentrations of platelet and white blood cells differ in their anti-inflammatory effects. The goal of this project was to use an in vitro co-culture model of OA in human cartilage and synovium to investigate the anti-inflammatory effects of two different platelet rich plasma preparations.

Methods:

Discarded osteoarthritic cartilage and synovium was obtained from nine individuals undergoing total knee arthroplasty and was used to create a co-culture system. IL-1 β was added to each co-culture to induce inflammation. Two different PRP preparations were obtained from three individuals- one yielding lower white blood cells and platelet concentrations (PRPLP), and one yielding high platelet and white blood cell concentrations (PRPHP). PRPLP, PRPHP, or media was added to the co-culture wells. Quantitative polymerase chain reaction (qPCR) was used to test for changes in markers of inflammation (ADAMTS-5, TIMP-1, VEGF, aggrecan and Type I Collagen) in both cartilage and synovial tissues at four time points: 0, 24, 23 48, and 72 hours.

Results:

Treatment with PRPLP or PRPHP significantly decreased expression of TIMP-1 and ADAMTS5 in cartilage, increased ACAN expression in cartilage, and decreased ADAMTS5, VEGF, and TIMP-1 expression in synovium compared to control co-cultures that received IL-1 β but no PRP ($p < 0.05$). There was also significantly less NO production in the PRPLP and PRPHP groups compared to controls ($p < 0.05$).

Conclusions:

This co-culture model allowed for the assessment of two different preparations of PRP and their anti-inflammatory effects over time on human OA cartilage and synovium. PRPLP and PRPHP had a significant anti-inflammatory effect on gene expression at all four time points; however there was no difference in the anti-inflammatory effect between the two preparations. The results suggest that in the future, PRP injections may be an effective alternative anti-inflammatory agent in the treatment of OA.