

Early Weight-Bearing after Cartilage Injury Increases Joint Inflammation

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Introduction

- After ACL injuries, aggressive rehabilitation is encouraged with early weight-bearing to retain muscle strength and preserve motion.
- However, in 40-80% of cases, MRI demonstrates that an articular injury is also present

Introduction: Bone Bruise

- Documented first by MRI
- Arthroscopy has noted area as softer with a dimpling phenomenon
- Histology demonstrates microfractures, fissuring of cartilage, and cartilage matrix breakdown

The Effects of Weight-Bearing

- Weight-bearing on damaged cartilage may:
 - Cause microtrauma
 - Prolong the injury
 - Delay possible recovery of the cartilage
 - Increase the degree of inflammation

Aims

- To determine the effect of weight bearing on joint inflammation after acute mechanical trauma
- To document the progression of cytologic and biochemical events occurring after acute osteochondral injury

Methods

- 16 dogs
- All impacted on the lateral femoral condyle
- Impact with 18-25 MPa peak stress







Postoperative protocols

- Group 1 (8 dogs) : Full Weight Bearing (FWB)
- Group 2 (8 dogs) : Minimal Weight Bearing (MWB)
 - Full motion with minimal weight bearing for 1 month followed by full weight-bearing and motion.
 - Weight-bearing was restricted with an ankle brace that placed the forefoot in maximal plantar flexion.
- The opposite leg acted as a control in all animals

Methods

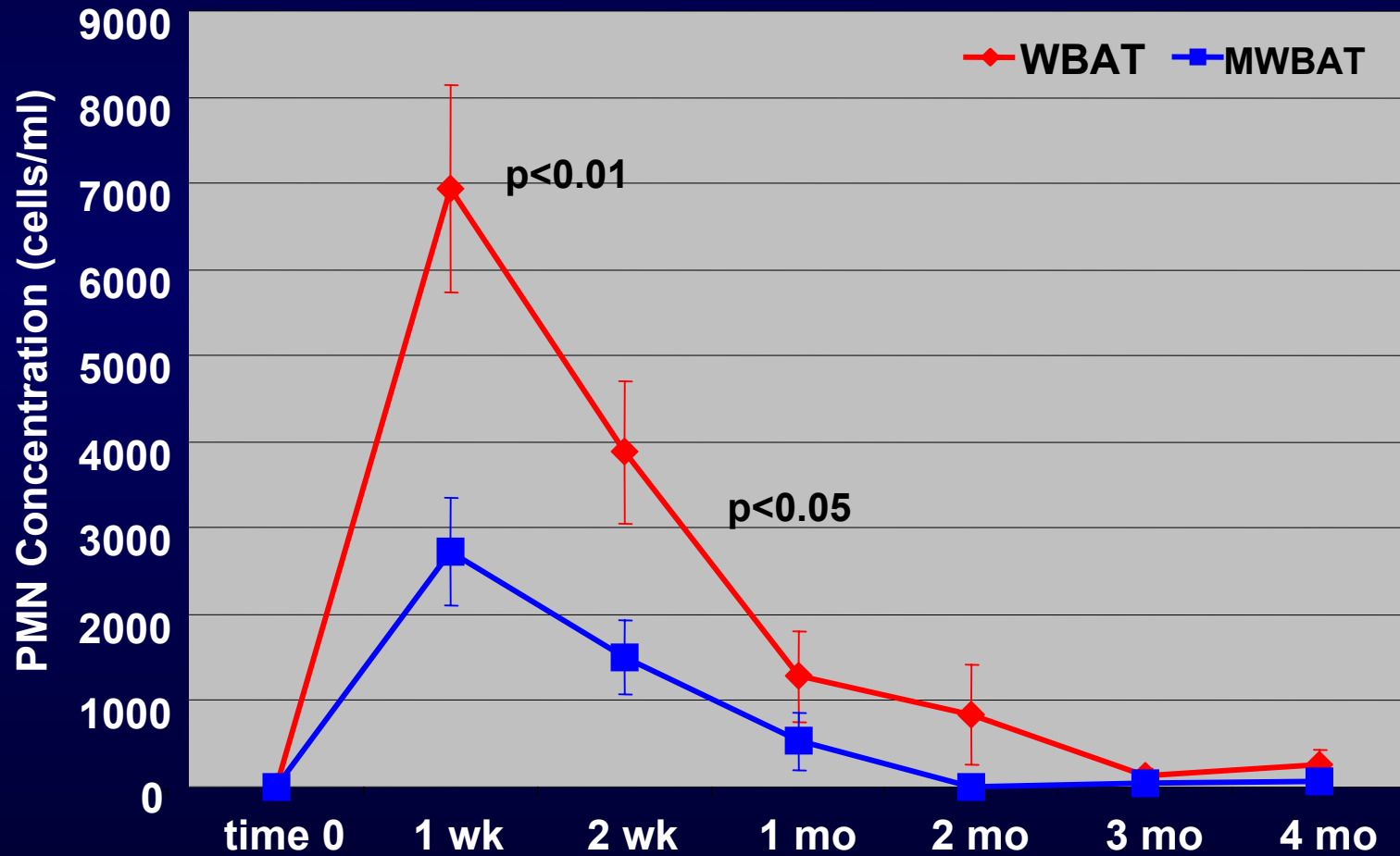
- MRIs performed pre and post injury
 - T1, T2, and T2 fat sat
- Synovial Fluid Aspiration
 - At time zero, 1, 2,4,8, and 12 weeks post op



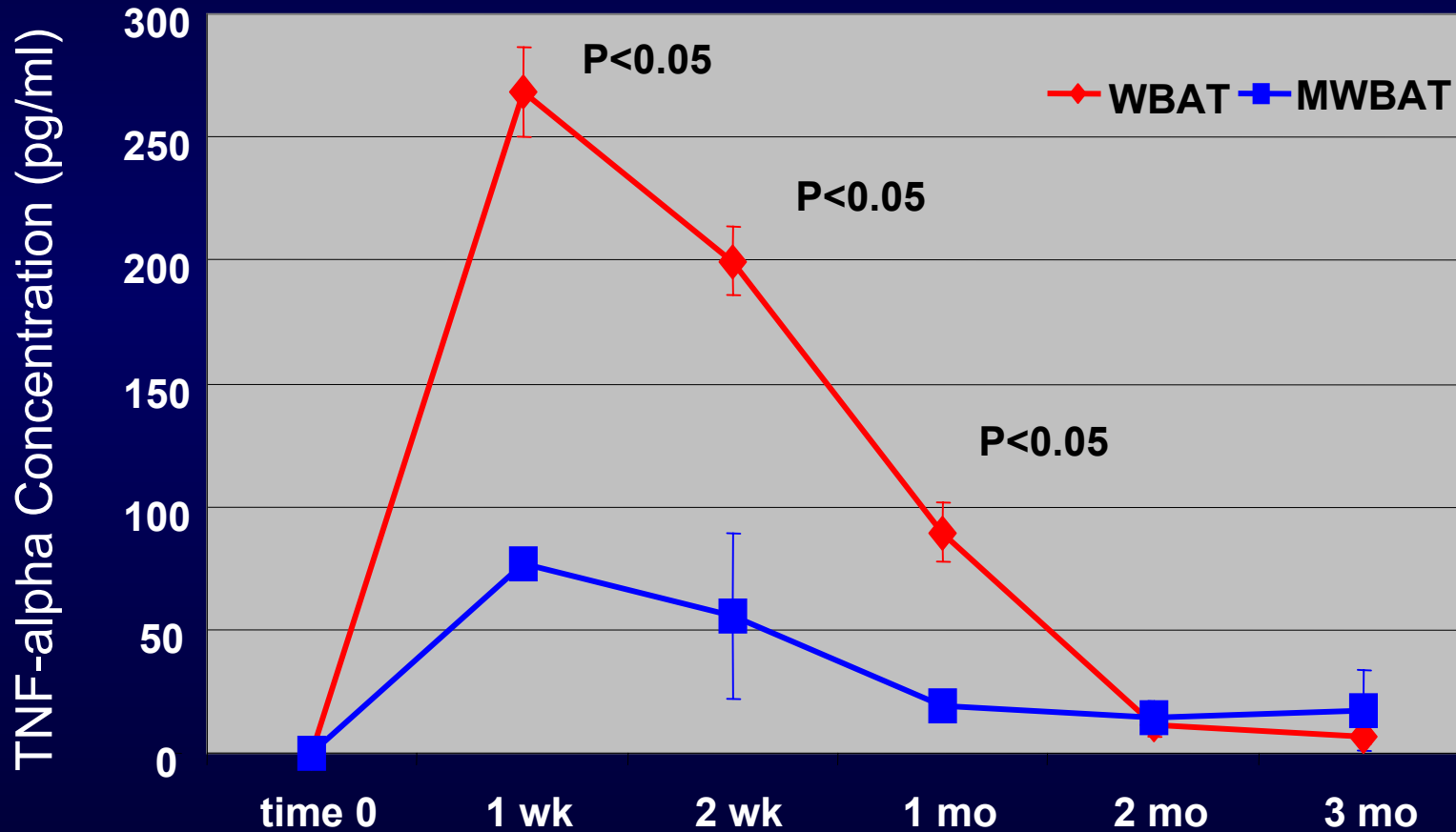
Methods: Analysis of Synovial Fluid

- Cell Count
- Cytokines/mediators
 - » TNF-alpha
 - » Nitric oxide
 - » Metallo-matrix Proteases
 - » IL-10

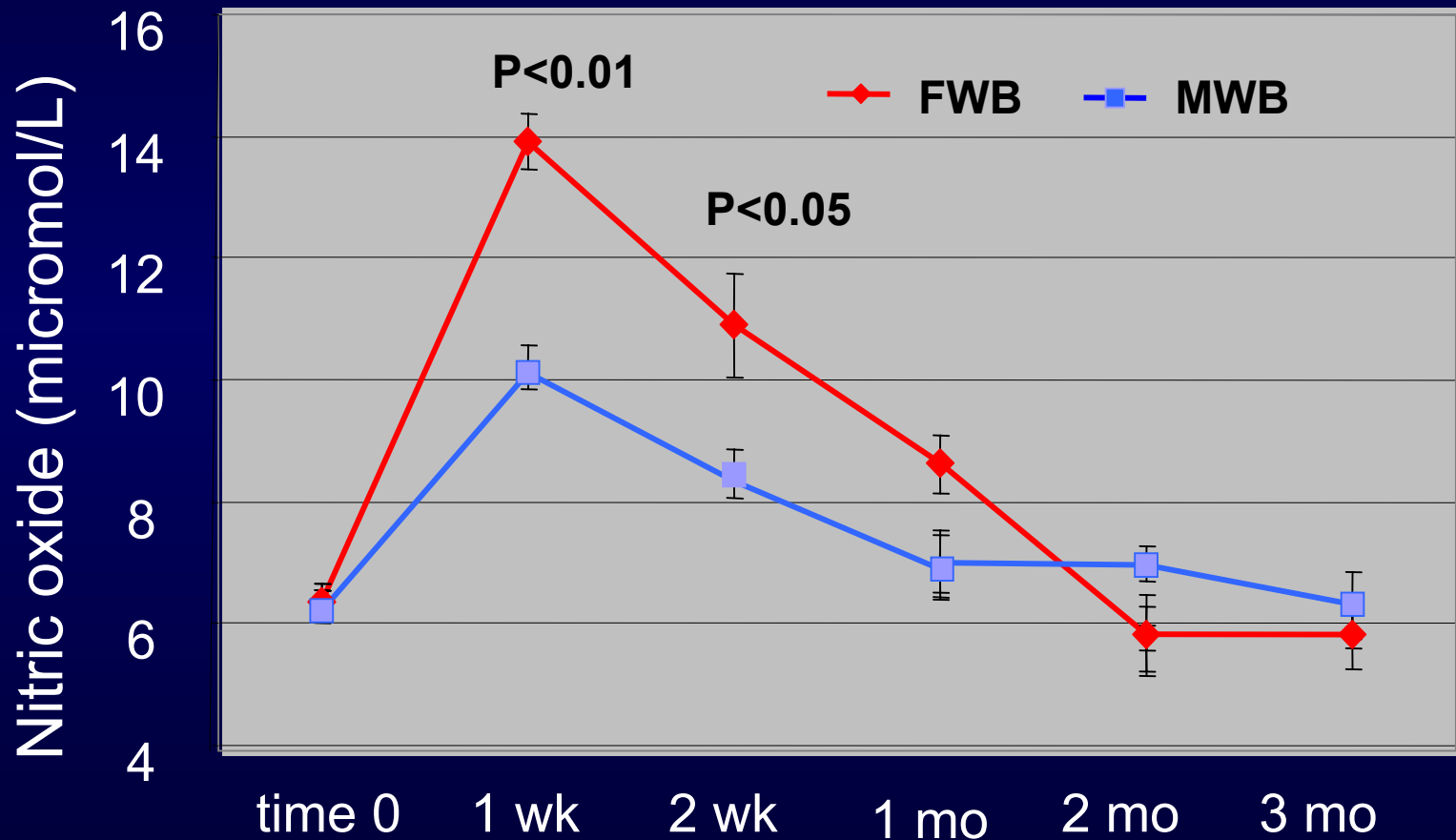
Neutrophil Concentration in Synovial Fluid after Impact Injury



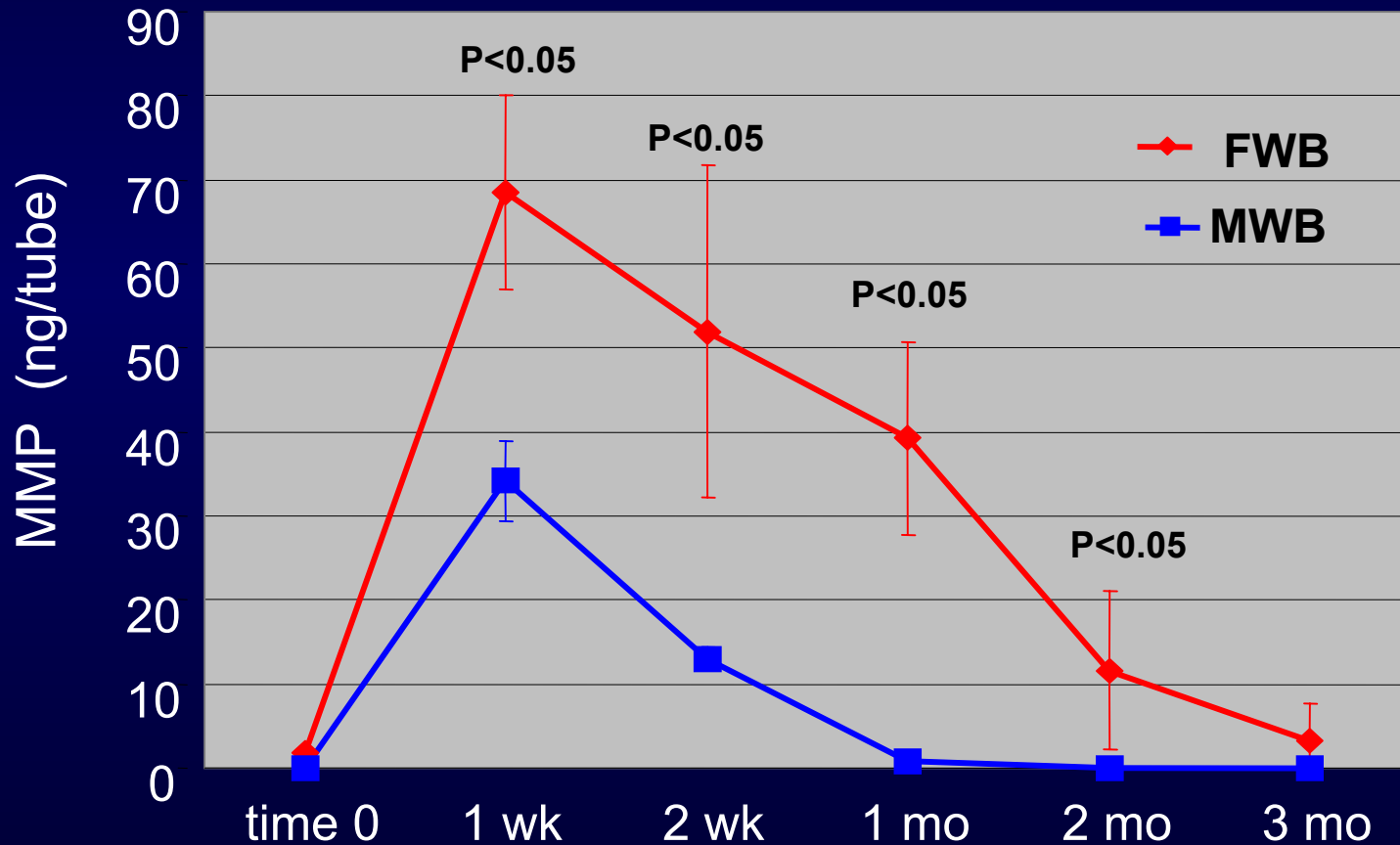
TNF-alpha Levels in Synovial Fluid after Acute Mechanical Impact Injury

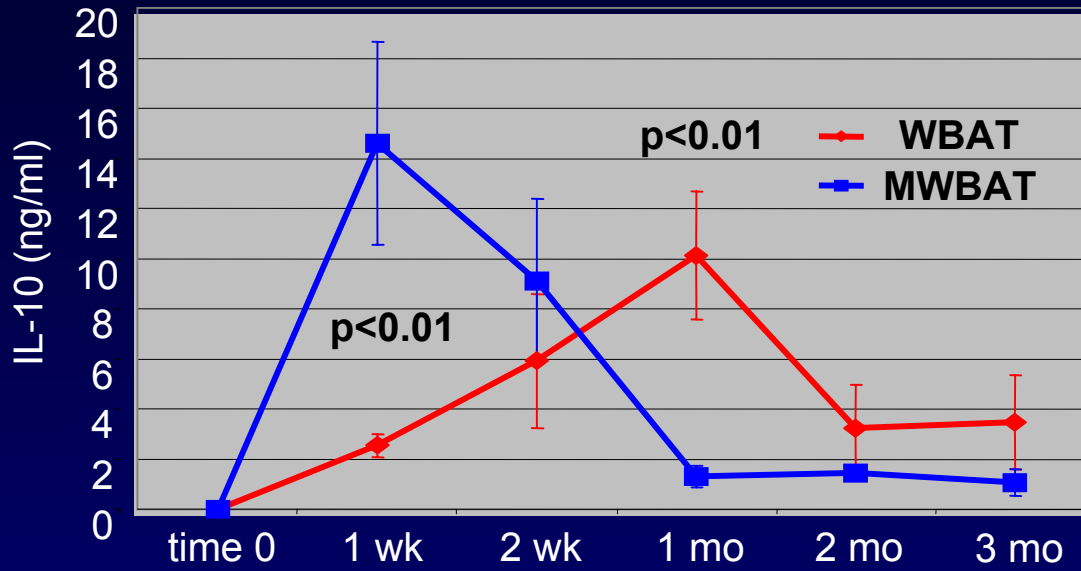


Nitric Oxide in Synovial Fluid after Mechanical Trauma

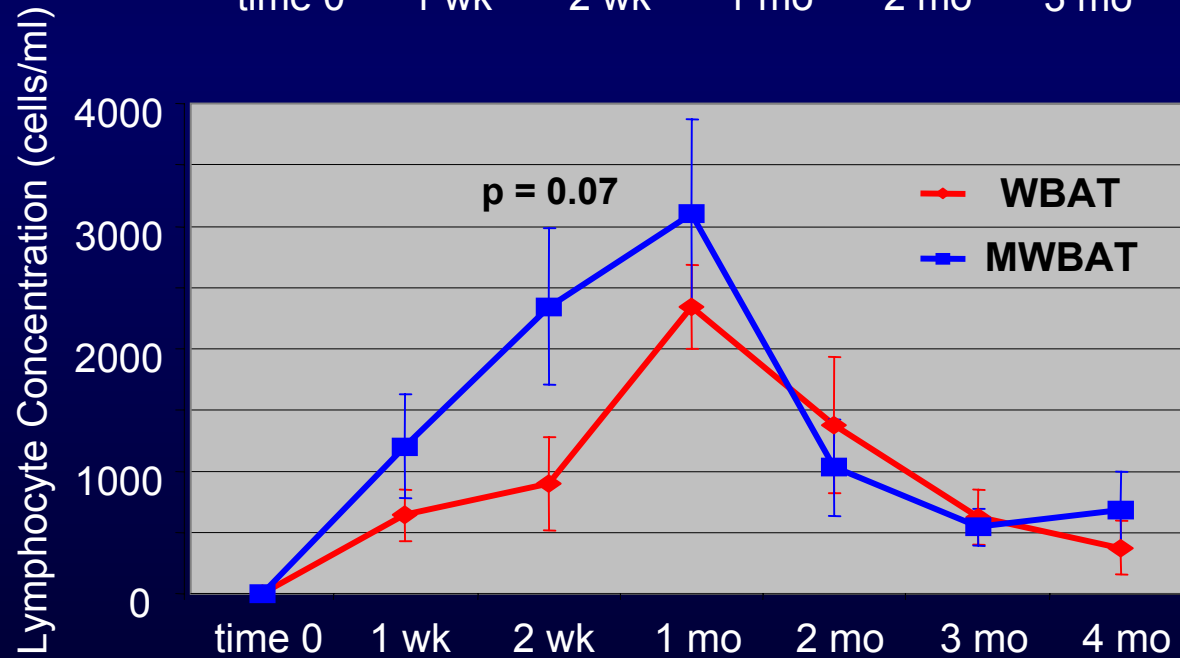


Synovial Concentration of Metallo-Matrix Protease after Articular Injury





IL-10



Lymphocytes

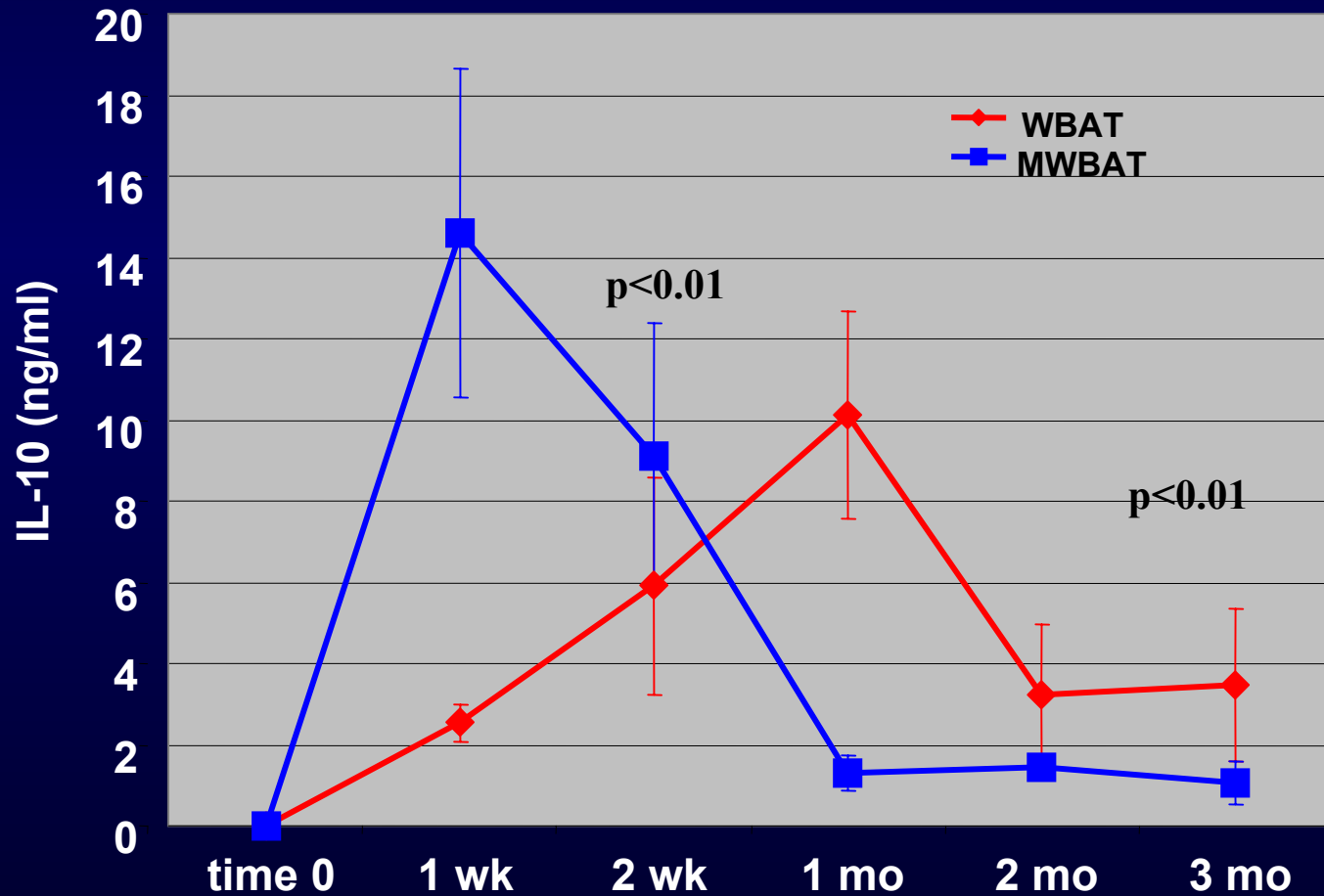
Conclusion

- After articular injury, weight-bearing caused a significant increase in acute inflammation with elevated levels of key mediators such as TNF-alpha, nitric oxide, and metallo-proteases.
- Minimal weight-bearing promoted the release of key cytokines such as IL-10 that decrease the acute inflammatory response and may promote extra-cellular matrix synthesis by chondrocytes.

Conclusions

- This suggests that weight-bearing should be delayed following joint injuries until the inflammatory response has resolved.
- The long-term effects of these inflammatory changes on cartilage viability await further investigation.

IL-10 Levels in Synovial Fluid after Acute Mechanical Injury to Articular Cartilage



Lymphocyte Concentration in Synovial Fluid after Impact Injury

