

Identification of Clinical and Biological Risk Factors for Postoperative Stiffness After Total Knee Arthroplasty for Osteoarthritis

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Introduction: There is evidence that cytokines and adipokines play a role in the development of organ fibrosis, however the role of inflammation in the development of arthrofibrosis after total knee arthroplasty (TKA) has not been well explored. This study aims to identify differences in the perioperative clinical and cytokine profiles of patients who do and do not develop stiffness after TKA performed for osteoarthritis (OA).

Methods: 162 patients with end-stage OA scheduled for TKA were enrolled in this prospective cohort study. Perioperative plasma and synovial fluid cytokine levels were measured using the V-Plex Human Cytokine 30-Plex Panel (Mesoscale: Rockville, Maryland, USA). All cytokine concentration levels are log-transformed. Linear mixed model was used to estimate the difference of changes of each plasma cytokine from baseline to POD2 between stiffness and non-stiffness subjects, with autoregressive covariance structure, using time points as fixed effect and subjects as random effect.

Results: 19.8% (32/162) of patients met criteria for postoperative stiffness at 6 weeks following TKA for OA. Lower preoperative ROM and presence of neuropathic pain were associated with increased risk of postoperative stiffness. Postoperative plasma levels of 9/31 cytokines studied were significantly different between stiff and non-stiff patients ($p < 0.05$) including Interferon Gamma Induced Protein 10 (IP10) and Interleukins 5, 7, and 12p70.

Conclusions: Nearly 20% of patients in this cohort developed early postoperative knee stiffness, which was associated with limited preoperative ROM, neuropathic pain, and acute postoperative differences in levels of nine cytokines. These results support the theory that the biologic response to surgery in the first two days postoperatively may influence long-term clinical outcomes. Future research directed towards early control of inflammatory cytokines may identify interventions to reduce post-TKA stiffness.