

Abstract

Title: Correlation of Outcomes and Intradiscal Cytokine Expression in Lumbar Fusion Patients

Authors: Christopher K. Kepler, Dessislava Markova, John Koerner, Joseph Mendelis, D. Greg Anderson

Introduction: Symptomatic degenerative disc degeneration is a leading cause of chronic back pain and results in approximately 25% of lumbar fusion cases in the United States. Despite the high incidence of surgery for painful disc degeneration, there are no highly accurate testing strategies to confirm the presence of pain at a particular disc level and the results of this type of surgery remain suboptimal. Previous work has shown that certain cytokines/chemokines are more highly expressed in painful disc tissue versus non-painful disc tissue but correlation with clinical outcome following surgery has never been studied. We sought to answer the following question: Is there a significant correlation between intradiscal expression levels of Interleukin-6 (IL-6), a cytokine previously described to be associated with painful disc degeneration, and clinical outcome measures in patients undergoing lumbar fusion for painful disc degeneration?

Methods: Patients undergoing anterior lumbar interbody fusion (ALIF) for low back pain unresponsive to conservative treatment were included in this study. All patients completed preoperative and postoperative Visual Analog Scale (VAS) back pain and Oswestry Disability Index (ODI). Intervertebral disc (IVD) tissue was collected and separated into annulus fibrosus (AF) and nucleus pulposus (NP). Each disc sample was finely minced and placed into tissue culture media for 48 hours before the conditioned media (CM) was collected. The CM was analyzed via ELISA to quantify concentration of IL-6. Pearson correlation coefficients (ρ) were used to quantify relationships between expression levels of IL-6 and preoperative and postoperative VAS back pain and ODI, as well as change in VAS back pain and ODI. Significance was assumed for $p < 0.05$.

Results: Sixteen discs were harvested from 9 patients undergoing ALIF for discogenic pain (mean age 44.4 years, range 21-61). VAS back pain and ODI were collected preoperatively and at an average of 6 months postoperatively. The mean preoperative and postoperative VAS back pain scores were 8.1 and 3.7 respectively. The mean preoperative and postoperative ODI were 56.2 and 25.6, respectively. There were significant positive correlations between intradiscal IL-6 expression and postoperative VAS back pain ($\rho = 0.38$, $p = 0.048$) and ODI ($\rho = 0.44$, $p = 0.02$). No significant correlations were found between intradiscal IL-6 expression and preoperative VAS back pain ($\rho = -0.12$, $p = 0.54$). Trends were seen associating IL-6 expression and change in VAS back pain, and change in ODI ($\rho = -0.35$, $p = 0.067$, $\rho = -0.34$, $p = 0.08$ respectively). Similarly, a trend was seen associating IL-6 expression and preoperative ODI ($\rho = 0.36$, $p = 0.063$).

Discussion: The significant direct association between intradiscal IL-6 expression and ODI and VAS scores suggests patients with elevated cytokine expression levels may have worse outcomes. Significant correlations were not seen between intradiscal IL-6 expression and preoperative outcomes, or change in outcomes after surgery although we found negative associations between IL-6 expression and both outcome measures suggesting those patients with elevated preoperative IL-6 levels have less postoperative improvement. Our results suggest that patients with elevated IL-6 expression may benefit less from surgery for symptomatic disc degeneration compared to those with lower expression of IL-6.