

Elevated Inflammatory Cytokines in the Aqueous Humor of Glaucoma Patients Undergoing Endothelial Keratoplasty

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Purpose: Descemet's Membrane Endothelial Keratoplasty (DMEK) is a cornerstone in the treatment of corneal endothelial dysfunction. Long-term graft survival is dependent on a variety of factors including the presence of ocular co-morbidities such as glaucoma. It is well established that patients with glaucoma undergoing keratoplasty have greater risk of graft rejection and failure. Previous studies have demonstrated that glaucoma patients have a distinct aqueous humor (AH) inflammatory cytokine profile. **Purpose:** To further characterize the pro- and anti-inflammatory cytokine levels in patients with glaucoma undergoing keratoplasty and assess its relationship with long-term graft survival.

Methods: This was a prospective study including 14 patients with glaucoma undergoing DMEK and 17 patients undergoing cataract surgery alone. AH was extracted from each patient at the beginning of their respective surgeries. A 48-analyte bead assay from Sigma-Aldrich (Milliplex Human Cytokine/Chemokine/Growth Factor Magnetic Bead Panel) was run on each sample to test for a variety of cytokines. Kruskal-Wallis and Dunn's multiple comparison tests were used to determine significance.

Results: Twenty cytokines showed statistical significance in the glaucoma group when compared to the control group. CD40L ($p < 0.001$), Eotaxin ($p = 0.005$), FLT-3L ($p = 0.005$), Fractalkine ($p = 0.02$), G-CSF ($p < 0.001$), GRO α ($p = 0.02$), IL-5 ($p = 0.009$), IL-6 ($p < 0.001$), IL-8 ($p < 0.001$), IL-10 ($p = 0.006$), IL-12p40 ($p = 0.01$), IL-15 ($p = 0.005$), IP-10 ($p = 0.02$), MCP-1 ($p = 0.01$), CXCL9 ($p = 0.01$), MIP-1 β ($p = 0.002$), and TNF α ($p < 0.001$) were significantly elevated in the glaucoma group. In contrast, GM-CSF ($p = 0.01$), IL-22 ($p < 0.001$), and M-CSF ($p = 0.007$) were all significantly decreased in the glaucoma group.

Conclusion: There was a significant increase of many inflammatory cytokines in glaucoma patients compared to cataract controls. These cytokines indicate the potential presence of innate immune cells, such as macrophages, which could affect corneal graft outcomes. Future studies will evaluate DMEK graft survival and its association with cytokine profiles at time of surgery.