Jack A. Leoni
L3
LSU Health Sciences Center, New Orleans, LA

Mentor: Taylor Phelps, M.D.
LSU Health Sciences Center, Department of Ophthalmology, New Orleans, LA

"Anti-Glaucoma Medication Use Prior to Anti-VEGF Injections in Lowering Intraocular Pressure: A Systematic Review"

Background: Intravitreal injections (IVI) of anti-VEGF agents are essential for treating retinal diseases like age-related macular degeneration, diabetic retinopathy, and retinal vein occlusion, but they carry risks of acute and chronic intraocular pressure (IOP) elevations. Each injection adds 0.05 mL to the eye's 4 mL vitreous volume, increasing pressure in this closed system. This can damage the optic nerve or reduce retinal perfusion, risking ischemia especially in glaucoma patients. Despite studies on prophylactic anti-glaucoma medications to prevent IOP spikes, inconsistencies in research design have created uncertainty about best practices.

Methods: A comprehensive literature search of all records in PubMed, Embase, the Cochrane Library, and records identified from citation searching was conducted. A systematic literature search was then done to investigate all literature reports of cases of anti-glaucoma medication administration in reducing IOP prior to anti-VEGF injection. Covidence™, an online program that facilitates screening and data extraction, was used, with three reviewers independently screening articles for inclusion criteria, while blinded to each other's selections. Criteria for inclusion were all articles conducting placebo-controlled trials of adults over 18 receiving anti-glaucoma medications before IVI. Studies that did not have extractable numerical data, failed to include a control comparison group, or trials that did not report measures of intraocular pressure or detail specified time frames of glaucoma medication application were excluded. The senior author resolved any conflicts between reviewers regarding inclusion and exclusion criteria.

Results: 98 articles on IVI were initially identified, of which 50 ineligible articles and duplicates were removed. The remaining 48 articles were screened against the inclusion and exclusion criteria of the study. Twelve studies meeting inclusion criteria were identified and subsequently full text reviews were conducted. Preliminary statistical analysis of the twelve selected studies have demonstrated that mean IOP prior to injection was slightly lower in the anti-glaucoma medication group compared to control groups, yet no statistical significance was found. Further, mean IOP had a statistically significant ($P < 0.00001$) decrease in the anti-glaucoma medication prophylaxis group at four different time points (0-4 minutes (mean= -5.92 mmHg, 95% CI [-6.70, -5.13]); 5-14 minutes (mean= -4.69 mmHg, 95% CI [-5.25, -4.13]), 15-29 minutes (mean= -2.50 mmHg, 95% CI [-2.83, -2.16]), and >30 minutes after injection (mean= -1.00 mmHg, 95% CI [-1.36, -0.64])) compared to control groups.

Conclusion: The key takeaway from our work thus far is that while there is a statistically significant change in IOP with the use of anti-glaucoma prophylaxis prior to anti-VEGF IVI, the clinical impact is minimal. However, an argument can be made that patients with end-stage glaucoma, who are more vulnerable to IOP fluctuations and often receive multiple IVI treatments per year, may still benefit from any available intervention.