Intracameral Moxifloxacin Prophylaxis for Postoperative Endophthalmitis: Dose Optimization for Posterior Capsular Rupture and Secondary IOL Cases

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Introduction: Previously, we developed a mathematical model for optimizing drug delivery of prophylactic intracameral moxifloxacin (ICM) after routine cataract surgery with in-the-bag IOL implantation. This model ultimately recommended injecting 0.55 mL (150 ug/0.1 mL) of ICM to reliably achieve a retained mass of 500 ug ICM in the anterior chamber at the conclusion of surgery, which according to literature, should eliminate known pathogens to cause postoperative endophthalmitis with negligible risk of toxicity. However, even with adoption of ICM prophylaxis at the end of surgery, evidence suggests statistically higher rates of postoperative endophthalmitis after complex cases involving intraoperative posterior capsular rupture (PCR) and secondary intraocular lens (IOL) implantation. The purpose of this work was to adapt the model to these more complicated cases to optimize the prophylactic ICM dose and administration method at the end of surgery.

Methods: We employ mathematical modelling, specifically first order mixing methods accounting for simultaneous fluid injection and leak from the anterior chamber, to predict achieved drug delivery. We have extended our previous mathematical model to these two previously unconsidered scenarios (which have different volume and compartment properties than simple pseudophakic eyes after routine cataract surgery) based on the surgeon's ability or inability to reinstate a "posterior capsular barrier". For both groups of scenarios, we then propose an enhanced dose and method to deliver ICM which may reduce their reported increased infection rates.

Results: We identified two groups (Group 1, in which the capsular barrier is reinstated, and Group 2, in which the barrier cannot be reinstated). Unlike the 0.5 mL volume of a newly pseudophakic eye after cataract surgery, the working volumes were determined to be separated 0.5mL and 1.0mL compartments in Group 1, and a single 1.0 mL compartment for Group 2. For Group 1, our suggested approach is to inject 0.55 mL (150 µg/0.1mL) ICM just prior to IOL implantation, directed towards the vitreous, and another 0.55 mL moxifloxacin through the side port at the end of the case after the main incision has been sealed. For Group 2, we recommend injecting a total injection of 1.1 mL (150 µg/0.1mL) ICM, which can be achieved using the same technique as for Group 1.

Conclusions: We suggest an enhanced ICM protocol for PCR and secondary IOL implantation cases to more accurately achieve the desired POE prophylactic dose of 500 µg per 0.5 mL volume in the at-risk increased anterior chamber and anterior vitreous volumes.