Engineered Intraocular Injection Guide (IIG): Pain Reduction in Ophthalmic Disease Treatment

Maturi, Vikas

Purpose: Millions of intraocular injections are given each year. I developed a novel device (the Intraocular Injection Guide, IIG) to improve patient comfort during intraocular injections by eliminating the need for the painful eyelid speculum. Methods: Using Autodesk Inventor software, I designed over 30 successive prototypes of the IIG1. This guide was tested with a variety of needle/syringe complexes on a model eye to ensure compatibility with most intraocular treatments. We then tested the first final prototype IIG1 vs. speculum on 50 subjects needing bilateral injections. A Visual Analogue Scale (VAS) was used to determine pain levels immediately following treatment. Based on physician feedback, I subsequently modified the device further and repeated the study with IIG2 vs. speculum. Results: IIG1 had a mean pain score of 14.76mm (range 0–100 mm) vs. 32.22mm for the lid speculum. In Part 2, IIG2 had a median pain score of 9.94mm vs. 27.65mm for the speculum. Scatterplots of pain scores for IIG1 vs. lid speculum (Part 1) and IIG2 vs. lid speculum (Part 2) had R2 values of .000068 and .01205 respectively, suggesting minimal to no intrasubject pain correlation. 95% confidence intervals for pain score in Part 1 (IIG 1: (9.37, 20.15); Speculum: (24.65, 39.79)), and in Part 2 (IIG 2: (6.52, 16.02); Speculum: (19.22, 36.08)) do not overlap within each Part, suggesting significant reduction in pain with the IIG1 and IIG2. T-tests for each part resulted in P-values of .00043 and .00025 respectively, indicating decreased pain with the IIG1 and IIG2. Conclusions: Patients find the IIG to be more comfortable than the traditional speculum. Decreased discomfort generally leads to better compliance. The device will be implemented on a large scale via injection molding.

Awards Won:

Fourth Award of $500

Serving Society Through Science: First Award of $500