The usage of the rabbit model in GFS research for the development of new treatment modalities.

abstract

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Abstract

Purpose: Degeneration of retinal ganglion cells and subsequently the optic nerve leads to progressive visual field loss in glaucoma. Currently, all treatments focus on reducing intraocular pressure (IOP). These include drugs, laser, and glaucoma filtration surgery (GFS), including minimally invasive glaucoma surgery (MIGS). During GFS, a small reservoir or “bleb” is created to redirect aqueous humor flow and subsequently decrease IOP. Although surgical intervention is highly effective, clinicians withhold from surgery due to considerable postoperative care and possibly vision threatening complications. The formation of fibrosis can limit the functionality of the bleb. Fifteen to 43% of surgeries fail due to the postoperative formation of fibrotic tissue. Development of novel treatments require the use of animal models. In the present study we have validated a rabbit model of fibrosis after MIGS and studied the cellular response with Immunohistochemistry (IHC).
Methods: Twenty rabbits were implanted with a MicroShunt. Rabbits were sacrificed at postoperative day (POD) 1, 5 and 40, to assess the fibrotic reaction via IHC. In vivo examinations included slit lamp examinations, Optical coherence tomography (OCT) and IOP measurements.
Results: Bleb failure occurred between 1-2 weeks in all rabbits. OCT images showed similar results with the bleb height declining within 2 weeks. The IOP on POD 0, 1 and 7 was 11.41 mmHg (+/- 2.7), 9.21 mmHg (+/- 2.04) and 11.2 mmHg (+/- 1.5).
Conclusion: A strong fibrotic reaction was seen in vivo. All blebs failed within 2 weeks. Therefore, this is a reliable model to assess the efficacy and safety of novel biomedical devices.