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**Abstract Title:**

PATHWAYS AND MECHANISMS OF GLAUCOMA MICRO DRAINAGE SURGERY

**Purpose:**

To study the drainage pathways of aqueous humour from the subconjunctival space following a new micro drainage surgery technique using an anterior chamber approach to avoid surgical damage to conjunctiva.

**Design:**

Experimental study in laboratory animals

**Participants:**

Rabbits and Monkeys

**Main Outcome Measures:**

Monitoring of drainage from the subconjunctival space

**Methods:**

We have developed an anterior chamber approach to micro drainage surgery aimed at creating a precisely controlled and permanent drainage channel between the anterior chamber and the subconjunctival space. A bio-engineered microfistula tube was implanted. This surgical approach was tested in normal rabbits and in monkeys. Dynamic monitoring of fluorescein drainage not only from the anterior chamber to subconjunctival space, but also more interestingly from the subconjunctival space to the systemic circulations assessed the functional status of the drainage pathways at different time points. The normal distribution of the lymphatics

and/or veins and their relation to drainage pathways were also assessed using subconjunctival injection of trypan blue, histochemistry and immunohistochemistry.

#### Results:

The anterior chamber was well maintained and a conjunctival bleb formed immediately after surgery. The implanted microfistula tubes were well tolerated and later absorbed, leaving a patent drainage channel with minimal scarring. With successful implantation, functional drainage pathways were not only evident between the anterior chamber and the bleb, but direct drainage pathways were demonstrated between the bleb and the lymphatics and/or veins as early as two weeks after surgery. The size of the subconjunctival bleb and the number of the lymphatics and/or veins varied between animals during the follow up period. The presence of lymphatic drainage was further confirmed by direct connection between drainage pathway and conjunctival lymphatics.

#### Conclusion:

This new micro drainage surgery produces long lasting drainage pathways with minimal damage to ocular tissues. The avoidance of conjunctival injury at the implantation site appears not only to avoid the complications of conjunctival scarring, but also provides an opportunity to study possible pathways and mechanisms following drainage surgery. Drainage pathways formed by the lymphatics and/or veins in the conjunctiva are critical for successful glaucoma drainage surgery.