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## The I-OPener: A Novel Glaucoma Tube Shunt Device





## **OBJECTIVE** An improved glaucoma implant for regulating excessive fluid pressure within the eye

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## Background

#### Glaucoma is the second highest cause of blindness worldwide

Affecting over **65 million** people, **glaucoma** is a disease that causes excessive **fluid buildup** within the eye. Over time, increased pressure inside the eye **damages** the optic nerve and **impairs vision**. While **no cure exists**, several treatment options are used, including medication, laser treatment and **surgery**.

# Tube Shunt Surgery is an effective treatment for severe glaucoma

In severe cases, surgeons will lower eye pressure by redirecting fluid into a tube shunt implant. Fluid from the eye will drain into a tube and collect onto the plate sutured to the back of the eye, where it is reabsorbed by the body. Although these devices can initially lower eye pressure, they have a higher rate of failure over time.

#### Conventional tube shunt devices have several limitations

- Existing devices are unable to account for the varying resistance to fluid flow before and after scar formation, the body's immunological response to an implant.
- 2. Commonly used implants cost up to **\$1,000** each.
- 3. Each device includes only **two sizes** for all patients.

Internal Eye Pressure

8 - 21 mmHg

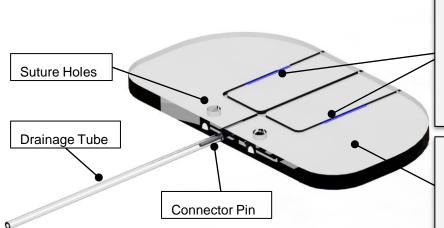
22 - 50 mmHg

#### Normal

Glaucoma

## **Design Solution**

The I-OPener Tube Shunt is a low-cost (~\$20), patient-specific device which accurately regulates intraocular pressure (IOP) using two degradable blockers encased within a microfluidic chamber.



#### **Degradable Blockers:**

- Gradually dissolve over time, increasing fluid flow and counteracting resistance created through scar formation
- Polymer concentration and length can be modified, altering the degradation rate to match each patient's initial pressure

### Microfluidic Chamber:

- Multiple channels allow for improved pressure control
- Silicone material is affordable, biocompatible, and easy to manufacture