



USE OF NANOTECHNOLOGY AND RELAY SWITCHES TO TREAT GLAUCOMA

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ABSTRACT—*Vision is so important in one's life. But it is likely to be lost by various diseases. One such disease is called glaucoma. If the intraocular pressure in the eye exceeds 10-20 mm of hg, it may result in glaucoma. The front part of the eye is filled with a clear fluid called intraocular fluid or aqueous humor made by the ciliary body. The fluid flows out through the canal of schelmm whose diameter is of micrometer range. It is then absorbed into the blood stream through the eye's drainage system. The inner pressure of the eye (intraocular pressure or IOP) depends upon the amount of fluid in the eye. In glaucoma, the drainage system remains open or closed causing the IOP to increase or decrease. The purpose of this paper is to overcome this disorder.a nanosensor is implanted in the eyes. A micro sized relay switch is placed at the opening of the canal of schelmm. The pressure in the eyes is detected by the nanosensor. If the pressure of the aqueous fluid exceeds 20 mm of hg, the relay switch is opened and the fluid is allowed to drain through the canal of schelmm. If the pressure is below 10mm of hg, the relay switch is closed, so that the fluid does not drain into the canal of schelmm. Thus the pressure is maintained constant. So the patient with glaucoma never loses his/her vision.*

I. INTRODUCTION

Glaucoma refers to certain eye diseases that affect the optic nerve and cause vision loss. The front part of the eye is filled with a clear fluid called intraocular fluid or aqueous humor, made by the ciliary body (The ciliary body is the circumferential tissue inside the eye composed of the ciliary muscle and ciliary processes. It is coated by a double layer, the ciliary epithelium. This epithelium produces the aqueous humor.). The fluid flows out through the pupil into the front chamber. Once in the front part of the eye, the fluid drains out of the eye through an area called the canals of Schlemm This appears in histological sections as a flattened and irregular vessel much like a lymphatic duct, but like other structures in this region of the eye, it runs circumferentially around the entire periphery of the limbus (The limbus is a common site for the occurrence of corneal epithelial). The Canal of Schlemm eventually leads

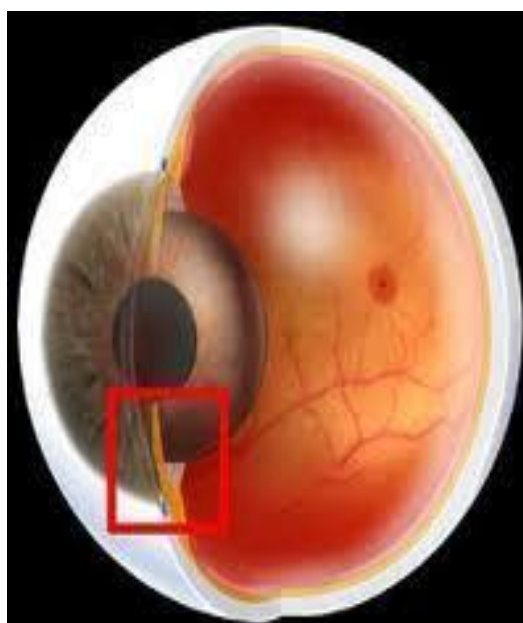


into the lymphatic drainage of the eyeball, which exits via vessels in the sclera. The fluid is then absorbed into the bloodstream through the eye's drainage system. This drainage system is a meshwork of drainage canals around the outer edge of the iris. Proper drainage helps keep eye pressure at a normal level. The production, flow, and drainage of this fluid are an active continuous process that is needed for the health of the eye. International Journal of Advanced Research in Electronics, Communication and Instrumentation Engineering and Development

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The inner pressure of the eye (intraocular pressure or IOP) depends upon the amount of fluid in the eye. If your eye's drainage system is working properly then fluid can drain out and prevent a buildup. Your IOP can vary at different times of the day, but it normally stays within a range that the eye can handle.

The eye with glaucoma





In most types of glaucoma, the eye's drainage canals become clogged over time, causing an increase in internal eye pressure and subsequent damage to the optic nerve.

As the fluid builds up, it causes pressure to build within the eye. High pressure damages the sensitive optic nerve and results in vision loss.

II. GLAUCOMA SYMPTOMS

Most people with glaucoma do not notice symptoms until they begin to have significant vision loss. As optic nerve fibers are damaged by glaucoma, small blind spots may begin to develop, usually in the peripheral or side vision. If the entire optic nerve is destroyed, blindness results.

Other symptoms usually are related to sudden increases in IOP, particularly with acute angle-closure glaucoma, and may include blurred vision, halos around lights, severe eye pain, headache, abdominal pain, nausea, and vomiting.

There are a number of ways to treat glaucoma. While some people may experience side effects from glaucoma medications or glaucoma surgery, the risks of side effects should always be balanced with the greater risk of leaving glaucoma untreated and losing vision. International Journal of Advanced Research in Electronics, Communication and Instrumentation Engineering and Development **Trabeculectomy** is a surgical procedure used in the treatment of glaucoma to relieve intraocular pressure by removing part of the eye's trabecular meshwork and adjacent structures. It is the most common glaucoma surgery performed and allows drainage of aqueous humor from within the eye to derneath.

In trabeculectomy, a small flap is made in the sclera (the outer white coating of your eye). A filtration bleb, or reservoir, is created under the conjunctiva — the thin, filmy membrane that covers the white part of your eye. Once created, the bleb looks like a bump or blister on the white part of the eye above the iris, but the upper eyelid usually covers it. The aqueous humor can now drain through the flap made in the sclera and collect in the bleb, where the fluid will be absorbed into blood vessels around the eye. If Trabeculectomy cannot be performed, aqueous shunt surgery is usually successful in lowering eye pressure which involves use of a plastic tube





Through which the fluid drains

In Trabeculectomy, a flap is first created in the sclera (the white part of the eye). Then a small opening is made into the eye to release fluid from the eye.

IV. DISADVANTAGE

Eye pressure is effectively controlled in three out of four people who have trabeculectomy. Although regular follow-up visits with your doctor are still necessary. If the new drainage channel closes or too much fluid begins to drain from the eye, additional surgery may be needed.

V. LASER TRABECULOPLASTY

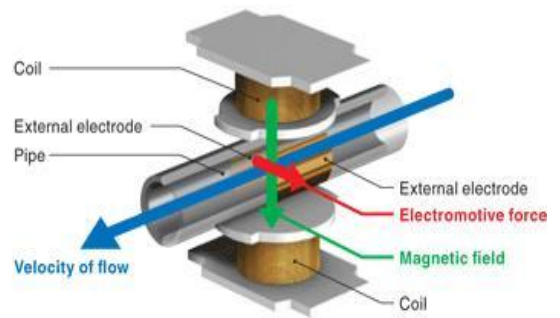
A surgery called laser trabeculoplasty is often used to treat open-angle glaucoma. There are two types of trabeculoplasty surgery: argon laser trabeculoplasty (ALT) and selective laser trabeculoplasty (SLT). During ALT surgery, a laser makes tiny, evenly spaced burns in the trabecular meshwork. The laser does not create new drainage holes, but rather stimulates the drain to function more efficiently. With SLT, a low level energy laser targets specific cells in the mesh-like drainage channels using very short applications of light. The treatment has been shown to lower eye pressure at rates comparable to ALT.

VI. DISADVANTAGE

Even if laser trabeculoplasty is successful, most patients continue taking glaucoma medications after surgery. For many, this surgery is not a permanent solution. Nearly half who receive this surgery develop increased eye pressure again within five years. Many people who have had a successful laser trabeculoplasty have a repeat treatment. Laser trabeculoplasty can also be used as a first line of treatment for patients who are unwilling or unable to use glaucoma eyedrops. International Journal of Advanced Research in Electronics, Communication and Instrumentation Engineering and Development

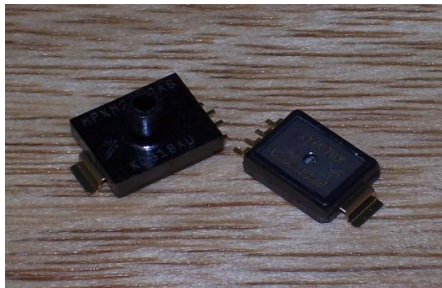


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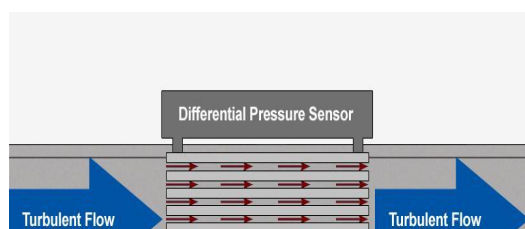




VI
I. DETECTING
GLAUCOMA USING



A pressure nano sensor usually acts as a transducer; it generates a signal as a function of the pressure imposed. These sensors are commonly manufactured out of piezoelectric materials. It is developed for the continuous monitoring of fluctuations in intraocular pressure of the eye. Activity of nano pressure sensor If the pressure of the aqueous fluid exceeds 20 mm of hg, the relay switch is opened and the fluid is allowed to drain through the canal of schelmm. If the pressure is below 10mm of hg, the relay switch is closed, so that the fluid does not drain into the canal of schelmm. Thus the pressure is maintained constant.



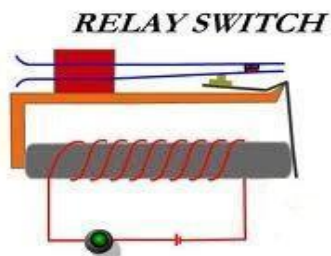


Flow of fluid within nano sensor

VIII. RELAY SWITCH

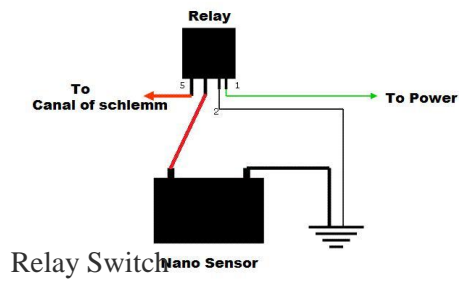
A relay is an electrically operated switch. Many relays use an electromagnet to operate a switching mechanism mechanically, but other operating principles are also used. Relays are used where it is necessary to control a circuit by a low-power signal (with complete electrical isolation between control and controlled circuits), or where several circuits must be controlled by one signal. A relay switch is a simple device with an electromagnetic coil that pulls on a contact to make or break the circuit when the International Journal of Advanced Research in Electronics, Communication and Instrumentation Engineering and Development

coil is energized. The switches in the relay are of two types. They are: normally open and normally closed switches. In this system a normally closed switch is used.





mm of hg, the relay switch gets closed so the fluid will not drain through the canal of schlemm.

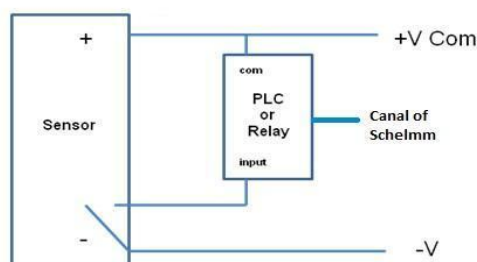


Block diagram of the activity of relay switch



IX. TREATMENT USING ELECTRONICS

Glaucoma can be avoided by the use of pressure nanosensor (a device which is used to detect the pressure of its surroundings) and a micro sized relay switch (Relays are used where it is necessary to control a circuit by a low-power signal (with complete electrical isolation between control and controlled circuits)) within the eye. In a healthy eye, light is converted into electrical signals by the rods and cones in your retina, which are then transmitted down your optic nerve to your brain. So the power supply needed is provided by these electrical signals. Before implanting these in the eyes, the patients should undergo laser trabeculoplasty surgery to make the drainage system free from clogs. Normal IOP is measured in millimeters of mercury and can range from 10-20 mm Hg. the pressure nanosensor is used to measure the pressure within the eye. The micro sized relay switch is placed at the opening of the canal of schlemm (diameter is in the range of micrometers) through which the aqueous fluid drains. If the pressure within the eye exceeds 20 mm of hg, the relays switch opens making the fluid to drain through the canal of schelmm. When the pressure within the eye is below 10 This prevents the clogging of the drainage system and the intralocular pressure within the eye to remain constant and glaucoma can be prevented.



Path from sensor to relay

X. ADVANTAGES

Even if laser trabeculoplasty is successful, most patients continue taking glaucoma medications after surgery. For many, this surgery is not a permanent solution. Nearly half who receive this surgery develop increased eye pressure again within five years. Many people who have had a successful laser trabeculoplasty have a repeat treatment. Hence for regular check and regular draining of fluid present in the eye, one has to adopt the above methods. The cost is not much expensive. This method gives the life time treatment for the glaucoma disorder. International Journal of Advanced Research in Electronics, Communication and Instrumentation Engineering and Development
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XI. DISADVANTAGES

The main disadvantage is to have a regular check on the nano sensor since there is a possibility dislocate.

XII. CONCLUSION

Nanotechnology extends the limits of molecular diagnostics to the smaller scale. Some techniques are only imagined, while others are at various stages of testing or actually being used today. Use of these technologies in the field of medicine could revolutionize the way we detect and treat damage to the human body and disease in the future, and many techniques, only imagined a few years ago, are making remarkable progress towards becoming realities. If this idea is implemented, the patients with glaucoma are no longer at the risk of losing their vision. Thus by these technological developments the

Risk of losing one's vision can be brought to Control in the future.

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BIOGRAPHY



I'm Nandhini.M pursuing BE (Electronics and Communication) in Velammal Engineering College, Chennai.I have also done a project “Automated Process of Monitoring and Controlling Temperature” and presented it in intra department project display (ELECTRONICA'13).