

# Laser Surgery



Eye Care For You

## Laser Surgery

Ophthalmic laser surgery is a significant development in ophthalmology over the past two decades. Several types of lasers may be used on different parts of the eye and have been helpful in treating many different types of eye diseases, and conditions.

### What is a laser and how does it work?

The term “LASER” is an abbreviation for “Light Amplification by Stimulated Emission of Radiation”. In the most commonly used ophthalmic lasers, a powerful electric current is passed through a tube containing one of several gases (Argon, Krypton) or a solid material (neodymium-YAG). Energy is produced and the laser emits a small uniform light beam which, when focused through a microscope, produces either heat coagulation, cutting, or dissolves certain eye tissues.

Various types of ophthalmic lasers are used to treat different types of eye disorders. Ophthalmic lasers are usually named according to the material contained in the plasma tube. The laser which uses Argon gas and emits a green or blue-green light beam, is used to treat some types of eye disorders, while the Krypton gas laser which emits a red or yellow light beam is used for treating other types of disorders. Solid state crystal lasers and diode lasers are commonly available too, and have their specific applications.

### What are the advantages of using ophthalmic lasers?

Ophthalmic laser surgery has gained importance for several reasons. The ophthalmic laser allow patients to be treated without the risk of infection, in a relatively painless way with minimal discomfort, on an outpatient basis. With their sophisticated microscopic focusing and delivery systems, ophthalmic lasers provide the ophthalmologist with precision and control not previously available with other surgical techniques. This precision, safety, convenience, and reduced cost allows more people to be treated successfully for an increasing number of eye

disorders and diseases.

## **Which conditions can be treated with ophthalmic lasers?**

### **Disease of the retina.**

Retinal tears or holes, which can lead to retinal detachment may be treated with laser coagulation, using the Argon or green laser. Symptoms of retinal tears often include a sudden onset of flashes or floaters in one eye. Visual acuity may or may not be decreased. Not all retinal tears are suitable for treatment with the laser. If retinal detachment has occurred, ophthalmic laser coagulation cannot be of much use and an operative surgical procedure is usually performed, which may include intra-operative laser therapy.

### **Diabetic retinopathy.**

This is a major cause of blindness. There are two major types of diabetic retinopathy. One form e.g. edematous, or background diabetic retinopathy, is characterized by leakage of small blood vessels in the retina, which can cause reduced vision. Advanced background diabetic retinopathy can lead to a second form, proliferative retinopathy, which is characterized by the growth of new blood vessels on the surface of the retina, which may lead to hemorrhage and scarring of the retina. People with diabetic retinopathy may not suffer reduced vision in the early stages, and therefore regular eye examinations by an ophthalmologist are important, especially for people who have been diabetic for a number of years. Uncontrolled diabetes mellitus causes accelerated diabetic damage to the retina, leading to vision loss. Earlier than what the average diabetic patient may encounter.

### **Macular degeneration.**

This condition never leads to total blindness as such, but can severely affect the central or reading vision. In certain cases, it may be treated with the Argon, Krypton or Green crystal lasers. Unfortunately not all patients with macular degeneration can benefit from ophthalmic laser treatment because of the type of degeneration and gradual deterioration of the central retina. Patients must be evaluated carefully, using photographic techniques (fluorescein angiography or indocyanine—green angiography) to determine the presence and location of abnormal blood vessels. Ophthalmic laser treatment attempts to destroy these abnormal blood vessels so that hemorrhage or scarring will be limited and not decrease central vision as much as if left untreated. There are other retinal disorders that also may be successfully treated with the ophthalmic laser, such as central serous retinopathy, Eales' disease, histoplasmosis and some tumours of the eye.

### **Glaucoma**

Glaucoma is a disease which, affects at least two out of every hundred elderly Americans, and more in certain other population groups. In untreated cases, the nerve of sight (optic nerve) becomes damaged usually because the fluid pressure inside the eye that remains too high.

Fortunately, loss of vision from glaucoma can be prevented or limited most of the time if the disease is detected and treated before noticeable damage occurs to the optic nerve. Glaucoma, more than any other eye condition, needs to be detected early if treatment is to be successful, and vision loss to be limited.

### **Open angle glaucoma.**

This is the most common form of glaucoma. Early diagnosis is possible only through examination by an ophthalmologist since there are no early symptoms. If medication does not adequately control pressure within the eye, ophthalmic laser surgery may be used to improve fluid drainage and lower the eye's pressure. If the laser therapy proves to be inadequate in the long term, the ophthalmologist may have to surgically intervene to reduce intra-ocular pressure adequately.

### **Angle closure glaucoma.**

This condition is less common and usually accompanied by pain, red eye, halo's around lights, blurred vision, and occasionally nausea and vomiting. The laser is used to create a tiny opening in the iris of the eye to allow the ocular fluids to circulate better and reduce pressure rises from developing surgical intervention, and cataract may assist in control of the intra-ocular pressure, if it proves to be necessary and appropriate.

### **Membranes of the eye.**

Following surgery of the eye, e.g. cataract extractions, or as a result of disease, membrane clouding can obscure vision. The neodymium –YAG laser is often used to open or dissolve these membranes. The neodymium—YAG laser may be used before or after cataract surgery to open a hole in the membrane or capsule which contains the lens of the eye. The laser is however not used to remove cataracts, contrary to popular belief.

### **Modern advances in laser surgery.**

Technological improvements in the expanding field of laser applications, enable ophthalmologists to continually find better methods to treat eye diseases with the various laser surgery options available.

- The **endolaser** for instance is a small probe, which, when inserted into the center of the eye allows the ophthalmologist to apply the laser beam treatment during retinal and vitreous surgery, and certain forms of glaucoma surgery.
- Another exciting area of ophthalmic laser treatment is Refractive surgery (Vision Correction Surgery), which is used to correct near-sightedness, far-sightedness and astigmatism. Precisely controlled ablations are made in the cornea with the excimer laser to reshape the dome of the cornea and reduce or eliminate the need for glasses.
- The CO<sub>2</sub> laser which is used to cut various tissues around the eye, is under investigation.
- A tunable dye laser (diode) can allow the ophthalmologist to select the best wave length of laser light to treat the particular eye diseases that may be present.

- Photodynamic Therapy (PDT) is used for degenerative retinal conditions where new blood vessels form and leak to cause disruption of the delicate anatomy. Visudyne (a dye) is injected intra-venously followed by specific laser treatment to the involved area.

Undoubtedly, the future will bring advancements with even better tools for ophthalmologist to treat more eye conditions with laser surgery.

Most laser surgeries can be performed in the ophthalmologist's office or an outpatient facility. Eye drops are used to numb the eye for the duration of the procedure.