Laser Surgery of the Eye

Introduction

The word laser stands for "**L**ight **A**mplification by **S**timulated **E**mission of **R**adiation." Laser is a concentrated small beam of light, created when electric current passes through a special material. The type of laser depends on the specific material used.

Indications

There are two different ways that lasers are used to treat eye diseases.

Thermal Lasers

The light is converted to heat when it reaches the eye tissue. The heat is used to:

- Seal blood vessels to stop bleeding or fluid leaking
- Destroy abnormal tissue such as some form of intraocular tumors
- Bond the retina to the back of the eye (e.g. seal off retinal holes before the retina is actually detached)
- Create an opening in the iris for treatment of narrow angle glaucoma
- Open the eye's filtration system for glaucoma treatment
- Destroy part of the ocular structure responsible for aqueous production to lower the intraocular pressure (IOP) for better glaucoma control

Photodisruptive Lasers

- The light cuts or sculpts the tissue, similar to a knife. e.g. for vitreous strand cutting. The beam of light is used to change the shape of the tissue applied on e.g. corneal surface.

Laser Surgery in Eye Diseases

1. Retinal Diseases

a. Retinal tears or holes (if untreated may develop into retinal detachment)
   - The retina is the inner layer of the eye that senses light and helps you see things. If the retina tears, it can separate from

the back wall of the eye that leads to vision loss. This is called retinal detachment.

- If retinal tears are found before the retina detaches, most of them can be treated with laser. The laser helps to seal off the tear and bond the retina to the wall of the eye to reduce the risk of a later retinal detachment.

b. Diabetic retinopathy

- Eye diseases due to diabetes is a major cause of vision loss. Diabetes can cause retinal ischaemia and the growth of abnormal blood vessels in the retina. These vessels are brittle and may leak fluid (macular edema) or bleed inside the eye leading to swelling in the macula and bleeding in the vitreous.
- Laser is used to seal the leaking blood vessels, reducing macular edema to prevent further vision loss. However, laser itself cannot improve vision. It slows or stops abnormal blood vessels growth to reduce the chance of bleeding inside the eye. According to the study, in patients with severe diabetic retinopathy, it has been shown that laser treatment is effective in decreasing the risk of severe visual loss in 50% - 60% of patients. However, not every patient responds to laser the same way. Some patients respond poorly to laser and may subsequently develop vitreous haemorrhage, as laser fails to halt the natural deterioration in visual function caused by the retinopathy. Others suffer from different degrees of visual deterioration and constriction of the field of vision. Usually more than one laser sessions are required to achieve the regression of the growth of the abnormal blood vessels.

c. Macular degeneration

- The macula is the small, central area of the retina that allows us to see fine details clearly. Macular degeneration affects the central or reading vision.
- “Wet” macular degeneration is the abnormal blood vessels which cause bleeding and scarring of the macula. In certain cases, it may be treated with laser to seal the blood vessels and prevent further damage. A special group of patients having a particular type of macular degeneration (age-related

macular degeneration) may need to have special medication injected into the vein to assist the effects of laser.

Other retina problems can be treated with laser such as:

d. Retinal vein occlusions
e. Central serous retinopathy
f. Some types of tumors of the eye

Possible risks and complications of Laser Surgery in Eye Diseases

- Decrease vision and causing dimming and visual field defects
- Loss of / decreased accommodation +/- refractive error changes
- Bleeding in the retina or vitreous
- Accidental burn to macula and optic nerve leading to visual loss
- Enhance growth of retinal fibrous tissue
- Retinal detachment / break if the reaction to the laser treatment is too excessive
- Corneal injury
- Lens injury
- Blindness

2. Glaucoma

- Glaucoma damages the optic nerve, usually caused by the fluid pressure inside the eye that becomes too high. Further vision loss may be prevented or slowed down if the problem is treated before severe damages occur in the optic nerve.
- Laser may be used to lower the pressure such as laser iridotomy, laser iridoplasty, laser trabeculoplasty and ciliary body destruction.

Possible risks and complications of Laser Surgery in Glaucoma

- Failure to penetrate the iris
- Closure of laser iridotomy
- Transient blurring
- Temporary eye pressure elevation
- Glare and seeing double or multiple images
- Corneal or lens injury
- Bleeding
- Iritis
- Hypotony

- Blindness

3. After Cataract Surgery

After a cataract is removed, the capsules of the lens may sometimes become cloudy. The YAG laser can open up the cloudy membrane and restore clear vision.

Possible risks and complications of Laser Surgery in Cataract

- Failure to open up the cloudy membrane
- Residual / recurrence of posterior capsule opacification
- Transient rise of eye pressure
- Retinal detachment
- Macula edema
- Damage to the implanted intraocular lens producing glare and seeing multiple images.
- Rarely causes implanted intraocular lens subluxation / dislocation
- Vitreous floater

4. Oculoplastic Surgery

Laser can be used to treat certain eyelid diseases e.g. trichiasis ablation and lacrimal drainage problems.

5. Cornea

Corneal new vessels

The normal cornea is transparent and avascular. Ocular insult, like infection, inflammation, can encourage new blood vessels to grow from the limbus. The corneal new vessels may threaten the vision through corneal haemorrhage, scarring, and lipid deposition. Laser can be used to occlude the abnormal corneal new vessels.

Possible risks and complications of Laser surgery in corneal new vessels

- Iris damage
- Corneal limbal stem cell damage
- Inflammation
- Corneal haemorrhage
- Corneal thinning
- Corneal perforation
- Reactivation of preexisting eye disease

Follow Up after Laser Surgery

- It is advisable to have adequate rest after laser treatment and avoid eye contusion. Avoid contact sports and high platform diving (especially patients with retinal tears) after laser treatment.
- Laser treatment is not 100% effective and safe. After laser surgery, regular follow up is necessary to look at the treatment results, possible complications and to monitor the progress. Some patients may need more than one session of laser treatment.
- In most situations, laser surgery helps to control the disease and prevent further loss of sight, but it cannot provide restoration or great improvement in vision.
- If you have acute severe eye pain, vomiting or significant blurring after laser therapy, please consult your doctor immediately or go to nearby Accident and Emergency Department for treatment.

Remarks

This is general information only and the list of complications is not exhaustive. Other unforeseen complications may occasionally occur. The actual risks may be different for different patients. During the operation, unpredictable condition may arise, and additional procedures may be performed if necessary. For further information, please contact your doctor.