

INTRODUCTION:

This fact sheet is intended to give you an understanding of refractive surgery and assist you to come to an informed decision as to whether you wish to consider undergoing treatment. It does not provide an in-depth explanation of the various procedures available, how they are performed and all of the possible complications and side effects. If you decide to proceed please make an appointment to consult with your surgeon.

When making your appointment, please inform the receptionist that you wish to discuss Excimer Laser Surgery to ensure that she allocates sufficient time. During this appointment a thorough eye examination and specialised tests (including corneal mapping and pachymetry) are performed to ascertain if your eyes are suitable to be treated and which type of treatment is most suitable for you.

To enable the surgeon to perform a thorough eye examination, it will be necessary to dilate your pupils. This will make your vision blurred for some hours afterwards and you will need someone to drive you home. We suggest that you bring a family member or friend with you to provide this service and to sit in during your consultation so that you may later discuss all the information to assist you in coming to a decision.

WHAT IS REFRACTIVE SURGERY?

The ability to change the optical power of the eye to eliminate or reduce the dependency on glasses or contact lenses. The refractive errors that can be corrected include myopia (short sight), hypermetropia (long sight) and astigmatism (when the optical power of the eye is greater in one meridian than another). It is not possible to correct an unlimited amount of refractive error and the further the eye is from normal the more difficult the correction. Some refractive errors cannot be corrected at the moment. The commonest of these is

*“Throw away
your glasses or
contact lenses
forever”*



presbyopia (the need for reading glasses that occurs in the mid to late forties).

HOW IS IT DONE?

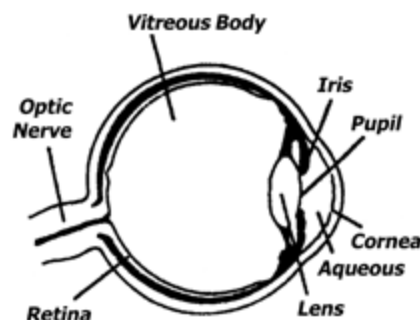
A variety of techniques are used to correct refractive errors depending upon each patient's problem. The most commonly used technique is called LASIK. In this procedure a thin film is lifted from the cornea with a hinge at one edge. The refractive correction is carried out with an Excimer laser and then the flap is repositioned. The Excimer laser can also be used directly on the surface of the eye. These techniques called PRK and PARK give slower recovery and may be more painful post operatively but may be more suitable in some circumstances. Incisions into the cornea can be made to correct astigmatism in the operation of Arcuate Keratotomy. A lens can be placed inside the eye (sometimes called the intraocular contact lens), and this technique may be particularly suited for patients with very high degrees of refractive error.

THE EYE: HOW DOES IT FUNCTION?

In some ways the eye is similar to a colour video camera.

The iris or coloured part acts as the aperture of the camera², regulating the amount of light reaching the inside of the eye. The clear window of the eye, or cornea, acts with the lens inside the eye to bend light rays and bring them to a point of focus on the retina.

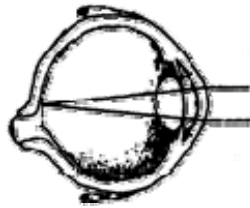
The retina is a thin layer on the back of the eye that is sensitive to light like a photographic film. The image formed on the retina is then sent along the optic nerve to the brain.



REFRACTIVE VISION PROBLEMS:

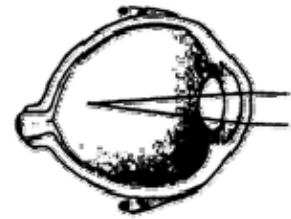
Normal Vision:

In a normal eye, light rays through the cornea and lens then focus on the retina in a precise way without blurring.



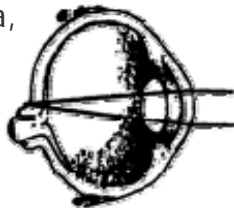
Short-sighted Vision:

A short-sighted, or myopic eye is pass longer than normal. Light rays focus in front of the retina rather than on the retina. Distant objects appear blurred.



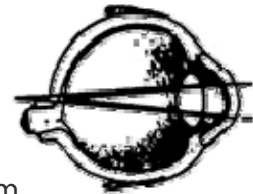
Long-sighted Vision:

A long-sighted eye, or hypermetropic eye is shorter than normal. Light rays focus behind the retina, and close objects appeared blurred.



Astigmatism:

Many people with myopia or hypermetropia also have some astigmatism. Caused by changes in the curvature of the cornea itself astigmatism distorts the light rays entering the eye and prevents them from focusing clearly.



MYOPIA: CORRECTION

Spectacles are most commonly prescribed to correct vision. Patients with a small degree of refractive error can be corrected effectively with spectacles. For patients with large errors, thick glasses are needed which may reduce the size of the visual image by up to 25%.

Contact lenses, both hard and soft, are designed to fit directly over the cornea. These may be worn by most patients provided there are no corneal diseases present. Patients must be adept at inserting and caring for the lenses in order to wear them successfully. The contact lenses may be irritating to the eyes, and patients may develop allergies to the cleaning solutions. Some people are unable to wear the lenses. Contact lenses are unsuitable for many people involved in contact or water sports, or in environments with fumes or particulate debris.

Radial Keratotomy "the Russian operation" involves placing deep radial incisions into the peripheral cornea to correct myopia. It is little used now as it may weaken the eye and the optical correction may be unstable.

PRK, PARK, LASEK and LASIK are techniques used with the Excimer Laser. The ultraviolet argon fluoride laser produces a cold beam of energy which is used to reshape the surface of the cornea to change its curvature and power of refraction.

EXCIMER LASER: WHEN IS SURGERY INDICATED?

Refractive eye surgery is an elective procedure, it is not essential for health or survival.

The following are reasons why some patients elect to have refractive surgery.

- Some patients with refractive errors wish to be independent of their spectacles or contact lenses.
- Some elect surgery to enable them to participate in certain sports such as windsurfing, swimming, mountain climbing, scuba diving, waterskiing, or for certain occupations such where glasses or contact lenses are not permitted.
- Others feel visually and socially restricted by spectacles or contact lenses.

Your ophthalmologist will be able to answer any questions concerning the advantages and disadvantages of spectacles, contact lenses and radial Keratotomy compared to laser surgery.

SURGERY: WHO IS SUITABLE?

- Minimum age for PRK, PARK, LASEK, LASIK and the Intraocular contact lens is 18 years but there is no upper limit. Younger patients may be suitable for treatment in some unusual circumstances.
- Those who have had no significant change in spectacle prescription for the last 12 months.
- Very high degrees of myopia or myopic astigmatism may not be able to be fully corrected.
- The patient is prepared to pay the cost of correction as it is not covered by health insurance or Medicare.

These are guidelines only and your situation should be fully discussed with your surgeon.

WHO IS NOT SUITABLE?

Relative ocular contraindications:

- History of ocular herpes virus infection
- Previous ocular surgery
- Any active/residual/recurrent ocular disease
- Unstable/progressive myopia
- Irregular astigmatism
- Depressed corneal scars
- Forme fruste keratoconus

Relative general contraindications:

- Diabetes mellitus (types I and II)
- Atopy if clinically significant
- Pregnancy/Lactating mother due to fluctuating hormone levels

Absolute ocular contraindications:

- Clinical keratoconus
- Monocular patients
- Severe dry eye with epithelial breakdown
- Exposure keratopathy
- Herpes zoster ophthalmicus

Absolute general contraindications:

- Autoimmune diseases
- Systemic illnesses affecting wound healing
- Immunosuppressed / immunocompromised patient

CLINICAL RESULTS:

At this stage, several million patients are believed to have been treated worldwide.

The results show that for patients with less than 5 dioptres of myopia on the cornea 87% can see 6/12 or better without glasses at twelve months. 6/12 is a measurement on the eye chart and is the legal standard for driving.

For patients with myopia between 5 and 10 dioptres on the cornea, 69% can see 6/12 or better without glasses at twelve months.

For patients with extreme myopia of greater than 10 dioptres, 32% can see 6/12 or better without glasses at twelve months.

The results for patients with higher degrees of myopia are less predictable. Some may require further treatment with the Excimer laser, or need to wear glasses or contact lenses (of a lower prescription from their original glasses) for their best vision.

With the introduction of the LASIK technique in late 1996 the results for patients with a higher degree of myopia have significantly improved.

PRE-OPERATIVE CONSULTATION AND SURGERY PREPARATION:

The pre-operative consultation provides an explanation of Excimer Laser Surgery, its benefits, alternatives and complications. A thorough eye examination will be performed to ascertain the patients suitability, specialised testing and a careful refraction is performed to ascertain what the best corrected vision could be and to calculate and design the treatment required. Further information is given to the patient for them to consider before coming to an informed decision.

After deciding to proceed with treatment an informed consent form will need to be signed before treatment is performed.

Hard (PMMA) or rigid gas permeable contact lenses must be left off the eye a minimum of 6 weeks prior to this appointment. Soft contact lenses must be left off the eye a minimum of 2 weeks. You may continue to wear a contact lens in the eye not being operated upon after the testing has been completed.

SIDE EFFECTS AND POSSIBLE COMPLICATIONS:

As with any surgery, complications are possible and long-term effects are still to be established. The following is a list of some of the possible side effects and complications.

1. Reduction in best-corrected visual acuity:

Corrected vision, measured with glasses or contact lenses after surgery, may be less than the corrected vision measured prior to treatment. This is often unnoticed by patients who do not wear glasses or contact lenses after the treatment. The incidence is small in patients with low to moderate myopia. There is a 4% chance of losing 2 or more lines of best corrected visual acuity on the eye chart in patients with myopia of up to 5 dioptres on the cornea and a 7% chance for those with myopia between 5 and 10 dioptres. For patients with extreme myopia of over 10 dioptres on the cornea, the incidence is higher with a 19% chance of losing 2 or more lines of best corrected visual acuity.

2. Overcorrection:

It is necessary to initially overcorrect the eye as the cornea has a tendency to regress back to its original state. The overcorrection usually resolves at 1 to 3 months. Uncommonly, the eye may remain overcorrected and be long-sighted rather than short-sighted. This becomes important at about 40-45 years of age when most people find they need reading glasses. An enhancement procedure may be possible to correct this but a different type of laser is needed for this.

Presbyopia or the need to wear reading glasses occurs after age 45 and a patient who has had a correction of shortsight will then have this problem in the same way as a person with normal distance vision would have. By undercorrecting one eye with the laser a patient may have good distance vision in one eye and good reading vision in the other. This is known as monovision and works well for some patients.

3. Undercorrection:

Undercorrection means that the eye remains short-sighted after the eye has stabilised following surgery. This may be planned for, or occur as an unintentional effect. Should the degree of residual myopia be of sufficient concern to the patient, the eye may be retreated at a later date.

4. Regression:

Regression refers to a tendency for the eye to become progressively more myopic in the first 6 months or so after the treatment. It is related to the corneal healing process and occurs to a greater degree when larger amounts of myopia are treated. Steroid drops are sometimes used to control regression. An enhancement procedure to fine-tune the result can be performed at a later stage if required, once the eye is stable. Regression is more common in PRK than in LASIK procedures.

5. Post-operative Pain:

This occurs during the first 24-36 hours after treatment when the local anaesthetic has worn off. It is usually controlled with analgesic tablets and sleeping pills, but best of all, by keeping both eyes closed and resting.

Less discomfort is expected when patients are treated with LASIK.

6. Delayed Epithelial Healing:

The surface epithelium is removed prior to application of the laser in PRK and PARK. This usually heals in 2 to 4 days but in rare cases there may be a delay in this process. The epithelial surface is left virtually intact during LASIK treatment.

7. Corneal Flap Complications in LASIK:

Because the surface of the eye is minimally disturbed by LASIK the chances of scarring and regression are reduced but the intraoperative risks are slightly greater.

Most of the potential problems are those associated with forming the flap with the microkeratome. Most complications are not associated with permanent visual problems, but the treatment may be postponed if the corneal flap formation is imperfect. The use of the microkeratome may lead to the loss or misalignment of the corneal flap, this may require further surgery such as corneal grafting.

Occasionally the surface cells of the eye can grow beneath the flap and a minor procedure to remove these may be necessary.

8. Decentration:

Decentration of the zone of treatment is rare. Measures are undertaken to reduce the likelihood of this occurring. If this does occur some astigmatism would be induced.

9. Corneal Haze and Opacity:

This occurs as part of the healing process after corneal remodelling and is usually at its maximum severity 6-12 weeks after the laser treatment. This gradually settles over the first year. Steroid drops may be used to control the degree of haze. The haze is seen by the ophthalmologist with a microscope but is usually not detectable by the patient. This problem is less significant for LASIK patients.

10. Halo Effect:

This is an optical effect that is noticed in dim light as the pupil dilates, a second faded image is produced by the untreated peripheral cornea. It is less frequent with the larger treatment zones being used today and is less noticeable when the second eye is treated.

11. Light Sensitivity or Glare:

This is not usually a significant problem. However sunglasses are recommended in bright light. During the first few months there may be some discomfort driving at night or in bright sunlight. Occasionally patients may find this quite disabling.

12. Infection:

Infection is extremely rare, however, if infection does occur and fails to respond to treatment with antibiotics, the cornea could become scarred and the eye could require further surgery.

13. Other complications:

Other serious complications are possible for example persistent corneal oedema, corneal perforation and cataract.

LASER IN SITU KERATOMILEUSUS (LASIK):

Lasik involves the use of a micro-keratome (in concept similar to a carpenter's plane) to create a flap on the surface of the cornea. After determining the centre of the eye, a ring providing gentle suction, is placed onto the eye to both keep the eye in place and to ensure correct placement of the keratome and hold it in a stable position. When the suction ring is attached the vision will appear grey. The micro-keratome is a self-propelled instrument, it is extremely fine and precise with delicate gears. It fits onto the suction ring and runs within its tracks. To form the flap the micro-keratome passes over the specified area. You will not be able to see or feel the flap being formed. (This corneal flap is not completely removed from the eye, a ³hinge² is left on the nasal side to enable it to be secured back over the eye after treatment with the laser). The flap is then folded back to expose the corneal bed, this is the area which will be treated with the laser in the same fashion as with PRK or PARK.

After this has been performed the flap is returned to cover the exposed area. Treatment is then complete. Drops or ointment or both may be instilled into your eye and then a shield will be placed to keep the eye closed and protected. The flap is held in position by surface tension and the protective epithelial layer, which rapidly envelopes the cornea's surface. After a few days a firm seal forms along the flap edge.

You will be seen by the surgeon the following day.

You must avoid rubbing your eye or squeezing your eye forcefully shut for the first week, although the epithelium has generally healed within 24 hours you do need to take care to ensure you do not dislodge the flap.

The surface cells of the eye are the most sensitive in the cornea. When the surface of the eye is treated as in PRK or PARK, postoperative pain and scarring are more common. By going beneath these cells the area treated by the laser is covered, and there is generally less pain or discomfort with this procedure and improved vision is generally achieved more quickly.

There are risks associated with this technique that relate to the creation of the flap. It is vital that the flap be the correct thickness and shape. If the surgeon is not happy with the way the flap has been formed, he may decide not to proceed with the application of the laser. The surgeon may decide to reposition the flap and allow it to heal for a period of time. After this has occurred another attempt can be made some months later. Although this can be frustrating it is in the patients best interest not to proceed unless conditions are ideal. In moderate to severe cases of myopia and astigmatism where scarring and regression are more common, LASIK is usually the most suitable treatment choice.

PHOTOREFRACTIVE KERATECTOMY (PRK) & PHOTOASTIGMATIC REFRACTIVE KERATECTOMY (PARK) & LASEK:

During these procedures an Excimer Laser beam is aimed at the surface of the cornea, in order to reshape it. This is performed in an effort to reduce or eliminate the need for glasses or contact lenses in cases of myopia (nearsightedness), Hyperopia (farsightedness) and astigmatism.

The Excimer Laser utilises controlled pulses of ultraviolet light energy to ablate the corneal tissue in a precise refractive excision pattern. The ultraviolet photons are of very high energy and break the bonds between molecules when they hit corneal tissue. A thin layer of molecules can be vaporised in a very precise way with each pulse of the laser. With multiple pulses the central cornea can be sculpted to change the curvature and thus the magnifying power of the cornea.

With each pulse of the laser 0.25 microns of corneal tissue is removed. The removal of 10 microns of corneal tissue corrects one dioptre of myopia. A person with 5 dioptres of myopia would require 200 laser pulses to remove 50 microns of tissue (less than 10% of corneal thickness). This would take about 40 seconds. To enable a comparison, a human hair is between 50 and 100 microns thick.

The treatment with the laser takes less than five minutes, the application of the laser being broken down to a number of applications of a certain number of pulses in a specified number of seconds.

Lasek is a new variation of the treatment of PRK. It involves lifting only the surface or epithelial cells on the cornea, treating the eye with laser and then replacing the lifted epithelial cells. A bandage contact lens is put on the eye following this and needs to stay on for three or four days. Drops will need to be continued after this procedure for several months.

The Lasek and PRK procedures are suitable for patients whose corneas may be too thin to safely carry out Lasik treatment.

IMPLANTABLE CONTACT LENS (ICL):

Most refractive procedures are carried out on the cornea. This does have some limitations since only the central part of the cornea can be lasered. In conditions of dim illumination, light from the untreated cornea can enter the eye through a dilated pupil and cause a halo and glare. This is particularly apparent for higher degrees of correction.

The implantable contact lens (ICL) is placed inside the eye behind the iris and in front of the natural lens. About two weeks before surgery a small hole in the iris needs to be made with a laser. This is called an Iridectomy.. This is to prevent to possible development of glaucoma following the implantation of the ICL . At the time of surgery a 2.5 to 3 mm incision is made to the cornea peripherally, the anterior chamber of the eye is filled with a protective material, called Viscoelastic, and the ICL is inserted behind the iris.

The known risks of the procedure include glaucoma due to pupil block if the Iridectomy is not large enough. Localised cataracts either from the Iridectomy or from the implantation are possible and have been noted in some patients. In most cases the cataract is not progressive . There are other less common risks associated with the surgery, such as infection and problems with the cornea and iris. The ICL can be removed and the recovery period is rapid.

This procedure may be most suitable for patients with a very high refractive error. It should be stressed that is is a new procedure and long term safety has not as yet been established.

EXCIMER LASER FEES:

The cost of Excimer Laser Surgery includes the surgery and post-operative consultations carried out at The Eye Hospital for a period of one month. If significant optical aberrations exist WASCA (aberration correction treatment) may be needed as well. There is no fee for retreatment within one year.

If retreatments are required after a year they are charged at 50% of the then existing rate.

Surgeon Fee	\$1,100.00
Theatre Fee	\$1,900.00
TOTAL (for each eye)	\$3,000.00

PAYMENT IS REQUIRED IN ADVANCE

Personal cheques will be accepted one week in advance to allow for clearance.

All cheques to be made payable to The Eye Hospital.

No cover is available from Medicare for Excimer Laser Surgery.

Some health funds will pay a contribution towards the theatre fee.

Post-operative visits are usually required the day following surgery and at intervals following this as determined necessary by surgeon.