

LASIK and other vision correction surgeries



EYE CARE FOR YOU

Vision Correction Surgery

An increased awareness about Vision Correction Surgery (VCS) or Refractive Eye Surgery (RES) has led more and more people to seek ways of achieving independence of optical devices like glasses and contact lenses (CL's). The climate in Dubai and the Middle East can make wearing contact lens quite challenging, due to air-conditioning, dust & wind outside. Spectacles / glasses tend to get foggy during the summer humidity outside, and many people just do not tolerate frames very well, despite the latest in lightweight fashion trends.

Vision Correction Surgery has been available in various forms for the last two decades and has evolved through several changes and improvements in the techniques employed. This last decade has seen a vast improvement in precision, predictability and long-term safety of this surgery.

As with any medical and surgical procedure, there are certain risks involved. Since this is an elective procedure, it is essential that those seeking Vision Correction Surgery educate themselves about the specific options available.

According to a study from the Department of Ophthalmology and Visual Sciences at the Chinese University of Hong Kong, myopia (near sightedness) is one of the most common ocular conditions in humans. It affects 25 percent of the United States population between the ages of 12

and 54 years of age, and is thought to affect up to 71 percent of the adult Chinese population in Hong Kong.

Hyperopia (far sightedness) appears to affect a smaller segment of the population. Most hyperopic persons are generally asymptomatic, especially when they are young, or if the refractive error is relatively small. The reason is that it is usually possible to overcome low Hyperopia in younger people with the natural ability to accommodate, or focus nearby.

Refractive Eye Surgery (RES)

Many people need to rely on glasses and/or contact lenses to correct their vision. Some, however, may find these methods inconvenient, uncomfortable or unattractive. **Refractive eye surgery** is a general term for surgical procedures that can improve or correct the eye's focus, for example LASIK, by permanently changing the shape of the cornea. Other vision correction procedures include several kinds of Phakic Intra-Ocular Lenses (IOL), INTACS, Hyperopic implants, Conductive Keratoplasty, Clear Lens extraction and accommodative IOL's. These alternative procedures are usually offered when corneal surgery is not the best option for the individual patient.

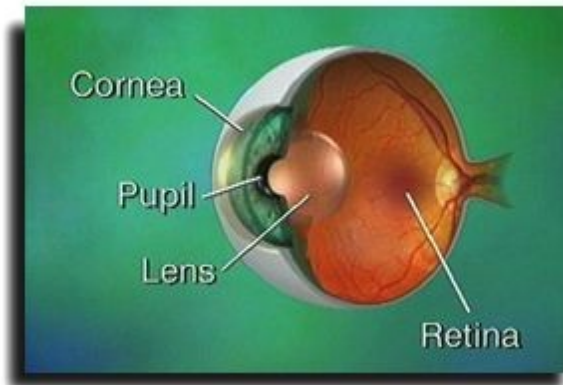
Refractive procedures have helped millions of people reduce or remove their dependence on eyeglasses or contacts.

The correct procedure done for the correct reasons in the correct patient with healthy normal eyes should produce the desired result – independence of optical devices.

A large part of the success of any procedure depends on thorough preparation with a comprehensive eligibility examination that will provide information enabling the refractive surgeon to suggest the most appropriate procedure for the patient. Your understanding of the procedure and your expectations is another important point. With the help of your ophthalmologist, it's ultimately your responsibility to weigh the risks and side effects with the benefits. If you are considering refractive surgery, consult with your ophthalmologist, read all the provided literature, and make an informed decision.

How do we see?

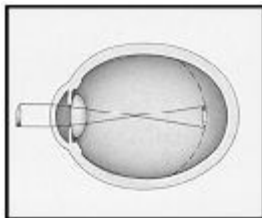
The cornea is the clear, window-like front surface of the eye, which bends or refracts light rays and images as they enter the eye.



For you to see images clearly, light rays and images must be focused by the clear **cornea** and **lens** to fall precisely on the **retina**, a layer of light sensing nerve cells that lines the inside of the back of the eye. The retina then converts the light rays into impulses that are sent through the optic nerve to the brain, which interprets them as images.

This process is very similar to the way a camera takes a picture. The clear cornea and lens in your eye act as the camera lens. The iris and pupil act as the light regulator or aperture control. The retina is similar to the film. If the image is not focused properly, the retina or film receives a blurry image. This condition in the human eye is known as a **refractive error**.

There are four types of refractive errors that can be corrected **or reduced** by refractive surgery, namely: **Myopia**, **Hyperopia**, **Astigmatism** and **Presbyopia**. Astigmatism usually occurs in combination with Myopia and Hyperopia, but can occur on its own.

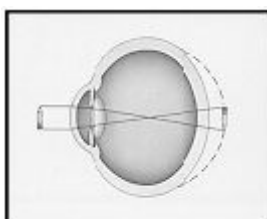


*Myopia:
a longer than
average eyeball*

Myopia

Myopia or nearsightedness is a refractive error that causes poor distance vision. Near vision is usually good, however. If your eye is too long, or your cornea has too much focusing power, images will focus in front of the retina. There are various degrees of myopia, usually called low, or moderate, or high myopia.

If you have myopia, light rays have passed the correct focal point by the time they reach the retina. The retina then sends this "over-focused," blurry image to the brain.

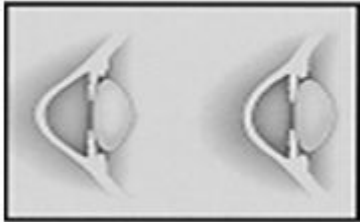


Hyperopia

Hyperopia or farsightedness is the opposite of myopia. Distant objects are clear, while close up objects appear blurry. This condition is a result of an eye that is too short or a cornea that lacks the necessary refractive power to focus images on the retina. There are also various degrees of Hyperopia, called low, moderate, or high Hyperopia.

If you have Hyperopia, images focus on a point beyond the retina. This unfocused image captured by the retina is then sent to the brain and processed as an unclear picture. Low Hyperopia is usually asymptomatic, but moderate to high Hyperopia may cause neither close nor far objects to be in focus, making the person totally dependent on correction for clear vision.

*Hyperopia:
a shorter than
average eyeball.*



*(left), Normal cornea
(right):uneven curvature
& focus*

Astigmatism

Astigmatism is a condition which blurs and distorts both distant and near objects. A normal cornea is round with even curves from side to side and top to bottom.

If you have astigmatism, your cornea is shaped more like the back of a spoon, curved more in one direction than in another. Light rays will then have more than one focal point and focus on different areas of the retina. Corrective lenses need to neutralize these focal errors to obtain clear vision.

Presbyopia

Presbiopia is the age-related loss of close-up focusing ability, otherwise known as accommodation. When we are young, our eye's lens is soft and flexible and can change shape easily, allowing the eye to focus on objects both close and far away with ease. As people enter their 40s, the lens becomes less flexible and is unable to focus as easily on close-up objects. Initially the blurring is worse in dim light, which is why many people first realize they have Presbiopia when they have difficulty reading a menu. Later, the fine print in newspapers, magazines and phone books appears blurry. Near vision is most often corrected with reading glasses

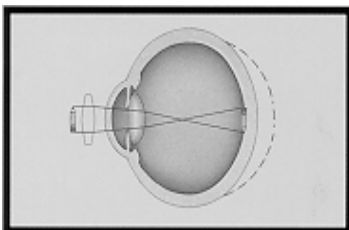
or bifocals or variable focus glasses, but refractive surgery can be used to create monovision in people who want correction for close-up vision. See the section on "Monovision" for more information. A newer method, called "Pseudo-accommodative cornea", is done with the Excimer laser.

Correcting Your Vision With Glasses and Contact Lenses

Glasses and contact lenses correct refractive errors by adding or subtracting focusing power to your cornea and lens. The power needed to focus images directly on your retina is measured in diopters. This measurement is also known as your eyeglass prescription.

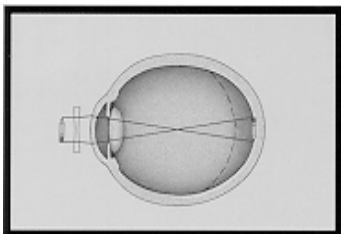
If you have myopia, your cornea and lens have too much focusing power, bending light rays to meet at a point in front of the retina. Glasses and contacts compensate for this condition by subtracting power from the eye's natural focus and allowing light rays to focus further back on the retina. If you have myopia, your prescription will be negative, for example, -4.25 diopters

Myopia Correction:



If you have hyperopia, glasses and contacts add focusing power, causing light rays to bend more as they enter the eye. This process moves the focal point back to the retina, allowing for clear vision. If you have hyperopia, your prescription will be positive, for example, +4.25 diopters.

Hyperopia Correction:



If you have astigmatism, the shape of the glass lens compensates for the uneven corneal curve and focuses the light rays to a single point on the retina.

The following sections are intended to provide general information about refractive surgery, and are not intended as medical advice; please

be sure to talk with your ophthalmologist for more specific information about refractive surgery and your own situation.

So, What Is Refractive Surgery then?

Refractive surgery procedures are designed to eliminate or reduce the need for glasses or contact lenses. These procedures correct refractive errors by changing the focus of the eye. Commonly done procedures such as LASIK, LASEK and PRK do this by reshaping the front curvature of the cornea (the clear front window of the eye) with Excimer laser beams, in order to move the point at which light is focused onto the retina (light-sensitive tissue lining the back of the eye). Implanting Intra-corneal Ring segments (INTACS) into the cornea can also change the cornea shape. INTACS also offers hope for Keratoconus patients with “pointed, misshapen corneas”, by postponing, or removing the need for corneal transplants/grafts to be done.

Less common procedures such as Conductive Keratoplasty (CK) use radio frequency energy to bend the cornea shape in patients with Hyperopia. Hyperopic implants can be placed beneath a LASIK-type flap to add tissue and curvature to the cornea profile. This is not yet commonly available.

Phakic Intra-ocular Lenses (IOLs) place an artificial lens inside the eye to more accurately focus light onto the retina. This is usually done for large refractive errors, where the cornea tissue may not be enough to allow for full correction, or if the cornea is misshapen, so that it may be damaged if refractive surgery is done on it.

Clear lens extraction is done in highly selective cases, where the normal clear natural lens is removed similar to a cataract surgery, and replaced with an Intra-Ocular Lens. These IOL's can be conventional single focus, or multifocal, or even more recent, accommodative IOL's.

An exciting development is becoming available for Presbiopia, where the cornea shape is altered during a LASIK procedure to provide for a “Pseudo-accommodation” that helps to improve near vision.

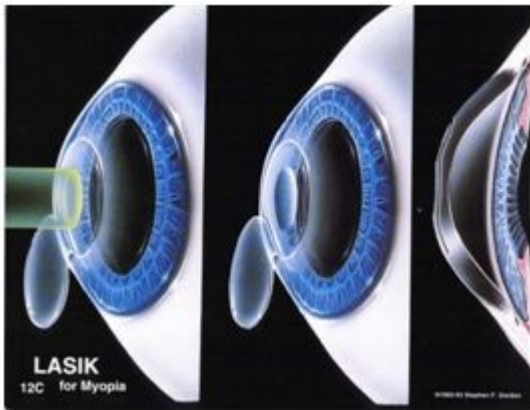
Four categories of refractive surgery include:

- excimer laser procedures;
- implant procedures;
- thermal procedures;
- other refractive procedures.

Category 1: Excimer Laser Procedures

LASIK (Laser Assisted In Situ Keratomileusis)

LASIK combines two techniques of surgery to correct low and moderate refractive errors such as Myopia, Hyperopia and Astigmatism. First, either a laser called a **femtosecond laser** or a surgical blade called a **microkeratome** creates a thin flap from the surface of the cornea. Next, an **excimer laser** sculpts the underlying cornea into a new appropriate shape to correct the refractive error. The flap is then repositioned and allowed to adhere on its own to the underlying tissue without sutures, after only a few minutes. Eye drops and/or ointment are placed in the eye to facilitate the healing process. Vision recovery typically is rapid, in a matter of hours or a day or so, and there is little or no post-operative pain or discomfort, other than the first few hours.



***Lasik
For Myopia***



***Lasik
For Hyperopia***

PRK (Photo refractive Keratotomy)

PRK reduces low to moderate myopia, low to moderate Hyperopia, and

astigmatism. In PRK, the **epithelium**, the superficial layer of cells covering the cornea, is removed and the excimer laser sculpts the cornea to correct refractive error. A contact lens is placed on the eye following the procedure to speed the epithelial healing process, which could take **three to four days**. Because PRK sculpts the outer surface of the cornea, patients experience some discomfort after surgery and recovery time lasts for a period of several weeks. PRK has been largely displaced all over the world by LASIK because LASIK provides less discomfort, faster vision recovery, and the ability to enhance or refine the outcome easily in as little as three months following the initial surgery. However, PRK might be recommended instead of LASIK because it does not create a flap in the cornea and may be a better option for people who have thin corneas or whose occupation makes it more dangerous to have a flap.

LASEK (Laser Assisted Epithelial Keratomileusis)

LASEK also corrects nearsightedness, farsightedness, and astigmatism. It is similar to PRK except that the surface layer (the epithelium) is preserved and replaced after surgery as a sort of bandage. Both PRK and LASEK are similar to LASIK in that they use the excimer laser to shape the cornea, but unlike LASIK neither procedure preserves the surface layers. Similar to LASIK, recovery time is rapid but discomfort is somewhat increased compared to LASIK. PRK and LASEK are sometimes recommended instead of LASIK for people with thin corneas because they do not penetrate as deeply into the eye's surface.

Customized / Wave front / Topographically guided LASIK / LASEK / PRK

A newer excimer laser technology is becoming available whereby a wider range of patients can be treated than before, or more specific treatments for detailed irregularities can be performed.

It involves specialized information acquisition equipment, dedicated software which helps to process and interpret this information and specific adaptations to the excimer laser machines to enable them to do these detailed treatments where and when necessary. The aim is to improve the quality of vision following the vision correction surgery and to reduce those instances where best-corrected vision turns out to be less than what was aimed for. More corneal tissue may be needed to achieve this more detailed treatment, so it is important to guard against over-corrections for these patients and to be sure that enough corneal tissue is available.

Category 2: Implant Procedures

Intra-corneal Ring Segments (ICRS)

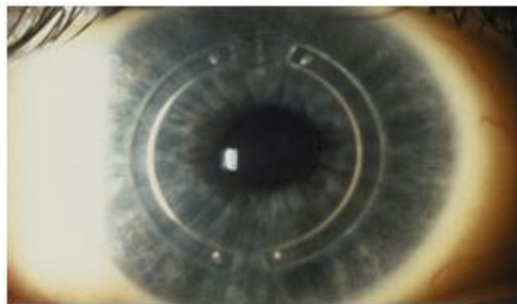
Intra-corneal ring segments are semicircular pieces of rigid plastic/Perspex that are implanted within the cornea to treat mild forms of myopia with little or no astigmatism. They also are more recently used for other conditions affecting the cornea, such as Keratoconus. They are designed to change the shape of the cornea to a flatter state, adjusting the focusing power of the eye so that light is focused onto the retina. The ICRS are inserted into the deeper layers of the cornea through a small incision near the upper edge of the cornea. The incision is closed with one or two small sutures that are usually removed within one to four weeks after surgery.

Unlike laser eye surgeries, ICRS are adjustable and reversible; if they are removed, the cornea usually returns to its original shape after about three months.

In the United States, ICRS are available under the brand name INTACS. Other brands exist in other regions.



ICRS and CL sizes



Intacs in the eye

Hyperopic corneal implants

This procedure involves creating a LASIK style corneal flap and, instead of removing tissue to reshape the cornea, a disc shaped implant is inserted under the flap, which will make the cornea steeper. The implants are not widely done yet, mainly due to further developments needed in the technique and materials used.

Phakic Intra-ocular Lenses (Phakic IOLs)

Until recently, refractive surgery has not been an option for some people with high degrees of Myopia, Hyperopia or Astigmatism. The amount of

correction needed could not be achieved safely through surgical procedures involving reshaping the cornea or inserting ring segments. However, cataract surgery patients have been treated successfully with plastic / perspex lenses (called intra-ocular lenses or IOLs) implanted in the eye for many decades. In cataract surgery, the natural lens is removed and the IOL is inserted in its place, replacing the focusing ability of the natural lens and also offering cataract patients correction for myopia and hyperopia at the same time.

Using a similar approach, a different style of IOL known as **Phakic IOL** can be used to treat patients who do not have cataracts but need correction for refractive errors that exceeds the safe range of excimer laser procedures such as LASIK. In order to preserve the focusing ability needed for reading vision, the natural lens is **not** removed from the eye.

The Phakic IOL, sometimes referred to as an "implantable contact lens" or ICL, is surgically implanted inside the eye in front of the eye's natural lens. Another alternative style of Phakic IOL (Artisan) is fixed onto the iris tissue in front of the pupil.

Multiple intra-ocular lens style Phakic IOLs are being used around the world. They currently are under FDA investigation in the United States.

Since Phakic IOLs involve entering the eye, unlike LASIK and PRK, the risk of complications is higher. The same precautions and care must be taken as for cataract surgery.

Clear lens extractions (CLE)

This procedure used to be done years ago for high refractive errors – mostly myopia – before Phakic IOL's became available. It is much the same as cataract surgery, but for removing a clear natural lens, rather than one that has undergone opacification. Initially no IOL's were implanted, as very low power IOL's were not available, but later IOL implants became the norm following Clear Lens Extraction. There are specific risks with this procedure in highly myopic patients.

Nowadays this procedure is reserved for exceptional cases, where there may not be enough space in the eye for a Phakic IOL implant additional to the natural lens. It provides an opportunity for implanting the newer accommodative IOL's, which enables the patient to focus both far and near.

Highly hyperopic patients who will not do well with LASIK or hyperopic implants, and who usually do not have much space inside their eyeballs, may benefit more from this option.

Category 3: Thermal Procedures

Laser Thermal Keratoplasty (LTK) and Conductive Keratoplasty (CK)

LTK and CK are generally used for people who are farsighted or who are over age 40 and have difficulty focusing on objects up close – this is commonly referred to as Presbyopia, or "aging eye". These procedures do not involve making an incision but instead apply heat to cause the peripheral (outside edge) area of the cornea to tighten like a belt and make the central cornea steeper. The procedures cause little or no discomfort or irritation and vision improvement is almost instantaneous. However, unlike other types of refractive surgery such as LASIK, correction from LTK and CK may be temporary and re-treatment may be necessary later.

LTK and CK are approved for use by the FDA in the United States.

Category 4: Other Refractive Surgery Procedures

Radial Keratotomy (RK) and Astigmatic Keratotomy (AK)

RK is an older style surgical procedure sometimes still used in some regions to correct low degrees of nearsightedness and astigmatism. Using a diamond scalpel, a calculated number of spoke-like cuts are made into the surface of the eye to flatten and reshape the cornea and reduce refractive error. RK has been largely displaced by LASIK, which is a more accurate procedure capable of correcting a larger range of myopia without structurally weakening the eye.

Myopic Lamellar Keratomileusis

This procedure is a pre-cursor to the modern day LASIK, before Excimer lasers came into being. It involves making the superficial flap as in the LASIK procedure, but this is followed by another pass of the microkeratome to remove an additional disc of corneal tissue, so as to change the shape. This procedure did not become very widely used, mainly due the lack of predictability of the correction that may be achieved, and the larger incidence of over-corrections and under-corrections that resulted. Many of the over-corrections also had much more tissue removed than intended, thus weakening the corneal structure significantly, so that the normal shape could not be maintained.

Monovision

Monovision is a refractive surgery technique for people with Presbyopia. Many people use reading glasses to correct Presbyopia but only use the glasses for close-up vision and take them off when they need to see

objects further away. While there are refractive surgeries to reduce nearsightedness and farsightedness, these procedures do not help to correct Presbiopia. Monovision is a compromise that refractive surgery can offer people with Presbyopia. The technique uses refractive surgery to enable one eye to focus at close proximity, and the other eye is left untreated or, if needed, treated to be able to focus at a distance. Having each eye configured for different focusing distances can reduce or eliminate the need for eyeglasses or contacts. It may seem difficult to get used to at first, but about six to eight weeks after the monovision procedure your brain is able to adjust to the different focusing ability of your eyes. A preoperative trial with contact lenses is a useful test to see if a patient will adapt to the intended refractive outcome.

Many patients cannot get used to having one eye blurred at all times. The difference between monovision with contact lenses and monovision with LASIK is that you can always take contact lenses out or have them changed (the treatment is reversible and adjustable) as opposed to LASIK, where the result of the surgery is **not** reversible or adjustable. Therefore, if you are considering monovision with LASIK, make sure you go through a trial period with contact lenses to see if you can tolerate monovision, before having the irreversible surgery performed on your eyes. Just before this trial period starts, find out if you pass your state's driver's license requirements with monovision, or if you need supplemental glasses to drive.

In addition, you should consider how much your presbyopia is expected to increase in the future. Ask your doctor when you should expect the results of your monovision surgery to no longer be enough for you to see near-by objects clearly without the aid of glasses or contacts, or when a second surgery might be required to further correct your near vision.

Bioptics

When two different techniques are combined to achieve vision correction, it is called Bioptics. For example, a patient might have a Phakic IOL implant done, but have a small residual refractive error remaining, which is then corrected with LASIK or INTACS. Or, following clear lens extraction or cataract surgery, LASIK or INTACS is used to correct the remaining refractive error. A patient may have had LASIK for a moderately high correction, but not enough corneal tissue for an enhancement. INTACS may help to clear the remaining error.

Who would be a good candidate for Refractive surgery / Vision Correction Surgery?

A comprehensive eligibility exam needs to be done to see which of the vision correction options would be best for each patient, whether it is LASIK or INTACS or IOL implants, or others.

To be a good candidate for vision correction surgery, one must meet the physical, health and age criteria for the particular surgery. The candidate should fully understand the procedure and be aware of the risks and possible side effects. The general guidelines below may help estimate a patient's suitability for surgery. However, a consultation with a refractive surgeon is necessary to determine whether you are truly a candidate. Several important tests are done during the consultation to assess the features of the eyes, and to search for conditions that might render the vision correction procedure unsafe.

The most important criterion is **realistic expectations**, based on adequate patient education.

Soft Contact lenses users need to remove the lenses for at least 10 -14 days prior to the eligibility exam, so that possible warpage effects caused by the lenses may have a chance to undo itself, and the corneas return to their most natural shape.

The reason is that some patients experience a "warpage" of the cornea if the contact lens fitting is not quite ideal for that eye - that's why the contact lenses work so well - they could "force" the cornea to their shape! For hard contact lenses it would need even longer time - many patients need to switch from hard to soft lenses for several months, and then get out of these for about another month prior to their exam. It sounds like a very long time, but it is worth the effort for the sake of a reliable examination process.

Some patient's eyes are ready right away; others may need more time out of the contact lenses, before their eyes would be ready.

The final results after surgery can be reasonably well judged from about a week after the surgery, and even better by a month.

There is however a stabilization period of about 3 months following the procedure, before it is advisable to do any enhancements, should it be necessary.

Most patients find that their vision is quite good on the first day - there might be some foginess, which usually clears as the days go by.

Physical, Health and Age Requirements

All refractive surgery procedures have physical, health and age criteria. This includes being at least 18 years old (the age of consent) and having:

- healthy eyes;

- a stable eyeglass prescription for at least one year;
- vision within the correctable range of the particular procedure.

Most procedures cannot be performed if you:

- have a history of autoimmune diseases;
- are pregnant or nursing;
- have a history of eye disease or previous eye injury;
- take prescription medications that may affect corneal healing or vision.

Understand the Procedure

Read the literature your ophthalmologist gives you carefully, and ask all your questions if you need further explanation. Also read the consent form carefully and make sure you fully understand it before signing.

It is important to be aware that refractive surgery procedures do not stop the natural changes that occur as the eye ages. Even after refractive surgery you may reach a time in your life when you need corrective lenses or eyeglasses. Refractive surgery changes only the front of the eye while the rest of the eye will change naturally as you age.

A good example of this is Presbyopia, which is the loss of close-up focusing ability that occurs as most people get into their 40s. People who have had refractive surgery will still develop presbyopia and need to wear corrective lenses or eyeglasses for activities such as reading, unless the procedure incorporates the “pseudo-accommodative” correction.

Understand the Risks and Possible Side Effects

Apart from explaining the vision correction procedure, your ophthalmologist should also provide adequate information about the risks and possible side effects of the procedure.

Typical side effects associated with refractive procedures include:

- **Visual aberrations.** With some procedures, patients report seeing halos or starbursts around lights at night, especially in the early post op period. It subsides and vanishes with time in the majority of cases.
- **Dry eye.** Symptoms of dry eye are common for many patients following surgery and are usually relieved with the use of artificial tears. The condition usually goes away on its own in the weeks/months following surgery. In some cases, dry eye is a persistent problem, particularly in patients who had dry eyes prior to surgery. Adequate lubrication is essential in the recovery period.

- **Discomfort or irritation.** Some patients experience some discomfort during surgery and some eye irritation after surgery, like grittiness and weeping. This usually lasts for 4-6 hours and then eases off.
- **Sensitivity to light.** Some patients report being more sensitive to light for a few days after surgery. Lubrication with artificial tears and using sunglasses outside will be a great help.
- **Time for vision to stabilize.** With some procedures, better vision is experienced immediately after surgery. With other techniques results can take a few days/weeks to be evident.
- **Under- or over-correction.** The goal of the surgery is to achieve the desired visual result with one surgical procedure, but sometimes under-correction or over-correction may occur. It may be due to differences between patient's tissues. In many cases of under- or over-correction, additional surgery, commonly called an enhancement, is performed after the first surgery has healed to achieve a better result. Additional treatment may not be possible. You may still need glasses or contact lenses after surgery. This may be true even if you only required a very weak prescription before surgery. If you used reading glasses before surgery, you will still need reading glasses after surgery, unless presbyopia was addressed during the procedure.

Results are generally not as good in patients with very large amounts of astigmatism or very large refractive errors of any type. You should discuss your expectations with your doctor and realize that you may still require glasses or contacts after the surgery, depending on your pre-op prescription.

- **Results may not be lasting.** The level of improved vision you experience after surgery may be temporary, especially if you are farsighted or currently need reading glasses. It is especially important for farsighted individuals to have a cycloplegic refraction (a vision exam with lenses dilated drops) as part of the screening process. Patients whose manifest refraction (a vision exam with lenses before dilation) is very different from their cycloplegic refraction are more likely to have temporary results.
- **Some patients lose vision.** Some patients lose lines of vision on the vision chart that cannot be corrected with glasses, contact lenses, or surgery as a result of treatment. There is little known about how refractive procedures affect other aspects of vision, such

as contrast sensitivity (the ability to see objects clearly against a similar background or in dim lighting conditions). Some studies suggest that patients do not see as well in situations of low contrast, such as at night or in fog, after treatment as compared to before treatment. Therefore, patients with low contrast sensitivity to begin with probably should not have a refractive procedure. It is important for you to know that not all eye centers test contrast sensitivity, and that when it is tested, it should be done in a dark room.

Less common side effects include:

- ***Loss of best-corrected vision.*** Loss of best-corrected vision means that after the procedure, you may not be able to see as well with eyeglasses or contacts as you did with eyeglasses or contacts before the procedure.
- ***Flap complications.*** Corneal flap complications are possible with LASIK. When the flap is reattached to the eye after the cornea has been re-sculpted, it is important for the flap to be smooth and clear. Difficulties in creating or repositioning the flap could lead to reduced best-corrected vision. It is important not to rub or bother unnecessarily with the eyes following the procedure.
- ***Infection or inflammation.*** Although rare, an eye infection or severe inflammation can cause problems with vision after surgery. The inflammation or infection may need to be treated with antibiotic eye drops or oral medication.
- ***Corneal scarring.*** Corneal scarring is another rare complication of refractive surgery. It is more often associated with PRK and / or LASEK.

Bilateral Simultaneous Treatment

You may choose to have LASIK surgery on both eyes at the same time or to have surgery on one eye at a time. Although the convenience of having surgery on both eyes on the same day is attractive, this practice is riskier than having two separate surgeries. The second eye may have a higher risk of developing an inflammation if surgery is done on the same day than if surgery is performed on separate days. If a malfunction of the laser or microkeratome occurs causing a complication with the first eye, the second eye is more likely to also experience the same complication if the surgery is performed on the same day rather than on separate days. If you decide to have one eye done at a time, you and your doctor will decide how long to wait before having surgery on the other eye. If both eyes are treated at the same time or before one eye has a chance to fully heal, you and your doctor do not have the advantage of being able to see

how the first eye responds to surgery before the second eye is treated. Another disadvantage to having surgery on both eyes at the same time is that the vision in both eyes may be blurred after surgery until the initial healing process is over, rather than being able to rely on clear vision in at least one eye at all times. This is more common with PRK than LASIK.

What should I expect before, during, and after surgery?

What to expect before, during, and after surgery will vary from doctor to doctor and patient to patient. This section is a compilation of patient information developed by manufacturers and healthcare professionals, but cannot replace the dialogue you should have with your doctor. Read this information carefully and with the checklist, discuss your expectations with your doctor.

Before Surgery

If you decide to have LASIK surgery, you will need an initial / baseline evaluation by your eye doctor to determine if you are a good candidate. This is what you need to know to prepare for the exam and what you should expect:

If you wear contact lenses, it is a good idea to stop wearing them **before your baseline evaluation** and switch to wearing your glasses full-time. Contact lenses change the shape of your cornea for up to several weeks after you have stopped using them depending on the type of contact lenses you wear. Not leaving your contact lenses out long enough for your cornea to assume its natural shape before surgery can have negative consequences. These consequences include inaccurate measurements and a poor surgical plan, resulting in poor vision quality after surgery. These measurements, which determine how much corneal tissue to remove, may need to be repeated at least a week after your initial evaluation and before surgery to make sure they have not changed, especially if you wear RGP or hard lenses.

If you wear:

- **soft contact lenses**, you should stop wearing them for 2-3 weeks before your initial evaluation.
- **toric soft lenses or rigid gas permeable (RGP) lenses**, you should stop wearing them for at least 4 weeks before your initial evaluation.
- **hard lenses**, you should stop wearing them for at least 3 months before your initial evaluation. You could switch to soft lenses in the meantime up to 2 weeks before the evaluation.

				Soft Lenses			
		Rigid Gas Permeable Lenses					
Hard (PMMA) Lenses							
3 Mths		4 Weeks		2 Weeks		Initial exam	
Before your initial exam, stop wearing contact lenses.							

You should tell your doctor:

- about your past and present medical and eye conditions
- about all the medications you are taking, including over-the-counter medications and any medications you may be allergic to.

Your doctor should perform a **thorough eye exam** and discuss:

- whether you are a **good candidate**
 - what the risks, benefits, **and alternatives** of the surgery are
 - what you should expect before, during, and after surgery
- what your responsibilities will be before, during, and after surgery

You should have the opportunity to ask your doctor questions during this discussion. Give yourself plenty of time to think about the risk/benefit discussion, to review any informational literature provided by your doctor, and to have any additional questions answered by your doctor before deciding to go through with surgery and **before signing the informed consent form.**

You should not feel pressured by your doctor, family, friends, or anyone else to make a decision about having surgery. Carefully consider the pros and cons yourself.

The **day before surgery**, you should stop using:

- creams
- perfumes
- lotions
- makeup

These products as well as debris along the eyelashes may increase the risk of infection during and after surgery. Your doctor may ask you to scrub your eyelashes for a period of time before surgery to get rid of residues and debris among the lashes.

Also **before surgery**, arrange for transportation to and from your surgery and for your first follow-up visit. On the day of surgery, your doctor may give you some medicine to make you relax. This medicine impairs your ability to drive. Ensure that someone drives you home.

During Surgery

The surgery should take less than 30 minutes for both your eyes. You will lie on your back in a reclining chair or a bed in an exam room containing the laser system. The laser system includes a large machine with a microscope attached to it and a computer screen.

No eye make-up						
No non contact Sports						
No Strenuous or Contact Sports						
Wear Eye shields at night						
No swimming, whirlpool or hot tub						
1 Day	Surgery Day	1 Day	3 Days	1 Week	2 Weeks	4 Weeks

A numbing drop will be placed in your eye, the area around your eye will be cleaned, and an instrument called a lid speculum will be used to hold your eyelids open. A ring will be placed on your eye and suction will be applied to the cornea to create

very high pressure. Your vision will dim while the suction ring is on and you may feel the pressure and experience some discomfort during this part of the procedure. The microkeratome, a cutting instrument, is attached to the suction ring. Your doctor will use the blade of the microkeratome to cut a flap in your cornea.

The microkeratome and the suction ring are then removed. You will be able to see, but you will experience fluctuating degrees of blurred vision during the rest of the procedure. The doctor will then lift the flap and fold it back on its hinge, and re-measure the thickness of your cornea, to ensure you have enough tissue.

The laser will be positioned over your eye and you will be asked to stare at a light. This is **not** the laser used to remove tissue from the cornea. This light is to help you keep your eye fixed on one spot once the laser comes on. **NOTE: If you cannot stare at a fixed object for at least 60 seconds, you may not be a good candidate for this surgery.**

When your eye is in the correct position, your doctor will start the laser. At this point in the surgery, you may become aware of new sounds and smells. The pulse of the laser makes a ticking sound. As the laser removes corneal tissue, some people have reported a smell similar to burning hair. A computer controls the amount of laser delivered to your eye. Before the start of surgery, your doctor will have programmed the computer to vaporize a particular amount of tissue based on the

measurements taken at your pre-op evaluation. After the pulses of laser energy vaporized the corneal tissue, the flap is put back into position.

You should see your doctor within the **first 24 to 48 hours** after surgery and at regular intervals after that for at least the first six months. At the first postoperative visit, your doctor will remove the eye shield, test your vision, and examine your eye. Your doctor may give you one or more types of eye drops to take at home to help prevent infection and/or inflammation. You may also be advised to use artificial tears to help lubricate the eye. Do not resume wearing a contact lens in the operated eye, even if your vision is blurry.

You should wait **one to three days** following surgery before beginning any non-contact sports, depending on the amount of activity required, how you feel, and your doctor's instructions.

To help prevent infection, you may need to wait for up to **two weeks after surgery or until your doctor advises you otherwise** before using lotions, creams, or make-up around the eye. Your doctor may advise you to continue scrubbing your eyelashes for a period of time after surgery. You should also avoid swimming and using hot tubs or whirlpools for 1-2 months. Strenuous contact sports such as boxing, football, karate, etc. should not be attempted for at least **four weeks** after surgery. It is important to protect your eyes from anything that might get into them and from being hit or bumped.

A clear shield could be placed over your eye at the end of the procedure as protection, since no stitches are used to hold the flap in place. It is important for you to wear this shield to prevent you from rubbing your eye and putting pressure on your eye while you sleep, and to protect your eye from accidentally being hit or poked until the flap has healed.

Mild pain and discomfort

Burning or scratching

Tearing or watering

	Sensitivity to light				
	Hazy or blurred vision				
	Dry Eyes				
	Glare / difficulty driving at night				
	Fluctuations in vision				
Surgery					2
Day	1 Day	3 Days	1 Week	4 Weeks	Months

After Surgery

Immediately after the procedure, your eye may burn, itch, or feel like there is some sand in it. You may experience some discomfort, or in some cases, mild pain and your doctor may suggest you take a mild pain reliever. Both your eyes may tear or water. Your vision will probably be hazy or blurry. You will instinctively want to rub your eye, **but don't!** Rubbing your eye could dislodge the flap, requiring further treatment. In addition, you may experience sensitivity to light, glare, starbursts or haloes around lights, or the whites of your eye may look red or bloodshot. These symptoms should improve considerably within the first few days after surgery. You should plan on taking a few days off from work until these symptoms subside.

You should contact your doctor immediately and not wait for your scheduled visit, if you experience severe pain, or if your vision or other symptoms get worse instead of better

During the **first few months** after surgery, your vision may fluctuate.

- It may take up to three to six months for your vision to stabilize after surgery. With LASIK it is usually quicker, up to 3 months.
- Glare, haloes, difficulty with driving at night, and other visual symptoms may also persist during this stabilization period. If further correction or enhancement is necessary, you should wait until your eye measurements are consistent for two consecutive visits at least 3 months apart before re-operation.

- It is important to realize that although distance vision may improve after the operation, it is unlikely that other pre-existing visual symptoms such as glare or haloes will improve.

Contact your eye doctor immediately, if you develop any new, unusual or worsening symptoms at any point after surgery. Such symptoms could signal a problem that, if not treated early enough, may lead to a loss of vision, or vision quality.

Finding the Right Doctor

If you are considering refractive surgery, make sure you:

- **Compare.** The levels of risk and benefit vary slightly not only from procedure to procedure, but from device to device depending on the manufacturer, and from surgeon to surgeon depending on their level of experience with a particular procedure.
- **Don't base your decision simply on cost** and don't settle for the first eye center, doctor, or procedure you investigate. Remember that the decisions you make about your eyes and refractive surgery will affect you for the rest of your life.
- Be wary of eye centers that advertise, "20/20 vision or your money back" or "package deals." There are **never any guarantees** in medicine.
- **Read / Research.** Dr. Grim is a member of the International Society of Refractive Surgery as well as the American Academy of Ophthalmology. You can read more about her and LASIK on the following websites.

www.isrs.org

www.aaao.org

www.millicentgrim.eyemd.org

www.gulfeyecenter.com

Even the best screened patients under the care of most skilled surgeons can experience serious complications.

- **During surgery.** Malfunction of a device or other error, such as cutting a flap of cornea through and through instead of making a hinge during LASIK surgery, may lead to discontinuation of the procedure or irreversible damage to the eye.
- **After surgery.** Some complications, such as migration of the flap, inflammation or infection, may require another procedure and/or intensive treatment with drops. Even with aggressive therapy, such complications may lead to temporary loss of vision or even irreversible blindness.

Refractive procedures have helped millions of people reduce or remove their dependence on eyeglasses or contacts.

The correct procedure done for the correct reasons in the correct patient with healthy normal eyes should produce the desired result – independence of optical devices.

A large part of the success of any procedure depends on thorough preparation with a comprehensive eligibility examination that will provide information enabling the refractive surgeon to suggest the most appropriate procedure for the patient. Your understanding of the procedure and your expectations is another important point. With the help of your ophthalmologist, it's ultimately your responsibility to weigh the risks and side effects with the benefits. If you are considering refractive surgery, consult with your ophthalmologist, read all the provided literature, and make an informed decision.

Under the care of an experienced doctor, carefully screened candidates with reasonable expectations and a clear understanding of the risks and alternatives are likely to be happy with the results of their refractive procedure.

Advertising

Be cautious about "slick" advertising and/or deals that sound "too good to be true." Remember, they usually are. There is a lot of competition resulting in a great deal of advertising and bidding for your business. Do your homework.

LASIK Surgery Checklist

Know what makes you a poor candidate

- **Career impact** - does your job prohibit refractive surgery?
- **Cost** - can you really afford this procedure?
- **Medical conditions** - e.g., do you have an autoimmune disease or other major illness? Do you have a chronic illness that might slow or alter healing?
- **Eye conditions** - do you have or have you ever had any problems with your eyes other than needing glasses or contacts?
- **Medications** - do you take steroids or other drugs that might prevent healing?
- **Stable refraction** - has your prescription changed in the last year?
- **High or Low refractive error** - do you use glasses/contacts only some of the time? Do you need an unusually strong prescription?

- **Pupil size** - are your pupils extra large in dim conditions?
- **Corneal thickness** - do you have thin corneas?

Know all the risks and procedure limitations

- **Over treatment or under treatment** - are you willing and able to have more than one surgery to get the desired result?
- **May still need reading glasses** - do you have presbyopia?
- **Results may not be lasting** - do you think this is the last correction you will ever need? Do you realize that long-term results are not known?
- **May permanently lose vision** - do you know some patients may lose some vision or experience blindness?
- **Development of visual symptoms** - do you know about glare, halos, starbursts, etc. and that night driving might be difficult?
- **Contrast sensitivity** - do you know your vision could be significantly reduced in dim light conditions?
- **Bilateral treatment** - do you know the additional risks of having both eyes treated at the same time?
- **Patient information** - have you read the patient information booklet about the laser being used for your procedure?

Know how to find the right doctor:

- **Experienced** - how many eyes has your doctor performed LASIK surgery on with the same laser?
- **Equipment** - does your doctor use an FDA-approved laser for the procedure you need?
- **Informative** - is your doctor willing to spend the time to answer all your questions?
- **Long-term Care** - does your doctor encourage follow-up and management of you as a patient? Your pre-op and post-op care may be provided by a doctor other than the surgeon.
- **Be Comfortable** - do you feel you know your doctor and are comfortable with an equal exchange of information?

Know preoperative, operative, and postoperative expectations

- **No contact lenses prior to evaluation and surgery** - can you go for an extended period of time without wearing contact lenses?
- **Have a thorough exam** - have you arranged not to drive or work after the exam?
- **Read and understand the informed consent** - has your doctor given you an informed consent form to take home and answered all your questions?

- **No makeup before surgery** - can you go 24-36 hours without makeup prior to surgery?
- **Arrange for transportation** - someone to drive you home after surgery?
- **Plan to take a few days to recover** - can you take time off to take it easy for a couple of days if necessary?
- **Expect not to see clearly for a few days** - do you know you will not see clearly immediately?
- **Know sights, smells, sounds of surgery** - has your doctor made you feel comfortable with the actual steps of the procedure?
- **Be prepared to take drops/medications**- are you willing and able to put drops in your eyes at regular intervals?
- **Be prepared to wear an eye shield** - do you know you need to protect the eye for a period of time after surgery to avoid injury?
- **Pain/discomfort**-do you know how much pain to expect?
- **Know when to seek help** - do you understand what problems could occur and when to seek medical intervention?
- **Know when to expect your vision to stop changing** - are you aware that final results could take months?
- **Make sure your refraction is stable before any further surgery** - if you don't get the desired result, do you know not to have an enhancement until the prescription stops changing?

(Images and some basic information courtesy of the American Academy of Ophthalmology/ISRS and suppliers of equipment / materials)