

# Vision of the Future

New technologies and methods are being developed to address visual impairment

**B**espectacled people often used to be called “four-eyed”, but the arrival of many vision-correction techniques in the past decade means this slur is seldom heard nowadays. Even so, uncorrected refractive errors due to myopia (short-sightedness), hyperopia (long-sightedness) and astigmatism (blurred vision) still account for 43 percent of all visual impairment cases globally, according to the World Health Organization.

LASIK is probably the first word that will come into your mind when you think about junking those fragile spectacles or bothersome contact lens cleansing routines. Besides myopia, it can be used to treat hyperopia, astigmatism

and, to some extent, presbyopia (reduced ability to focus). What we conveniently call LASIK actually stands for Laser-assisted In-Situ Keratomileusis.

## LASIK: from Microkeratome to Femtosecond

LASIK began with the invention of the microkeratome, a mechanical blade that surgeons use to create a flap in the cornea. An excimer laser is then applied to remove tissue and reshape the cornea in a way that sharpens its vision. However, the microkeratome method is now becoming outmoded, due to the advantages of bladeless LASIK, in



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which the flap is created with a machine-controlled femtosecond laser. According to Dr. John Chang, Director of the Guy Hugh Chan Refractive Surgery Centre at Hong Kong Sanatorium and Hospital (HKSH), 90 percent of complications in LASIK arise during the creation of the flap. "Incidences of complications with microkeratome are five times greater than when a femtosecond laser is used for bladeless LASIK," he says.

In bladeless LASIK, pulses of infrared energy from a femtosecond laser create a layer of tiny bubbles. These in turn produce an interface that can be lifted as a flap. Hence its description as a bladeless procedure. From thereon, the LASIK procedure previously mentioned is carried out. An excimer laser shapes the cornea and the flap is placed back into position, where it adheres to the cornea and heals by itself. While the flap creation takes only about 15 to 20 seconds, the entire procedure can last between 10 and 15 minutes. LASIK can treat refractive errors of up to 1,200 degrees (in rare cases up to 1,400), astigmatism up to 600 degrees, and low-to-moderate hyperopia.

The paramount advantage of bladeless LASIK that is it creates a thinner flap. Dr. Chang believes that offers a number of benefits in the long run. "You leave more corneal tissue behind if you make a thinner flap. When you get older and have progression of myopia, the flap can be lifted with special instruments and a little enhancement can be performed, as long as you still have enough cornea left. Leaving more tissue also reduces the chance of corneal degeneration." In addition, the

femtosecond laser significantly reduces complications such as a partial or incomplete flap or one with a hole, although the latter is a rare occurrence.

Bladeless LASIK is therefore preferable to microkeratome. The femtosecond laser can also be used far more precisely, thanks to the recent development of wavefront technology. This ensures specific imperfections in each patient's eye can be scanned and mapped, so that the treatment is more customised and accurate, instead of the one-size-fits-all – or rather, one-laser-fits-all – approach.

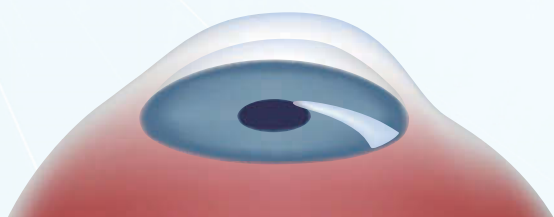
Dr. Chang reassures those worried about the dangers of refractive corrective surgery, especially flap complications. "The LASIK flap incision heals within just three hours. At worst, your eyes will only hurt for three hours, if at all. It just feels a little scratchy for most people. And you'll feel hardly anything if you close your eyes for three hours. The advantage of LASIK is that it heals quickly. The antibiotics we give last for five hours, so you're well covered."

"Some people ask: 'if a football hits me in the eye, is the flap going to fall off?' The fact is there was an experiment in the United States where scientists performed LASIK on rabbits, and nine days later, they opened up the eye, dropped in an anaesthetic and used a finger to rub the cornea. The flap did not move. So, it's lot more solid than a contact lens. The flap is like a locked door. It is hinged, so it will not fall off, and it will never open by itself, even if you rub your eyes. The incidence of the flap

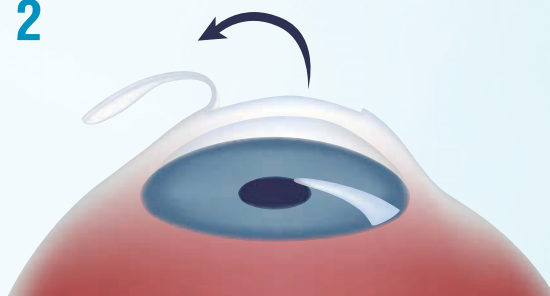


# Lasik Eye Surgery

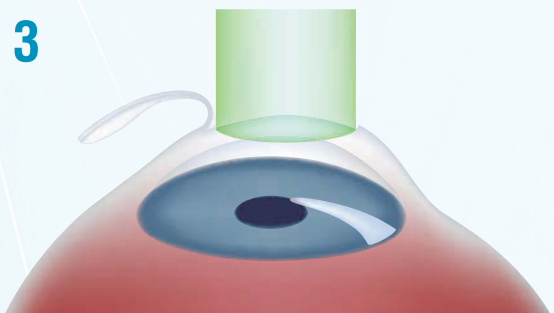
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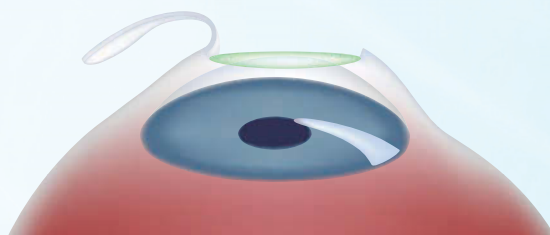
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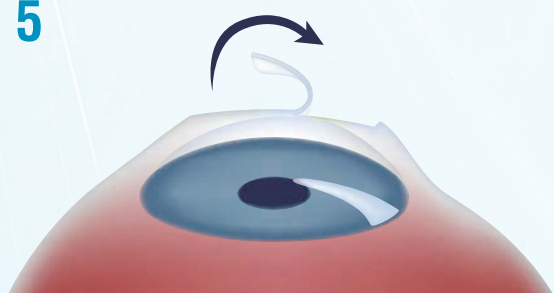
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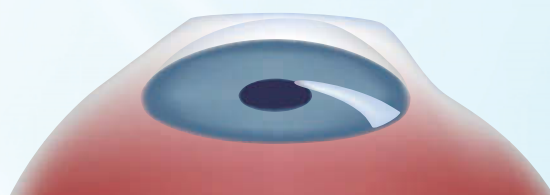
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moving is one in 10,000. Proper and meticulous repositioning of the flap should not lead to any loss of vision,” says Dr. Chang.

## ReLEx Smile

One of the newest techniques today is ReLEx Smile, or Refractive Lenticule Extraction (ReLEx) Small Incision Lenticule Extraction (Smile), to give it its full name. ReLEx is performed without creating a flap on the cornea. It uses only one laser (a femtosecond). The opening it creates is very small, like a “keyhole”, measuring between 2.5 to 4.0 mm. Instead of vaporising corneal tissue to correct underlying short-sightedness and astigmatism, ReLEx Smile removes a small piece of it (called a lenticule) through the incision.

“The lenticule’s configuration and profile are precisely

calculated to match the degree of correction needed. Since no flap is created, the cornea is biomechanically stronger, and flap displacement or dislodgement is not an issue. As such, the eye will be less susceptible to trauma,” says Dr. Cordelia Chan, Head and Senior Consultant of the Refractive Surgery Service at the Singapore National Eye Centre.

With its small incision compared to LASIK’s corneal flap, ReLEx Smile severs fewer corneal nerves and the incidence of dry eyes after surgery is reduced. ReLEx Smile can be used to treat myopia of up to 1,000 degrees and astigmatism up to 500 degrees.

## Epi-LASIK and LASEK

Epi-LASIK, short for epithelial LASIK, uses a blunt surgical



## LASIK: Choosing the Right Procedure and Ophthalmologist

An extensive array of invasive aesthetic eye surgery techniques is offered today, and a professional evaluation is essential. An ophthalmologist can decide which procedure would be best for your eyes and determine your suitability. But there are some limitations:

- > Your medical history should not include eye diseases or conditions such as glaucoma, cataracts, infection, severe dry eyes, and – depending on its severity – diabetes.
- > For ideal, long-term results, some clinics will not treat people under the age of 21, as a young person's vision might not have stabilised yet. However, other clinics have a minimum age of 18. Regardless of age, one consistent guideline all clinics adhere to is that your vision must have been stable for at least a year before surgery.
- > You must not be pregnant or breastfeeding.

### The Pre-Op Evaluation and Consultation Process

- > Contact lens users should refrain from wearing hard lenses for at four weeks prior to the operation. The rule is two weeks for soft toric lenses and one week for non-toric lenses. This is to allow the cornea to return to its natural shape and make a more accurate evaluation possible. "Toric contact lenses do not have a smooth shape. They have a little bulge to compensate for astigmatism. That compresses the cornea more, and it takes longer for the cornea to come back up," explains Dr. Chang. Some clinics recommend longer or shorter periods, but this is a good gauge.
- > Bspectacled patients should bring their most recent pair of eye glasses along to the clinic, as well as a

pair of sunglasses to protect their eyes, which may suffer discomfort from excessive glare during the tests. You may wish to bring a companion to assist you after the evaluation, as the dilation of pupils during the tests might lead to temporary blurred vision, and possibly discomfort and increased sensitivity to light. Driving after the consultation is not recommended for the same reasons.

- > The consultation will take between two and three hours, and needs no hospitalisation.
- > After the evaluation, the ophthalmologist will discuss the recommended options and their risks and benefits. Some are more conservative, and prefer not to operate on those with certain conditions, such as less-than-average corneal thickness. A second opinion can be sought.
- > New technologies are constantly being developed to address the eyes' complex needs. While certain clinics may offer the same procedures, the machines they use vary, so it is better to do some research and ask questions before choosing the clinic or doctor for the procedure.

### On Surgery Day

- > Wear comfortable clothing, preferably with zips and buttons in front. Avoid pullovers. Don't wear any make-up, perfume or cologne, and skip your morning skincare routine, as it may affect the process.
- > Bring a pair of sunglasses for post-surgery eye protection, as well as a companion to assist you.

### After the Surgery

- > The surgery can be performed on one day. No hospitalisation is required. But it is important to note is that, while the procedure in the operating theatre lasts only between 10 and 15 minutes, you may need to spend three hours in





PHOTO CREDIT: HONG KONG SANATORIUM &amp; HOSPITAL

the clinic altogether, due to the extensive pre-surgery preparations and resting time afterwards.

- > You should return home immediately after surgery, or to a place where you can rest. This is highly recommended, since irritants and dust from crowded public places can cause inflammation and infection. Your vision will also be affected and you may experience discomfort afterwards. You should therefore also take a few days off work.
- > Several follow-up appointments with the ophthalmologist will be required. One within 24 and 48 hours after the surgery, another one or two weeks later, and a third one or three months after the previous appointment. Some clinics require a subsequent appointment three months after the third one.
- > You will be given eye drops and artificial tears after the first review, to help with the healing process, dryness and discomfort, as well as to prevent infection or inflammation.
- > Contact sports like soccer and boxing should not be attempted for at least four weeks after the surgery. You are also strongly advised not to swim or use hot tubs for at least one month.
- > Your vision may fluctuate during the first few months after the surgery. While it is stabilising, you may experience glare and haloes, as well as dry, tearful or watery eyes. There may be increased sensitivity and difficulty driving at night too. The ophthalmologist should be informed if these effects become too uncomfortable.

[Hksh.com](http://Hksh.com)

[Theeyeclinic.com.sg](http://Theeyeclinic.com.sg)

[Snec.com.sg](http://Snec.com.sg)

instrument to move a layer of skin cells from the top of the cornea to the side. An excimer laser is then applied and the cells shifted back. As with ReLEx, patients do not need to worry about corneal flap complications. The cornea is left thicker, because only its surface is operated on. That reduces the risk of future conditions, such as corneal degeneration. However, the recovery time for the vision is also longer. Discomfort may last for up to four days, while recovery could take between one and two weeks. Epi-LASIK is the procedure of choice for patients with corneas that are too thin or flat for LASIK.

Like Epi-LASIK, LASEK concerns itself with the layer of skin cells at the top of the cornea. The difference is that LASEK uses a medical solution to loosen this layer of cells instead of pushing it aside with an instrument before applying the laser. It is an alternative for patients with thin, flat or irregularly-shaped corneas that make them unsuitable for LASIK. While flap complications are reduced, LASEK patients must wear a “bandage” contact lens for a few days after the surgery.

### Implantable Contact Lens (ICL)

ICLs can be likened to permanent contact lenses. They are suitable for patients with thin corneas or whose myopia is too great to treat by other methods. An ICL can correct myopia up to 1,900 degrees, astigmatism up to 600 degrees, and long sightedness up to 1,000 degrees. Because it does not change the shape or thickness of the cornea, the ICL procedure is reversible, and that is important in the long run.

“As we grow older, we may start to have vision problems when we read, and other issues. But because it is reversible, the ICL can be replaced with a multi-focal lens, for instance, to accommodate your new prescription. LASIK does not give you that option,” says Dr. Cheryl Lee, Surgeon at the Pacific Healthcare Eye, Cataract and Retinal Specialist Centre in Singapore. The ICL is implanted in front of the natural lens through a micro incision in the cornea. The surgery takes about 10 to 20 minutes.

While all these procedures can increase visual acuity, eye conditions like myopia can still return naturally, with age and lifestyle habits such as straining the eyes with excessive and prolonged use of computers and mobile phones. Visiting your ophthalmologist at least once a year will check the weakening of your eyesight. **GHT**