

Patient Guide to REFRACTIVE LASER EYE SURGERY

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Refractive laser eye surgery, also known as vision correction surgery, refers to the surgical procedure involved in fixing certain vision problems. In recent years, the technology in this field has advanced dramatically, providing many patients with the ability to see better than they've ever seen before.

The majority of these surgeries involve reshaping the clear, front part of your eye (the cornea), as it's this that's responsible for letting light through and focusing it on the back of your eye (the retina). Other procedures will replace the natural lens of your eye.

If you're thinking about undergoing this type of surgery or are waiting for your operation date to come through, this guide will answer some of the most frequently asked questions about refractive laser eye surgery. At the end, you'll also find a comprehensive glossary of terms, which you may come across throughout the research and consultation stages.

What are the Main Refractive Errors Treated by Laser Eye Surgery?

Laser eye surgery is available as a treatment for a number of refractive errors, including:



Myopia (Nearsightedness)

People with myopia struggle to see things in the distance with objects often becoming blurry, but their close-up vision remains clear.



Hyperopia (Farsightedness)

Opposite to myopia, people with hyperopia will be able to see objects in the distance clearly but will often find that items in the near distance are blurry and fuzzy.



Astigmatism

Another common but minor eye condition, astigmatism causes distorted or blurred vision. It arises when the lens or cornea is an irregular shaped (i.e. less like a football and more like a rugby ball). The majority of glasses wearers will have a certain degree of astigmatism.



Presbyopia

Occurring naturally during the aging process, presbyopia is a type of farsightedness. It's caused as the lens hardens and loses some of its elasticity, meaning it cannot focus the light on the retina correctly when looking at close-up objects.

Here's a table that demonstrates what refractive error can be treated by what laser eye surgery:

Laser Eye Surgery Type	Refractive Error Treated
LASIK	Astigmatism, Hyperopia, Myopia
LASEK	Astigmatism, Hyperopia, Myopia
PRK	Astigmatism, Hyperopia, Myopia
IntraLASIK	Astigmatism, Hyperopia, Myopia, Presbyopia
EpiLASIK	Astigmatism, Hyperopia, Myopia
Wavefront Technology	Astigmatism, Hyperopia, Myopia

What Are the Types Of Laser Eye Surgery?

As you can see from the above table, there is a range of different laser eye surgery procedures available. Here are some of the most popular and what they involve:

LASIK

Laser in situ keratomileusis (LASIK) tends to be performed using two lasers - one that's used to create a flap in the cornea so the other can work to reshape it. The former is a femtosecond laser and the latter is an excimer laser. Alternatively, instead of the femtosecond laser, the surgeon may use a microkeratome (a specialist instrument) to make the flap. Once the surgery is complete, the protective layer is put back and doesn't require any stitches in order to stay in place.

SMILE

Instead of creating a flap before reshaping the cornea, the surgeon will use a small hole that self-seals afterwards. Apart from this, the results achieved through this procedure are very similar to LASIK and the following surface laser treatments.

Surface Laser Treatments

PRK, LASEK and TransPRK are all types of surface laser treatments. They reshape the cornea using an excimer laser, but in order to do this, the clear skin that covers the cornea (the epithelium) is removed. How this skin is removed is what differentiates the different types of surface laser treatments available. In LASEK procedures, the layer is soaked in diluted alcohol first before the surgeon removes it. In PRK, the surgeon will just remove the layer. And in TransPRK, the layer is removed during the lens-reshaping procedure so as to minimize how much work needs doing, thus reducing the recovery period by up to 2 days. Over time, the skin that's removed grows back naturally, with the recovery period from these procedures tending to be around three months long. During this time, the surface of the eye can feel quite sore.

Wavefront Technology

As a newfound type of LASEK/LASIK surgery, wavefront technology utilizes computer software to create 3D images of the eyes. This enables a surgeon to accurately pinpoint how much reshaping the cornea needs. In fact, this technology has been so revolutionary it may even be introduced into routine eye examinations to help opticians diagnose eye conditions with far greater ease.

What Are the Benefits of Laser Eye Surgery?

Laser eye surgery comes with a number of benefits, and not just the fact that your vision can return to what it was before you had to wear glasses and/or contact lenses on a permanent basis.

You see, it also comes with a great success rate, with more than 95% of patients being satisfied with the results they've had through their surgery, even going as far as deeming it 'life-changing'.

There's also very little pain (if any) associated with these types of procedures, and for the majority of laser eye surgery patients, vision returns to normal (and is noticeably improved) within a few days of the surgery. Furthermore, the recovery time is quick, with no stitches or bandages being required afterwards.

Laser eye surgery procedures can also be repeated to correct your vision further down the line, which some patients will require due to their prescription levels changing again at a later stage of their life.

Finally, in most cases, patients won't need to wear corrective eyewear anymore, which reduces the potential restrictions they were faced with before. However, some may require glasses when carrying out specific activities - older patients often rely on reading glasses, for example.

Am I Suitable for Laser Eye Surgery?

Before committing to laser eye surgery, it's important to ensure you're eligible for the procedure as there are several exclusion and inclusion criteria that need considering.





What Are the Alternatives to Laser Eye Surgery?

If you're unable to have laser eye surgery or want to look at other available options before undergoing the procedure, there are some alternatives to consider:

Lens Surgery

Some patients who are looking for more permanent vision correction may benefit from the latest lens implantation techniques, which have evolved from cataract surgery. These are phakic intraocular lenses (PIOLs) and refractive lens exchange (RLE).

PIOLs are almost like placing permanent contact lenses into your eyes as they don't involve removing the natural lenses. However, as this lens is inside your eye, you aren't as restricted as you are with contact lenses.

In general, PIOL is a good option for younger people who aren't eligible for laser eye surgery, have a high degree of astigmatism or have a high eye prescription.

Alternatively, RLE is often recommended for people later on in life (with the onset of cataracts, a high eye prescription or who aren't suitable for laser eye surgery) and involves the same procedure as cataract surgery. Unlike PIOL, the natural lens of your eye is removed in RLE before being replaced with a new one (multifocal or monofocal).

Using Contact Lenses or Glasses

Another alternative is to stick with what you've already got - your glasses or contact lenses. And when weighing up your options as to whether or not this is a suitable choice for you, you'll need to consider the limitations of contact lenses and glasses alongside the fact these vision aids (particularly glasses) are primarily risk-free. Limitations include being unable to participate in sports and the aesthetics of wearing glasses (for some). There's also the ongoing costs involved in replacing these, and the fact contact lenses can also increase your risk of irritation and infection.

Getting Laser Eye Surgery Abroad

Sometimes, patients will opt to have their surgery done abroad as they may find the prices of the procedure are cheaper. But if you're considering this option, there are a few things you should consider first:



1. What Are the Additional Costs?

Despite the cost of the surgery perhaps being cheaper abroad, it's important to take into account all of the additional costs you may face. These include return flights, accommodation, insurance and days off work. For example, when travelling abroad for a medical procedure, you won't be covered by your standard holiday insurance, meaning you will need to take out additional cover, which could cost over £100 extra. Don't forget to allow for follow-up consultations with your surgeon, too.

2. Is the Surgeon Qualified?

Unfortunately, when it comes to laser eye surgery, there isn't a compulsory regulatory body, which means it can be difficult to find out what training a surgeon's had and where their skills have been accredited. However, in the UK, surgeons must be on the General Medical Council's register in order to perform procedures, so there are far more rigorous checks in place.

3. On the Day of Your Surgery, Will You Meet the Surgeon?

As time is often limited when you're travelling abroad for surgery, you might only be offered an online consultation with your surgeon prior to the procedure. This may mean you're not 100% comfortable with the operation as you haven't had time to build a relationship with the surgeon and ask all the questions you want to ask.

4. Do the Staff and Surgeon Speak English?

Even though most clinics offering international procedures will have some English-speaking staff, some do not. As you'll need to communicate effectively with them before, during and after your surgery, you may want to check this so you don't run into any communication problems further down the line.

5. Has the Clinic and/or Surgeon Received Good Reviews?

Before choosing a surgeon or clinic you should be able to do some thorough research on them to see if other people would recommend their services. Previous reviews will give you a good insight into whether or not these procedures are carried out well or not.

6. What Healthcare Regulations Does the Country Have?

Sadly, some countries will have far fewer regulations than we do in the UK, which is why a lot of patients travelling abroad for laser eye surgery have been dissatisfied with a number of things, including the quality of care received and the empathy and reliability of the surgical team.

7. Is There a UK Surgeon Who Can Help if There Are Any Problems Post-Surgery?

Even though some clinics will work closely with practitioners in the UK, some do not. Therefore, you may want to check you'll be able to receive aftercare in the UK if anything does go wrong after your surgery. In some cases, you may need to go back to the country of your operation to receive the right aftercare.

Even though laser eye surgery may seem more affordable in another country, it often loses its cost-effectiveness when you factor in all of the additional expenses involved in travel. Equally, laser eye surgery abroad often comes with added risks, so it's always worth bearing these in mind before you proceed.

What To Expect Before, During and After the Procedure



Before you go ahead with laser eye surgery, you'll need to meet with a specialist who will conduct a number of tests to ensure you're a prime candidate for the procedure. They'll also evaluate your medical history and answer any questions you may have about the operation.

Tests may include measuring your pupil dilation (large pupils aren't always suitable for LASIK due to the risk of ongoing visual problems), your eyes' refraction and the thickness of your corneas (too thin and it could be too risky to perform the surgery). They may also check the natural moisture level of your eyes to reduce the risk of dry, irritated eyes post-surgery.

Before these tests you will be asked to wear glasses instead of contact lenses. As contact lenses alter the shape of the cornea, it can make it more difficult to get the right measurements. You will need to stop wearing contact lenses up to 4 weeks before your consultation (this depends on the type of contacts you wear). You'll also need to avoid wearing certain contact lenses up to three weeks before your surgery (rigid gas permeable types) while you'll be able to wear other forms up to three days before.

Some of the tests will then be repeated on the day of your surgery to make sure nothing's changed. Furthermore, the day before your surgery you should refrain from wearing any creams or moisturisers, make-up and perfume on your face as these can increase your risk of infection.



During your laser eye surgery you'll probably be awake as eye drops will be used to anaesthetise your eye(s). You'll lie on a reclining chair throughout the procedure with the laser above your head; and a speculum will be used to keep your eyes open.

When the surgeon uses the microkeratome (or a laser) to cut the flap in the cornea, you may feel some slight pressure on your eye, but this passes quickly. You'll also be asked to focus on the light above you throughout because this makes it much easier to perform the operation. However, don't worry if your eyes do move, as modern lasers are designed to track your eyes' movement throughout.

It's normal for your eyes to blur during the procedure but the clarity of your vision should return shortly afterwards.

All in all, the procedure lasts only a few minutes for each eye, with the entire operation taking no longer than half an hour.



After your surgery, healing should occur very quickly. Within a few days you should notice a remarkable improvement in your vision, but don't be worried if, for the first day or two, you experience some fuzziness and blurring. (That's why it's highly recommended to get someone to drive you home after your procedure).

You may also be given some protective eyewear to wear during the night so you don't rub your eyes while you're asleep. And any discomfort you do experience can be eased with medication (recommended by your surgeon).

Your eyes will be dry after the surgery, so you'll need to keep them moist using the eye drops prescribed to you by your doctor. They also help keep inflammation to a minimum and prevent infection. Sometimes, these drops can cause a brief blurring of your vision and may sting a little.

What Are the Possible Risks of Laser Eye Surgery?

As with all forms of surgery, there are some problems that can arise during or after the operation. These problems can result in a serious loss of vision which is permanent. However, more commonly, problems can be corrected with additional surgery or changes in medication.

Double vision, halos and glare.

At night, you may notice you have some of these symptoms. However, these tend to last a few days, or, at the most, a few weeks.

Dry eyes.

Your tear production is temporarily decreased after LASIK, which is why your eyes may feel drier for up to six months after your operation. This, in turn, can reduce your vision's quality. However, to assist you throughout this period, your eye surgeon may offer you some eye drops. Or, in rarer cases, another operation may be required to plug the tear ducts and prevent them from draining moisture away from your eyes' surface.

Undercorrections.

If there isn't enough tissue removed from your eye you might not achieve the vision you set out for. This problem is more common in those who are nearsighted and may require a repeat procedure to remove more tissue.

Overcorrections.

Alternatively, it's possible to remove too much tissue during the procedure. Because of this, it can be more difficult to correct than undercorrections.

Astigmatism.

Arising from uneven tissue removal, this may result in you needing contact lenses, glasses or further surgery.

Vision changes or loss.

In very rare cases, you may experience vision loss due to a complication in your surgery. Some also find they don't see as clearly or sharply as they did before.

Flap problems.

Complications can arise due to the flap that's removed or folded back during the surgery. This can cause excess tears or infection, and the epithelium may grow back abnormally.

What Are the Possible Side Effects of Laser Surgery?

Even though most patients will experience some of the following side effects after their procedure, these will often improve with time. However, in some cases, they may not disappear completely.

Vision.

These issues include glare, halos, starbursts and ghost images. It's common to experience some of these side effects during the first few months after your surgery, particularly if your glasses prescription was quite high. Furthermore, you may notice that there's an increased amount of glare from oncoming headlights when you're driving at night, which is why you may want to refrain from doing this straight after your surgery.

Eye discomfort and blurring.

Often, patients will experience on-off blurring as well as discomfort to the surface of their eyes (the dry eye symptoms mentioned previously, e.g. gritty, mild discomfort). Again, this should improve in the first few months after your surgery and can be eased with the eye drops prescribed to you by your surgeon. In most cases, those with normal eye surfaces before the surgery should find there are no long-lasting issues.

Infection.

Although this isn't common, the risk of infection in your eye after your surgery can increase, especially if you've had an operation that involves surface ablations (e.g. PRK). To prevent this risk, natural bandages are often given to you to create a sterile environment that'll keep infections at bay and promote healthy healing in your eye.

Appearance.

Due to some small blood leaks (subconjunctival haemorrhages) that can occur during the procedure, you may notice red blotches in your eye. This is 100% normal and doesn't affect the overall health of your eyes. They can take around six weeks to clear up.

How To Reduce Potential Side Effects and Problems

To help reduce any of the potential issues that may arise during or after your surgery, there are a number of things you can do:

Stay calm and relaxed throughout your surgery.

Even though this is easier said than done, it does help the surgeon immensely if you can follow their instructions and remain calm throughout the procedure. However, as mentioned previously, there's no need to worry too much about your eyes moving while the laser's focused on it, as they will track this movement.

Keep your eyes well lubricated.

Every effort should be made to keep your eyes as moist as possible after laser eye surgery, using the drops provided and keeping your eyes closed while you're awake (for the first few hours afterwards). This is particularly important after LASIK.

Use your anti-inflammatory and antibiotic drops as prescribed.

This will help your eyes heal properly. Try to leave around two minutes between the two different types of eye drops, too, so each is thoroughly absorbed before the next is applied. Not sure if the first drop went in? Applying a second drop is fine.

Contact your surgeon if you have any concerns.

Always get in touch with them if you have any light sensitivity, increasing pain, blurring or injury to the eye that's followed by watering, blurred vision or pain.

Don't swim for a week.

Most surgeons will recommend this.

Avoid contact sports after LASIK for a month.

Non-contact sports like jogging or going to the gym are fine after surgery, though.

Always attend your reviews.

You might not be aware of a problem that's arisen after your surgery so always attend the reviews with your surgeon.

Typical Costs of Laser Eye Surgery

The costs of laser eye surgery can vary but hopefully, the below table will provide you with a good idea of how much you can expect to pay for each type of laser eye surgery in the UK:



Refractive Surgery Checklist for Patients

There are a lot of things you'll need to consider before you proceed with laser eye surgery, and it's inevitable you'll have lots of questions for your surgeon. Be sure to write these down so you don't forget anything in your initial consultation.

To help you come up with some questions, here are a number of things you might want to ask:



Are the Surgeon and Clinic Reputable?

- Does the surgeon have a Cert LRS qualification? <u>https://ww-w.rcophth.ac.uk/examinations/certificate-in-laser-refractive-surgery/</u>
 or are they on the General Medical Council's register for ophthalmology <u>http://www.gmc-uk.org/index.asp</u>?
- □ Is the surgeon fully insured to carry out this procedure in the UK (you're entitled to see a copy of this insurance)?
- Is the clinic or hospital regulated?
 England <u>Care Quality Commission</u>
 Scotland <u>Healthcare Improvement Scotland</u>
 Wales <u>Healthcare Inspection Wales</u>
 Northern Ireland <u>Regulatory and Quality Improvement Authority</u>
- □ How many procedures has the surgeon carried out previously using the same laser they'll use on your eyes?
- Does the surgeon have any reviews you can read, or are there previous patients you can talk to?
- □ What are your expectations, and are these realistic? Discuss what you want from the operation and whether or not the surgeon feels this is possible.
- □ Do you feel comfortable talking to the surgeon? Have they given you enough time to talk through the procedure and answer your questions?

What Do You Need to Know About the Procedure Itself?

- □ What does the procedure entail?
- □ What results can you expect?
- □ When will these results become apparent and how long will they last for?
- □ Will you need further surgery?
- □ Where does the procedure take place and how long does it take?
- What kind of activities might you still need to wear your glasses for after the procedure?

What Can You Expect to Spend in Total?

- □ What costs will you face?
- ☐ What are your rights to a refund if you change your mind? (Don't forget you may have to pay a fee for your initial consultation).

What Are the Possible Risks and Complications?

- □ What could go wrong and how can these issues be corrected if they do occur?
- In your surgeon's experience, what's the most common complication of the procedure? How frequent are these and how have they corrected them?

Note: Always take some time to think about how you'd deal with a complication if it happened. Are these risks worth it?

What Aftercare Can You Expect?

- □ How long will it take for you to recover?
- □ How long will you feel mild discomfort for?
- What can you / can't you do after the surgery?
- □ What does your aftercare package include/not include?
- □ Who will look after you and how long for?
- □ What happens if something doesn't go as it should? Who pays for this?
- □ What happens if you're not happy with the results?
- Do you have immediate access to care if the NHS can't help you?

Don't forget, you're entitled to ask these questions, so don't be afraid to do so. And always take the contact details of a doctor who can assist you if any problems do arise after your surgery.

Try to give yourself a week after your first consultation to think about the procedure and whether it's right for you or not.

Glossary of Terms

Accommodation:	The adjustment of the eye's lens to focus on nearby objects. With age, there's a natural loss of accommodation, which can lead to presbyopia.
Artisan/Verisyse PIOL:	A type of PIOL commonly used for younger patients which is clipped onto the iris.
Biometry:	A test that measures the eye and includes a set of calculations that determine the amount of focusing power needed before RLE or IOL procedures.
Binocular Vision:	The vision that's measured when both of the eyes are open.
Cataract:	When vision becomes hazy due to the misting of the natural lens.
Cataract Surgery:	Required when the eye's lens becomes cloudy and needs replacing with an artificial lens.
Conjunctiva:	The transparent membrane that covers the eyeball's outer surface (not the cornea).
Cornea:	Located at the front of the eye, this is the clear part of the eye's surface and holds most of the eye's focusing power.
Corneal Epithelium:	The skin layer of the corneas.
Corneal Topography:	A scan that traces the cornea's surface curvature.
D or Dioptre:	The unit used to measure the lens' refractive power.

Excimer Laser:	A type of laser that removes tissue without heating it. They're extremely accurate and don't cause any damage to the surrounding tissues. Commonly used in PRK treatments and LASIK.
Extraocular Muscles:	The six muscles responsible for moving the eye around in its socket.
Femtosecond Laser:	A type of laser designed to accurately cut 3D shapes into the cornea or natural lens. Commonly used in SMILE, LASIK and increasingly in cataract surgery or RLE.
Floaters:	Shadows (seen as spiders, spots and so on) that are cast onto the retina by particles that float around in the vitreous of the eyes.
Glaucoma:	A condition where the optic nerve and retinal nerve fibres become damaged over time due to increased intraocular pressure. It can cause 'tunnel vision' and even vision loss if left untreated, but surgery or drugs can keep it at bay.
ICL (Intraocular Collamer Lens):	The most common form of PIOL. It's implanted over the natural lens and behind the iris.
IOL (Intraocular Lens):	Small synthetic lenses that are used in RLE or cataract surgery to replace the natural lens
Intraocular Pressure (IOP):	The fluid pressure found within the eye. During routine eye checks this is normally measured with a puff of air.
lris:	Located behind the cornea, the iris is the pigmented tissue that gives the eye its colour. It's also responsible for controlling how much light enters the eye, contracting or expanding along with the pupil.
Keratometry:	Getting the measurement of the corneal curvature using a keratometer.
Laser Vision Correction:	Sight correction using femtosecond and/or excimer lasers that alter the focusing power and curvature of the cornea.

Low vision:	Often describing vision that's less than 20/200.
Macula:	The area of acute central vision, located in the centre of the retina.
Meibomian Glands:	Specialist glands in the eyelids that cover the eye in a layer of oil to stabilise the eye each time someone blinks. This floats on top of the tear film.
Micromonovision:	A strategy whereby the surgeon aims to achieve clearer focus in one eye at arms' length, and clearer distance focus in the other eye.
Monofocal IOL:	A lens that's used primarily in cataract surgery to create one clear point of focus. Compared to multifocal lenses, they have fewer side effects, but after implantation, glasses may still be required.
Multifocal IOL:	A lens that's used primarily in RLE to create more than one clear point of focus. These increase patients' freedom from wearing glasses.
Natural Lens:	Located just behind the pupil, the natural lens contains part of the eye's focusing power, contracting during accommodation.
Optic Nerve:	Carries the image placed on the back of the retina to the brain.
Peripheral vision:	Aka side vision.
Phacoemulsification:	Used during RLE and cataract surgery to liquefy the natural lens. This provides key-hole entry using ultrasound energy, compared to age-old techniques where the natural lens had to be scooped out.
PIOL (Phakic Intraocular Lens):	A synthetic lens that's implanted without removing the natural lens first. Used as an alternative to laser eye surgery for young people.
Posterior Vitreous Detachment (PVD):	Over time, the vitreous shrinks and often peels away from the back of the eye. This goes unnoticed for many but can become apparent when floaters appear in the vision. If this occurs, or they notice more floaters than normal, patients need to seek an eye examination.

Pupil:	Located in the centre of the iris, this black opening controls how much light enters the eye.
Refraction:	A test that determines the amount of astigmatism, hyperopia and myopia in the eyes, which is shown on a prescription.
Refractive Surgery:	Vision correction surgery.
Retina:	Located at the back of the eye, the retina is a lining of light-sensitive cells that send the image focused by the cornea to the brain, via the optic nerve.
Retinal Detachment:	When the retina becomes detached from the wall of the eye and its blood supply. To prevent vision loss, patients will need urgent surgery to reattach it.
Tear Film:	The wet film that covers the front of the eyes.
20/20:	Normal visual acuity.
Visual Acuity:	An assessment of how well a patient can see object shapes and details. This is tested by opticians by asking the patient to recall the letters on each line of a chart, which is usually 20 feet away.
Vitreous:	The transparent gel-like mass that fills two-thirds of the eye at the back (between the retina and the lens). It tends to shrink as someone gets older, contributing to particles and wrinkles that create floaters on the retina.
Wavefront Scan:	Used for excimer laser treatments, this creates an optical map of the eye.
YAG Capsulotomy:	Used to treat PCO, this is a minor laser procedure.

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