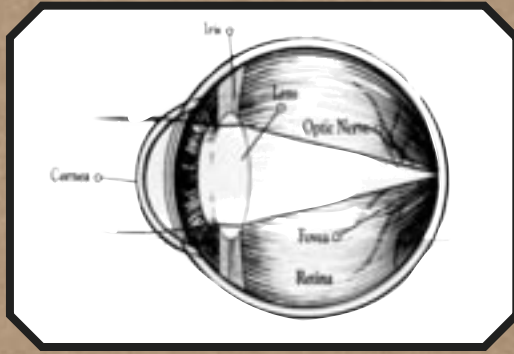


The Patient's Guide



UNDERSTANDING laser vision correction

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The Excimer Laser

In 1982, scientists discovered that laser energy, produced from the far ultraviolet portion of the light spectrum, was able to be reproduced artificially. This exciting discovery sparked further experimentation during which scientists found that by mixing different gases together, they could produce different laser wavelengths. Of the many wavelengths produced, scientists found the 193 nanometer wavelength particularly special because it could remove molecules of tissue without damaging surrounding molecules. Damage was avoidable since this wavelength removed tissue without using heat. Instead, molecules are swollen by the laser's energy and removed from the tissue's surface. This laser was termed "Excimer Laser".

The Excimer Laser mixes the gases Argon, Fluoride and a halogen to produce a cold ultraviolet beam of light. The light beam produced vaporizes tissue by breaking molecular bonds a few layers at a time. The laser light is so precise that it can remove tissue less than 0.25 microns at a time (1 micron = 1/1000 of a millimeter).

Due to the Excimer Laser's ability to remove tissue with such accuracy, its potential as a surgical instrument was quickly realized. Today, the Excimer is successfully used for correcting many vision problems. It is also being used by doctors in other areas of specialties of medicine.

Types of laser corneal surgery

Photorefractive Keratectomy (PRK). The technique combines the use of a surgical blade and the Excimer Laser to remove tissue from the surface of the cornea to correct a refractive problem. Removal of tissue is precise and does not weaken the cornea.

Laser Assisted In-situ Keratomileusis (LASIK). LASIK combines the older method of splitting the cornea with a blade called a microkeratome to form a flap. The inside of the cornea is then treated with the Excimer Laser. This type of surgery is promoted for rapid healing and vision recovery but is more difficult to perform and carries increased risk due to its' invasive nature.

'No Touch'TM laser vision correction. This technique evolved from PRK. It also treats the surface of the cornea but unlike other techniques, requires no assistance from manual surgical instruments. It is the only technique to use exclusively the Excimer Laser from start to finish.

Laser Epithelial Keratomileusis (LASEK). Yet another form of surface treatment, the outer tissue cells are folded back, a traditional PRK is performed after which the outer flap is repositioned over the treatment bed.

Who qualifies for laser vision correction?

It is essential for anyone interested in laser vision correction to have a full eye examination to determine if they are a suitable candidate or not. However, the following list of conditions can be used as a general guideline. The patient should:

- be 18 years of age or older
- have stable vision for at least one year prior to surgery
- have healthy eyes, free from ocular disease (some general health and eye problems could affect healing)
- have realistic expectations for surgical outcome
- accept that due to natural aging conditions, will likely need some reading magnification as they reach their 40s and 50s



If your cornea is too steep, focusing short of the retina at the back of your eye, you're nearsighted



If your cornea is too flat, focusing behind your retina, you're farsighted



If your cornea is irregularly shaped, you have astigmatism

At present, patients with virtually any degree of myopia (nearsightedness); hyperopia (farsightedness) or astigmatism can be treated using the 'No Touch' procedure. Results show an extremely high predictability with excellent visual outcomes. London Eye Centre, for instance, is also experienced at using 'No Touch' to treat the corneal disease Kerataconus, as well as patients who require further treatment following earlier methods of refractive surgery, such as Radial Keratotomy.

'No Touch' procedure for nearsightedness & astigmatism

The majority of surgical time is spent preparing both the laser and the patient's eye for the operation. The surface of the eye is prepared by anaesthetizing it with drops. Laser preparation involves programming the laser's computer to the eye's individual characteristics.

During the procedure the laser sculpts (ablates) the tissue of the cornea. With the 'No Touch' technique, no instrumentation beyond the laser is in contact with the cornea. Flattening of the cornea is achieved by removing more tissue from its centre than its periphery. The sculpting usually lasts between 30 seconds and 2 minutes (the total time in the operating room is less than 5 minutes per eye). The sculpting produces the desired curvature by a computer-controlled aperture opening in a circular or linear manner. This allows a different time exposure to the laser pulses to vary throughout the treated area in relation to the required curvature. The patient feels nothing during this process. The lids are held open with a retainer so the patient doesn't have to worry about blinking or closing their eye.

Immediately after treatment the eye is fit with a bandage contact lens, usually for two or three days. The patient is advised to rest for the remainder of the day following treatment. Vision is relatively good once the epithelium has grown back and the corneal surface has smoothed itself (usually two or three days). Within the next three weeks, predictable changes occur as healing stabilizes the end result. The vision is quite functional during this period. Stable vision should be accomplished between one to six months after the surgery. Results vary with different degrees of near and farsightedness and astigmatism, and individual healing rates.

Recovery after the procedure

Pain/Discomfort

Pain is not a significant problem with 'No Touch' laser vision correction. The majority of patients have grittiness or burning, some watering and light sensitivity lasting approximately 24 hours, and very few state that they had extremely disruptive pain. Virtually everyone is comfortable the next day. For control of pain, a bandage contact lens is used to shield the treated area. This is accompanied with analgesic drops and anti-inflammatory/antibiotic drops that are given to all patients. The average patient may take between two and four Tylenol tablets during the healing time and possibly a sleeping tablet the first night. Fear of pain should not be a reason to consider more complicated, higher risk or invasive procedures such as LASIK.

Recovery Time

Time is a most valuable commodity. The amount of downtime (time away from work or relative duties) is a consideration in having treatment. The vast majority of patients choose bilateral (both eyes) surgery which in turn means quicker return of binocular vision. 'No Touch' has also sped up recovery time compared to Standard PRK due to faster healing. Patients are functional the day of surgery meaning that they are mobile and are able to manage routine tasks on their own. However, it is recommended that patients have someone close at hand for assistance. Statistics show the majority of patients are able to legally drive by day three or four. Depending on age, "over the counter" reading glasses may be necessary for the early recovery days. Return to work depends on occupation. Three days to one week is normal. The eye is not weakened structurally with 'No Touch', so activity is generally not a problem.

'No Touch' procedure for farsightedness & farsighted astigmatism

Nearsightedness was the first refractive error to be corrected with laser vision correction. Subsequent to this, astigmatism correction was developed followed by farsighted correction and farsighted astigmatism. Considerable research and development of the hardware and software components was required for each of the above refractive error corrections. London Eye Centre performed Canada's first farsighted treatments nearly 10 years ago and is recognized as a specialist for these corrections.

At present, London Eye Centre is performing the majority of farsighted corrections with the Excimer Laser. This is done with a variation of the 'No Touch' procedure. For farsightedness, the periphery (rather than the centre) of the cornea must be treated and therefore a larger area of surface epithelium is removed. In farsighted cases, the epithelium is dissolved by placing a liquid solution on the intended area rather than using the laser. However, no surgical instruments or incisions are required.

Recovery after the procedure

Healing and recovery time is slightly longer for farsighted corrections than nearsighted because the zone treated is larger (9mm). It is for this reason that some farsighted patients are advised to take additional time from work. Most farsighted patients will become temporarily nearsighted during healing, leaving good near vision during the first days but causing some distance frustration. Temporary distance correction may be needed for some farsighted patients.

The Holmium Laser

The Holmium laser has been used at London Eye Centre since 1993. The value of the Holmium Laser is its safety and very short downtime required post treatment. The Holmium laser uses an infrared wavelength to tighten the tissue around the edge of the cornea. This results in the steepening of the cornea. No removal of the outer skin layer (epithelium) is required. Being minimally invasive, this procedure has little risk and requires less follow up care. The procedure is called Laser Thermal Keratoplasty (LTK). However, the Holmium is limited in its treatment potential. Selected patients of less than two diopters of farsightedness may do well with this procedure. It is particularly effective if over-correction occurred with Excimer Laser treatment of nearsightedness.

Presbyopia/Reading Glasses/Monovision

Some patients who choose to have laser vision correction may already be aware of a condition called presbyopia. This condition leads to the requirement for reading glasses. Not to be confused with hyperopia (farsightedness), patients who have to wear reading glasses do so because the lens inside the eye has become rigid with age (usually around 45 years old). A common solution for those with distance problems and presbyopia is either bifocal or progressive glasses or specially fitted contact lenses. With contact lenses one lens can be adjusted to intentionally leave you slightly nearsighted. This difference (usually about 1 diopter) is enough to aid your vision and your brain to “accommodate” and lessens the reading glasses requirement. This is known as monovision.

Most middle-aged patients wearing bifocals choose to be treated for full distance correction, accepting some dependency on reading glasses following the procedure. However if you presently wear monovision contact lenses, bifocals or progressive lenses, a surgeon or technician can advise you on how to lessen your dependence on reading glasses by intentionally under-correcting your non-dominant eye. This, in effect, will give you monovision. Monovision should not be decided on until discussed and demonstrated at the time of examination.

For those wearing reading glasses exclusively due to presbyopia, you may wish to note that London Eye Centre has been selected as an investigational site for a new laser procedure designed to reverse the aging effects of presbyopia. If all you require is reading glasses, monovision can be a solution for you, which is using the Holmium laser on only one eye.

The risks of laser vision correction

Based on accumulated data, there appear to be minimal risks associated with laser vision correction surgery on the cornea. However, there are a number of adverse effects that patients should be aware of prior to surgery.

Delayed epithelial healing

The outer layer of the cornea is removed prior to the 'No Touch' procedure. Normally this layer replaces itself within two to three days. Although rare, this sometimes does not occur within the regular time period and special medications or treatments may be needed to promote healing. To date, no case has been documented where healing has not occurred.

Light sensitivity

Most eyes are sensitive to light post-operatively. This is usually short lasting - less than 1-2 weeks. Sunglasses should be worn in bright sunlight for a few months following surgery to avoid excessive UV radiation.

Corneal haze

The term "haze" is used when the healing response results in new tissue growth on the treated surface sufficient enough for a loss of transparency visible with the examination microscope. It is graded by its density. Haze above grade 1 out of 4 will start to affect visual quality. It is the main reason why surgeons promote the LASIK technique since haze occurs less frequently in reported studies. Statistics of the 'No Touch' technique show it answers well to the problem of haze in all degrees of correction. The 'No Touch' technique promotes a more assured healing response. Studies currently show only 0.3% of eyes treated with a grade 1 or greater haze after healing.

Overcorrection

Initial overcorrection is usually planned as the cornea heals. The eye generally stabilizes to near-predicted results within three months, however rare cases may remain overcorrected. An overcorrection is more noticeable to older patients who already require bifocals. Overcorrections are treatable with both the Holmium or excimer laser depending on circumstance.

Undercorrection

Undercorrection is more common than overcorrection. Small amounts of undercorrection do not seriously affect the resulting vision. Large amounts however, may need a retreatment (or corrective lenses full or part time) for clear vision.

Superior healing after 'No Touch' laser vision correction

Removing the epithelium with the laser has shown much faster regrowth over other methods of removal (London Eye Centre's average is thirty five hours; other methods average seventy-two hours). When combined with a multipass and multizone software and the newest generation laser, all healing side effects are lessened. It results in: less risk of infection, quicker recovery of tear film, faster return of vision and less discomfort. Vision stabilizes quickly if the body's natural ability to heal is maximized on the newly created surface. This is very important and accomplished by having an extremely smooth ablated surface with a good contour. The 'No Touch' method of treatment is helping bring laser vision correction to a higher threshold of assurance.

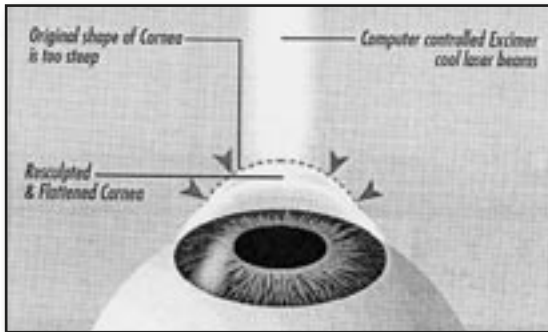
There are external factors which influence healing. Certain general medical conditions, severe dry eye problems and excessive exposure to UV radiation are known to impede healing. There are topical drugs to aid with certain healing problems. UV protection in early stages of healing is necessary.

Laser vision correction retreatment

In almost every case, the aforementioned adverse effects are treatable with a second procedure if necessary. The retreatment rate for 'No Touch' patients is around 3 to 4%. London Eye Centre does not charge for patient retreatments if the patient was treated originally at LPEC. The 'No Touch' technique demonstrates even greater value when it comes to retreatments. Any manual disruption of the previously treated surface has a greater chance of haze formation. 'No Touch' allows for a very smooth surface with laser epithelial removal. The multi-pass/multi-zone aspect of 'No Touch' allows for greater flexibility to improve accuracy:

- overcorrection and undercorrection are treatable
- haze can be removed
- any surface healing irregularities can be improved (scarring)

All re-treatment procedures must be thoroughly discussed between the surgeon and the patient to explore the risk versus reward ratio.



The rewards of 'No Touch' laser vision correction

Laser vision correction has a tremendous impact on people's lives. Benefits are apparent in many ways.

Physiological

Some refractive problems cannot be corrected with conventional glasses or contact lenses. In other cases corrective lenses can be worn but with extreme difficulty. For these people, laser vision correction provides a way to clear vision without battling with visual aids.

Occupational

There are a number of professionals such as pilots, firefighters, and police officers that are required to obtain a high standard of visual acuity without visual aids. Laser vision correction is certainly a solution that would allow such people freedom to pursue the career of their choice without otherwise being restricted by their vision. It is important to understand that individual professional organizations have their own policies on refractive surgery. Anyone who is considering laser vision correction should consult with a potential employer before making a decision.

Recreational

With little or no dependence on glasses or contact lenses, most sports activities are greatly enhanced. No longer does one have to battle with glasses under ski goggles, losing a contact lens while swimming or spectacles slipping down one's perspiration stained face during a tennis match. Many even find their central and peripheral vision improved, and participation in sports previously found not feasible, is now possible.

Visual quality

Improved peripheral vision, proper image size, binocular balancing of unequal vision between eyes, and possibly less fluctuation than contacts or glasses.

Cosmetic

Many people feel that glasses detract from their physical appearance. Laser vision correction is certainly a solution to this problem. However, this treatment is generally not encouraged for purely cosmetic reasons.

Psychological

Many people feel handicapped by the restrictions their visual aids set. Some fear the insecurity they would experience if they ever lost their lenses, especially during an emergency. Others feel a low self esteem because reliance on visual aids makes them feel clumsy, unattractive or left out of some activities. By reducing or eliminating dependence on visual aids for clear vision, many psychological fears subside.



Analysis of ‘No Touch’ laser vision correction

Definition

‘No Touch’ laser vision correction refers to the method developed at London Eye Centre of removing the epithelium (outer skin of the cornea) with the laser. This is combined with a customized computer formula (nomogram) used for sculpting the surface. There is no manual manipulation of the cornea with instruments.

Using the laser to remove the epithelium is less traumatic than the other methods such as LASIK. It produces a very smooth surface for lasering the required correction. There is more rapid regrowth of the epithelium following ‘No Touch’ treatment. This method is used at London Eye Centre with the VisX Star S3 with #D ActiveTrak and Variable Spot Scanning using a multi-pass, multi-zone technique.

Advantages of ‘No Touch’ over other refractive techniques

To compare ‘No Touch’ to other laser surgeries, it is necessary to define the specific methods and to compare complications as well as to look at the quality of vision obtained. To permanently alter the shape of the cornea, curvature changes must be made underneath the epithelial layer (outer skin that regenerates). How the tissue below the epithelium is exposed becomes an important aspect to laser vision correction and differentiates the various methods of treatment.

Standard PRK

The initial technique and one still performed at many facilities is to use a scalpel or other blunt instrument to scrape the epithelium away in the area treated. Other standard methods of epithelial removal include: rolling back the epithelium (LASEK); using a circular electric brush to loosen or remove epithelium or using the laser to remove the epithelium to a fixed depth and scraping the remaining layer with an instrument (Laser-Scrape).

LASIK (Laser Assisted in-Situ Keratomileusis)

A microkeratome blade is used to slice approximately 1/3 of the cornea tissue, creating a flap of cornea and exposing an inner bed to be lasered. Powerful eye suction is required to isolate the area to be cut.

‘No Touch’

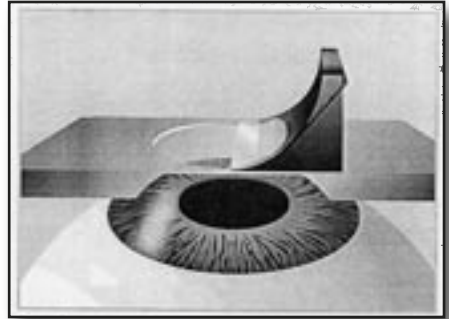
As defined earlier, this technique involves total epithelial removal with the laser, a technique developed at London Eye Centre. This is coupled with a multi-pass/multi-zone method and advanced lasers with the most updated hardware and software used anywhere in the world. Techniques such as standard PRK and LASIK that utilize manual epithelial removal introduce many variables that are eliminated with ‘no touch’.

Comparing Complications

‘No Touch’ laser vision correction is very safe. The procedure is designed to answer to all potential complications particularly those occurring during the procedure itself. This safety allows the patient to be very relaxed during treatment.

LASIK is a more involved procedure using additional equipment (a powerful suction ring and a motorized blade called a microkeratome are used to cut the flap) and brings potential concerns that aren’t associated with ‘No Touch’. Procedural concerns with LASIK include:

- complications from the pressure changes (optic nerve and retinal damage as intraocular pressure is raised to 4-5 times normal level with suction ring)
- complications from cutting the flap - improper cutting or mechanical failure can lead to concerns of thickness, evenness or even an incomplete flap or loss of cap
- bacteria from microkeratome blades and sterilization process
- repositioning of the flap - includes folds, wrinkles, ingrowth or debris under the flap



Also, during healing, incidence of dislodging or displacing the repositioned flap has occurred.

Comparing Adverse Effects

The development of 'No Touch' has eliminated many of the early adverse effects and minimized others.

- infection - the rate of infection with 'No Touch' is extremely low due to faster healing and no instrument contact with the eye
- haze/regression - 'No Touch' produces a smoother treatment surface than standard PRK and therefore, faster re-epithelialization and a shorter healing response. It also results in a more tapered, contoured final curvature because of the multi-pass/multi-zone technique, dramatically minimizing the incidence of both haze and regression.
- under/overcorrection - with the experience of tens of thousands of eyes treated, 'No Touch' has established excellent predictability resulting in a much lower rate for retreatments for under/overcorrection. LASIK retreatment of under/overcorrection is riskier and more complicated than even the primary LASIK procedure.

Summary

The 'No Touch' laser vision correction technique is a state of the art method developed at London Eye Centre. Presently, most clinics citing results for LASIK are comparing them to earlier standard methods of PRK. We have sufficient statistical data now with our 'No Touch' technique to know that 'No Touch' appears significantly safer than LASIK. There are no complications from a microkeratome or from "flap" healing. Risks of the powerful suction device used in LASIK and the incising of the cornea add significant concern for even the most experienced LASIK surgeon. Predictability with 'No Touch' is excellent with only 3-4% of patients requiring retreatment.

It is important to note that one should not decide the method of treatment based solely on first day discomfort or on the speed of recovery. Claims of slow return to functional vision, pain and haze production may be true of standard PRK, however, with the advanced technology of 'No Touch', these issues are addressed. 'No Touch' is less invasive and safer than LASIK and produces better results than standard PRK.

Frequently asked questions and their answers

Do I need to take time off work?

Patients are advised to take at least three days off work and avoid strenuous activity after surgery. This period of time is critical to the healing and stability of the eye. Time off work will vary with the individual and occupation. Individual assessment is required to determine the time needed for recovery.

How long will it take before I can drive?

Everybody heals at different rates and the amount of correction is also a variable. On average, patients obtain legal driving vision (20/40) or better in three to seven days.

What will I feel during the procedure?

The surgical staff will place anesthetizing drops in the eye ahead of time ensuring no pain during the treatment. These drops take about an hour to wear off. Some discomfort may be experienced in the first 24 - 36 hours following surgery. Medications are provided to reduce or eliminate any discomfort.

Can I have both eyes done at the same time?

At London Eye Centre, treating both eyes the same day is routine. In fact, over 90% of our patients elect to be treated in this manner. There are however some considerations such as extremely high corrections or farsightedness where waiting between eyes is advised.

Can you guarantee the result?

Although the predictability of results is very high and incidence of complications low, the answer is no. Different eyes heal at different rates, and in different ways. If you end up with less correction than you hoped for, chances are, your eye can be retreated simply and effectively to take it the rest of way.

Why do many patients from the U.S. continue to go to Canada for treatment?

Laser vision correction was, for many years, still investigational in the U.S., so Americans who didn't want to wait for approval chose to go to experienced clinics in Canada for treatment. There are still some technology advances which are available only in Canada outside of U.S. clinical trial sites. Also, many patients continue to choose a Canadian facility to receive treatment from surgeons with more experience using techniques still unavailable at this time in the U.S..

Does it matter which clinic does my procedure?

Experience is always crucial when selecting a clinic or doctor for any surgery. Equipment, technique and dedication to patient safety are also important factors to consider. At London Eye Centre all surgeons have extensive experience and use the same equipment, technique and highly trained support staff to ensure our high standards are met.

Published in 2007 by the Education Department of London Eye Centre

*For educational videos and further information,
please visit www.lasereye.com*