

refractive surgery

a closer look

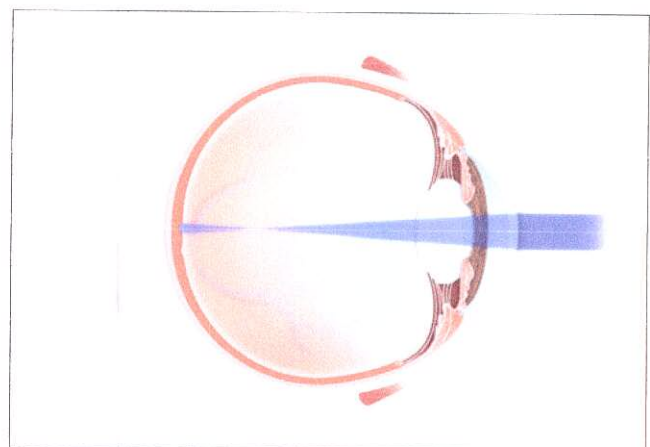
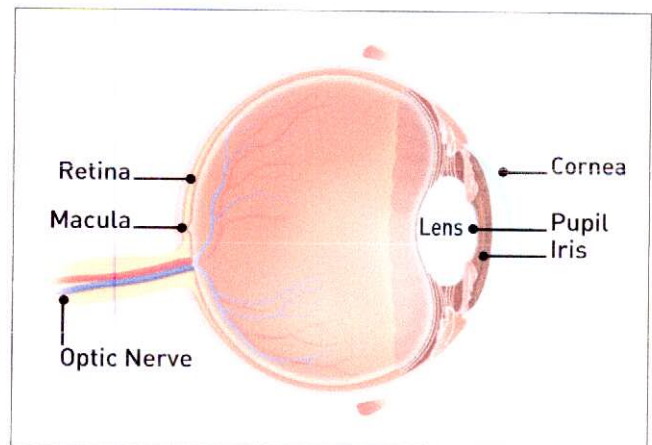
HOW THE EYE WORKS

Light rays enter the eye through the clear cornea, pupil and lens. These light rays are focused directly onto the **retina**, the light-sensitive tissue lining the back of the eye. The retina converts light rays into impulses, sent through the optic nerve to your brain, where they are recognized as images. About 70 percent of the eye's focusing power comes from the cornea and 30 percent from the lens.

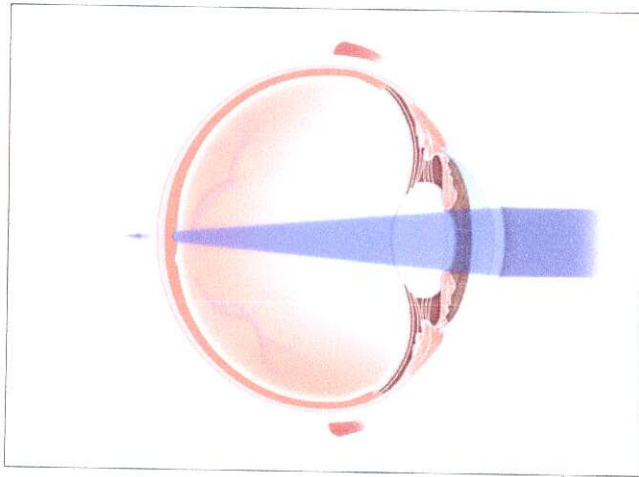
Many forms of refractive surgery improve vision by permanently changing the shape of the **cornea**, the clear front window of the eye. Other procedures involve implanting a lens inside your eye.

In an eye with **myopia** (nearsightedness), the corneal focusing power is too strong for the eye's overall length. Instead of focusing on the retina, images fall in front of it, and vision is blurry.

When treating myopia, certain refractive surgery techniques reduce the curvature of the cornea to lessen the eye's focusing power. Images that are focused in front of the retina, due to an elongated eye or steep corneal curve, are pushed closer to or directly onto the retina following surgery.



Myopia, or nearsightedness



Hyperopia, or farsightedness

In an eye with **hyperopia** (farsightedness), the corneal focusing power is too weak for the eye's overall length. Instead of focusing on the retina, images focus beyond the retina, and vision is blurry.

When treating hyperopia, certain refractive surgery techniques make the cornea steeper to increase the eye's focusing power. Images that are focused beyond the retina, due to a short eye or flat cornea, are pulled closer to or directly onto the retina following surgery.

Astigmatism occurs when the cornea is more curved in one direction than the other, like the shape of a football. If astigmatism is significant, light passing through the cornea is scattered. Images reaching the retina are distorted and vision is blurred. When treating astigmatism, refractive surgery techniques selectively reshape portions of the cornea to make it symmetrical and smooth, like the shape of a basketball, so that images focus clearly on the retina.

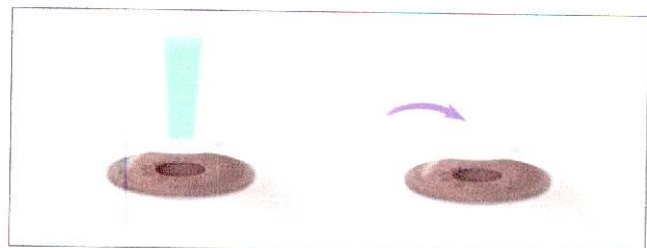
Common refractive surgery procedures include:

- Laser in situ keratomileusis (LASIK) and epithelial-LASIK (epi-LASIK);
- Advanced surface ablation (ASA), including photorefractive keratectomy (PRK) and laser epithelial keratomileusis (LASEK);
- Phakic intraocular lenses (IOLs).

LASIK AND EPI-LASIK

LASIK is a combined microsurgical and excimer laser procedure used to correct nearsightedness (myopia), farsightedness (hyperopia) and astigmatism. In LASIK, either a laser or a highly specialized instrument, a **microkeratome**, is used to make a thin flap in the cornea. The excimer laser is applied beneath the corneal flap. The flap is then replaced and allowed to heal. No stitches are necessary.

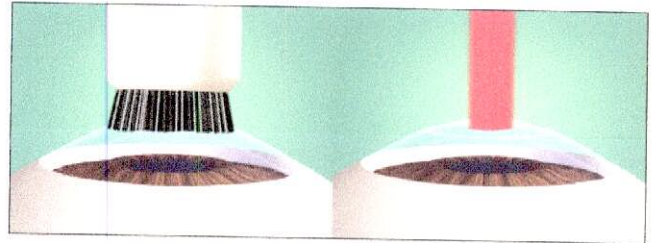
Epi-LASIK (epithelial LASIK) is a refractive surgery procedure used to treat nearsightedness (myopia), farsightedness (hyperopia) and astigmatism. Epi-LASIK is similar to LASIK in that a flap is made with a keratome or mechanical device. But the flap with Epi-LASIK is much thinner and may be more appropriate for patients with thin corneas who would not otherwise be candidates for the conventional LASIK procedure.



A flap is created in the cornea with either a laser or a microkeratome. A laser sculpts the exposed surface of the cornea (left), and the tissue flap is replaced (right).

refractive surgery

The epi-LASIK procedure uses a specific type of microkeratome, called an **epi-keratome**. The epi-keratome precisely separates the thin epithelial sheet — much thinner than a LASIK flap — from the rest of the cornea. Once the epithelium is separated from the rest of the cornea, the thin sheet of epithelial cells is lifted to one side. After a laser is used to treat the cornea, the thin sheet is then moved back into place, where it will self-adhere. After the procedure, a transparent bandage contact lens is placed on the cornea to promote healing.



With PRK, a special brush may be used to remove the outermost layer of the cornea, the epithelium (left); a laser removes tissue from the cornea to reshape it (right).

ADVANCED SURFACE ABLATION (PRK AND LASEK)

Advanced surface ablation (ASA) is a refractive surgery technique used to treat nearsightedness (myopia), farsightedness (hyperopia) and astigmatism. With ASA, the outermost layer of the cornea, the epithelium, is removed or displaced to expose the stroma (the middle, thickest layer of tissue in the cornea). A computer-controlled excimer laser then reshapes the front surface of the corneal stroma. The epithelium is either replaced or assisted in healing back over the surface of the cornea underneath a bandage contact lens. ASA is usually recommended instead of LASIK for people with thin corneas. ASA procedures include photorefractive keratectomy (PRK) and laser epithelial keratomileusis (LASEK).

PHOTOREFRACTIVE KERATECTOMY (PRK)

With **PRK**, the surgeon removes micro-thin layers of tissue from the outermost layer of the cornea, the **epithelium**. When treating myopia, or nearsightedness, the surgeon then uses the laser to remove central corneal tissue in a circular pattern, thereby flattening the cornea and weakening the focusing power of the eye. The tissue is removed

in a controlled pattern programmed into the computer by the surgeon. When treating hyperopia, or farsightedness, the surgeon uses the laser to remove peripheral corneal tissue, thereby steepening the central cornea to increase the focusing power of the eye.

In comparison, when treating astigmatism, the laser is programmed to remove tissue in an elliptical pattern, selectively reshaping some portions of the cornea to form a smooth symmetrical surface. This procedure requires precise evaluation of the astigmatism so that the correct amounts of laser energy are delivered to the appropriate areas of the cornea. PRK is often a better option for people whose occupation makes it more dangerous to have a flap, as it could be dislodged accidentally.

LASER EPITHELIAL KERATOMILEUSIS (LASEK)

With **LASEK**, your ophthalmologist (Eye M.D.) uses an alcohol solution to loosen and peel back the epithelium to expose the cornea. The excimer laser then resculpts the cornea, and the epithelium is placed back into position. After the procedure, a transparent bandage contact lens is placed on the cornea to promote healing.



CONDUCTIVE KERATOPLASTY (CK)

CK is a noninvasive, thermal refractive surgical procedure used to correct mild to moderate farsightedness (hyperopia) in people over age 40. With CK, your ophthalmologist uses a tiny probe that releases controlled amounts of radio frequency (RF) energy, instead of a laser, to apply heat to the peripheral portion of the cornea. The heat then causes the peripheral cornea to shrink and to tighten like a belt. This increases the curvature (steepness) of the central cornea, improving the optical power of the central cornea. This refocuses light rays on the retina and enhances vision.

CK can be used to achieve “monovision” (“blended vision”). With monovision, CK can be used to improve close-up vision in a presbyopic eye with good vision but poor near focus. To maintain good distance vision, usually only one eye is set to near focus (the non-dominant eye), while the other is left or set at good distance vision. CK does not offer permanent correction; for some patients, farsightedness may return over time.

PHAKIC INTRAOCULAR LENSES (IOLS)

Phakic IOLs are designed for people with high degrees of refractive errors that cannot be safely corrected with corneal-based refractive surgery. 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. The eye’s natural (phakic) lens is not removed, so patients can retain their pre-existing ability to focus.

During the phakic IOL procedure, your ophthalmologist places the phakic IOL either in front of or behind the iris of the eye. Once the IOL is properly positioned inside the eye, it provides the necessary correction to redirect light rays precisely onto the retina.

WHICH METHOD IS BEST?

There is no universally-accepted, best method for correcting refractive errors. Discuss your needs and lifestyle with your ophthalmologist to determine the best procedure for you.

ARE YOU A GOOD CANDIDATE FOR REFRACTIVE SURGERY?

You might consider refractive surgery if you:

- Wish to decrease your dependence on glasses or contact lenses;
- Are free of eye disease;
- Can accept the inherent risks and potential side effects of the procedure;
- Have the appropriate refractive error.

While refractive surgery does offer some people an alternative to dependence on glasses or contact lenses, it’s not for everyone. You may not be a good candidate for refractive surgery if you are generally satisfied with glasses or contact lenses and unwilling to accept the uncertainty in the outcome of refractive procedures. Even after refractive surgery, certain people may still need to wear glasses or contacts. Surgery, contacts and glasses each have their benefits and drawbacks. The best method of correcting your vision should be decided after a thorough examination and discussion with your ophthalmologist.



IMPORTANT FACTS

More than 95 percent of people who have had refractive surgery can pass a standard driver's license exam that requires a visual acuity of at least 20/40 without glasses or contacts.

Additional enhancement surgeries may be required to achieve your desired results.

You may still need glasses or contact lenses to achieve your best vision even after refractive surgery.

Fitting contact lenses may be difficult or impossible because of corneal changes following refractive surgery.

Reading glasses may still be necessary for middle-aged and older adults. Refractive surgery does not alter the aging process of the eye and does not prevent presbyopia. In fact, you may need reading glasses at a younger age.

If you have specific occupational goals, check with your prospective employer about regulations concerning refractive surgery.

NOTES

COMPLIMENTS OF YOUR OPHTHALMOLOGIST:

San Antonio Eye Center, P.A.
(210) 226-6169
www.saeye.com

Academy reviewed 03/11

© 2011 American Academy of Ophthalmology. The American Academy of Ophthalmology, The Eye M.D. Association and the Academy logo are registered trademarks of the American Academy of Ophthalmology.