

# Laser Eye Surgery Technology – LASIK

## **Abstract:**

Over 1 million LASIK procedures a year are performed in America. With a number of high profile athletes including Tiger Woods and Dallas Cowboy quarterback Troy Aikman singing LASIK's praises, the procedure has gained a tremendous amount of public attention. However, LASIK is surgery, which also involve uncertainties and risks. The uncertainties and risks should be clearly understood before the surgery. In this report, we will study how this technology works and what are some of its risks and uncertainties.

## **Introduction:**

We are both wearing eyeglasses. We are also aware that the laser eye surgery technology is available and become more popular. We would like to spend some time to research on this topic and learn about it. Maybe someday we may go for the eye surgery to get rid of our eyeglasses.

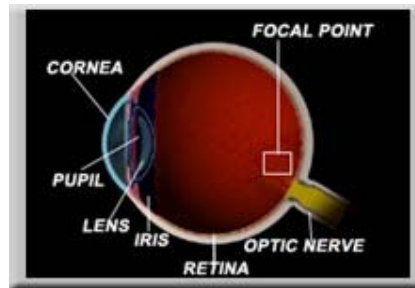
LASIK stands for Laser-Assisted In Situ Keratomileusis and is a procedure that permanently changes the shape of the cornea, the clear covering of the front of the eye, using an excimer laser. LASIK is the most advance form of laser vision correction that is currently available.

## **Content:**

### 1. How the eye work

Human eye works in a similar manner like a camera. Each part plays a vital role in providing clear vision. Imagine the cornea, behaving much like a lens cover. As the eye's main focusing element, the cornea takes widely diverging rays of light and bends them through the pupil, the dark, round opening in the center of the colored iris. The iris and pupil act like the aperture of a camera. Next is the lens of the eye that have similar role with camera's lens which helps to focus light to the back of the eye. And at the very back of the eye is retina which acts like the film of a camera. The retina's main duty is to sharp your vision.

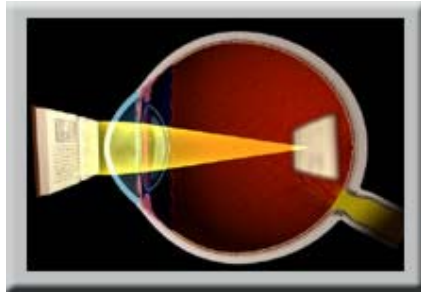
## 2. Anatomy of the eye



- a. Cornea  
The cornea has three main layers: the epithelium (the thin outer protective layer of cells), the stroma (the strong, fibrous layer that makes up 90% of the cornea's thickness and provide its structure and shape) and the endothelium (the single cell layer that lines the inside of the cornea)
- b. Pupil  
Pupil appears as a black circle in the middle of the iris. When the light is bright, the iris muscle makes pupil becomes small and vice versa.
- c. Lens  
The lens is a circular structure located directly behind the pupil and held in place by ligaments. When the ligaments tighten, the lens become flatter allowing the eye to see objects at a distance. When the ligaments relax, the eye can see objects that are close.
- d. Iris  
The iris is a thin diaphragm composed mostly of connective tissue and smooth muscle fibers that is seen from the outside as the colored portion of the eye. It extends forward from the periphery of the ciliary body and lies between the cornea and the lens.
- e. Retina  
Retina consists of complex layer of nerve tissue that lines the inside back wall of the eyeball.
- f. Optic nerve  
The duty of the optic nerve is to transmit electrical impulses from the retina to the brain. A portion of optic nerve called optic disc can be seen when examining the back of the eye.

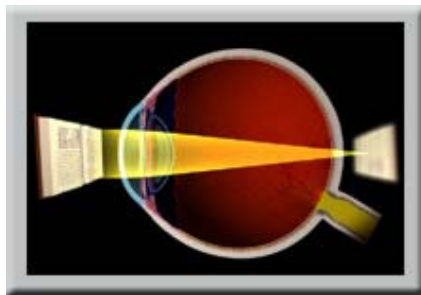
### 3. Common Vision Problems

#### a. Myopia (Nearsightedness)



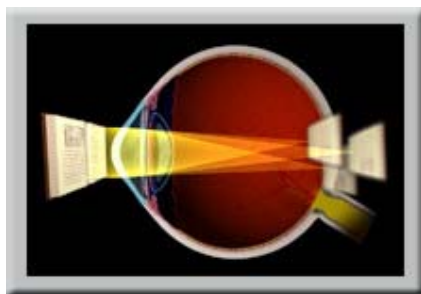
It is a condition in which you can see nearby objects very well but objects at a distance appear blurry. This situation occurs when the light rays focus in front of the retina.

#### b. Hyperopia (Farsightedness)



Hyperopia is the opposite of myopia. It is the condition when you can see distant objects more clearly than nearby objects. The light rays focus behind the retina.

#### c. Astigmatism



Most people who suffer myopia and hyperopia also have some degree of astigmatism. In astigmatism, light entering the eyeball focuses on multiple areas rather than on the retina. Objects both far and near appear blurry.

d. Presbyopia



Presbyopia is the common vision problem for people with old age. This age group of people is dependent with reading glasses. This problem occurs because human eye loss flexibility in the lens and a weakening in the muscle that enable the lens to flex the focus.

4. Nonsurgical Vision Correction Options

a. Eyeglasses

Eyeglasses are one of the options for vision correction. It works like a magnifying glasses that enhance the eye's ability to focus sharply, whether near or far. There are some advantages using eyeglasses such as affordable and easy to maintain. On the other hand, glasses can be a distraction for certain activities and it may restrict the outer part of your field of vision.

b. Contact Lenses

Contact lenses are another option. Since the contact lenses are extremely thin and custom shaped for the cornea, contact lenses float on the surface of your eye; they are held in place by natural suction and are constantly lubricated by the eye's own moisture.

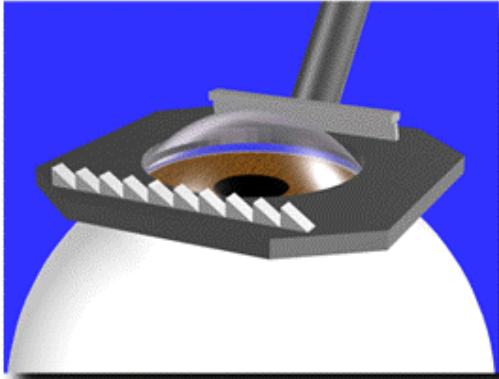
c. Orthokeratology

This is an option to treat myopia. The technique uses a series of rigid contact lenses that apply pressure to the sides of the cornea to flatten them. The disadvantages are very expensive, high maintenance and require continuous follow-up visit.

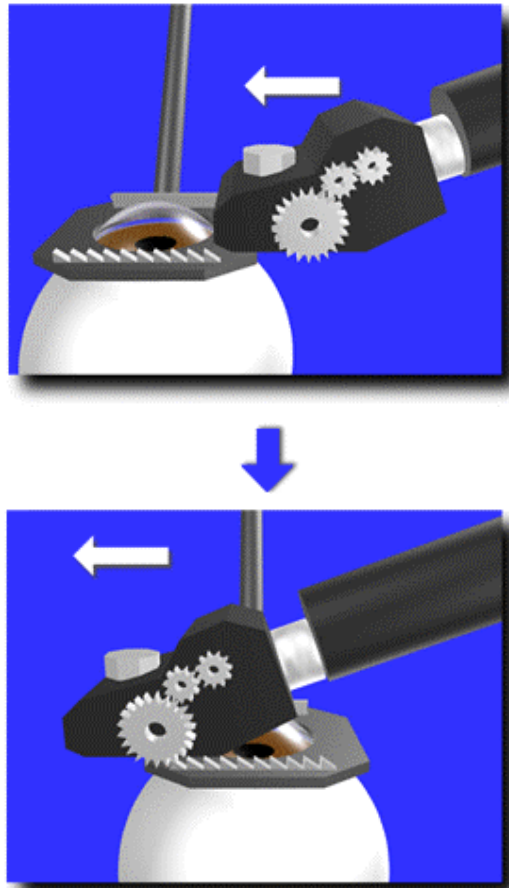
# How LASIK is Performed

## Step 1

After anesthetic eye drops are put on the eye, a suction ring is centered over the cornea of the eye. This suction ring stabilizes the position of your eye and increases the pressure to a level that is needed for proper functioning of the microkeratome. The guide tracks on this suction ring are used to provide a precise path for the microkeratome.



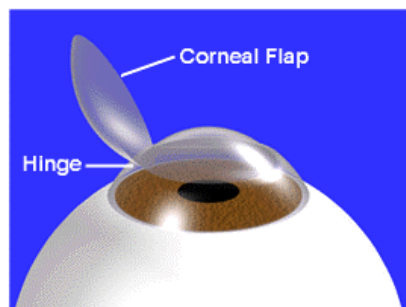
## Step 2



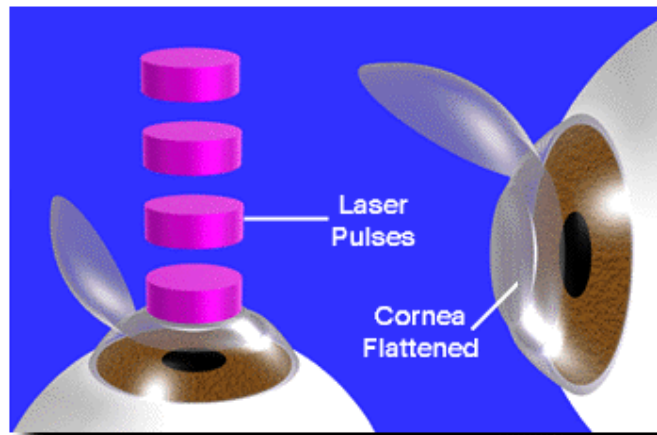
The microkeratome is a very precise instrument that is the "keystone" in the LASIK procedure. This device is a mechanical shaver that contains a sharp blade that moves back and forth at high speed. This shaver is placed in the guide tracks of the suction ring and is advanced across the cornea using gears at a controlled speed. This process creates a partial flap in the cornea of uniform thickness. The flap is created with a portion of the cornea left uncut to provide a hinge.

## Step 3

After the suction ring and microkeratome have been removed, the corneal flap is folded back on the hinge exposing the middle portion of the cornea.

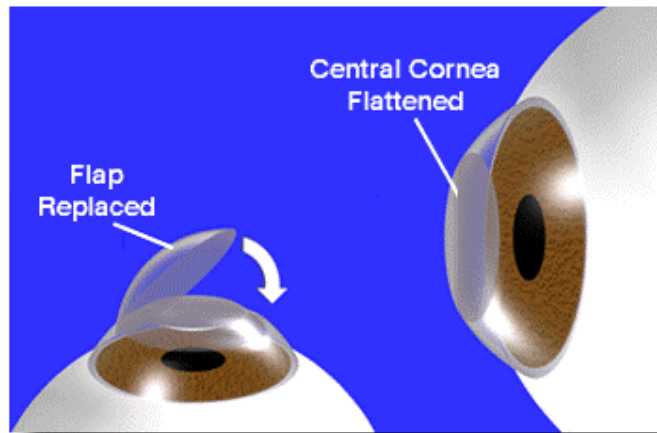


## Step 4



The excimer laser is then used to remove tissue and reshape the center of the cornea. The amount of tissue removed is dependent upon the degree of near-sightedness that is being corrected. This portion of the LASIK procedure is almost identical to the PRK procedure, except that in the PRK the surface of the cornea is treated **without** the creation of the corneal flap.

## Step 5



In the final step, the hinged flap is folded back into its original position. The front surface of the eye is now flatter since the flap conforms to the underlying surface. In effect, the change made in the middle of the cornea is translated to the front surface of the cornea.

## What are the risks?

Most patients are very pleased with the results of their refractive surgery. However, like any other medical procedure, there are risks involved. That's why it is important for you to understand the limitations and possible complications of refractive surgery.

Before undergoing a refractive procedure, you should carefully weigh the risks and benefits based on your own personal value system, and try to avoid being influenced by friends that have had the procedure or doctors encouraging you to do so.

- **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.
- **Some patients develop debilitating visual symptoms.** Some patients develop glare, halos, and/or double vision that can seriously affect nighttime vision. Even with good vision on the vision chart, some 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.
- **You may be under treated or over treated.** Only a certain percent of patients achieve 20/20 vision without glasses or contacts. You may require additional treatment, but 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 may still need reading glasses after surgery.
- **Some patients may develop severe dry eye syndrome.** As a result of surgery, your eye may not be able to produce enough tears to keep the eye moist and comfortable. This condition may be permanent. Intensive drop therapy and the use of plugs or other procedures may be required.
- **Results are generally not as good in patients with 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.
- **For some farsighted patients, results may diminish with age.** If you are farsighted, the level of improved vision you experience after surgery may decrease with age. This can occur if your manifest refraction (a vision exam with lenses before dilating drops) is very different from your cycloplegic refraction (a vision exam with lenses after dilating drops).

- **Long-term data is not available.** LASIK is a relatively new technology. The first laser was approved for LASIK eye surgery in 1998. Therefore, the long-term safety and effectiveness of LASIK surgery is not known.

### **When is LASIK not for me?**

#### **You are probably NOT a good candidate for refractive surgery if:**

- **You are not a risk taker.** Certain complications are unavoidable in a percentage of patients, and there are no long-term data available for current procedures.
- **It will jeopardize your career.** Some jobs prohibit certain refractive procedures. Be sure to check with your employer/professional society/military service before undergoing any procedure.
- **Cost is an issue.** Most medical insurance will not pay for refractive surgery. Although the cost is coming down, it is still significant.
- **You required a change in your contact lens or glasses prescription in the past year.** This is called refractive instability. Patients who are:
  - In their early 20s or younger,
  - Whose hormones are fluctuating due to disease such as diabetes,
  - Who are pregnant or breastfeeding, or
  - Who are taking medications that may cause fluctuations in vision, are more likely to have refractive instability and should discuss the possible additional risks with their doctor.
- **You have a disease or are on medications that may affect wound healing.** Certain conditions, such as autoimmune diseases (e.g., lupus, rheumatoid arthritis), immunodeficiency states (e.g., HIV) and diabetes, and some medications (e.g., retinoic acid and steroids) may prevent proper healing after a refractive procedure.
- **You actively participate in contact sports.** You participate in boxing, wrestling, martial arts or other activities in which blows to the face and eyes are a normal occurrence.
- **You are not an adult.** Currently, no lasers are approved for LASIK on persons under the age of 18.

## **Conclusions:**

Before we research on the topic of LASIK, we thought that the LASIK is completely safe and 100% effective. And after the surgery, we are guaranteed to be able to completely remove our eyeglasses and contacts.

After we researched on the technology of LASIK, we have learned the how the LASIK technology works and what are the risk and uncertainties that involve with it. Since, LASIK is a relatively new technology, the first laser was approved for LASIK eye surgery in 1998. Therefore, the long-term safety and effectiveness of LASIK surgery is not known. Maybe, it's a good idea to wait for a few more years until there are more long-term data is available.

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