

Chapter 4

The Excimer Laser and Older Procedures

What is an excimer laser?

The excimer laser is the most important piece of equipment in the LASIK procedure. The term **laser** is an acronym for **L**ight **A**mplification by **S**timulated **E**missions of **R**adiation. The excimer laser was developed by two Columbia University medical professors (Stephen Trokel, MD, and Francis L'Esperance, MD) while Dr. Chynn was a medical student at Columbia. They applied a new laser technology that had been developed by IBM in Armonk, NY, to etch silicone chips for computer use.

With the excimer laser, energy is produced in the form of a narrow beam of ultraviolet light. This is created by passing a strong electrical current through a tube containing a mixture of gases. The excimer laser is often described as a *cold laser*. This is because its ultraviolet light beam breaks down molecular tissue in a very minute targeted area without producing heat.

Laser Vision Surgery

The predominant feature of the excimer laser for surgical applications is its ability to focus its powerful energy on a ***microscopic target*** without affecting the surrounding area. Each pulse of the laser removes approximately 1/500th the thickness of a human hair, which is about 125 microns in diameter. These two factors of precise depth and area control are of particular significance in surgical applications such as refractive vision correction.

The different types of excimer lasers

Excimer lasers currently in use or under FDA investigation fall into three categories: broad beam lasers, scanning spot lasers, and scanning slit lasers. The largest percentage of excimer lasers currently in use are broad beam lasers that use a single beam that can be adjusted for various refractive conditions.

The technology used in the scanning lasers is gaining rapid acceptance from ophthalmologists because it is designed to create a smoother corneal ablation and provide a superior optical surface. The scanning slit laser uses a fine beam that scans across the cornea much like a paint brush, while the scanning spot laser light uses a small spot of laser light (2 mm or less in diameter) that moves rapidly around the cornea, removing small areas of tissue. This pattern is predetermined by computerized measurements.

Another new technology incorporated in some scanning lasers is the ability to track and compensate for minute eye movements called ***saccades***. Even when you think you are focusing your eyes and holding them still, these movements will occur. In fact, they are necessary for normal vision. Typically with a broad beam laser, the patient fixates (stares) at a red blinking dot and the sur-

geon moves the patient's head to keep the pupil centered in the treatment zone.

Older Procedures

Radial Keratotomy (RK)

RK was developed in 1973 as the first successful refractive surgery procedure for the correction of myopia. The RK procedure involves the placement of *microscopic incisions* in a radial pattern around the periphery of the cornea with extreme care taken not to invade the visual axis. As the incisions heal, the cornea flattens, thereby correcting for the patient's myopia. You do not need to concern yourself with this procedure because it has been made obsolete by the advent of laser surgery, and is not performed by Dr. Chynn or other experienced surgeons.

Photorefractive Keratectomy (PRK)

PRK was a popular procedure in the past that has now been largely supplanted by the newer LASEK surgery. Although it is very similar to LASEK, the main disadvantage of PRK is that there is no flap created during the surgery. This means that the outermost layer of the cornea must be removed before the laser can ablate the underlying tissue. The removal of this tissue leads to greater risk of scarring and infection, as well as longer post-operative healing time because the tissue must grow back over the next few days.

Astigmatic Keratotomy (AK)

The AK procedure is a variation of RK, except that it is used to treat astigmatism. Unlike RK, this procedure is still used to treat patients in certain cases. Dr. Chynn is well-experienced in this type of surgery and will perform it readily if he determines that it is necessary for you.

Dr. Chynn performs his LASIK and LASEK procedures with a laser that has tracking capability. This means that the laser he uses actually follows the tiny movements of your pupils, taking up to 4,000 readings per second and adjusting the laser 100 times per second. This results in a safer and more precise treatment for your eyes.

Even though this book is current at the time of printing, advancements continue to be made in this field. If you have questions about the lasers being used in refractive vision correction today, please feel free to ask Dr. Chynn. He is in a position to be fully informed about any new developments and will provide you with the best vision correction for your individual needs.