

# *Laser Vision Surgery*

*Get Ready to See into the Future!*

*More than 5000 People have trusted Dr.  
Chynn with their eyes; now it's your  
turn!*

Published by Emil W. Chynn, M.D. FACS, Chirag Shah,  
and Insun Lee  
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**Chapter 1**

**Understanding Your Eyes..... 7**  
    **What do we mean by “refractive surgery”?.....7**  
    **How does the normal eye work? .....8**  
    **Why should we learn about these conditions? ..... 10**  
    **What is myopia? ..... 10**  
    **What is hyperopia? .....11**  
    **What is astigmatism? ..... 12**  
    **What is presbyopia? ..... 14**

**Chapter 2**

**Deciding on Surgery ..... 15**  
    **Why you should have refractive surgery..... 15**  
        **Guideline 1: Are you the right age?..... 16**  
        **Guideline 2: Is your vision correctable? ..... 17**  
        **Guideline 3: Do you have healthy eyes? ..... 18**  
    **What kind of tests will you need?..... 18**

**Chapter 3**

**Having the Surgery ..... 21**  
    **Pre-operative requirements ..... 21**  
    **Inter-operative Procedure ..... 25**  
    **Post-operative requirements ..... 27**  
        **Expectations .....27**  
        **Precautions .....28**  
    **What results should you expect? ..... 32**  
    **Any risks? ..... 32**

**Chapter 4**

**The Excimer Laser and Older Procedures .....35**  
    What is an excimer laser? ..... 35  
    Older Procedures..... 37  
        Radial Keratotomy (RK) .....37  
        Photorefractive Keratectomy (PRK).....37  
        Astigmatic Keratotomy (AK) .....37

**Chapter 5**

**LASIK and LASEK .....39**  
    How is LASIK performed? ..... 39  
        Step one: Preparing for surgery .....39  
        Step two: Creating the flap .....40  
        Step three: Activating the laser .....40  
        Step four: Replacing the flap ..... 41  
    Advantages of LASIK ..... 42  
    What is Wavefront-Guided LASIK? ..... 43  
    Should I have Wavefront LASIK?..... 44  
    Is Wavefront better than conventional LASIK?..... 45  
    What is LASEK? ..... 46  
        What are the advantages of LASEK? .....46  
        What are the disadvantages of LASEK? .....46  
        What are the side effects? .....47  
        How Do I Know if this Procedure Is For Me? .....47  
        What Happens During the Procedure? .....47  
    The Epi-LASIK Procedure .....48  
    The CustomVue LASEK Procedure .....49  
    LASEK versus LASIK ..... 51  
    Which Procedure is Right for Me? .....52

*Table of Contents*

**Chapter 6**

**Solutions for Presbyopia .....53**  
    **Monovision – LASIK for presbyopia..... 53**  
    **Surgical Reversal of Presbyopia ..... 54**

**Chapter 7**

**Other Laser Surgeries .....55**  
    **What are some other laser surgery options?..... 55**  
        **IntraLASIK® .....55**  
        **Laser Thermal Keratoplasty (LTK) .....56**

**Chapter 8**

**Non-Laser Surgeries .....57**  
    **What are some non-laser surgery options? ..... 57**  
        **Automated Lamellar Keratoplasty (ALK).....57**  
        **Implantable Contact Lens (ICL) .....57**  
        **Intracorneal Lens Implants .....58**  
        **Clear Lens Extraction (CLE) .....58**  
        **Intrastromal Corneal Ring Segments (ICRS).....58**

**Chapter 9**

**Choosing the Right Doctor.....59**  
    **What should I look for in an eye surgeon?..... 59**  
    **Advice from the National Institutes of Health ..... 60**  
        **Experience .....60**  
        **Training .....60**  
        **Education.....60**  
        **Certifications.....60**  
        **Professional memberships..... 61**  
        **Training and teaching activities..... 61**  
        **Research and writing activities..... 61**  
        **Reputation ..... 61**

*Laser Vision Surgery*  
Equipment .....62

**Chapter 10**

**Financing Your Surgery** .....63  
**Appendix: Anatomy of the Eye** .....66  
**Glossary** .....68  
**Acknowledgements** .....75





# Chapter 1

## Understanding Your Eyes

### What do we mean by “refractive surgery”?

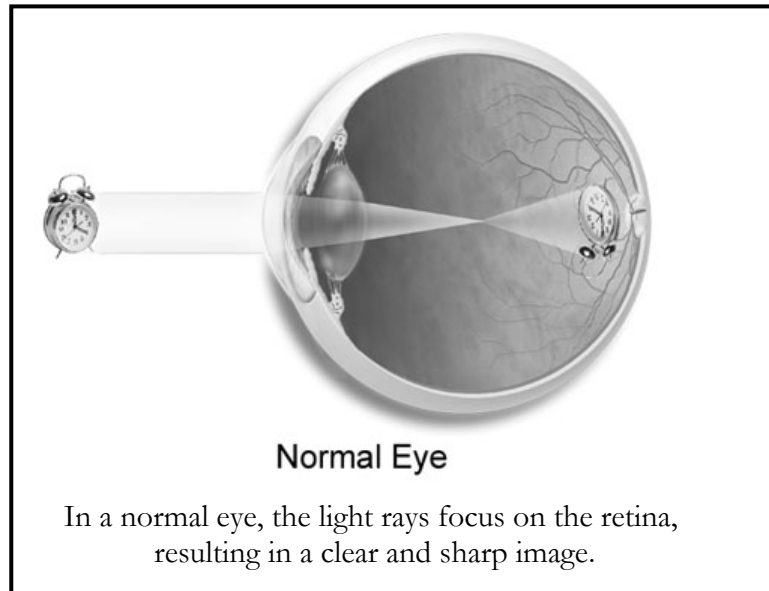
In the world of **optics** (the scientific study of light and vision), the word “refractive” refers to the bending of light waves by a lens so that the light rays focus on a specified point. When taking a photograph, the camera’s focus point is the film, located at the back of the camera. With your eye, the desired focus point is the retina. The **retina** is a thin membrane that covers the inner surface at the back of the eye – just like the film in a camera.

Images are focused on the retina by the **cornea** (the front surface of the eye) and the lens, and the images are then transmitted to the brain through a “cable” called the **optic nerve**. If properly focused on the retina, the images created in the brain are sharp, clear and true in color.

Just as an improperly focused camera produces a blurred picture on the film, improper focusing by the eye creates a blurred image in the brain – this is what happens if you have myopia (nearsightedness), hyperopia (farsightedness), astigmatism, or presbyopia.

### *Laser Vision Surgery*

The surgery portion of “refractive surgery” refers to the physical procedure of “fixing” your eyes. Using our state-of-the-art VISX Laser coupled with Dr. Chynn’s exceptional technique, your eyes will be in the best hands around. Not only has Dr. Chynn had eye surgery himself (with a prescription of -7.50, -7.50), but he has also treated his staff. Amber Ly’s pre-operative prescription was 1, -1.50; Missy’s was -3, -2.75; Joanna’s was -4, -3.75; however, now all of them see 20/20 or better!

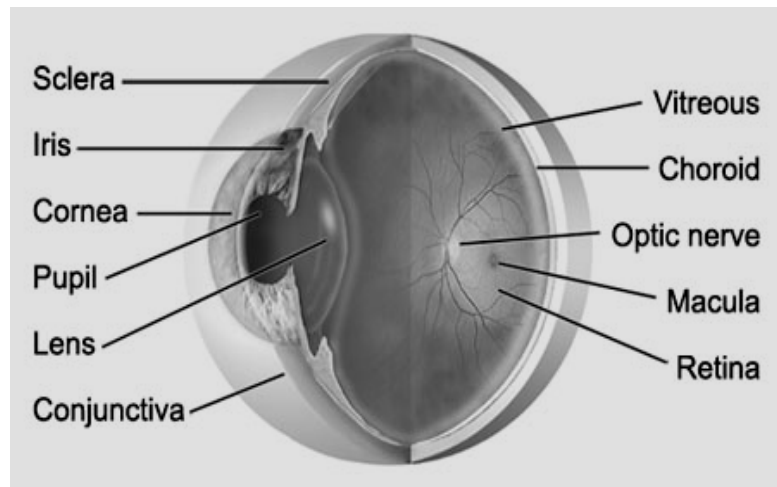


If you would like to learn more about the different parts of the eye, please refer to the Appendix at the back of this book. Many of the **bold** terms in this book are also defined in the Glossary.

### **How does the normal eye work?**

The eye is normally spherical, and covered on the front surface by the cornea. The cornea is a clear, convex

cover over your **iris** (the colored part of your eye). Its function is to help focus entering light rays and to protect the eye.



The **cornea** is the most important lens or refractive surface of the eye because it is responsible for most of the refracting (bending) of light rays as they enter the eye. There is another convex **lens**, located behind the colored iris and held in place by the ciliary muscles, which are the internal eye muscles. This second lens serves to “fine-tune” the focus of the images, and is especially useful for focusing on near objects.

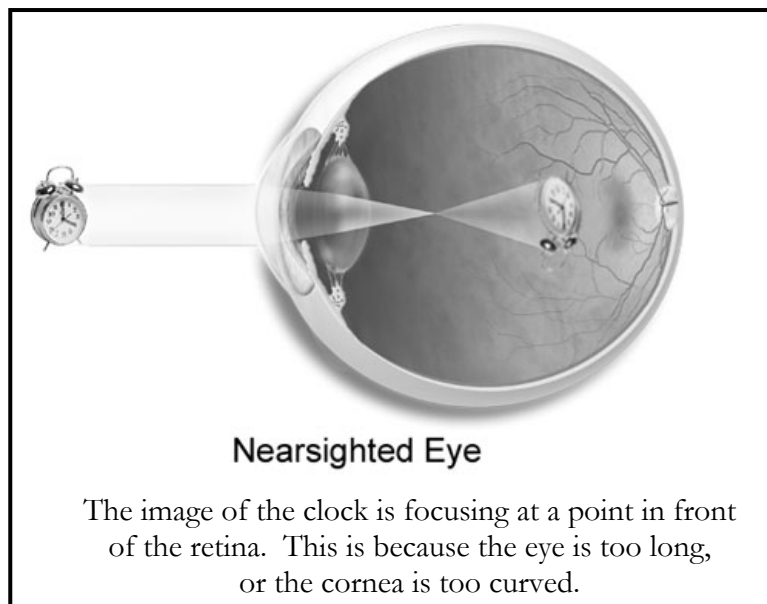
A normal, healthy eye automatically accomplishes this “fine-tuning” by tightening or relaxing the ciliary muscles that hold this crystalline lens in place. This lets you focus on either near or distant objects, and is called **accommodation**. (This process is explained in more detail under the section on **presbyopia**.)

### **Why should we learn about these conditions?**

Before we discuss any solutions, we must first understand the problem. You could have myopia, hyperopia, astigmatism, presbyopia or a combination of these problems. In this book we will examine all of these disorders and see which can be treated most successfully with existing refractive surgery procedures.

### **What is myopia?**

People with nearsightedness, or **myopia**, have blurry vision because their eyes are too long from front-to-back or because their corneas are too steep.



This makes the light rays focus at a point in front of the retina instead of on the retina itself. Depending on the degree of nearsightedness, people with myopia can usually

see near objects very well but cannot see far objects. Nearsightedness is a common refractive disorder, affecting about one in five people.

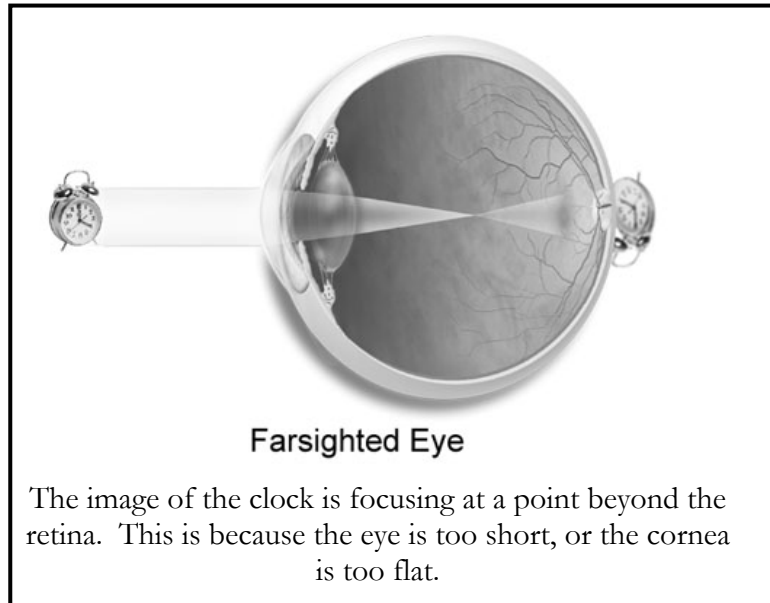
Myopia is corrected with prescription lenses that are concave in shape. Concave lenses are thinner in the middle, with thicker edges. When light passes through them, the light rays are diverged (spread out), so they can enter the eye and focus directly on the retina, correcting your vision.

### **What is hyperopia?**

People with farsightedness, or **hyperopia**, also have blurry vision. The problem in this case is that their eyes are not long enough or their corneas are too flat. This makes the light rays focus at a point beyond the retina. Essentially, hyperopic people are the exact opposite of myopic people—they cannot see objects that are close by, but they can see objects that are far away.

Farsighted people are usually born with this disorder. If the condition is not too severe, it can be overcome in early years by the natural reflexive action of the ciliary muscles in contracting the lens. This accommodates for the hyperopic condition by positioning images directly on the retina.

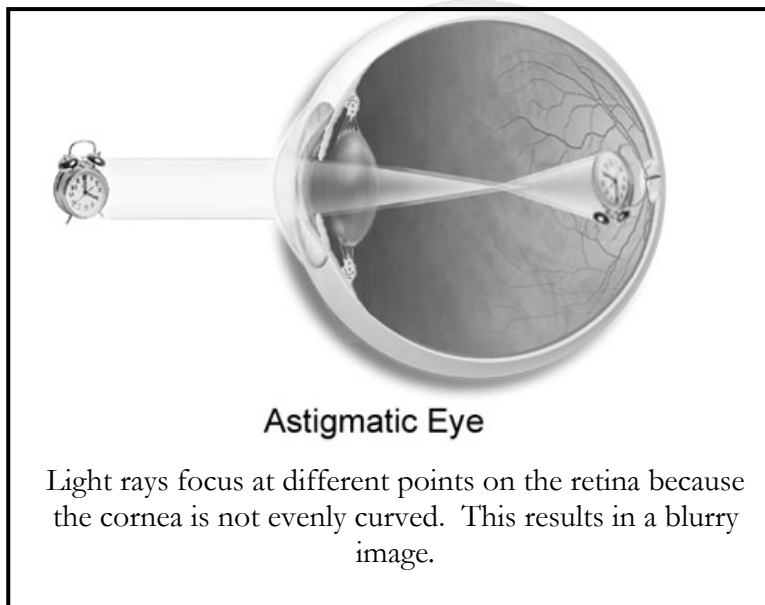
Hyperopia is corrected with prescription lenses that are convex in shape. Convex lenses are thicker in the middle, with thinner edges. When light passes through them, the light rays converge (bend towards each other), so they can enter the eye and focus directly on the retina, correcting your vision.



### **What is astigmatism?**

**Astigmatism** is the medical term used to describe an uneven curvature of the cornea that often occurs in conjunction with myopia or hyperopia. You are usually born with this condition and it does not worsen with age. The degree of astigmatism is a measure of irregularity in the curvature of the cornea. Generally, astigmatic people have slightly blurred vision, but sometimes they can suffer from headaches or eyes strains.

Normal corneas are spherical, like a baseball. Astigmatic corneas are curved more like a football. This results in a blurry image because light rays are directed to several different places on the retina, instead of focusing at one point.



The corrective lenses for this condition are thicker and thinner in varying places. Such variations can be incorporated into lenses that correct either myopia or hyperopia.

Many people mistakenly believe that having astigmatism makes them ineligible for refractive surgical procedures such as LASIK. However, the presence of astigmatism is no worse than the presence of myopia or hyperopia. It is simply an additional condition that interferes with perfect vision, and it is just as correctable as other refractive disorders.

### **What is presbyopia?**

**Presbyopia** is a refractive disorder that does not result from irregularities of the eye or corneal surface. Rather, presbyopia occurs when your inner crystalline lens loses its flexibility. Before the onset of presbyopia, your lens changes shape as a natural reflex to see an object up close, such as when you are reading a book. This process is known as **accommodation**, and it allows the light to focus directly on the retina.

After the ages of 40--45, the internal eye muscles, known as **ciliary muscles**, become less flexible and lose their ability for accommodation. This is the reason why many people over the age of 40 need **bifocals**. Bifocal lenses have two different prescriptions within the same lens in order to allow you to focus on tasks that are both near and distant.

Even after refractive surgery, some people may still need reading glasses for up-close activities after a certain age. At the present time some investigational surgical techniques are currently being done in an effort to correct this condition, and **monovision** continues to remain a popular laser surgery option for addressing presbyopia (see Chapter 6).