



## refractive errors

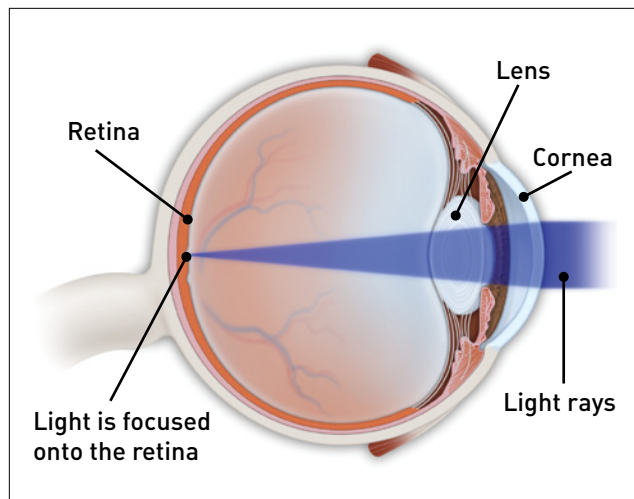
### a closer look

#### WHAT ARE REFRACTIVE ERRORS?

In order for our eyes to be able to see, light rays must be bent or refracted by the **cornea** and the **lens** so they can focus on the **retina**, the layer of light-sensitive cells lining the back of the eye.

The retina receives the picture formed by these light rays and sends the image to the brain through the optic nerve.

A refractive error means that due to its shape, your eye doesn't refract the light properly, so the image you see is blurred. Although refractive errors are called eye disorders, they are not diseases.



In a normal eye, the cornea and lens focus light rays on the retina.

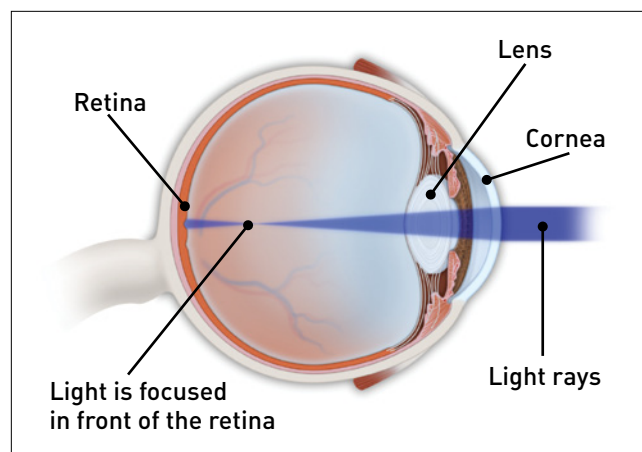
#### WHAT ARE THE DIFFERENT TYPES OF REFRACTIVE ERRORS?

##### MYOPIA (NEARSIGHTEDNESS)

A myopic eye is longer than normal or has a cornea that is too steep. As a result, light rays focus in front of the retina instead of on it. Close objects look clear but distant objects appear blurred.

Myopia is inherited and is often discovered in children when they are between ages eight and 12 years old. During the teenage years, when the body grows rapidly, myopia may become worse. Between the ages of 20 and 40, there is usually little change.

If the myopia is mild, it is called low myopia. Severe myopia is known as high myopia.



In myopia, the eye is too long or the cornea is too steep. Distant objects appear blurry because images focus in front of the retina instead of on it.

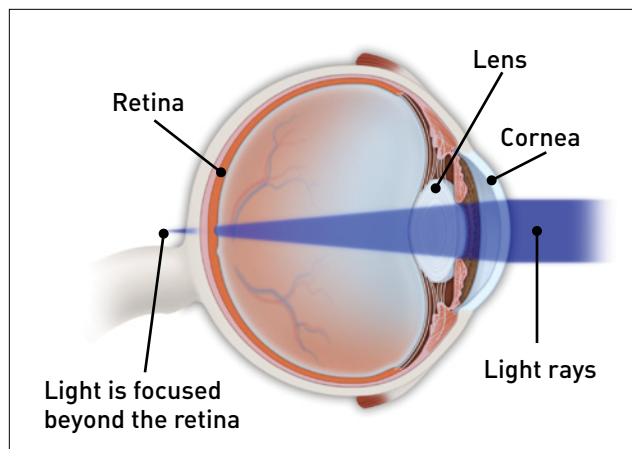
## refractive errors

If you have high myopia, you have a higher risk of detached retina. Your ophthalmologist (Eye M.D.) should discuss the warning signs of retinal detachment with you if you are in this risk category. If the retina does detach, a surgical procedure is the only way to repair it. It is important to have regular eye examinations by an ophthalmologist to watch for changes in the retina.

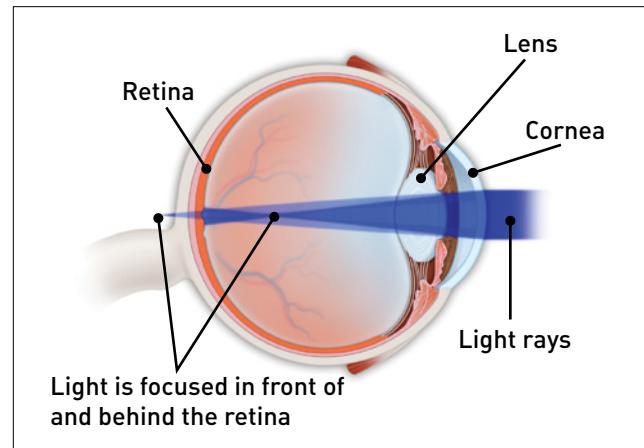
### **HYPEROPIA (FARSIGHTEDNESS)**

A hyperopic eye is shorter than normal or has a cornea that is too flat. As a result, light rays focus beyond the retina instead of on it. Most children are farsighted, yet they do not experience blurry vision. With focusing (accommodation), children's eyes are able to bend the light rays and place them directly on the retina. As long as the farsightedness is not too severe, hyperopic children will have clear vision for seeing objects at a distance and up close. As we get older we slowly lose our ability to focus, and adults with hyperopia may experience increased difficulties with reading or other tasks up close.

Like nearsightedness, farsightedness is usually inherited. Babies and young children tend to be slightly hyperopic. As the eye grows and becomes longer, hyperopia lessens.



**In hyperopia, the eye is too short. Close objects appear blurry because images focus beyond the retina.**



**In astigmatism, the cornea is uneven. Images focus in front of and beyond the retina, causing both close and distant objects to appear blurry.**

### **ASTIGMATISM (DISTORTED VISION)**

The cornea is the clear front window of the eye. A normal cornea is round and smooth, like a basketball. If you have astigmatism, the cornea curves more in one direction than in the other, like a football.

Astigmatism distorts or blurs vision for both near and far objects. It's almost like looking into a fun-house mirror in which you appear too tall, too wide or too thin. It is possible to have astigmatism in combination with myopia or hyperopia.

### **PRESBYOPIA (AGING EYES)**

When you are young, the lens in your eye is soft and flexible. The lens of the eye changes its shape easily, allowing you to focus on objects both close and far away. After the age of 40, the lens becomes more rigid. Because the lens can't change shape as easily as it once did, it is more difficult to read at close range. This normal condition is called presbyopia.

You can also have presbyopia in combination with myopia, hyperopia or astigmatism.

## HOW ARE REFRACTIVE ERRORS CORRECTED?

Eyeglasses or contact lenses are the most common methods of correcting refractive errors. They work by refocusing light rays on the retina, compensating for the shape of your eye. Refractive surgery is also an option to correct or improve your vision. These surgical procedures are used to adjust your eye's focusing ability by reshaping the cornea, or front surface of your eye.

There is not adequate scientific evidence to suggest that eye exercises, vitamins or pills can prevent or cure refractive errors.

### EYEGGLASSES

Wearing eyeglasses is an easy method to correct refractive errors. They can also help protect your eyes from harmful light rays, such as ultraviolet (UV) light rays. A special lens coating that screens out UV light is available. Glasses or goggles made of protective lens material (polycarbonate) should be used for sports and all hazardous activities. All children and adults who have one poorly seeing eye should wear protective polycarbonate lenses at all times to protect their "good" eye.

Bifocals are eyeglasses used to correct presbyopia. They have a correction for reading on the bottom half of the lens and another for seeing at a distance on the top. Trifocals are lenses with three different lens corrections in one set of eyeglasses.

If you don't need correction for seeing at a distance, you can receive a prescription for reading glasses or buy them over the counter to correct presbyopia.

No exercise or medication can reverse presbyopia. You will probably need to change your prescription from time to time between the ages of 40 and 60 because your lens will continue to lose flexibility.

### CONTACT LENSES

There is now a wide variety of contact lenses available. The type best suited for you depends on your refractive error and your lifestyle. If you want to wear contact lenses, discuss the various options with your ophthalmologist.

You may have heard of a process called **ortho-keratology** to treat myopia. It uses a series of hard contact lenses to gradually flatten the cornea and reduce the refractive error. Improvement of sight from orthokeratology is temporary. After use of the lenses is discontinued, the cornea goes back to its original shape, and myopia returns.

## REFRACTIVE SURGERY

### LASIK AND EPI-LASIK

#### Laser in situ keratomileusis (LASIK)

With **LASIK**, an instrument called a **microkeratome** is used to create a thin flap in the cornea. This flap is folded back, and an **excimer laser** sculpts the exposed corneal tissue to reshape it. The flap is then repositioned and allowed to heal naturally. No stitches are necessary to hold the flap in place.

### Epi-LASIK

**Epi-LASIK** uses a special device called an **epikeratome** to separate the thin epithelial sheet — much thinner than a LASIK flap — from the rest of the cornea. An excimer laser is then used to reshape the cornea. Afterwards, the epithelial sheet is repositioned (or in some cases, is simply removed). A bandage contact lens is applied and left in place for a few days to help the epithelium heal.

### ADVANCED SURFACE ABLATION (PRK AND LASEK)

#### Photorefractive keratectomy (PRK)

With **PRK**, the surgeon removes the epithelium from the cornea. An excimer laser is then used to reshape the cornea. A bandage contact lens is applied and left in place for a few days to help the epithelium heal.

#### LASEK

With **LASEK**, a dilute alcohol solution is used to separate the epithelium and an instrument is used to gently scroll it to the side. An excimer laser is then used to reshape the cornea. Then, the epithelial sheet is repositioned (or in some cases, is simply removed). A bandage contact lens is applied and left in place for a few days to help the epithelium heal.

### COMPLICATIONS AND SIDE EFFECTS

Because LASIK, epi-LASIK and advanced surface ablation are surgical procedures, it is very important to make an informed decision when deciding whether refractive surgery is the right choice for you.

Complications and side effects from these procedures may include:

- Temporary discomfort;
- Blurry and fluctuating vision;
- Glare and halos;
- Undercorrection or overcorrection;
- Poor night vision;
- Irregular astigmatism;
- Corneal scarring;
- Permanent vision loss.

### WHAT IS THE BEST METHOD OF CORRECTING REFRACTIVE ERRORS?

There is no best method for correcting refractive errors. The most appropriate correction for you depends on your eyes and your lifestyle. You should discuss your eye condition and your lifestyle with your ophthalmologist to decide which correction may be most effective for you.

#### COMPLIMENTS OF YOUR OPHTHALMOLOGIST:

**Academy reviewed 03/11**

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