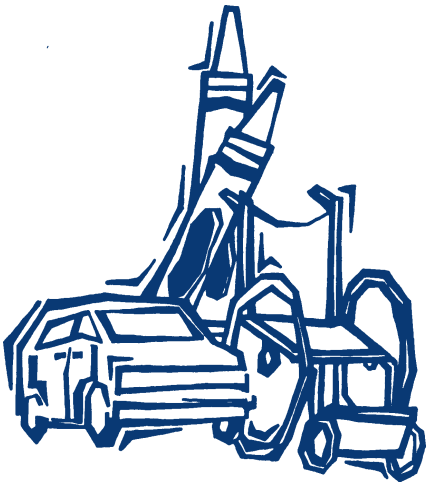

FAMILY

Age-Related Changes in Vision no. 10.245

by C. E. Barber [1]

Quick Facts...

In older adults, the four most common vision-threatening diseases or conditions are cataracts, glaucoma, macular degeneration and diabetic retinopathy.

Cataracts are the primary cause of poor vision among adults, and one of the leading causes of blindness.

Glaucoma refers to several conditions caused by the buildup of pressure in the eye.

Age-related macular degeneration causes loss of central or "straight-ahead" vision.

The eye functions much like a camera. Light enters through a primary lens called the cornea and then through a secondary lens called the lens. Both the cornea and the lens are needed for vision.

Between these two lenses is a diaphragm called the iris. It is similar to the diaphragm on a camera that can be adjusted to let more or less light pass through the opening.

The iris is the colored part of the eye and the opening it makes is called the pupil (like the aperture on a camera). Just as the light in a camera passes through a dark air-filled chamber, the light in our eye passes through a fluid-filled chamber, known as the posterior (rear) chamber.

The fluid is called the vitreous ("glassy") because it is gelatin-like. Instead of film, our eyes use the retina, a network of thousands of tightly-packed nerve endings (rods and cones). Light on the retina produces complex chemical reactions that stimulate nerve endings. These stimulations travel along the optic nerve to the brain, where they are seen as visual images.

Normal Age-Related Changes in the Eye

The main parts of the eye are the cornea, iris, lens, vitreous, retina and optic nerve. The normal process of aging can produce changes that affect vision.

For example, when we are young, the lens of the eye is soft and flexible and changes shape to maintain a clear focus of visual images on the retina. As we grow older, the lens loses flexibility. Often, by the time a person is 40, the lens may harden and set. No matter how hard the muscles operating the shape of the lens strain, they cannot change its shape. At this point, the eye becomes like a fixed focus camera: fine for distance, but not much good for close-up work. This condition is known as *presbyopia.*

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Changes in the structure of the eye result in common age-related changes in vision:

- *Decreased sharpness of vision (visual acuity).*
- *Decreased ability to focus on near objects.*
- *Decreased ability to focus on objects at varying distances (visual accommodation).*
- *Decreased ability to discriminate or discern between certain color intensities, especially in the blue-green end of the color spectrum. The "yellowing" of the lens with age makes blues and greens appear "washed out" or faded).*
- *Decreased ability to perceive or judge depth.*
- *Decreased ability to focus in low light levels.*
- *Slow responsiveness to changes in light levels (dark to light, and light to dark).*
- *Increased sensitivity to glare.*
- *Decreased ability to accurately judge distances.*
- *Increased need for light needed to see objects clearly.*

Normal Changes vs. Diseases and Conditions

As we get older, we can expect to experience the normal changes described at left. Generally, these are focusing problems called *refractive errors.* The most common refractive errors (near- or far-sightedness) occur when our eyes change shape or the lenses lose elasticity. When this happens, an ophthalmologist or optometrist can usually correct vision by prescribing glasses or contact lenses.

However, there are some eye diseases and conditions that are not part of normal aging. They are serious and become more so with age. In older adults, the four most common vision-threatening diseases and conditions are cataracts, glaucoma, macular degeneration and diabetic retinopathy.

Cataracts

Cataracts are the primary cause of poor vision among adults, and one of the leading causes of blindness. At age 60, the probability of having cataracts is about 66 percent and at age 70, it is 90 percent.

The word cataract comes from the Latin word for waterfall. If you imagine trying to look at objects as if you were standing behind a waterfall, you can get some idea of what it's like to see the world when suffering from cataracts. A more practical means of simulating a cataract is to look through a piece of plastic kitchen wrap, and then contrast this by looking through a piece of waxed paper. The view through the waxed paper is similar to vision impaired by cataracts.

Symptoms and Treatment

A cataract is formed by a change in the lens itself, not a film over the eye as is often thought. The lens is the structure behind the pupil that helps focus images on the retina. In a healthy eye, the lens is clear and transparent, and light can pass through normally. In the case of cataracts, certain parts of the lens become cloudy or opaque and hinder the passage of light.

Although a cataract may occasionally be caused by an illness, such as diabetes, more commonly the development of a cataract is a function of age-related chemical changes. A cataract is indicated by one or more of the following symptoms: hazy, fuzzy, or blurred vision; frequent changes in prescription lenses; film over the eyes that doesn't disappear when you blink; changes in the color of the normally black pupil; and lights that appear double or dazzling.

How to Help the Visually-Impaired

1. *Use color contrast.*
2. *Use coding schemes.*
3. *Control glare.*
4. *Encourage regular eye examinations.*
5. *Increase light levels.*
6. *Use balanced lighting instead of increased light intensity from a single source.*
7. *Give the person time to respond.*
8. *Provide materials with larger print.*
9. *Announce your presence.*
10. *Tell what you are going to do.*
11. *Simplify the visual field.*
12. *Keep objects in the same place.*
13. *Talk directly to the person.*
14. *Orient the person in unfamiliar environments.*
15. *Offer assistance.*
16. *Use the person's remaining senses.*
17. *Know how to be a sighted guide.*
18. *Obtain low-vision aids for the person to use.*

Cataracts usually develop gradually, without pain, redness or tearing. How seriously a cataract will affect vision depends on its location, density and size.

Studies indicate that 95 percent of all men and women develop some degree of cataracts between 65 and the end of their lives. This statistic does not mean that all people will require cataract surgery. The key question is "How much is the cataract affecting my lifestyle?" A cloudy lens can be removed and full vision restored with an intraocular lens at any stage, but most doctors agree that surgery should not be performed at the first sign of a cataract. Surgical treatment is considered when cataracts begin to affect lifestyle and functioning.

Cataract surgery is performed on more than a million patients annually and has become one of the most successful surgical procedures. In most cataract surgery, the eye with the cataract is anesthetized An ophthalmologist surgeon removes the natural lens and provides a substitute (artificial) lens to focus light on the retina.

While laser treatment may be possible in the future, all primary cataract surgery is currently performed by making a tiny incision in the cornea and inserting an ultrasonic probe to break the cataract into an emulsion, which is subsequently vacuumed out of the eye.

The implanting of intraocular artificial lenses (the third option) accounts for 90 percent of all cataract surgery cases. Implants are safe and effective replacements for natural lenses.

Usually the surgery is done on an outpatient basis, with no hospital stay and little discomfort or disruption of routine. Shortly after surgery, most people are sent home (driven by a friend or family member) wearing a protective patch over the eye. Usually the patch is removed the next morning. At that time, vision may be excellent, or it may take a few days to clear. Except for swimming and heavy lifting, people can resume ordinary activities after the first day.

Glaucoma

The eye is a biological plumbing system that circulates fluid from the back chamber to the area around the lens and the pupil. In a healthy eye, this fluid is constantly being formed and drained away, and a normal pressure is maintained within the eye.

In the case of glaucoma, the drainage channels in the eye become blocked. When fluid cannot drain normally, pressure in

the eye builds. Glaucoma refers to several conditions caused by the buildup of pressure in the eye. If left unchecked, this pressure can damage the optic nerve and cause a loss of vision.

Properly speaking, glaucoma is not an eye disease, but rather an age-linked condition affecting the eye. Nearly 3 million people in the United States have glaucoma, a leading cause of blindness. Although anyone can get glaucoma, those at risk include people with a family history of glaucoma or diabetes, African-Americans over 40, and everyone over 60.

Symptoms and Treatment

Common symptoms and signs of advanced glaucoma include one or more of the following: blurred vision, sensitivity to glare, difficulty in adjusting to changes in light levels, pain or redness in the eye, seeing colored rings or "halos" around light sources, or tunnel vision (loss of peripheral or side vision). Just because you don't have pain, however, doesn't mean you can't have glaucoma. This makes it particularly important to have regular checkups after age 35.

There are two forms of treatment: medication and surgery. The primary method is medication: eye drops, pills, ointment or some combination. Some slow down the eye's production of fluid; others help fluid drain more rapidly.

Laser surgery focuses a tiny beam of light on a spot in the eye. People see only a bright flash of light and feel faint tingling. The laser beam passes harmlessly through the outer eye and cuts only where it is focused. Other treatments involve microsurgery (surgery performed with a microscope). Unlike laser treatment, microsurgery must be done in a hospital or surgery center and requires recuperation time.

Eye-Care Professionals:

Ophthalmologists *specialize in the diagnosis and treatment of eye diseases and vision problems, and perform eye surgery.*

Optometrists *screen for vision problems and prescribe glasses or contact lenses. Referrals are made to ophthalmologists for diagnosis of suspected eye diseases and medical treatment or surgery*

Opticians *fit or adjust eye wear prescribed by ophthalmologists and optometrists.*

Macular Degeneration

Age-related macular degeneration (AMD) is caused by damage to or breakdown of the macula, an area 3/16 inch in diameter in the retina. It causes loss of central or "straight-ahead" vision. Sometimes only one eye is affected. Macular degeneration does not progress to total blindness, and peripheral vision is not affected.

There are two types of AMD. The most common is "dry" AMD, in which tiny yellow deposits from beneath the macula and light-sensitive cells in the macula break down. Vision is typically blurred or distorted.

The second type is “wet” AMD, caused by the growth of abnormal blood vessels under the macula that may leak fluid or blood into surrounding cells. Wet AMD distorts vision in more pronounced ways: straight lines may look wavy, or there may be blank spots in the field of vision.

Symptoms and Treatment

Symptoms of macular degeneration include: a dark, empty, or blurred space in the center of vision; parts of words on a page are blurred or disappear; or objects with straight lines appear bent or wavy.

Only a professional eye specialist can tell whether an individual has dry or wet AMD. Individuals whose sight is threatened by wet AMD can be helped by a treatment called laser photocoagulation. In this treatment, powerful light rays focus on a tiny spot on the macula, destroying abnormal blood vessels. This treatment works best in the early stages of wet AMD. It does not seem to help those with dry AMD or people whose eyes have already been badly damaged by AMD.

Eye Care Tips

- *Exercise and eat right. Have regular check-ups to monitor high blood pressure and diabetes.*
- *Schedule a complete eye exam every few years, even if you haven’t noticed any vision problems. Have more frequent eye exams if you have diabetes or a family history of eye disease.*
- *See an eye doctor right away if you notice blurred or distorted vision (even with prescription lenses), unusually tired or painful eyes, an unusual amount of discharge from your eyes, double vision, red or swollen eyelids, dry or burning or itching eyes, or an increase in the number of threadlike particles that normally float across the eyes.*

Diabetic Retinopathy

Diabetic retinopathy, a complication of diabetes, occurs when small blood vessels within the retina weaken. In the early stages, they may leak fluid and blur the central field of vision. In later stages, new blood vessels may grow on the retina and optic nerve and release blood into the eye, resulting in serious loss of vision.The retina may also become detached from the back of the eye. If untreated, blindness can occur.

Symptoms and Treatment

Some people with diabetic retinopathy notice changes in their vision, but there are usually no discernible changes in the early stages. Instead, diabetics need to rely on trained eye care professionals to detect signs of the disease.

Laser photocoagulation may lower the risk of losing vision. Powerful beams of light are focused on the diseased retina to seal leaking blood vessels. Laser treatment may not be appropriate for everybody. Discuss the risks and benefits with an ophthalmologist.

Dry Eye Syndrome

In the eye, tears are produced in the lacrimal gland, wash across the cornea of the eye, and drain into the nose through tiny ducts on the inner corner of the eye. With age, some

People with low vision need to take advantage of low-vision aids such as special lenses or magnifiers, large print or television reading machines.

people's eyes don't produce enough tears, resulting in a condition known as *keratoconjunctivitis* or dry eyes.

Many older adults opt to live in drier climates to help maintain their active lifestyles. A drawback is that fans and air-conditioning can negatively affect the lacrimal (tear) system.

People with dry eye syndrome should consult an eye specialist. In some cases, medication may solve the problem. In severe cases, eye specialists can insert a tiny implant, or plug, into a person's tear ducts. In effect, this dams the normal drainage system between the eye and the nose, keeping the eye bathed in normal tears.

References

American Assoc. of Retired Persons, 1986. *The Eyes Have It.* Washington: AARP (D12460).

Brint, S.F.,1989. *Sight for a Lifetime.* Metairie, La.: Plantain Publishing.

Christiansen, J.L., Grzybowski, J. M., 1993. *Chapt. 14: The Sense Organs.* The Biology of Aging. St. Louis, Mo.: Mosby. pp. 293-312.

Fozard, J.L., 1990. *Vision-hearing in aging.* In J.E. Birren and K. W. Schaie (eds.). *Handbook of the Psychology of Aging.* New York Academic Press. 150-166.

Kart, C.S., E.K. and Metress, S.P., 1992. *Age-associated changes in vision and hearing.* Human Aging and Chronic Disease. Boston: Jones and Barlett, 103-116.

Free Literature

The Lighthouse, The National Center for Vision and Aging, (800) 334-5497 or (212) 355-2200, 111 East 59th Street, New York, NY 10022.

American Foundation for the Blind, Program Services, (212) 620-2063, 15 West 16th Street, New York, NY 10011.

National Library Service for the Blind and Physically Handicapped, (202) 707-5100. Library of Congress, Washington, DC 20542.

National Eye Institute, (301) 496-5248, Scientific Reporting Section, Bdg. 31, Room 6A32, Bethesda, MD 20892.

National Society to Prevent Blindness, (312) 843-2020, 500 E. Remington Road, Schamburg, IL 60173.

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