

“Glaucoma: What You Need to Know”

Jamie L. Shelly

April 24, 2007

Glaucoma is the second most frequent cause of vision impairment and legal blindness among older adults in the United States and is the leading cause of blindness for African Americans. About 120,000 people in the United States are blind because of glaucoma (4). One to three percent of all people above the age of 40 are affected (1). Glaucoma can cause disability, limitation of functioning, and decreased quality of life in older adults. With increased visual disability, falls and fractures may cause hospital or nursing home admission and premature death in the older adult population (4).

What exactly is glaucoma?

Glaucoma is a term used to describe several eye diseases characterized by increased intraocular pressure and leading to atrophy of the optic nerve and retinal ganglion cells with consequent loss of peripheral and central visual fields (1).

PATHOPHYSIOLOGY OF GLAUCOMA:

Glaucoma results from disturbances in the formation and circulation of intraocular fluid (1). These fluids, vitreous and aqueous humor, help maintain intraocular pressure, which in turn allows the eye to hold its shape and function properly (5). Aqueous humor is secreted by the ciliary body into the posterior chamber of the eye and then moves into the anterior chamber (1). Aqueous humor is continuously produced and circulated through the anterior chamber before draining out of the eye. This continuous flow of fluid nourishes the lens and cornea and also removes unwanted debris. Aqueous humor exits the eye through a drainage system located at the angle formed where the iris and the

cornea meet. Here it passes through a sieve-like system of spongy tissue called the trabecular meshwork and drains into a channel called Schlemm's canal. The fluid then merges into a person's bloodstream. When this drainage system does not function properly—for example if the trabecular meshwork becomes clogged—the aqueous humor cannot filter out of the eye at its normal rate, and pressure builds within the eye. For reasons not completely understood by doctors, increased eye pressure is often associated with gradual damage to the nerve fibers that make up the optic nerve (5).

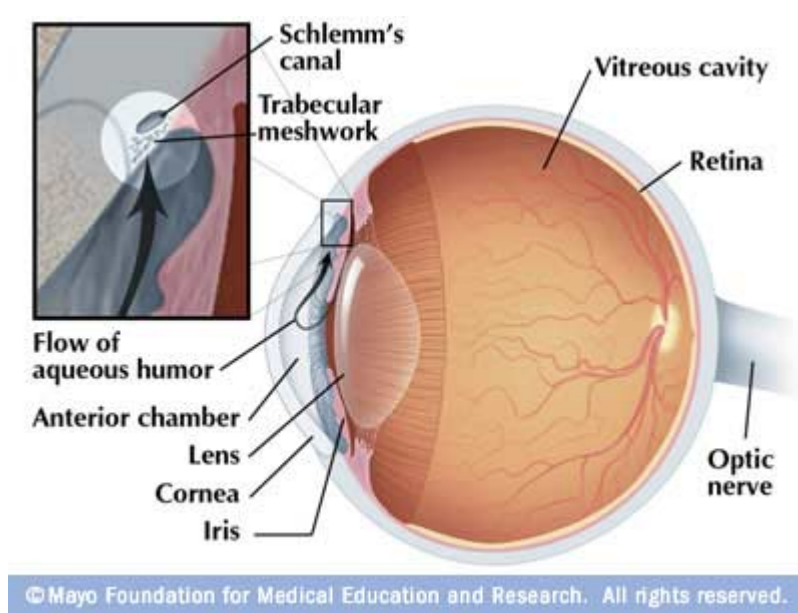
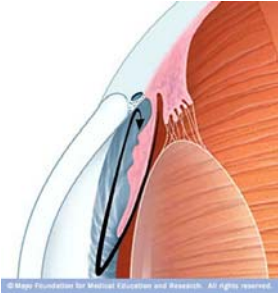


Image available at: <http://www.mayoclinic.com/health/glaucoma/DS00283/DSECTION=3>

PATHOLOGY:

Glaucoma is considered *primary* when it occurs without any obvious cause. It is classified as *secondary* when it is related to a preexisting eye disease, such as iridocyclitis, intraocular hemorrhage, trauma, or tumors. Primary glaucoma is more common than secondary and may be classified into two subtypes: open-angle and closed-angle glaucoma (1).

In the case of open-angle glaucoma, the drainage angle formed by the cornea and the iris remains open, but the aqueous humor drains too slowly. This leads to fluid backup and a gradual buildup of pressure within the eye. Damage to the optic nerve is so slow and painless that a large portion of vision may be lost before a person is aware of the problem. The exact cause of open-angle glaucoma is unknown (5).



Open-angle glaucoma: blockage of the trabecular meshwork slows drainage of the aqueous humor, which increases intraocular pressure.

Image available at: <http://www.mayoclinic.com/health/glaucoma/DS00283/DSECTION=3>

Closed-angle glaucoma is a medical emergency that may cause vision loss within a day of its onset. It occurs when the drainage angle formed by the cornea and the iris closes or becomes blocked. Whether the narrow drainage angle is an abnormality from birth or a result of aging, as the angle narrows, the iris gets closer to the trabecular meshwork. If it gets too close, the aqueous humor cannot exit through the trabecular meshwork, resulting in a buildup of fluid and an increase in eye pressure. Closed-angle glaucoma can be chronic or acute and requires immediate medical attention (5).



Closed-angle glaucoma: The angle formed by the cornea and the iris narrows, preventing the aqueous humor from draining normally out of the eye. This can lead to a rapid increase in intraocular pressure.

Image available at: <http://www.mayoclinic.com/health/glaucoma/DS00283/DSECTION=3>

What are the risk factors & who is most likely afflicted by glaucoma?

The incidence of glaucoma increases with age. Risk factors other than age include a family history of glaucoma, African American ancestry, and diabetes (3). Those who are nearsighted also have an increased chance of developing glaucoma (4). The prevalence of glaucoma is equal among men and women, as community studies currently show no significant sex differences in glaucoma (3).

What are the signs and symptoms of glaucoma?

Open-angle glaucoma is largely asymptomatic. Headaches or achy pains behind the eye may be felt by a person with glaucoma, and a gradual reduction in near vision may be noticed. Upon ophthalmic examination, there may be an abnormal optic disc, nerve fiber layer defect, visual field defect, or elevated intraocular pressure. Later on in the disease vision may be diminished. During the crisis of acute closed-angle glaucoma, the sufferer usually looks ill and complains of sudden onset of unilateral ocular pain that radiates to the forehead. Nausea and vomiting often follow, and the pupil dilates slowly. The person often reports seeing halos around lights and has a red sclera. In addition, the cornea may become steamy and edematous from increased intraocular pressure causing fluid to leak into the cornea from the anterior chamber (4). An attack often happens in the evening or in a darkened room, and pain may be severe (5).

How is glaucoma diagnosed?

Eye doctors can perform a series of tests to aid in determining whether or not a patient has glaucoma, even if symptoms do not exist. Such tests include:

- Tonometry-a simple, painless procedure that measures a person's intraocular pressure. This is usually the initial screening test for glaucoma (5).
- Ophthalmoscopy-Using an instrument called an ophthalmoscope, an eye doctor can look at the optic nerve directly through the pupil. The nerve's color and appearance can indicate whether or not damage from glaucoma is present and how extensive it is (2).
- Visual Field Test-Testing a patient's visual field lets one's doctor know if and how the patient's field of vision has been affected by glaucoma. Several methods of examination are available. In computerized visual field testing, the patient places his or her chin on a stand appearing before a computerized screen. When a flash of light appears, a button is pressed, and the entire visual field of the patient can be mapped (2). Another method, tangent screen perimetry, involves looking at a screen with a target in the center while an eye doctor or technician manipulates a small object on a wand at different locations in the patient's visual field. When the object comes into view, the doctor is informed, and in repeating the process, the visual field can be mapped (5).
- Pachymetry-The eyes are numbed for this test, which uses an ultrasonic wave instrument to gauge the thickness of each cornea. The thickness of the cornea is an important factor for accurately diagnosing glaucoma (5).

How is glaucoma cured?

There is no cure for glaucoma, and damage caused by the disease is irreversible.

Having glaucoma requires lifetime treatment. However, glaucoma can be controlled with such treatment (5).

How is glaucoma treated?

Glaucoma can be treated with eye drops, pills, eye operations, laser surgery, or a combination of such methods. The purpose of treating glaucoma is preventing further loss of vision, which is imperative as loss of vision due to glaucoma is irreversible. The key to preventing vision loss as a result of glaucoma is keeping intraocular pressure under control (2). This is done by improving aqueous humor outflow, reducing the production of aqueous humor, or both through the previously stated methods. Because glaucoma can progress or change, treatment may be adjusted over time. Regular checkups and adherence to a treatment plan may seem burdensome but are essential in the prevention of vision loss (5).

Can glaucoma be prevented?

Until recently, there was no proven way to prevent glaucoma. Nevertheless, a trial supported by the National Eye Institute found that when glaucoma eye drops were given daily to people with eye pressure above 24 mm Hg, eye pressure was reduced an average of 22 percent. The researchers discovered that daily use of eye drops can reduce the risk of developing glaucoma by nearly half in African Americans with elevated eye pressure. Another study found that cholesterol-lowering medications reduced the risk of open-angle glaucoma, especially for people who already have cardiovascular disease. However, more studies need to be done to confirm the reduction in risk of glaucoma. Regular checkups help detect glaucoma in its early stages before irreversible damage has occurred (5). The American Academy of Ophthalmology recommends a complete vision exam at least once during the 20s, at least twice during the 30s, every 2 to 4 years from age 40 to 64, and every 1 to 2 years for those 65 and older (4). If a person is at increased

risk of developing glaucoma, his or her doctor will likely recommend more frequent monitoring (5).

Where can one find more information?

The following site contains links to information regarding glaucoma, blindness, and eye care: <http://www.glaucomafoundation.org/links.php?s=1> (2). An individual can also contact his or her physician regarding local assistance.

Works Cited

1. Damjanov I. *Pathology for the Health Professions*. 3rd ed. St. Louis, MO: Elsevier Saunders; 2006: 504-506.
2. The Glaucoma Foundation Website. Available at: <http://www.glaucomafoundation.org/index.php>. Accessed April 19, 2007.
3. Gohdes DM, Balamurugan A, Larsen BA, Maylahn C. Age-related Eye Diseases: An Emerging Challenge for Public Health Professionals. *Prev Chronic Dis* [serial online]. 2005. Available at: http://www.cdc.gov/pcd/issues/2005/jul/04_0121.htm. Accessed April 19, 2007.
4. Houde SC, ed. *Vision Loss in Older Adults: Nursing Assessment and Care Management*. New York, NY: Springer Publishing Company, LLC; 2007: 41-45.
5. Mayo Clinic Staff. Glaucoma. Mayo Clinic [serial online]. 2006. Available at: <http://www.mayoclinic.com/health/glaucoma/DS00283/DSECTION=1>. Accessed April 19, 2007.