



GLAUCOMA: DIAGNOSIS AND TREATMENT- A REVIEW ARTICLE

Dr. Sanjay Upadhyay*

Assistant Professor, Department of Ophthalmology, Gujarat Adani Institute of Medical
Science, Bhuj, Gujarat, India.

Article Received on 21/06/2015

Article Revised on 15/07/2015

Article Accepted on 06/08/2015

***Correspondence for
Author**

Dr. Sanjay Upadhyay

Assistant Professor,
Department of
Ophthalmology, Gujarat
Adani Institute of Medical
Science, Bhuj, Gujarat,
India.

ABSTRACT

The term “glaucoma” covers a number of different eye conditions, all of which involve damage to the optic nerve. One common cause is that there is too much pressure inside the eye. Glaucoma is the leading cause of preventable blindness. Recent advances have seen a surge of new ideas and technologies to aid in the detection, treatment and further understanding of glaucoma. These technologies and advances are discussed to provide information on risk-factors, diagnosis and treatment. If ophthalmologist or optometrist detects glaucoma, early

treatment can help prevent the loss of your vision.

KEYWORDS: Blindness, Eye, Glaucoma, treatment.

INTRODUCTION

The term “glaucoma” covers a number of different eye conditions, all of which involve damage to the optic nerve. One common cause is that there is too much pressure inside the eye. This pressure is called intraocular pressure. Intraocular pressure is caused by a fluid called aqueous humor produced by the eye itself in the chambers of the eye between the cornea and the lens. If the aqueous humor is prevented from draining properly, it starts to collect and pressure within the eye builds up. This presses against the optic nerve and there is a risk that nerve cells die. Whether the increased intraocular pressure does cause damage depends on, among other things, how well the optic nerve can resist this pressure. Intraocular pressure is measured in mm Hg (millimeters of mercury), the same unit used for blood pressure. Readings between 10 and 21 mm Hg are considered normal. Someone who has glaucoma does not always have above-average intraocular pressure.^[1]

Types of Glaucoma^[2]

There are a variety of different types of glaucoma. The most common forms are

- **Primary Open-Angle Glaucoma**
- **Normal Tension Glaucoma**
- **Angle-Closure Glaucoma**
- **Acute Glaucoma**
- **Pigmentary Glaucoma**
- **Exfoliation Syndrome**
- **Trauma-Related Glaucoma**

Primary Open-Angle Glaucoma It occurs mainly in the over-50 age group. There are no symptoms associated with POAG. The pressure in the eye slowly rises and the cornea adapts without swelling. If the cornea were to swell, which is usually a signal that something is wrong, symptoms would be present. But because this is not the case, this disease often goes undetected. It is painless, and the patient often does not realize that he or she is slowly losing vision until the later stages of the disease. However, by the time the vision is impaired, the damage is irreversible. Glaucoma is really about the problems that occur as a result of increased IOP. The average IOP in a normal population is 14-16 millimeters of mercury (mmHg). In a normal population pressures up to 20 mmHg may be within normal range. A pressure of 22 is considered to be suspicious and possibly abnormal. However, not all patients with elevated IOP develop glaucoma-related eye damage. It may be hereditary. There is no cure for it at present, but the disease can be slowed or arrested by treatment. Since there are no symptoms, many patients find it difficult to understand why lifelong treatment with expensive drugs is necessary, especially when these drugs are often bothersome to take and have a variety of side effects. Taking medications regularly, as prescribed, is crucial to preventing vision-threatening damage. That is why it is important for you to discuss these side effects with your doctor. The two of you need to act as a 'team' in the battle against glaucoma.^[3]

Normal Tension Glaucoma Normal-tension glaucoma, also known as low-tension glaucoma, is characterized by progressive optic nerve damage and visual field loss with a statistically normal intraocular pressure. This form of glaucoma, which is being increasingly recognized, may account for as many as one-third of the cases of open-angle glaucoma in the United States. Normal-tension glaucoma is thought to be related, at least in part, to poor

blood flow to the optic nerve, which leads to death of the cells that carry impulses from the retina to the brain. In addition, these eyes appear to be susceptible to pressure-related damage even in the high normal range, and therefore a pressure lower than normal is often necessary to prevent further visual loss. Research in the field of optic nerve blood flow and its role in glaucoma is a source of much excitement at the present time, and hopefully will lead to new methods of treating this disorder. Since the best therapy for normal-tension glaucoma is largely unknown, much attention is being given to a study known as the International Collaborative Low Tension Glaucoma Protocol.^[3]

Angle-Closure Glaucoma Angle-closure glaucoma affects nearly half a million people in the United States. There is a tendency for this disease to be inherited, and often several members of a family will be afflicted. It is most common in people of Asian descent and people who are far-sighted. In people with a tendency to angle-closure glaucoma, the anterior chamber is smaller than average. As mentioned earlier, the trabecular meshwork is situated in the angle formed where the cornea and the iris meet. In most people, this angle is about 45 degrees. The narrower the angle, the closer the iris is to the trabecular meshwork. As we age, the lens routinely grows larger. The ability of aqueous humor to pass between the iris and lens on its way to the anterior chamber becomes decreased, causing fluid pressure to build up behind the iris, further narrowing the angle. If the pressure becomes sufficiently high, the iris is forced against the trabecular meshwork, blocking drainage, similar to putting a stopper over the drain of a sink. When this space becomes completely blocked, an angle-closure glaucoma attack (acute glaucoma) results. Acute Glaucoma Unlike POAG, where the IOP increases slowly, in acute angle-closure, it increases suddenly. This sudden rise in pressure can occur within a matter of hours and become very painful. If the pressure rises high enough, the pain may become so intense that it can cause nausea and vomiting. The eye becomes red, the cornea swells and clouds, and the patient may see haloes around lights and may experience blurred vision. An acute attack is an emergency condition. If treatment is delayed, eyesight can be permanently destroyed. Scarring of the trabecular meshwork may occur and result in chronic glaucoma, which is much more difficult to control. Cataracts may also develop. Damage to the optic nerve may occur quickly and cause permanently impaired vision. A variety of drugs can also cause dilation of the pupil and lead to an attack of glaucoma. These include anti-depressants, cold medications, antihistamines, and some medications to treat nausea. Acute glaucoma attacks are not always full blown. Sometimes a patient may have a series of minor attacks. A slight blurring of vision and haloes may be experienced, but

without pain or redness. These attacks may end when the patient enters a well lit room or goes to sleep -- two situations which naturally cause the pupil to constrict, thereby allowing the iris to pull away from the drain. An acute attack may be stopped with a combination of drops that constrict the pupil and drugs that help reduce the eye's fluid production. Laser surgery may be performed prophylactically on the other eye, as well. Since it is common for both eyes to suffer from narrowed angles, operating on the unaffected eye is done as a preventive measure. Routine examinations using a technique called gonioscopy can predict one's chances of having an acute attack. In some cases, laser treatment is recommended as a preventive measure. Not all angle-closure glaucoma sufferers will experience an acute attack. Instead, some may develop what is called chronic angle-closure glaucoma.^[2]

Pigmentary Glaucoma: Pigmentary glaucoma is a type of inherited open-angle glaucoma that develops more frequently in men than in women. It most often begins in the twenties and thirties, which makes it particularly dangerous to a lifetime of normal vision. Nearsighted patients are more typically afflicted. The anatomy of the eyes of these patients appears to play a key role in the development of this type of glaucoma. Miotic therapy is the treatment of choice, but these drugs in drop form can cause disabling visual blurring in younger patients. Fortunately, a slow-release form is available. Laser iridotomy is presently being investigated in the treatment of this disorder.

Exfoliation Syndrome This common cause of glaucoma is found everywhere in the world, but is most common among people of European descent. In about 10% of the population over age 50, a whitish material, which upon slit-lamp examination looks somewhat like tiny flakes of dandruff, builds up on the lens of the eye. This exfoliation material is rubbed off the lens by movement of the iris and at the same time, pigment is rubbed off the iris. Both pigment and exfoliation material clog the trabecular meshwork, leading to IOP elevation, sometimes to very high levels. Exfoliation syndrome can lead to both open-angle glaucoma and angle-closure glaucoma, often producing both kinds of glaucoma in the same individual.

Trauma-Related Glaucoma A blow to the eye, chemical burn, or penetrating injury may all lead to the development of glaucoma, either acute or chronic. This can be due to a mechanical disruption or physical change within the eye's drainage system. It is therefore crucial for anyone who has suffered eye trauma to have check-ups at regular intervals.^[4]

Glaucoma affects about 70 million people worldwide, of whom about 10 per cent are believed to be bilaterally blind. It is estimated that by the year 2020, this number would rise

to around 79.6 million. Statistics gathered by the World Health Organization (WHO) show that glaucoma is the second leading cause of blindness globally, after cataract. Glaucoma, however, presents greater health challenge than cataract because the blindness it causes is irreversible. India has the third largest number of glaucoma patients, after China and Europe/USA. Glaucoma is the third leading cause of blindness in India, but the alarming thing is that by the time a patient is detected to be having glaucoma, 90% have lost 50% of their sight. In India, it is estimated that glaucoma affects 12 million people accounting for 12.8% of the countries blindness and by 2020; this is expected to be 16 million. Population based studies report a prevalence between 2 to 13 % in India. In India, more than 90 per cent of glaucoma in the community is undiagnosed. Statistics say one in eight persons above the age of 40 years in India is either suffering from glaucoma or is at risk of the disease. Glaucoma can affect any age group, including newborn, infants, children and elderly.^[5-6]

Diagnosis^[2]

The Tonometer

The Tonometer measures the pressure in the eye. If your doctor were to use applanation tonometry, your eye would be anesthetized with drops. Then, you would sit at the slit lamp, and a plastic prism would lightly push against your eye in order to measure your IOP. In air tonometry a puff of air is sent onto the cornea to take the measurement.

Visual Field Test

In computerized visual field testing you will be asked to place your chin on a stand that appears before a computerized screen. Whenever you see a flash of light appear, you will be asked to press a button. At the end of this test, your doctor will receive a printout of your field of vision.

Ophthalmoscopy

Using an instrument called an ophthalmoscope, your eye doctor can look directly through the pupil at the optic nerve. Its color and appearance can indicate whether or not damage from glaucoma is present and how extensive it is.

Treatment

Glaucoma can be treated with eyedrops, pills, laser surgery, eye operations, or a combination of methods.

Glaucoma Medications

Glaucoma is typically treated with the use of medications that either help the fluid drain better or decrease the amount of fluid made by the eye. In most cases, medication can safely control eye pressure for many years. Experts agree that your eye pressure must remain under constant control to prevent your glaucoma from growing worse. Most medications have some side effects. Usually, side effects lessen after a few weeks. In particular, older people with glaucoma should look for changes in behavior or mobility that may be a side effect of medications.^[7]

Recent exciting developments in glaucoma management hope to, in part, address these concerns. These include the development of a new class of IOP lowering medications (Rho-kinase inhibitors), newer and safer techniques for surgically reducing IOP and the development of non-IOP dependant therapies such as neuroprotection.^[8-10]

Eyedrops

All eyedrops may cause a burning or stinging sensation at first. This is often due to the antibacterial agent present in the drop solution and not due to the drug itself. While it can be uncomfortable, the discomfort lasts for only a few seconds.

Pills

Sometimes, drops are not enough to control IOP. When this is the case, pills may be prescribed in addition to drops. These pills, which have more side effects than drops do, also serve to turn down the eye's faucet and lessen the production of fluid in the eye. The medication is usually taken from two to four times daily.

Surgical Procedures When medication does not achieve the desired results, or when it has intolerable side effects, your ophthalmologist may suggest surgery.

Laser Surgery

Laser surgery has become increasingly popular as an intermediate step between drugs and traditional surgery. The most common type performed for open-angle glaucoma is called trabeculoplasty. This procedure takes between ten and twenty minutes, is painless, and can be performed in either a doctor's office or in an outpatient facility. The laser beam (a high energy light beam) is focused upon the eye's drain. Contrary to what most people think, the laser does not burn a hole through the eye. Instead, its intense heat causes some areas of the

eye's drain to shrink, resulting in adjacent areas stretching open and permitting the fluid to drain more easily.^[2]

Traditional Surgery

The most common of these operations is called a trabeculectomy. In this procedure, the surgeon removes a small section of the trabecular meshwork -- the eye's drain. This allows the aqueous humor to drain more easily, reducing the pressure in the eye. This procedure is usually done under local anesthesia either as an outpatient or with a brief hospital stay. As your doctor will want to see you on the day after the operation to check both your vision and ocular pressure, some prefer that you remain in the hospital. It is important to note that your eyes may not have their normal visual acuity for several weeks following this procedure. Although trabeculectomy is a relatively safe surgical procedure, about one-third of patients develop cataracts within five years of surgery. After trabeculectomy, most patients are able to discontinue all anti-glaucoma medications. Perhaps ten to fifteen percent of patients require additional surgery.^[11-12]

CONCLUSION

Glaucoma is the leading cause of preventable blindness. Routine eye exams are vital for protecting the health of your eyes. If ophthalmologist or optometrist detects glaucoma, early treatment can help prevent the loss of your vision.

REFERENCES

1. US Library of Medicine. PubMed Health.Fact sheet: Glaucoma. July 5, 2012. <http://www.ncbi.nlm.nih.gov/pubmedhealth/PMH0048141/> (Accessed on October 2, 2014).
2. Patient guide. Available at www.glaucomafoundation.org. (Accessed on November 5 2014).
3. http://www.dnaindia.com/health/report_glaucoma-silently-blights-light-in-the-eyes_1519673 (Accessed on September 6, 2014).
4. Glaucoma Society of India. <http://www.glaucomaindia.com/> (Accessed on September 28, 2014).
5. Study of Glaucoma Treatment in India Completed. Cure glaucoma Winter 2006. http://www.hopkinsmedicine.org/wilmer/news/cureglaucoma/cure_glaucoma_W06.pdf. (Accessed on September 6, 2012)

6. Glaucoma silently blights light in the eyes. Mar 14, 2011. http://articles.timesofindia.indiatimes.com/2011-04-18/pune/29443049_1_glaucoma_mutationsgene-therapy. (Accessed on September 6, 2012).
7. Gupta, Brij Mohan Dr and Bala, Adarsh. Glaucoma Research: A Scientometric Study of Indian Publications Output, 2002-11. (2013). Library Philosophy and Practice (e-journal). Paper 939.
8. de Jong L58. A. The Ex-PRESS glaucoma shunt versus trabeculectomy in open-angle glaucoma: a prospective randomized study. *Adv Ther*, 2009; 3: 336-45.
9. Marzette L, Herndon LW. A comparison of the Ex-PRESS™ mini glaucoma shunt with standard trabeculectomy in the surgical treatment of glaucoma. *Ophthalmic Surg Lasers Imaging.*, 2011; 42: 453-9.
10. Seider M60. I, Rofagha S, Lin SC, Stamper RL. Resident-performed Ex-PRESS Shunt Implantation Versus Trabeculectomy. *J Glaucoma.*, 2012; 21: 469-74.
11. Stein J61. D, Herndon LW, Brent Bond J, Challa P. Exposure of Ex-PRESS Miniature Glaucoma Devices: case series and technique for tube shunt removal. *J Glaucoma.*, 2007; 16: 704-6.
12. Papaconstantinou 62. D, Georgalas I, Karmiris E, Diagourtas A, Koutsandrea C, Ladas I, *et al.* Trabeculectomy with OloGen versus trabeculectomy for the treatment of glaucoma: a pilot study. *Acta Ophthalmol.*, 2010; 88: 80-5.