

All About Glaucoma

This booklet is for people with glaucoma
and their families and friends.

It provides **information about glaucoma** and its problems.
It answers questions about the causes, symptoms and
discusses diagnosis and types of treatment, and the
latest techniques for glaucoma treatment

Only at

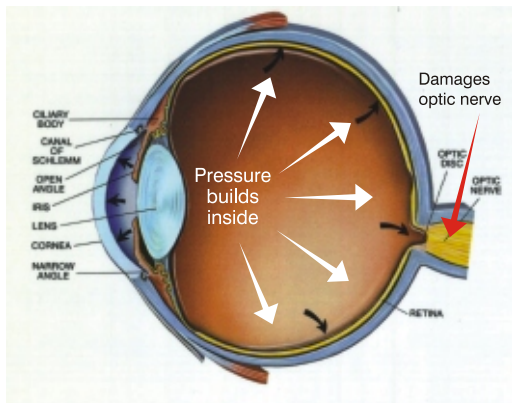
The Mehta International Eye Institute

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What is Glaucoma ?



Glaucoma is raised pressure in the eyeball. Glaucoma needs to be detected at routine screening at the time of the yearly eye examination as it has virtually no symptoms and the blindness just creeps in with no warning. Glaucomatous damage occurs due to excessive pressure on the optic nerve due to a raised intraocular pressure (the pressure in the eye ball). When the pressure goes too high for the optic nerve to sustain itself, damage leads to loss of the retinal peripheral fibers and then gradually the central fibers in the retina.

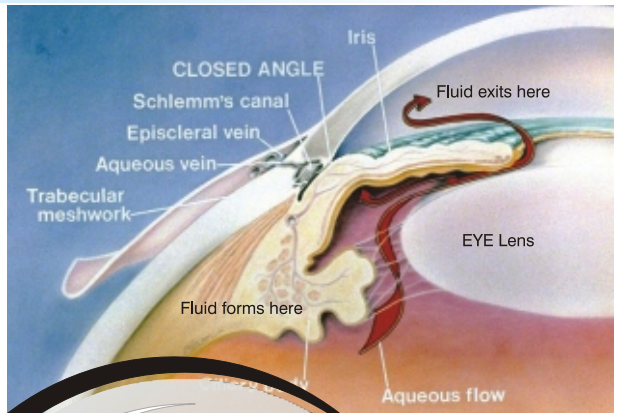
How is Glaucoma caused

Glaucoma is the term applied when the intraocular pressure of the eye is beyond the normal pressure of 18 - 21 mm of Hg as measured on a tonometer.

The eye produces a liquid termed as aqueous in a specialized part of the eye termed the ciliary body. The liquid percolates through the open pupil, bathes the front of the eye termed the anterior chamber and passes out via a meshwork termed as the trabecular meshwork. An excessive production of the aqueous by the ciliary body or a decreased outlet due to blockage of the outlet channels leads to a rise in pressure.

It is this pressure which induces the damage. The raised pressure affects the blood vessel to the optic nerve and the nerve fibers themselves, leading to weakness of the nerves.

Interestingly, Glaucoma is almost as common as diabetes and can occur at any age, even in new born babies but is more common after the age of 40 years



Are you at risk of Glaucoma ?

If you are over the age of 40 years, have a family history of glaucoma and have diabetes, even if mild, you have an increased risk of developing glaucoma

Often it is only the routine eye test which will detect your glaucoma. It is therefore essential that regular eye examination be carried out and if a suspicion exists then the eyes should be evaluated on special instrumentation which will tell if the eye has been affected by the glaucoma and if so where and how much.

What are the symptoms of Glaucoma



Normal Vision



Glaucoma Affected Vision

Glaucoma basically consist of two types. Open angle glaucoma which is the most common type and constitutes almost 92% of all glaucoma, is totally symptomless, painless loss of vision and is often undetected till too late.

The second type termed closed angle glaucoma is painful, red eyes with sudden fall in vision.

In the common open angle type of glaucoma, damage progresses slowly and gradually, over time, destroys vision, starting first with side vision.

Question often asked as to why wasn't it detected. The reason is that the good eyes field of vision can make up for the fall in the affected eye. It is only when one eye is covered that it becomes obvious that in one eye, the side vision is affected. By that time it is usually a well advanced glaucoma.

How does vision appear to a case with advancing glaucoma



In the early stages: When you focus on an object it is sharp and clear but there will be areas at the side where the image will be blurry or seem to run into itself. Interestingly if you look at the blurred area it again becomes clear but now another area at the side will become blurry. This is because your side vision has started to blur.

This is the reason why it is so difficult to detect the peripheral loss of vision (called filed defects). It is for this reason that glaucoma has been well labeled as the “**sneak thief of sight**”

In advanced Glaucoma the filed goes on narrowing till only the central area is visible. It is like when you are looking through a roll of paper.

In summary unchecked and uncontrolled Glaucoma can lead to a symptom free but progressive loss of vision if undetected and unchecked in time.

Are there any early indicators for Glaucoma

Though symptoms are virtually absent some indicators may point towards a developing glaucoma.

- Difficulty in reading appearing in short time
- Missing words while reading
- Excessive watering
- Sensitivity to light Rainbow haloes around lights

How is Glaucoma Tested

1

Tonometer Checking the pressure of the eye

There are various types of tonometers, They all work by determining the resistance of your cornea to an indenting force.

Why is Tonometry done ?

Tonometer is done to: Evaluate the intraocular pressure as a routine test during eye examination. Used to check how well the medication is working in glaucoma and to evaluate the result of surgery.

There is a variation in normal pressure and the range is between 18-21 mm of Hg with IOP above 21 being abnormal. Customarily females have a slightly higher IOP.

Non contact tonometry (Pneumotonometry).

Non contact (or air-puff) tonometer does not touch your eye but uses a sharp puff of air which flattens your cornea. It is ideal to quickly evaluate if the IOP is high. Is ideal for post operative cases and after doing LASIK and naturally for children.

Applanation (Goldmann) tonometry:

This type of tonometer is very accurate and uses a small cylinder which is placed on the cornea after putting fluorescein dye on the eye. It measures the force required to flatten (or applanate) a fixed area of the cornea. The patient needs to be very steady as any movement can scratch the front of the eye.

Indentation (Schiotz) tonometry:

This tonometer uses a plunger connected to a pointer moving against a scale with different weights. It measures the amount of indentation on the cornea induced by fixed weights. Utilized as a backup in cases when other devices it is difficult to measure the intraocular pressure. Usually used in the operating theater also prior surgery.

Electronic indentation tonometry:

A small hand held device is used to electronically measure the pressure. Not very accurate but a good screening test and a good backup unit.



Who is at risk for Glaucoma

Although anyone can get glaucoma, some people have a higher risk, those with

- A family history of glaucoma
 - Diabetes
 - Migraine
- Short sightedness (myopia)
 - Eye injuries
 - Blood pressure
- Past or present use of cortisone drugs (steroids)

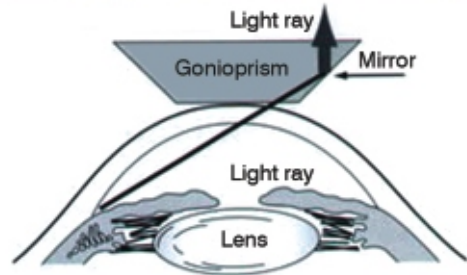
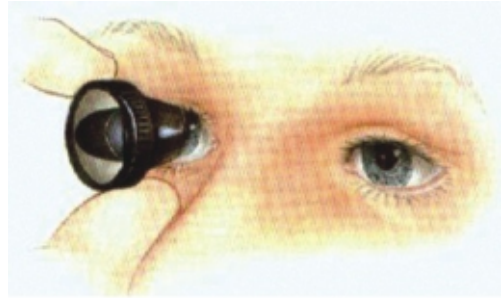
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Gonioscopy Checking the angle of the chamber

The angle is evaluated using a reflection mirror contact lens termed a gonioscope. The fluid produced by the ciliary body drains out through the angle of the eye via the trabecular meshwork. Glaucoma depends on how open the angle is. To check that, we have to be able to peer into the angle of the eye.

A small instrument called a Gonioscope is placed in contact with the eye after instilling some anesthetic drops, and with its inbuilt mirror, one can see the angle of the eye. There is hardly any discomfort and it takes, for a skilled examiner hardly a few minutes.

The advantage is that it tells how open the angle is, whether it is in danger of closing, and as to whether there are debris which are causing blockage at the angle. It's a routine test even after doing the surgery for glaucoma



3

Evaluating the Retina MOST IMPORTANT

In the retina, 3 areas need to be evaluated in concert to give a correct picture. First a quick check is made of the retina with an Indirect Ophthalmoscope which gives a quick idea of optic nerve damage.

- I **Computerized Humphrey Visual Fields Analyzer** which evaluates the nerve fibre function in the periphery of the retina. Essentially it evaluates the retinal function in the periphery.
- II **HRTII Heidelberg Retinal tomograph** This unit tests the optic nerve head and its changes. It is so sensitive that it can predict glaucoma almost 5 years in advance and measures any advance in glaucoma or the changes in microns (1000th of a mm)
- III **Fourier OCT (Optical coherence tomography)** Evaluates the nerve fibres next to the optic nerve and the ganglion cell complex next to the retina which is considered the most sensitive indicator of damage to the retina from glaucoma

Let us take each one individually to really understand how Glaucoma is evaluated.

All three retinal tests are required. It is only after evaluating all three test together that a true picture of the Glaucoma emerges.

B Humphrey Computerized Field Analyzer II: The Gold Standard in Glaucoma evaluation

- Visual testing is very important to evaluate the quantum of damage to the nerve fibers of the retina from the raised pressure due to Glaucoma.
- It acts as a very sensitive monitor of the state of the glaucoma and to the stability of the control.
- The Humphrey Field Analyzer II is a sophisticated diagnostic tool used to examine a patient's visual field.
- The Humphrey Field Analyzer II is the recognized gold standard of care for early diagnosis and management of ocular diseases resulting in visual field loss. Conducting the test is simplicity itself. The patient sits on the machine with a small click switch in the hand which he presses every time he sees a light spot which is randomly cast by the computer on the globe.
- The beauty of the instrument is that it will check almost 400 areas with varying degrees of size and light intensity to get a very comprehensive picture of the health of the retinal nerve fibers. The Humphrey Field Analyzer II with its latest software, permits visual fields assessment in as little as two minutes.



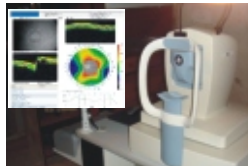
B Heidelberg Retinal Tomographer

- The HRT II is a confocal scanning laser ophthalmoscope. It permits a very accurate analysis of the optic nerve head and evaluates as to whether there is any progression in the glaucoma.
- It produces using a very sophisticated software a three dimensional view of the optic nerve and most important of all the data lies in the computer. The next time you come to check it after 4 months, the KRT draws a line showing your old and your new examination and even shows the amount or absence of progression.
- The biggest advantage is that it shows glaucoma changes almost 5 years before they show themselves on the field test. It generates extremely accurate analytical data that is not possible to obtain with traditional examinations.
- The HRT II exam is rapid (hardly 3 minutes) safe, and usually does not require dilating the eye. With the patient sitting comfortably in a stationary position, a laser scans the eye for just a few seconds (at a lower energy level then that produced from a television remote control).
- Dr. Keiki's Mehta International Eye Institute was one of the very early institutes to offer this very accurate non-invasive HRT II exam for early diagnostic and monitoring of glaucoma.



C The Fourier Optical Coherence tomography for Glaucoma evaluation

- OCT is like a body CT scanner except developed specially for the retina. Dr. Keiki Mehta has brought in, for the first time the Super-fast Fourier Domain, Optical Coherence Tomography laser machine, which brings high resolution 3-D imaging of the retina for better diagnosis and treatment
- The device uses near-infrared laser waves to visualize the retinal tissue with ultra-high clarity in a fraction of seconds giving ultrahigh resolution 3-D images which can be rotated around to examine the retina from all angles.
- Here not only can the optic nerve be examined in great detail literally in slices but for the first time the nerve fibers can be evaluated to see the extent of damage. The instrument is so sensitive that it can measure literally the size of the cells of the retina giving new dimension to effective glaucoma control and treatment.
- In the retina the ganglion nerve fibers show changes, considered to be the most sensitive indicator of progression of glaucoma and this is evaluated by the Fourier OCT or the Optical Coherence Tomography



Although there is no cure for the damage induced by preexisting glaucoma, it can certainly be arrested using drops, Laser therapy or as a last resort, surgery. Slowed down Treatments include

Eye Drops

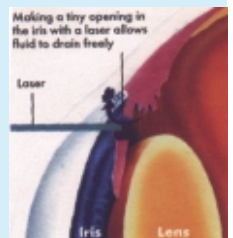
These are the most common form of treatment and must be used systematically. The drops can be varied to best suit the patient and the type of glaucoma. Usually medication is a long term control requirement and need to be put regularly and the patient should never discontinue the drops unless medically advised to do so. If drops are unable to control the pressure sometimes tablets are prescribed also.

Laser therapy

Lasers are used to treat both the acute congestive type as well as the chronic type. Lasers can be used to punch a hole in the iris of the eye to permit fluid to circulate freely, and it can be used to open up the trabecular meshwork. They can also be used to jumpstart a failed glaucoma surgery by opening up the channels.

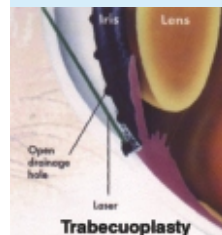
Laser Iridotomy:

In narrow angle glaucoma using a Nd:Yag laser, a small hole is made in the iris. It is completely painless and once the opening is made, it rarely, if ever closes down. For those with narrow angles it acts as a good prophylactic. It is also used sometimes after cataracts surgery if the pressure suddenly jumps up



Laser Trabeculoplasty:

This procedure is fairly effective in patients with chronic open angle glaucoma. Its immediate results are good but the treatment is short-term and needs to be repeated. Essentially it's a stop gap measure to delay surgery.



How is Glaucoma treated

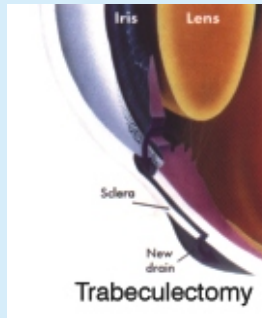
Glaucoma Surgery

This is performed usually after eye drops and laser have failed to control the eye pressure. A new channel for the fluid to leave the eye is created. Glaucoma surgery is indicated when no other safe alternative is available to consistently maintain the IOP (eye pressure) within the required limits by medication or the application of laser. The primary goal of eye surgery is to stabilize the glaucoma, keep the optic nerve healthy and prevent it deteriorating further

Surgery designed to enhance drainage Of fluid from the eye

Trabeculectomy

Considered the most common type of surgery. In this type of surgery, a trapdoor is fashioned in the white of the eye or the sclera, under which the trabecular meshwork which acts as the main site for blockage is excised. The trapdoor is sutured securely. This permits the fluid to drain out under the clear conjunctiva of the eye. The trapdoor can be made with a conventional or a laser cutting tool. Sometimes under the flap a small plastic device called a seton is implanted which permits better drainage.

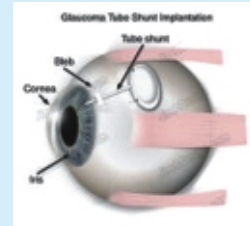


Non Penetrating Deep Sclerectomy (NPDS for short)

Is new, non invasive procedure the eyeball is not opened but a little of the white of the eye is thinned adequately to permit the high pressure aqueous to simply filter through. Though technically more demanding, the results are very gartifying. If the pressure is high, this is the safest type of surgery.

Tube shunt surgery is another type of drainage surgery.

Sometimes where a Trabeculectomy has failed or the pressure is very high a tube shunt permits unrestricted flow out of the eye. Especially useful in managing glaucoma in children and those with severe absolute or vascular glaucoma.



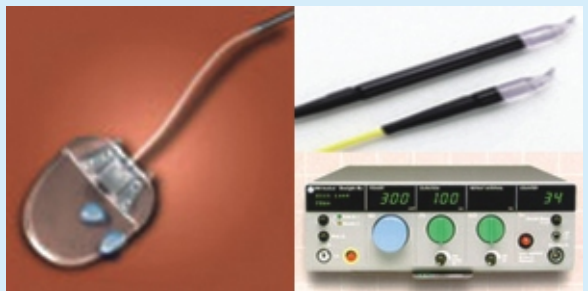
Surgery designed to diminish the amount of fluid produced in the eye

When conventional surgery fails to improve the flow of fluid from the eye a simple technique is to selectively destroy very fine parts of the ciliary body the little area from which aqueous is produced that produces fluid (ciliary body) can be done which reduces the pressure in the eye.

There are two ways to carry it out. In the older days Cyclocryotherapy uses a carbon dioxide freezing probe to destroy the ciliary body.

The latest technique is to use a Near Infra Red Laser photocoagulation selectively diminish ciliary body function.

Remember: Treatment can save remaining vision but it does not improve eye sight



FOR OPTIMAL RESULTS IN THE MANAGEMENT OF GLAUCOMA

- Eye pressure checked every 3 months
- Visual Computerized Humphrey field test every 6 months
 - HRT every 4 months
- OCT for Glaucoma every 6 months unless labile, then 4 monthly

Know Your Surgeon

Prof. Dr. Keiki R. Mehta

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**Chief Surgical & Medical Director,
Mehta International Eye Institute.**



Dr. Keiki R. Mehta, receiving the Padmashree Award by the President of India, Smt. Pratibha Patil for his exemplary surgical skills and his outstanding contribution to Ophthalmology

- Prof. Dr. Keiki R. Mehta is India's foremost Consultant Ophthalmic Surgeon, and is The Surgical Chief & Medical Director of The Mehta International Eye Institute, Colaba, Mumbai, considered to be Asia's most advanced and foremost Ophthalmic Institute, and specializes in **Cataract, LASIK, Glaucoma, Squint, Lazy Eyes, Keratoconus, Retinal surgeries and treatment**. An outstanding researcher and clinician, he has extensive experience of Excimer Laser, PRK and LASIK techniques which he has done on over 11000 patients over the last 15 years
- He has pioneered, in India, the commencement of Intraocular Implants, Phacoemulsification Cataract surgery.
- He is the winner of 11 Gold Medals in India, having received virtually all the Honors possible, has been the President of the All India Ophthalmologists Association and President of the Intraocular Implant and Refractive Society among many others. Chairman and Organizing Secretary of the very successful Eye Advance Congresses for the last 12 years 1996-2008. These have now reached an iconic status and are recognized worldwide
- The American Implant Society awarded him its Appreciation Award, at San Francisco for pioneering Soft Intraocular implants for the first time in the world. He has received Grand Honors Award from the National Eye Research Foundation, Chicago, USA, the only Indian to be ever awarded. Presented the prestigious Lim International Award from the Asia Pacific Intraocular Implant Association for outstanding work in Ophthalmology in the Asia Pacific Region, the only India to be presented this award. Awarded the Triple Ribbon Award of the American Society for Cataract and Refractive Surgery, USA, for Outstanding Research presentations in Ophthalmology. Presented the Outstanding Recognition Award by International Council of Cataract Surgeons for Outstanding Research & Development in Cataract Surgery, award presented at Barcelona, Spain
- He is the only Indian to be elected a Member of the Legion d' Honor of the Instituto Barraquer, Barcelona, Spain
- Prof. Dr. Keiki Mehta is the only distinguished Indian Ophthalmic surgeon to be ever invited to Operate Live at Video Cataracta in Milan, Italy, where only the best of the best are invited, at Europe's biggest Live Surgery Conference
- Presented advanced research papers on Lasik Internationally and won the Outstanding Presentation Award at San Diego, USA
- Prof. Dr. Keiki R. Mehta is considered India's foremost Ophthalmic surgeon, and has conducted Live Surgical workshops in every major city in India, and has trained thousands of doctors in Intraocular implant surgery and Phacoemulsification and Laser refractive surgery including Lasik
- He is Honorary Visiting Professor at ONO Eye Hospital in Geneva, Switzerland and St. Luke's Institute, Texas, USA
- He is the Consultant Ophthalmic Surgeon to the Governor of Maharashtra, to the Armed Forces, Government of India and to the Maharashtra Police.

Awarded *Padmashree* by the President of India in 2008 for Exemplary Surgical Skills and his outstanding Achievements and Research in Ophthalmology

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