

# 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 and symptoms and discusses diagnosis and types of treatment, and the latest techniques for glaucoma treatment.



## **Mehta International Eye Institute**

Managed by  
**KRM Eye Institute Pvt. Ltd.**

**Padmashree**

*Awardee*

**Prof. Dr. Keiki R. Mehta**

M.B.B.S., D.O.M.S., M.S. (Ophth), D.O. (Ireland), R.C.P. & S (Ireland),  
D.O. (London), R.C.P. (London), R.C.S. (England), F.A.I.C.O, F.N.E.R.F. (USA),  
F.R.S.H. (London), F.I.C.O.R, F.I.O.S (USA)

**Consultant Ophthalmic Surgeon | Medical Director & Chief**

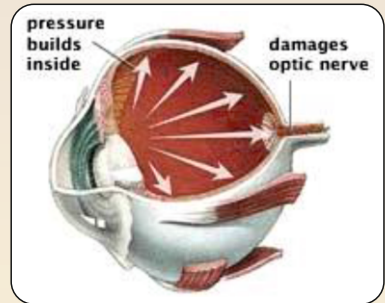
**Mehta International Eye Institute**

**Breach Candy Hospital & Research Centre | D. Y. Patil Medical College and Hospital**



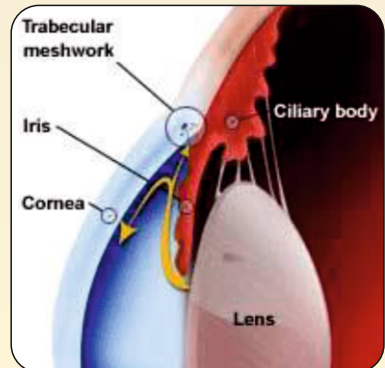
# What is Glaucoma

- Glaucoma is raised pressure in the eyeball. Glaucoma need 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 itself) .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

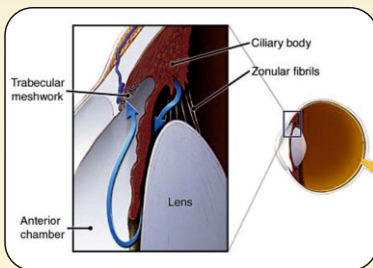
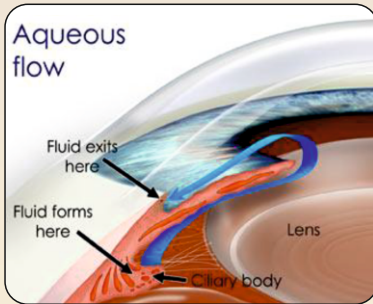


## Are you at risk for Glaucoma ?

- 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 an 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.



## How is glaucoma caused ?



- Glaucoma is the term applied when the intraocular pressure of the eye is beyond the normal pressure of 24 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 thru 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 lead to an 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 a weakness of the nerve.
- Interestingly, Glaucoma is almost as common as diabetes and can occur at any age , even new born babies but is more common after the age of 40 years.

## What are the symptoms of glaucoma?

- 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 , often undetected till too late.
- The second type termed closed angle glaucoma is a painful, red eye with sudden fall in vision. and pain..



- 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 the 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.

## Are there any early indicators for glaucoma

- 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



## 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)



## How does vision appear to a case with advancing glaucoma

**Normal**



**Glaucoma**



Visual field defect

**Advance Glaucoma**



Extensive visual field loss

- **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 blue.
  - 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. Almost like you are looking through a roll of paper.
- In summary unchecked & uncontrolled Glaucoma can lead to a symptom free but progressive loss of vision if undetected unchecked in time.

## How is Glaucoma Tested ?

**Glaucoma is evaluated by first of all checking**

a) **Checking the eye pressure pressure of the eye utilizing an instrument called a tonometer.**

- 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 :

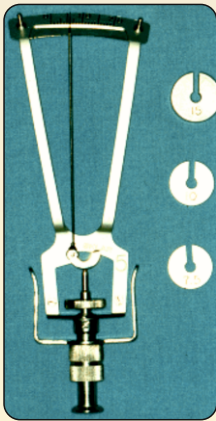
- Evaluating the intraocular pressure as a routine test during eye examination..
- Used to check how well the medication is working in glaucoma and to evaluated the result of surgery.
- There is a variation in normal pressure and the range is between 18-21 mm of Hg with IOP above 21 being abnormal. Customarily females have a slightly higher IOP.
- **Non contact tonometry (pneumotonometry).** Noncontact (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.



## Goldmann



- **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 . It however requires a patient to be very steady as any movement can scratch the front of the eye.



- **Indentation (Schiottz) 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. Usually utilized as a backup in case with other devices it is difficult to measure the intraocular pressure. Usually used in the operating theatre also prior surgery.

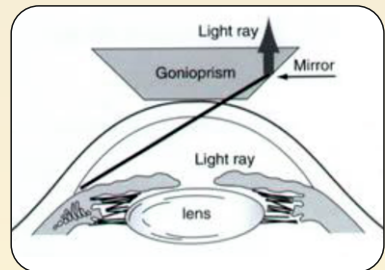
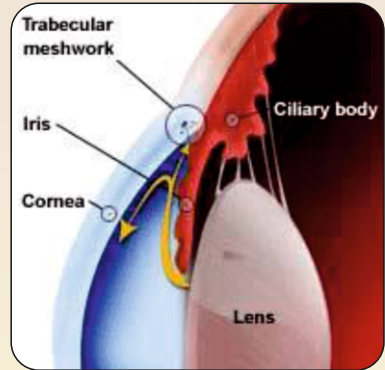


- **Electronic indentation tonometry.** A small hand held device is used to electronically measure the pressure. Not very accurate but a good screening test and a good backup unit .

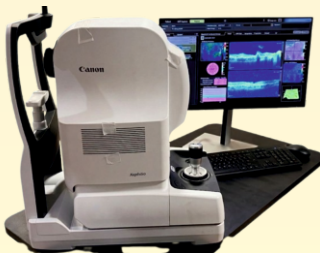
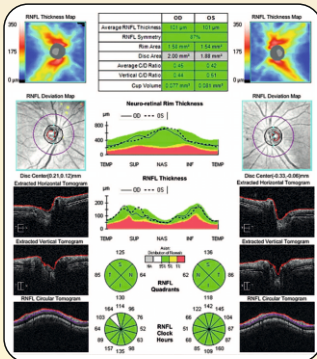
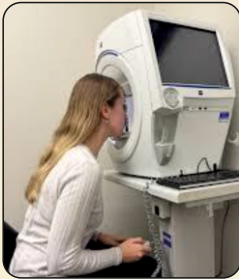
# Gonioscopy

## b) 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, as 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 is debris which is causing blockage at the angle. It's a routine test even after doing the surgery for glaucoma.



# How is Glaucoma tested



1. Heine Indirect Ophthalmoscopy A check is made of the retina with an Indirect Ophthalmoscope which gives a idea of optic nerve damage.
2. Computerized Humphrey Visual Fields Analyzerf which evaluates the nerve fibre function in the periphery of the retina. Essentially it evaluates the retinal function in the periphery.
3. The Retinal Nerve Fiber Layer (RNFL) eye test, typically done using Optical Coherence Tomography (OCT), It assists in early diagnosis by detecting structural changes that often precede permanent vision loss.
4. Optic nerve Blood flow done using the latest Canon Angio Oct which evelautes the blood flow in the optic pap[illae the optic disc. It is the most sensitive test for glaucoma and can predict any loss long before it occurs.

## 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



## Heidelberg Retinal Tomographer

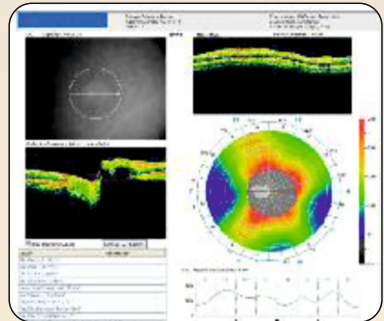
- The HRT II is a confocal scanning laser ophthalmoscope. It permits a very accurate analysis of the optic nerve head, and evaluates as to whether there is any progression in the glaucoma.
- It produces using a very sophisticated software a three dimensional view of the optic nerve and most important 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).
- 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.





## The Fourier Optical Coherence tomography for Glaucoma evaluation.

- OCT is like a body CT scanner except developed specially for the retina. Mehta International Eye Institute has brought in, for the first time the Superfast 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



## How is glaucoma treated

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

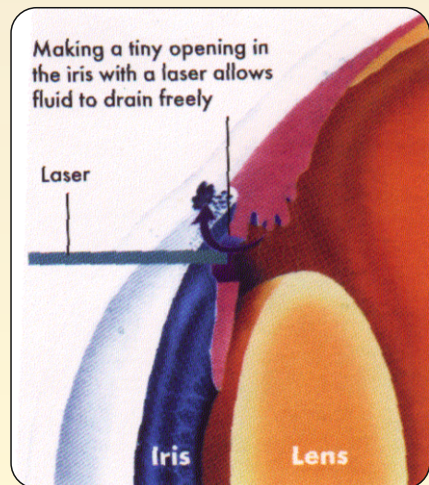
- Eye Drops - These are the most common form of treatment and must be used systematically. The drops can be varied to best suit the patient and the type of glaucoma. Usually medication is a long term control requirement and need to be put regularly. And the patient should never discontinue the drops 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 they 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's 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.



# Glaucoma Treatment

## Laser Trabeculoplasty :

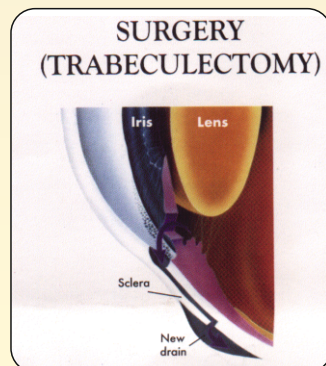
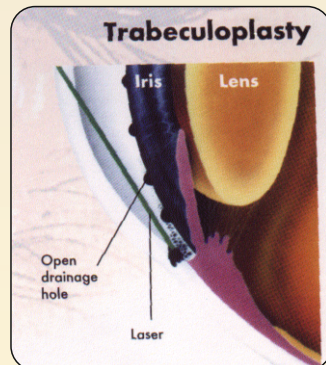
This procedure is fairly effective in patients with chronic open angle glaucoma. Its immediate results are good but the treatment is short-term and needs to be repeated. Essentially it's a stop gap measure to delay surgery.

## Glaucoma Surgery :

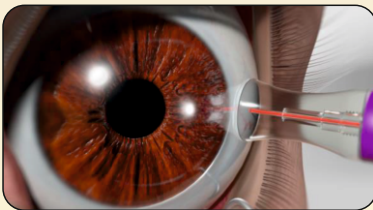
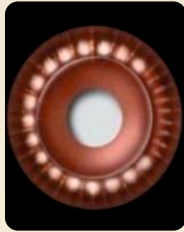
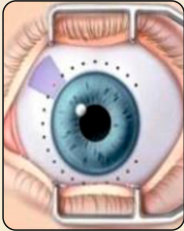
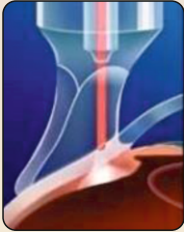
This is performed usually after eye drops and laser have failed to control the eye pressure. A new channel for the fluid to leave the eye is created. Glaucoma surgery is indicated when no other safe alternative is available to consistently maintain the IOP ( eye pressure) within the required limits by 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

- (1) 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.



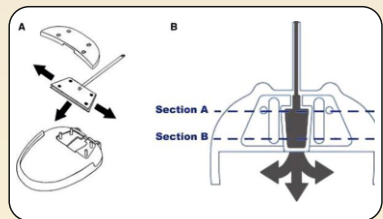
# Cyclodiode Laser (Cyclophotocoagulation)



- **Diodel LASER Cyclophotocoagulation** technique which works in a far better fashion. Cyclodiode laser (cyclophotocoagulation) is a non-invasive, typically outpatient procedure that lowers high eye pressure in refractory or advanced glaucoma. By applying laser energy to the ciliary body, it reduces aqueous fluid production. It is usually chosen when other treatments, such as drops or surgery, have failed or are unsuitable
- **Key Aspects of Cyclodiode Laser for Glaucoma :**
- **Procedure :** A laser probe is placed on the white of the eye (sclera) to deliver energy, usually under local anesthesia.
- **Alternatives :** Newer techniques include Micropulse Transscleral Cyclophotocoagulation (MP-TSCPC), which uses shorter, lower-energy pulses to reduce inflammation.
- **Indications :** Often used for advanced glaucoma, neovascular glaucoma, or cases where other surgeries have failed.
- **Benefits :** Effectively lowers intraocular pressure (IOP) and can relieve pain.
- **Risks & Side Effects :** Common side effects include temporary pain, inflammation, and a bloodshot eye. Rare, severe risks include excessive reduction of eye pressure (hypotony)

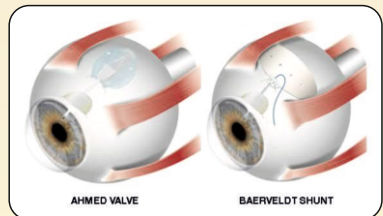
# Ahmed Glaucoma Valve

The Ahmed Glaucoma Valve (AGV) is a silicone or polypropylene tube shunt designed to lower intraocular pressure (IOP) in patients with uncontrolled or refractory glaucoma. It drains excess eye fluid (aqueous humor) through a valve mechanism, preventing excessive drainage (hypotony). The procedure is generally safe and often used for refractory glaucoma, with success rates as high as 85-90% reported in specific populations.



## Key Aspects of the Ahmed Valve

- **Mechanism** : It consists of a drainage tube connected to a silicone plate with a unique one-way valve that opens only when eye pressure rises, reducing the risk of hypotony.
- **Procedure** : A 1 to 1.5-hour outpatient surgery where the device is placed on the white part of the eye under the conjunctiva.
- **Indications** : Primarily used for refractory cases, including neovascular glaucoma, congenital glaucoma, and failed previous surgeries.
- **Post-Op Care** : Involves steroid and antibiotic eye drops for several weeks.



# The latest in Glaucoma surgery .. MIGS

## Microinvasive Glaucoma Surgery (MIGS)

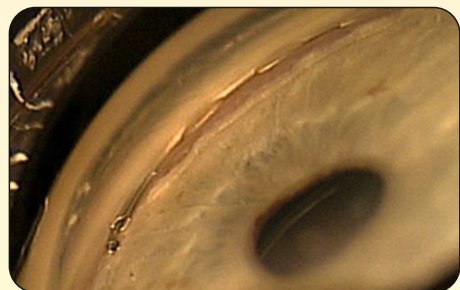
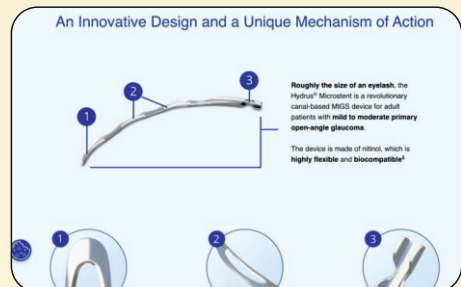
Consists of safe, rapid-recovery procedures designed to lower intraocular pressure (IOP) in mild-to-moderate glaucoma patients. Utilizing microscopic devices and techniques, MIGS improves fluid drainage with less tissue disruption than traditional surgery. Often performed during cataract surgery, it is ideal for patients needing to reduce reliance on eye drops.

### Key Aspects of MIGS

- **Purpose** : To lower eye pressure & reduce reliance on glaucoma medication.
- **Candidates** : Patients with mild to moderate open-angle glaucoma, particularly those struggling with eye drop compliance, side effects, or uncontrolled pressure.
- **Advantages** : High safety profile, minimal trauma, and rapid recovery (usually 1–2 weeks)
- **Types of Procedures:**
  - Trabecular Bypass** : Using stents to bypass the blockage, such as the iStent or Hydrus.
  - Trabecular Surgery** : Removing tissue with devices like the Kahook Dual Blade to improve drainage.

## Typical Procedure Details

- **Duration**: Often short, typically lasting around 5 minutes.
- **Recovery** : A few weeks of using antibiotic or steroid eye drops.
- **Combination** : Frequently done alongside cataract surgery.





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F.R.S.H. (London), F.I.C.O.R, F.I.O.S (USA)

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Consultant Ophthalmic Surgeon  
Medical Director & Chief  
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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◆ 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.

◆ Received the "ASCRS Honored Guest Award", the highest recognition award by the American Society of Cataract and Refractive Surgeons, (ASCRS), the world's largest ophthalmic society, at the ASCRS Annual Symposium held in Boston, USA this April, 2014 by the President of the Society, Prof. Dr. Eric Donnenfield.

◆ Awarded the Antonio SCARPA Medal and Oration of the Italian Ophthalmic Society, which is the highest honor given by the Italian Ophthalmic Society for outstanding Work, Research, Outstanding Surgical Skills in Ophthalmology by the President of the Society, Prof. Matteo Piovella in Milan, Italy, May 2014.

◆ He has been honored by the Swiss Eye Research Foundation, by the President of the Swiss Ophthalmic Society, Prof. Bojan Pajic at the recently concluded Congress EyeAdvance Focus conference, June 2014.

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

◆ 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



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## **Knowing Prof. Dr. Keiki R. Mehta**

- ◆ 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 Indian 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. Presented advanced research papers on Lasik Internationally and won the Outstanding Presentation Award at San Diego, USA.
- ◆ 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 EyeAdvance Congresses for the last 26 years 1996-2023 These have now reached an iconic status and are recognized worldwide.



**Prof. Dr. Keiki R. Mehta**  
receives the Grand Honors award from the  
ASCRS in Boston at the hands of the  
President Prof. Eric Donnenfield



**Prof. Dr. Keiki R. Mehta**  
receives Leading International  
Ophthalmological Award from  
Swiss Eye Research Foundation Award



**Prof. Dr. Keiki R. Mehta**  
presented the Prestigious  
Antonio Scarpa Medal in Italy.



**Padmashree**  
*Awardee*

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**KRM Eye Institute Pvt. Ltd.**

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Opp Woman's Graduate, Union Hostel, Colaba, Mumbai 400005, India

☎ **+91-22-22151303 | 22151676**

☎ **+91-9372631041 | 9321731041 | 9137211660**

☎ **+91-9820021041**



✉ [admin@mehtaeyeinstitute.com](mailto:admin@mehtaeyeinstitute.com) | 🌐 [www.mehtaeyeinstitute.com](http://www.mehtaeyeinstitute.com) / [www.mehtaeye.com](http://www.mehtaeye.com)