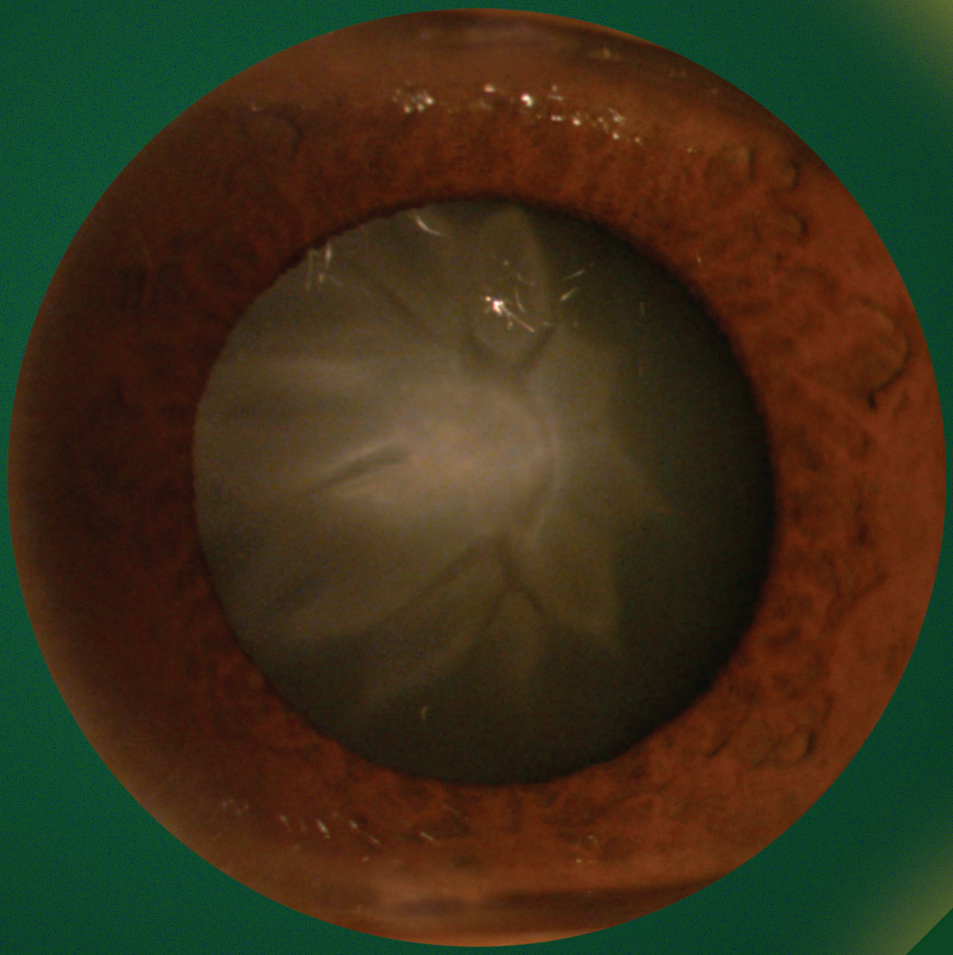
MPSOS TIMES

Vol 02 (Cataract) Apr - Jun 2023



MADHYA PRADESH STATE OPHTHALMIC SOCIETY
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Your **Vision** Our **Experience.**
IN CATARACT

In Pain and Inflammation associated with Cataract Surgery

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Nepafenac Ophthalmic Suspension 1mg/ml

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Disappearing Preservative*
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REFERENCE:

1. Kaur IP, Lal S, Rana C, Kakkar S and Singh H. Ocular preservatives: associated risks and newer options. *Cutaneous and Ocular Toxicology*. 2009; 28(3): 93–103 | **2.** Aldrich DS, Bach CM, Brown W, Chambers W, Fleitman J, Hunt D, et al. *Ophthalmic Preparations*. Sept–Oct. 2013; Vol. 39(5) | **3.** Allergan: Data on File (Quality control report) | **4.** Allergan: Data on File (Manufacturers packaging report) | *Purite is a brand of Stabilised Oxychloro Complex, a diaspearing oxidative preservative that breaks down into sodium chloride and water when exposed to light

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Abbreviated Prescribing Information
Composition: Each ml of AMPLINAK™ contains Nepafenac 0.1%w/v, **Indications and Usage:** AMPLINAK™ ophthalmic suspension is indicated for the treatment of pain and inflammation associated with cataract surgery. **Dosage and Administration:** One drop of AMPLINAK™ ophthalmic suspension should be applied to the affected eye three-times-daily beginning 1 day prior to cataract surgery, continue the day and through the first 2 weeks of the postoperative period. **Contraindications:** AMPLINAK™ is contraindicated in patients with previous demonstrated hypersensitivity to any of the ingredients in the formula or to other NSAID. **Warnings & Precautions:** Caution should be used when treating individuals who have previously exhibited sensitivities to acetylsalicylic acid, phenylacetic acid derivatives, and other nonsteroidal anti-inflammatory agents. With some nonsteroidal anti-inflammatory drugs including AMPLINAK™, there exists the potential for increased bleeding time due to interference with thrombocyte aggregation. All topical nonsteroidal anti-inflammatory drugs (NSAIDS) including AMPLINAK™ may slow or delay healing. Use of topical NSAIDs may result in keratitis, epithelial breakdown, corneal thinning, corneal erosion, corneal ulceration, or corneal perforation which may be sight threatening. **Use In Special Population:** *Pregnancy:* There are no adequate and well-controlled studies in pregnant women. AMPLINAK™ should be used during pregnancy only if the potential benefit justifies the potential risk to the fetus or should be avoided. *Lactation:* It is not known whether this drug is excreted in human milk. Caution should be exercised when AMPLINAK™ is administered to a nursing woman. *Pediatric Use:* Safety and effectiveness of AMPLINAK™ in pediatric patients below the age of 10 have not been established. *Geriatric Use:* No overall differences in safety or effectiveness have been observed between elderly and younger patients. **Adverse Reactions:** *Ocular Adverse Reactions:* The most frequently reported adverse reactions following cataract surgery were capsular opacity, decreased visual acuity, foreign body sensation, increased intraocular pressure, and sticky sensation, conjunctival edema, corneal edema, dry eye, lid margin crusting, ocular discomfort, ocular hyperemia, ocular pain, ocular pruritus, photophobia, tearing and vitreous detachment. Non-ocular adverse reactions: Headache, hypertension, nausea/vomiting and sinusitis. **Overdose:** Not available. **Pharmaceutical Particulars Presentation & Storage:** AMPLINAK™ ophthalmic suspension is supplied in 5 ml dropper bottle, Store below 30°C in a dark place, Source: Prescribing Information version dated November 2020 Date of updation: Dec 2021 For full prescribing information please contact: Allergan India Private Limited, Level 6 & 7 Prestige Obelisk, Kasturba Road, Bangalore 560001.

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1. Paugh JR, Nguyen AL,et.al, Precorneal residence time of artificial tears measured in dry eye subjects, Optom Vis Sci. 2008 Aug;85(8):725-31. 2. Simmons PA. and Vehige JG. Clinical performance of a mid-viscosity artificial tear for dry eye treatment. Cornea. 2007 Apr;26(3):294-302.

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MESSAGE

Dr Ulka Shrivastava

It is a matter of immense pride and repute that 'Cataract' is the topic for publication in the scientific e-magazine of M.P. State Ophthalmological Society.

Cataract is most commonly observed ophthalmic condition which is also very successfully treatable.

Ophthalmologists of various subspecialties do come across cataract in their routine practices and they should be well versed in treating the conditions, with ever evolving new techniques.

I am sure this volume of publication on 'Cataract' by MPSOS will be useful in updating the knowledge of each of us in this field.

Dr Ulka Shrivastava

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MESSAGE

Dr U.S. Tiwari

Past President & Ex chairman scientific committee, MPSOS

Dear friends,

Greetings!

I am glad to pen for this issue of MPSOS times as an appreciation of the sincere efforts put forth by the chair person scientific committee, Dr Vinita Ramnani and her team to bring out this issue on cataract.

Cataract is the commonest eye ailment that we deal with in our day to day practice. This booklet includes almost all the common clinical situations related to cataract surgery and their management. It covers basics as well as advancements in the field of cataract surgery.

It is indeed a matter of proud that many of our society's members who are national faculty with a vast experience have also contributed for this issue of MPSOS times. I am sure our members benefit by their words of wisdom.
The coordination and efforts put in by the scientific committee in its endeavor to update the members is commendable.

I wish the team scientific committee all success.

Dr U.S. Tiwari

Past President & Ex chairman scientific committee, MPSOS
Email: ustiwarigwalior@gmail.com

MESSAGE

Dr. Y.K Vinayak

Regards seniors and dear friends

We are aware that there are around 30 million people blind in India , of which 12 million are cataract related and 3 million refractive error related. We need to put in place effective strategies to prevent further growth of this population. MPSOS should also play its role in this task.

We plan to prepare forums to create public awareness of eye diseases as to prevent blindness through seminars, pamphlets, radio, television, press and other means of communication media like film, etc.

Achieving a goal without roadmap is like going on a road trip without a map, if you are lucky, you might eventually get to your destination but you will likely end up in some run- down motel. So it is important to have a roadmap which simply reflect your strategy with choices, prioritization of right things and proper communication..

Thank you one and all.

I wish you all a pleasant reading.

With warm regards.

Dr. Y.K Vinayak

Director and Consultant, Vinayak Netradham eye hospitals
Email: yogvin@hotmail.com

MESSAGE

Dr Praveen Khare

Member Scientific Committee, MPSOS

Dear members MPSOS

Scientific Committee of MPSOS is working hard under the guidance of Dr Vineeta Ramnani for MPSOS TIMES on cataract. First volume on Glaucoma has covered the topic comprehensively. The upcoming volume of MPSOS TIMES will cover all the topics starting from basic to the latest in Catarct surgery from renowned cataract surgeon of state and across the nation.

This is first time that MPSOS scientific Committee has done such activity and quality and contents in first edition were of high standard, matchable to any reputed journal of India. So everyone's expectations are high with upcoming editions too. Looking forward to many more such innovations and initiations.

Dr Praveen Khare

Member Scientific Committee, MPSOS
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MESSAGE

Dr Chahveer Singh Bindra
Co-editor MPSOS times

Greetings to all MPSOS members,

It is a matter of great pride to be a part of MPSOS times as a coeditor to bring out this current issue on "Cataract".

MPSOS times has been initiated under the able guidance and leadership of our editor in chief Dr Vinita Ramnani. It has been a great experience to work with our editer Dr Mita Joshi and my coeditors Dr Ravi Chandil and Dr Rahul Chaubey.

The current issue on subspecialty "Cataract" includes case reports, one minute tips, recent advances, surgical secrets and beyond eye section. We have tried to cover most of the important topics pertaining to cataract. I would like to thank all the seniors and my colleagues for sharing their inputs and valuable experience in shaping this current issue.

We aim at enhancing the knowledge in ophthalmology and strive for never ending efforts in serving mankind.

Wish you all happy reading.

Dr Chahveer Singh Bindra
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CONTENTS

EDITORIAL

The Past, Present, and Future of Cataract Surgery

Dr Vinita Ramnani

Chairman, Scientific Committee, MPSOS
HOD, Department of Ophthalmology, Bansal Hospital, Bhopal

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Introduction-

Cataract surgery, a modern-day miracle, has come a long way since its ancient roots in couching. The past and future of ophthalmology are closely tied to cataract surgery, in spite of amazing technical progress, cataracts remain the leading cause of blindness in the world, affecting almost half (45%) of the 40 to 45 million blind people worldwide according to the WHO, this number increases to 180 million when people with visual deficiency are included. Cataract surgery has undergone an incredible transformation over the centuries, from ancient couching practices to modern-day surgical miracles.

The Past: From Couching to IOLs -

The history of cataract surgery dates back to ancient times, with early techniques like couching, where the cataractous lens was manually pushed to the back of the eye. For centuries, cataract surgery saw little fundamental change until the introduction of intracapsular cataract extraction (ICCE) in the 18th century. However, ICCE had its complications due to the removal of the entire lens capsule. A major breakthrough came in the mid-20th century when Sir Harold Ridley implanted the first intraocular lens (IOL) made of polymethyl methacrylate (PMMA). Initially met with skepticism and complications, this innovation paved the way for safer and more effective IOL implants, reducing the need for thick eyeglasses or aphakia after surgery.

The Present: Technological Marvels and AI in Cataract Surgery -

The present-day cataract surgery has evolved into a highly sophisticated and safe procedure, thanks to significant technological advancements. Phacoemulsification, introduced by Dr. Charles Kelman in 1967, revolutionized the process by using ultrasound to break up the cataract, allowing smaller incisions and faster healing times. Today, foldable IOLs made of flexible materials like acrylic and many softer materials have become the standard, enabling easier implantation through smaller incisions. Additionally, premium IOLs, including toric IOLs for astigmatism correction and multifocal IOLs for presbyopia, provide patients with the potential for spectacle independence. Furthermore, the advent of femtosecond laser-assisted cataract surgery (FLACS) has offered more precise corneal incisions, capsulotomy, and lens softening, optimizing outcomes for patients with advanced technology lenses. Extended Depth of Focus (EDOF) IOLs promise continuous vision from distance to intermediate, reducing the dependence on glasses for various activities. Intraoperative aberrometry, OCT and optical Biometers have enhanced accuracy and precision.

The integration of artificial intelligence (AI) and Chat GPT, into cataract surgery has brought transformative benefits. AI algorithms analyze medical imaging data, aiding in the detection and diagnosis of cataracts. They can also predict postoperative refractive outcomes, optimizing IOL selection for personalized visual results. During surgery, AI can provide real-time guidance to assist surgeons, enhancing precision and reducing the risk

of complications. Postoperative monitoring using AI ensures early identification of any issues or complications, leading to better patient outcomes. collaborative partnership between human expertise and AI assistance is set to revolutionize cataract surgery, making it even safer and more effective.

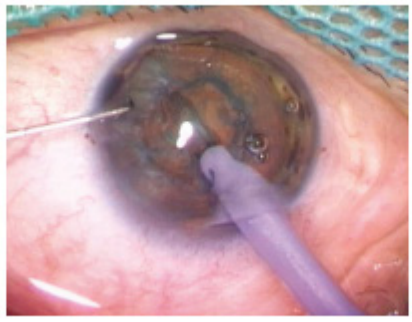
The Future: Advancements and Innovations-

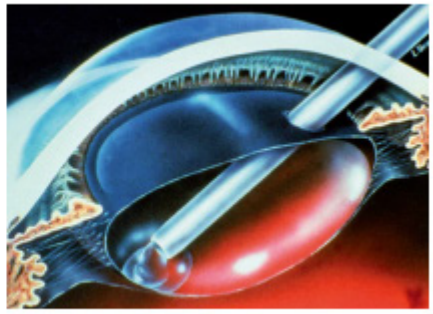
The future of cataract surgery is ripe with exciting advancements and innovations. Exciting development on the horizon is adjustable lens technology, in which the implanted lens power can be adjusted postoperatively with a secondary non-invasive or invasive procedure, and light-adjustable IOLs, multicomponent IOLs, mechanically adjustable IOLs, and magnetically adjustable IOLs. This technology will lead to a higher level of precision in cataract surgery. Light-Adjustable IOLs (LAL) technology allows for postoperative power adjustments, enhancing refractive accuracy and reducing the need for IOL exchange surgeries.

Artificial intelligence-driven IOL calculations based on patient-specific data will further optimize refractive outcomes, improving spectacle independence. Next-generation femtosecond lasers will refine FLACS procedures, making them more efficient and precise. Extended Reality (XR) visualization, including augmented reality and virtual reality, will enhance surgical planning, visualization, and guidance, further improving surgical outcomes. Robotic-assisted cataract surgery shows promise in enhancing surgical accuracy and reducing human errors.

Conclusion:

Cataract surgery may be considered one of the most successful treatments in all of medicine. With continued advancements in techniques and technology, cataract surgery has evolved into a refractive procedure rather than simply a surgical treatment of cataract. With the continued collaboration between medical professionals, researchers, and AI developers, the future of cataract surgery holds the promise of unprecedented precision, quicker recovery times, and better overall outcomes. Looking to the future, the possibilities for cataract surgery seem endless, with personalized, precise, and safe procedures on the horizon. As the field continues to evolve, patients can expect even better outcomes and an improved quality of life after cataract surgery.





EXPERT OPINION ON MFIOL

Expert Panelists

Dr. Rajiv Choudhary (RC)

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Q1: What are different varieties of MFIOL you are using?

RC- We are mostly using EDOF IOLs and Multifocals. We decide the type of IOL as as per patient's visual activity and requirement while work and ocular status. In my practice I usually prefer MFIOLs like panoptix, EDOF IOLs like vivity,symphony, lucidis and Hybrid models like synergy as per patient's need.

VKN- Now a days I am stick to diffractive trifocals, EDOF and hybrids only. Initially used refractive, diffractive, accommodative and extended vision MF IOLs .

Refractive and diffractive are two common optical designs used in multifocal intraocular lenses (MFIOLs). There principles determine how the lens distributes light to provide both near and distance vision.

PB- Diffractive MFIOLs are the established and more pronounced lenses, they tend to provide better contrast sensitivity and less glare compared to refractive MFIOLs. However, they may exhibit reduced image quality in intermediate distances, resulting in a trade-off between near and intermediate vision.

Some MFIOLs combine both refractive and diffractive elements to leverage the advantages of both designs. These hybrid lenses aim to provide a balance between image quality, depth of focus, and visual side effects. The specific design of the MFIOL and its performance characteristics can vary among different MFIOLs.

I commonly use following diffractive MFIOLs as per patient's requirement and budget:

Bifocal IOLs: These lenses have two distinct optical powers, usually optimized for near and distance vision.

Trifocal IOLs: Trifocal lenses have three optical powers that allow for near, intermediate, and distance vision. They aim to provide clear vision at multiple focal points.

Extended Depth of Focus (EDOF) IOLs: EDOF lenses are designed to provide a continuous range of vision from distance to intermediate and to some extend near vision. They use advanced optical technology to elongate the range of focus.

Multifocal Toric IOLs: These lenses are a combination of multifocal and toric technologies, addressing both presbyopia and astigmatism.

RS- **I have used and using**

(1) Alcon Panoptix & Panoptix Toric (trifocal)

(2) Tecnis trifocal and Toric trifocal

(3) Alcon Vivity and Vivity Toric (EDOF)

(4) Alcon Restor & Restor Toric

(5) Care group Acrydiff (Multifocal)

Q2: Indications of MFIOL?

RC- In today's scenario cataract surgery is a refractive surgery. So all those patients who want spectacle free life are good candidates for MFIOL and EDOF IOLs except where these IOLs are contraindicated

VKN- Better to discuss contraindications, rest would be the indications.
Irregular corneas with higher order aberrations
Deep corneal opacities in pup area, superficial can treated with PRK and then can be planned for MF IOL
Irregular pupil, eccentric pupil, coloboma of pupil, atrophic iris
Zonular weakness, if bag is lax and weak all around. CTR and segment not able to stabilize the bag enough.
Retinal Factors, retinitis pigmentosa, ARMD, diabetic macular oedema with retinopathy, ERM and other vascular pathologies involving macular region.
Any optic nerve disorder that compromises the visual acuity. Advanced glaucoma
Alternate divergent squint patient may not get advantage of binocular vision, hyperopic with mild exotropia will have same effect .large angle Kappa. Partial amblyopia
A child below the age of 12 year, I consider is not a good candidate of MF IOLs.
A person who wants unrealistic improvement.
Person and profession who is annoyed with glare and halos in night driving.

PB- MFIOLs are designed to provide both distance and near vision, reducing the dependence on glasses or contact lenses for various tasks. The indications for MFIOLs include:

Cataracts: MFIOLs are primarily used in cataract surgery when the natural lens of the eye becomes cloudy, due to any reason and affects vision.

Presbyopia: Presbyopia is an age-related condition that affects the ability of the eye to focus on near objects. MFIOLs can help correct presbyopia by providing near vision in addition to distance vision.

Refractive Lens Exchange (RLE): Many individuals and people who lead active lifestyles prefer to reduce their reliance on corrective eyewear for daily activities such as reading, working on a computer, or engaging in hobbies. MFIOLs even without cataract, offer the possibility of improved vision at different distances, decreasing the need for glasses or contacts.

The decision to use MFIOLs is based on several factors, including the overall health of the eye, the patient's visual needs, and their expectations.

I personally do not prefer doing RLE, my first preference would be to perform other established refractive procedures like LASIK Laser or Phakic IOL (ICL) in the absence of cataract. This is because of high chances of developing macular pathologies (CME, CNVM etc.) and Retinal detachments post operatively even in an uncomplicated surgery case. If need be, I might do it in the cases of high hypermetropia but largely avoid in high myopia cases.

RS- **My criteria**

(A) On scale of 0 to 10 with zero means no issues and 10 means a lot of issues .. how would you rate your comfort levels with glasses for reading after cataract surgery and IOL implantation.. if the answer is 5 and above then I start talking about the presbyopia correcting lenses.

(B) Patient wants the presbyopia correcting lenses

(C) Preferably no MGD but if it's present then should be a treatable MGD, and I treat it before the go ahead with surgery. it might take a few weeks to a couple of months .. but I wait till it's treated.

(D) No corneal abnormalities

(E) No Glaucoma (for Trifocals)

(F) No Retinal Pathology (for Trifocals)

(G) For EDOF IOLs Glaucoma and diabetic retinopathy upto moderate NPDR without CSME are also included.

Q3: Preoperative evaluation?

RC- Preoperative examination is very crucial to rule out any contraindications which may lead to unhappy patients. So the initial workup before surgery should always be meticulous and precise. We need to evaluate any corneal pathologies, dry eye, zonular weakness, any retinal abnormalities, aberrometry, angle kappa to minimize dysphotopsia and choosing the correct IOL for best outcome. Lastly biometry and patient counselling is of foremost importance for post operative visual outcome and patient satisfaction

VKN- Accurate preoperative diagnostics are essential with Preoperative patient counseling and proper surgical planning, goal is to achieve anatomic success with the multifocal IOL.

SLE a thorough examination from anterior to posterior pole is important.

Astigmatism play an important role. Should not be more than 0.75D, try to put incision on steep axis to neutralize it further. More astigmatism can be neutralized with LRI and Toric MF IOLs.

Topography tells us regularity of astigmatism, dioptric power of central cornea 3 mm or less, any past history of refractive surgery will be revealed. Also estimation of aberrations is important for visual outcome

Posterior corneal astigmatism essential factor to have total magnitude of astigmatism, pantacam can measure it, Barrettes formula add this factor as one of its inherent feature by extrapolating with anterior astigmatism when we feed in formula.

Good macular functions proper fundus examination added by OCT if needed

Perfect Biometry optical and immersion that too with surgeons factor with different variety IOLs.

PB- A comprehensive ocular examination is performed, including visual acuity, refraction, intraocular pressure measurement, complete slit lamp and fundus examination of both eyes to assess for any conditions that may affect the success of the surgery or the visual outcomes. Conditions such as glaucoma, other optic nerve diseases, macular degeneration or retinal diseases are evaluated and managed if necessary.

The cornea's shape, and curvature, any opacity, degeneration or dystrophy are assessed by Topography/Tomography/ASOCT/Specular Microscopy to rule out any irregularities and ensure the safety of MFIOL implantation.

The quality and stability of the tear film is evaluated, as dry eye syndrome or other tear-related abnormalities can affect visual outcomes after the surgery. If necessary, treatment for dry eye may be initiated before planning for the MFIOL procedure.

Precise measurements of the eye's biometric parameters preferably by optical biometer or by immersion biometry are obtained. These measurements include axial length, corneal curvature, anterior chamber depth, and lens thickness. These measurements help determine the appropriate power of the MFIOL. IOL power is calculated meticulously by fourth generation Barrett or other reliable newer IOL calculation formula.

Assessment of visual needs and expectations is very important, I discuss with the patient for the desire for spectacle freedom and the visual needs and expectations after the surgery. I ask for the occupation and lifestyle such as - Sports, Artist, Avid reader, Drivers etc. This discussion helps me in selecting the appropriate MFIOL design that matches the patient's requirements.

I strongly recommend MFIOLs for - Housewives, retired elderly persons, persons with dementia, parkinsonism, persons who are bed-ridden but mentally active. Obviously, there should be no other contraindications

Finally, I will discuss the potential risks and benefits of MFIOL implantation, ensuring

that the patient is fully informed and able to make an educated decision about undergoing the procedure. Always promise less and deliver more, this would provide happier post op patients

RS- - Counselling sessions, two, one by counsellor then a 5 minute session with me and patient

with relatives, my session is telling all the cons only. Also telling that once they acknowledge the cons they will be signing it in the Multifocal / EODF consent form before the surgery. That makes them listen to all the cons very carefully and ask questions which are very valid and I am able to clear the doubts. We don't promise spectacle free vision BUT less spectacle dependance, with very clear scenarios where the glasses will be needed.

- Blood pressure check

- Blood tests- CBC, ESR, RBS, HBsAg, HCV, Retroviral screening (HIV), Conjunctival swab for

gram staining. If Diabetic then fasting and Post meal sugars along with HB1AC

- Medical fitness compulsory from a physician including an ECG, and a cardiac fitness from the

treating cardiologist and to follow medical and dietary restrictions as advised.

- Schirmers, T-BUT and Roplas test

- Specular count

- Autoref K values, Lenstar K values, Pentacam K values and old glass power and correlation

between them to make sure the Ks are axis are in order.

- Axial length with Lenstar & with immersion A-Scan

- Lenstar gives most of the modern formulas (Holladay, SRK-T, Barrett, Hill RBF and Hoeffer Q)

(my choice is Barrett and SRK-T) and we use online toric calculator from Alcon, Tecnis and

Barrett's online calculator.

- Depending on the Axial length used we use the optical and Ultrasound A constants respectively, didn't feel the need to customise the A-constant.
- The IOL power chosen is closest to zero preferably a slight on the negative side
- All tests are done in both eyes and repeated if any test does not correlate with other

Q4: When not to use MFIOL?

RC- There are not very absolute contraindications regarding MFIOL use. It entirely depends on the surgeon's preference and patient's expectation. But what I look for as red flag while deciding MFIOL for my patients are:

- Monofocal IOL in fellow eye (relative)

- Ocular morbidity like severe dry eye, corneal pathology, compromised retina

- Previous keratorefractive surgery (relative

VKN- An appropriate selection of formulae is essential for best outcome. I choose Barrettes and Haigis, always compare these two. Hoffers Q for shorter eyes. In post refractive patients, correcting factor **K** readings then calculating IOL power is predict corrected value. Using Shamma's formula is of help.

PB- Diffractive MFIOLs may not be suitable for individuals who have pre-existing eye conditions such as macular degeneration, diabetic retinopathy, advanced glaucoma, pupillary mydriasis and corneal opacity/irregularities. These conditions can affect visual outcomes and may interfere with the performance of MFIOLs.
MFIOLs may not be ideal for individuals who have high visual demands or rely heavily on crisp, high-contrast vision. Some patients, such as professional drivers or pilots, may require excellent distance vision or have specific visual requirements that may not be fully met with MFIOLs.

MFIOLs should better be avoided in cases with intraoperative complications during surgery like PC Rent, Zonular dehiscence, Extended CCC etc.

It's important to exclude patients considering MFIOLs to have unrealistic or hypercritical expectations about the potential visual outcomes. Patients requiring to drive vehicles for long hours, especially at night should be discouraged for MFIOLs.

Patients with certain neurological or perceptual conditions, such as amblyopia (lazy eye) or visual processing disorders, may not benefit fully from MFIOLs. These conditions can affect the brain's ability to interpret multiple focal points and may lead to visual disturbances.

RS- **Contraindications**

(A) A patient who can't wait for the full evaluation and keeps asking reception staff (how much

more time will it take)

(B) Bossy patients or those who refuse a counselling session

(C) Those who want a guaranteed spectacle free vision

(D) For both trifocals and EDOFs - Non treatable MGD, Severe NPDR, PDR, any

macular pathology, any prior intraocular procedure (AGS, retinal injections or lasers, RK, Lasik, PRK), Myopic maculopathy, recurrent Uveitis, any systematic disease that leads to any ocular pathology or warrants a long course of steroids or any medication that has an effect on macula.

(E) For trifocals - all included above plus moderate NPDR, Glaucoma

(F) For EDOF - nothing exclusive, only the points mentioned above.

Q5: Tips to optimise outcome of MFIOL?

RC- Today's cataract surgery is evolving towards refractive procedure and MFIOLs allows major spectacle independence and quality of vision. An accurate preoperative workup is of utmost priority for excellent visual outcome. I usually prefer undilated optical biometry with IOL Master 700 or Lenstar, a complete aberration profile with i-trace, and compare astigmatism and keratometry with corneal topography (Pentacam) for better accuracy. OCT macula is checked in all patients. Angle kappa & angle alpha is evaluated. Anterior segment OCT evaluation for posterior capsule integrity in all posterior polar cataracts is also checked. Intraoperative IOL centration should be good enough.

I believe when all evaluations concluded together for choosing MFIOL, it can give optimized outcome and happy patient

VKN- Address DED and MGD before surgery
Flawless and no complication surgery
360 degree cover of IOL with CCC rim
IOL positioning with perkinje images for proper centration and alignment with optical axis
Posterior capsule polishing
Early address to PCO
Avoid post op inflammation
Address to post op residual refractive error.
Sympathetic approach to unhappy post op patients and try to evaluate the errors and rectify them as per the need of patient.

PB- We should remember that Diffractive MFIOLs can provide enhanced near, intermediate and distance vision at the same time they may also result in some visual disturbances, such as poor contrast, glare or halos, particularly in low-light conditions. Therefore, proper patient selection and counselling is very important.

Treat dry eye, corneal or macular pathologies (if possible) before the surgery.

Plan MFIOL/TFIOL for housewives, non-driving life style persons with no other ocular pathology.

Plan pure EDOF IOL like Alcon Vivity or Tecnis Eyehance for almost any monofocal lens patient, like uncontrolled diabetes, very active lifestyles, and in Optic Nerve/Macular/ Corneal pathologies.

Select an IOL which has stable Toric correction possibility, Implant Toric multifocal or EDOF IOLs to correct small amount (1D or more) of astigmatism for the better visual outcome and patient satisfaction.

The key to success is the immaculate, uncomplicated surgery with 360° CCC-IOL overlap. At the end of surgery, the IOL should be well centred and accurately aligned.

Understand that adapting to MFIOLs may require some time and visual training. The brain needs to adjust to the multifocal nature of the lenses. Reassure your patient and give time to the visual system to adapt to the MFIOL effectively.

In a case with suboptimal visual outcomes post presbyopia correcting IOL surgery examine thoroughly and try to find out any cause for it. There could be dry eye, macular pathologies - ERM, CME etc., misaligned toric lens or erroneous biometry or keratometry.

Lastly, do not hesitate to do Lasik Laser touch ups for the Residual Refractive Errors at later date.

RS- **Tips**

(A) I see all the scans and values of all printouts, just a glance to rule out any error in scan, a SD

under 0.1 preferably.

(B) We always order an extra IOL

(C) We at our centre highlight the right eye finding with fluorescent yellow marker and left with

blue marker and the pre op sheet also has the same marker that way there is less confusion.

(D) Intaop- we use a 5.25mm corneal ring marker, a complete CCC is must, special caution while

cortical clean up

Q6: MFIOL in paediatric patients??

RC- MFIOL in pediatric age group has been supported in many literature. Implantation of MFIOL allow rapid visual rehabilitation and reduce risk of amblyopia. However at present IOL power calculation is a major issue in this age group and I usually prefer EDOF lOLs in this age group over MFIOL in unilateral or bilateral cataract surgery.

VKN- MFIOL in pediatric paediatric in my practice not before 12 years that too with multiple sittings of counselling

PB- The long-term effects of MFIOL implantation in pediatric patients are not well-studied or established, since these lenses are designed primarily for presbyopia correction in adults.

They are typically not recommended for pediatric patients due to several reasons:

Ongoing Eye Growth: Pediatric eyes are still undergoing growth and development. The shape keratometry and size of the eye can change significantly during childhood and adolescence. Implanting a fixed power MFIOL may not accommodate these changes appropriately and may lead to refractive errors or visual disturbances.

Visual Adaptation: Pediatric patients may have difficulty adapting to the bifocal or trifocal nature of MFIOLs. Younger patients have a more neuroplastic visual system, and their brains may not be as capable of adjusting to the simultaneous near and distance focal points provided by MFIOLs. This could result in reduced visual quality or difficulty in focusing.

Long-Term Visual Outcomes: The long-term effects of MFIOL implantation in pediatric patients are not well-studied or established. Since these lenses are designed primarily for presbyopia correction in adults, the potential impact on visual development and stability in children is uncertain.

Revisions and Replacements: Pediatric patients may require additional surgeries or interventions as they grow and their ocular parameters change. Implanting MFIOLs at a young age could necessitate more frequent revisions or replacements as the child's visual needs evolve. This increases the risk and complexity of the surgical procedures.

Challenges in IOL power calculations: IOL power calculations in paediatric age group is less reliable. Their predictability is less, which is the most important prerequisite for the MFIOLs.

However, in recent years, there has been interest in using multifocal IOLs in certain paediatric cases like older children (above 12 years of age) who have good visual potential with no ocular comorbidity and have better tolerance for the multifocal optics. However, careful patient selection and thorough preoperative evaluation are crucial to ensure that the benefits of multifocal vision outweigh the potential drawbacks.

I personally do not have any experience of implanting MFIOLs in paediatric age group patients less than 15 years of age.

RS- Not yet

Q7: How to compare MFIOL with EDO ?

RC- Both the IOLs have their own pros and cons. EDOF IOLs create a single elongated focal range of vision whereas MFIOLs has different zones of different power providing near, intermediate and distance and needs Neuroadaptation. At my scenario I used EDOF IOLs when patient wants a good distance and intermediate range of vision and is comfortable to wear minimal near glasses. MFIOL is preferred when patient wants good near vision also. Dysphotopsia again is more with MFIOL so patient like night driver, pilots, should be advised EDOF IOLs. As per contrast reduction, MFIOL reduces more than EDOF IOL.

VKN- MF IOLs have crisp distance, intermediate and near vision but with a disadvantages of halos and glare
Pure EDOF IOLs has elongated focus curve hence the quality of vision is compromised, more for near. On top if there are higher order aberrations it may not be acceptable to patients.
Now a days we have hybrid and combination of IOLs with refractive / diffractive and addition of EDOf technology to improve the vision with less glare and halos. Hence as per the need of patient these IOLs along with toric variety can be offered. All eyes are different in anatomy, physiology and need varies with the lifestyle of patients, so consider all above before offering these all IOLs.

PB- MFIOL (Multifocal Intraocular Lens) and EDOF (Extended Depth of Focus) both are types of presbyopia correcting intraocular lenses. While they aim to improve distance and near vision, they differ in their mechanisms and characteristics. Here's how we can compare MFIOL with EDOF.

MFIOLs have multiple focal points that allow for clear vision at different distances. They typically have concentric rings or diffractive zones on the lens surface, which divide the incoming light to create multiple focal points.

EDOF lenses, on the other hand, use a different optical design, to provide a continuous range of clear vision by extended depth of focus technology by manipulating spherical aberrations or by wavefront manipulation. They might additionally use diffractive elements to produce EDOF effect or use a limiting aperture pin hole effect to extend the depth of focus. Some IOLs have combinations of any of these features.

Trifocal, MFIOLs are newer generation lenses, they offer distinct focal points for near, intermediate, and distance vision. This allows for good vision at multiple distances but can result in some degree of compromise in visual quality or contrast sensitivity. EDOF lenses provide a continuous range of vision, often optimized for intermediate to near distances, while maintaining good distance vision. They aim to reduce the need for glasses at intermediate distances, such as for computer work or reading from Laptop/ Tablet. The near vision with EDOF IOLs may not be as good as it is with MFIOL.

MFIOLs may offer sharper vision at the different focal points, but some patients may experience halos, glare, or reduced contrast sensitivity due to the nature of their optical design. EDOF lenses strive to provide a more continuous range of vision, which can result in improved overall visual quality. However, some individuals may still experience minor visual disturbances, albeit to a lesser extent compared to multifocal lenses.

The choice between MFIOLs and EDOF lenses depends on various factors, including the patient's lifestyle, visual needs, and personal preferences. MFIOLs are often preferred by individuals who have a high demand for near vision tasks, such as avid readers and those who work extensively on near tasks, or people who require precise vision at multiple distances like professional photographers or an active office worker. EDOF lenses on the other hand may be more suitable for patients who desire a broader range of clear vision across distances without compromising visual quality. Therefore, it is crucial to determine the need or requirements of the patient looking at his/her profession and lifestyle.

MFIOLs typically may require a period of adaptation as the brain adjusts to the different focal points, and some individuals may find the transition challenging. EDOF lenses may have a shorter adaptation period like a monofocal IOL, as they provide a smoother transition of focus. However, individual experiences may vary, and patient satisfaction depends on personal expectations, lifestyle, and visual demands.

RS- Trifocal

Patients who are type B personality b. Those who drive less at night

Young adults

(C) An IT guy

(D) Patients with 20 & 40 inch working distances for more than 4 hours daily

(E) Good vision at all distances but the glare is frustrating and adjusting to glare is difficult in

25-30%

Very Less forgiving IOL

(G) Few patients have complained working in dim lit areas.

EDOF

(A) My preferred choice

(B) Anyone who wants less dependence on spectacles for intermediate vision (newspaper, mobile, tabs & computers)

(C) Very forgiving IOL (minor surprises are less worrisome) d. No complaints working in dim lit areas so far.

RECENT ADVANCES

THE ADVANTAGES OF FEMTOSECOND LASER-ASSISTED CATARACT SURGERY

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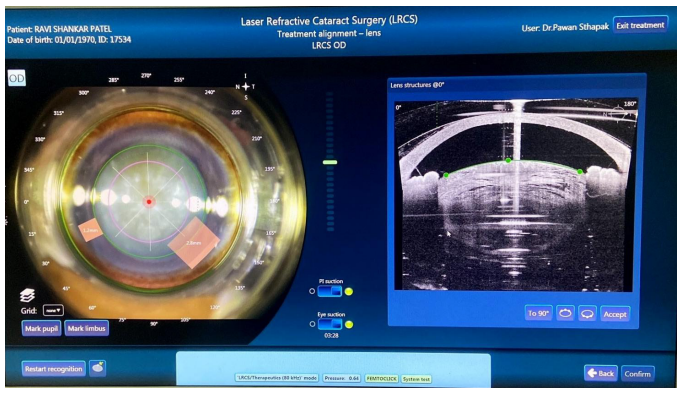
Introduction

Four years ago, when the femtolaser technology entered the field of cataract surgery, it aroused much controversy among ophthalmologists. Some surgeons considered that manual phacoemulsification is a perfectly controlled technique, combining micro-incisions, fluidics regulation and refined micro- instrumentation and guaranteeing a high level of predictability, adjustability and safety. So what could be the interest in introducing a laser that would make the platform heavier?
Reflecting over the past, surgeons remembered that even the transition from EEC to phaco-emulsification implied a lot of skepticism, since it required the acquisition of new, expensive machines and materials and a long learning curve. Nowadays, every cataract surgeon performs this technique successfully While the transition from EEC to phaco-emulsification, from removing the whole crystalline lens to fragmentation and aspiration of the nucleus, represented a revolution, femtosecond laser-assisted cataract surgery is no revolutionary concept, but it introduces the most advanced technology, which renders all critical steps of phaco-emulsification into a consistent, safe and predictable procedure..

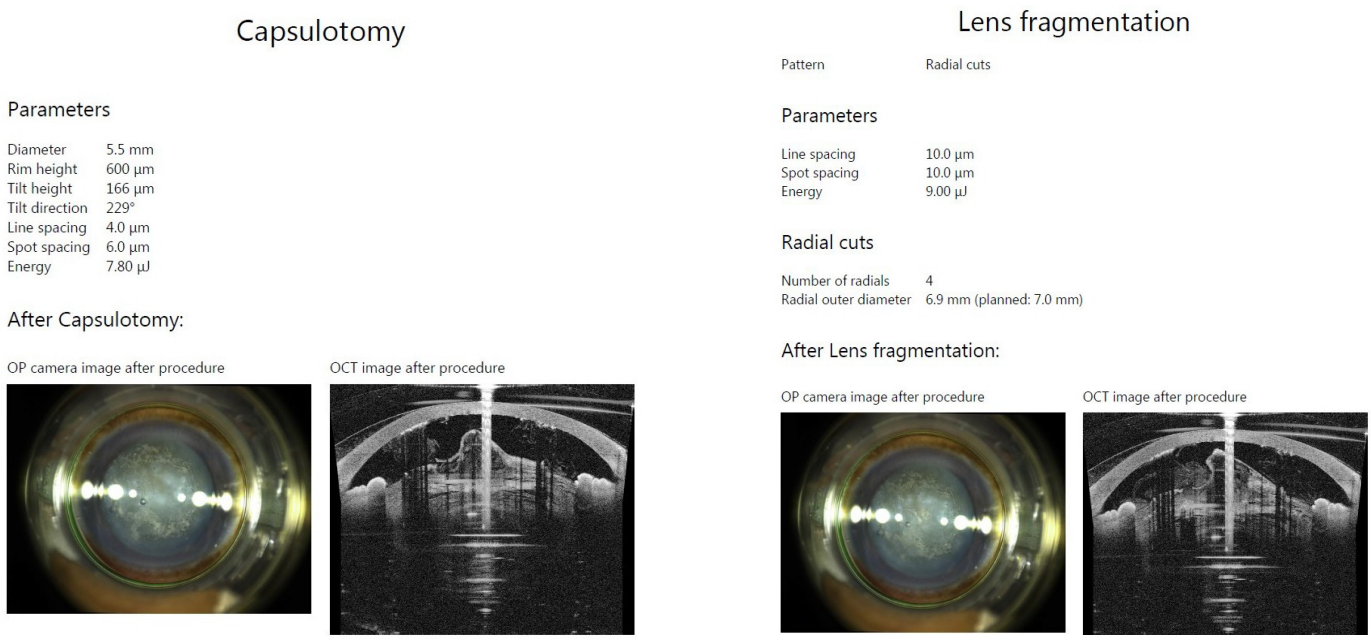
Femtolaser surgery becomes the ideal solution for patients who desire newer, advanced technology intraocular lenses (IOLs) by maximizing their benefit, since the refractive results depend upon a perfectly centered capsulotomy and implant positioning.

Surgical technique

The docking is the first step of the femtolaser-assisted cataract surgery and it determines the safety and the accuracy of the entire procedure. Once it is properly done and the position of the eye is checked on the screen, suction is applied by simply pressing a button.

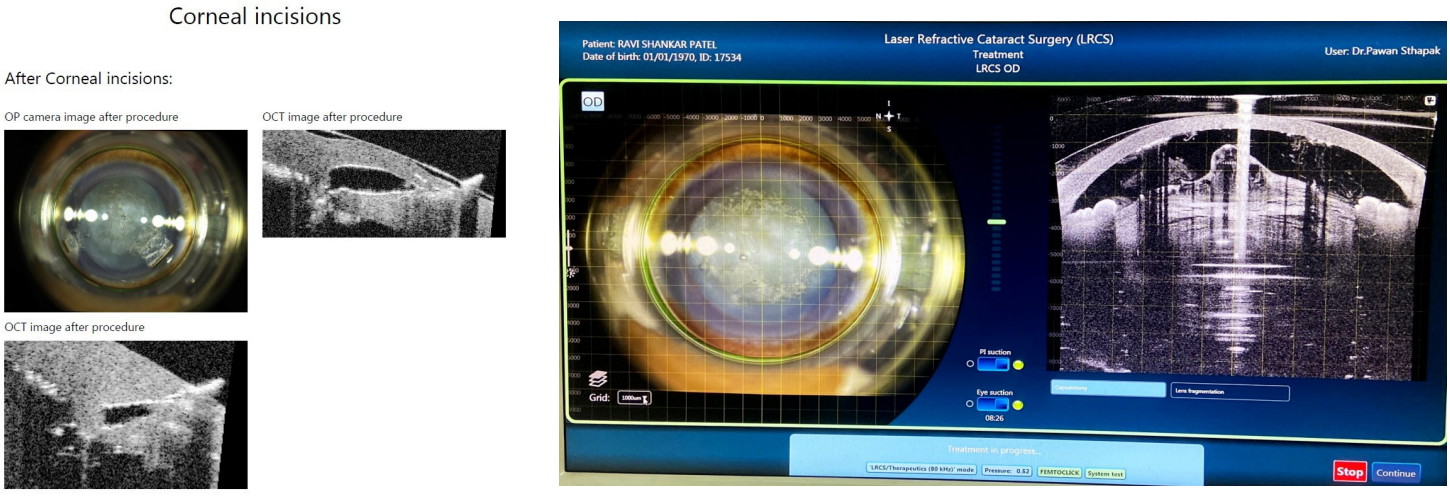


The next step is to center the treatment plan on the screen.



First, the incisions had to be placed. Once the corneal incisions are designed in location, length and width, we are able to focus on the capsulotomy. The size of the capsulorhexis could be chosen according to the IOL optic center and the pupil diameter while paying attention to the iris border. After determining the size, the capsulorhexis could be perfectly centered. It could be done the other way round also.

The last step is to choose the modality of nucleus fragmentation, 4 /8/16 quadrant cracking.



The patient is positioned under the usual operating microscope. After draping the eye, the corneal incisions are opened with a blunt spatula, viscoelastic material is injected in the anterior chamber through one side-port and the anterior capsule is removed with Utrata forceps.

Discussions

The cataract surgery using manual phacoemulsification is one of the most common medical procedures and definitely one of the safest and most effective, but also totally dependent on the surgical skills and experience of the physician. New, advanced technology IOLs are nowadays on the market and patients want surgery at a younger age than ever before with very high expectations regarding the refractive outcome.

The femtosecond laser-assisted cataract surgery is not substantially different from phacoemulsification only the key steps are more consistent and automated. The self-sealing corneal wounds, the more precise and better-centered capsulotomy and the fragmentation of the lens nucleus, all lead to a reduced number of complications. The beauty and novelty of the femtolaser technology consists in our ability to customize the pre- and intraoperative parameters, once the proper suction is achieved, which brings us closer to perfection.

The femtolaser precision is due to the new real time optical coherence tomography (OCT) software programs allowing us to visualize the anterior segment of the eye during every step of the treatment. Peer-reviewed studies have already demonstrated that the femtolaser capsulotomy is better centered and more precise compared to manual capsulorexis. Due to an adequate capsulotomy, a most precious postoperative IOL positioning can be achieved. A properly sized and centered capsulorhexis is essential to reach demanding refractive results. A 360° overlapping capsular edge was thought to be an important feature for standardizing refractive results, preventing optic decentration, shifts toward myopia or hyperopia, tilt or capsular opacification due to symmetric contractile forces of the capsular bag. An irregular or eccentric capsulotomy would lose all these advantages.

With femtolaser technology, the corneal wounds can be created with the desired size, geometry and location. The corneal incisions are self-sealing, preventing wound leakage, maintaining a stable anterior chamber and avoiding postoperative vision-threatening endophthalmitis. The peripheral localization is very important to avoid surgically induced astigmatism (SIA), but it is more difficult to achieve this during the learning curve.

The nucleus is pre chopped during laser- assisted cataract surgery and effective phaco time is optimized. A four-segment pre chop approach is preferred. This allows burying the phaco tip inside the nucleus for a quick and easy separation and emulsification. Another benefit of pre chopping the lens is that it reduces the stress placed on the zonules. This is particularly important in eyes with traumatic cataract, as the zonules are already weak. In our study, we had one case of traumatic cataract with zonular dialysis under 45° in which the femtolaser proved its efficiency.

Conclusions

1. The main advantages of femtosecond laser-assisted cataract surgery are standardized corneal incisions, perfectly centered and round capsulorhexis, lens nucleus fragmentation even in eyes with hard cataracts.
2. The femtolaser precision is due to the new real time optical coherence tomography software program, which covers the whole anterior segment, up to the posterior capsule of the crystalline lens.
3. It is helpful for less experienced surgeons since it requires a short learning curve and the uniformity of its results is beneficial for the patient.

RECENT ADVANCES

WHAT IS THE ORA SYSTEM ?

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The ORA system is a machine that provides the cataract surgeon the ability to measure, refine and verify outcomes during the actual surgical procedure, taking cataract surgery to an entirely new level. ORA system uses the same technology used during LASIK surgery to provide optimal results.
It uses intraoperative wavefront aberrometry, providing real time refractive information to increase the precision & accuracy of IOL selection & positioning. While the ORA system cannot predict the results with 100 % certainty, it allows the surgeon to accurately predict the surgical outcome.
In summary , ORA greatly increases the likelihood of cataract surgery success & reduces the dependance on glasses & contact lenses.

PRINCIPLE :
The devices project light onto the retina & the reflected images pass through the optical system of the eye, distorting its wavefront which is subsequently analyzed according to optical & mathematical principles proprietary to the device.
Instead of a laser light, ORA uses a super luminescent light emitting diode (SLED) & Talbot-Moire Interferometer to take 40 measurements in less than 1 minute.
The ORA analyzes & combines data from the central 4 mm optical zone with a dynamic range of -5.00 to +20.00D & an accuracy of +/- 0.30D. It takes into account parameters such as posterior corneal astigmatism & HOAs, allowing the surgeon to confirm or revise the IOL power chosen according to preoperative biometry.

Figure 1: *ORA display with data entry from conventional biometry technique*

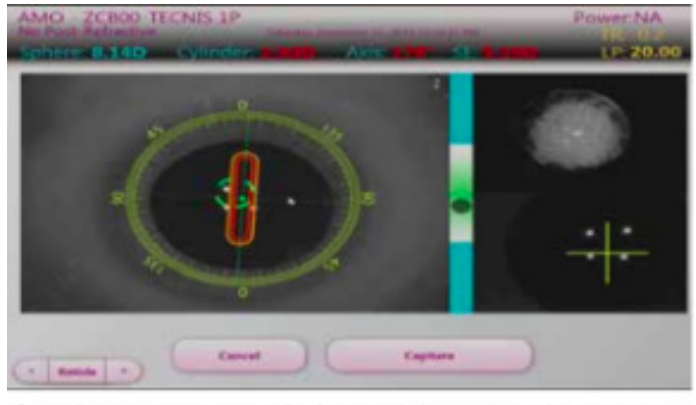

Figure 2: *Intraoperative ORA display in aphakic mode used to capture IOL power. Patient looks at the target light.*

HOW DOES THE ORA SYSTEM WORK ?

The ORA is attached to the surgical microscope with a display adjacent to it & provides continuous streaming measurements of the IOL calculations intraoperatively, ensures proper IOL placement & determines treatment zones for correcting astigmatism.

After phacoemulsification, I & A, chamber is formed with viscocohesive viscoelastic to increase IOP > 25 mmhg. Cornea is washed & ORA is performed in aphakic mode after thorough corneal wash in topical anesthesia. Patient has to look in the target green light & ORA can be captured.

There are settings available for post LASIK, post RK, etc & can be selected as required.

For toric IOL, ORA can be captured in pseudophakic mode & it suggests the required rotation, which can be used to check the correct astigmatism.

It measures the total ocular refraction that accounts for total ocular astigmatism , including surgically induced astigmatism & posterior corneal astigmatism.

The ORA ANALYZOR database can identify outliers mid procedure to help surgeon hit refractive targets with more precision & consistency.

Figure 3: IOL power calculated on the basis of aphakic refraction by ORA

USES :

- ORA can be used for IOL power calculation in normal, small & longer eyes with equal or superior results compared to standard IOL power calculation methods.
- Can measure the refractive power in different meridians & is uniquely suited for TORIC IOLS.

ORA is able to combine anterior & posterior corneal power along with the toricity of the Implanted IOL within the capsular bag, improving the accuracy of the IOL selection.

- Helps surgeons to choose the meridian & length of corneal relaxing incisions when correcting astigmatism.
- The technology is especially useful for patients who have previously undergone RK, LASIK surgery or those who chose a premium IOL implant, or those with astigmatism. In these patients predicting the outcomes of cataract surgery can be difficult & with the ORA system the mystery is gone!

LIMITATIONS :

- The fact that measurements taken during surgery do not reflect the postoperative state of the eye, can introduce inaccuracies in IOL power calculation
- The biometry of the eye can be affected at the time of surgery by patient factors, equipment factors or intraoperative manipulation (such as stromal hydration). These factors can change IOP & axial length, corneal thickness & the refractive index of the anterior chamber.
- Surgeons should be cautious when using ORA on RK patients : the validations & accuracy of its usage in

previous RK patients has not been well studied in peer reviewed literature.

- Reports describes an issue using intraopeartive aberrometer, which may be unique in RK patients, affecting outcome as RK incisions could swell up acutely during the surgery. The cornea shape & curvature at the pressure of 21 mmhg just prior to the ORA reading may be artificially changed, far away from preoperative measurements & because of this acute change, it is also possible to have subsequent changes .

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CASE REPORT

Lens matter In Berger's space "CATARACT BEHIND CURTAIN "

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INTRODUCTION --

Lens matter trapped in Berger's space during phaco emulsification is a common situation but cortical sheet of lens matter found in Berger's space witch totally obstruct the red glow is a rare finding .

CASE HISTORY --

54 year male patient presented with gradual loss of vision in left eye, O/E his visual acuity was PL PR and IOP was within normal limit, papillary reaction was normal, slit lamp examination showed mature cataract.

Phacoemulsification was planned, after doing nucleus emulsification and cortical wash instead of seeing red glow there was a white sheet of cortical matter behind posterior capsule in Berger's space, it was managed by doing posterior capsulorhexis along with anterior vitrectomy , subsequently multipiece IOL implantation was done in sulcus .

On 1st post op day mild inflammation was present and patient had vision of 6/18 , it was managed with topical and systemic steroids , on subsequent follow up inflammation gradually resolved and patient achieved best corrected vision of 6/9 .

DISCUSSION –

Berger's space is a space located between the posterior capsule of lens and anterior hyaloid face, this space is about 4 – 5 mm in diameter and is bounded by weiger ligament witch a ring like attachment of the posterior capsule and anterior hyaloid face. The outer most part of the Weiger's ligament is called EGGER's line. Ligament prevents the passage of lens material from the anterior chamber to the Berger's space, if this ligament gets breached anterior chamber fluid and other materials can gain access to the Berger's space this occur more often if the zonules are weak as in pseudo exfoliation

In mature and hyper mature cataract, permeability of the posterior capsule increased that allows passing of high molecular protein and lens matter in Berger's space

An article published in clinical and experimental ophthalmology 2016 Dr Andraw and W.Kam concluded in there study, material can be seen 50.3 % of all phaco cases into Berger's space, in which 46.5% is lens matter. Journal of refractive surgery 2004, study done by AlonAng he concluded retro capsular lens fragment were present in 16.6 % patients

CONCLUSION:

This is a rare case demonstrating persistent cortical matter in Berger's space and should always be considered if red glow is not visualised after nucleus emulsification and cortical wash. Adequate management of such cases results in good outcome.

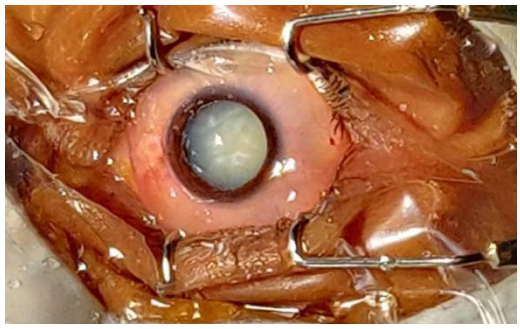

Figure 1- Mature cataract

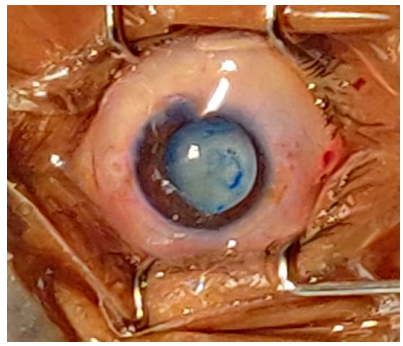

Figure 2 – Cortical sheet in Berger's space

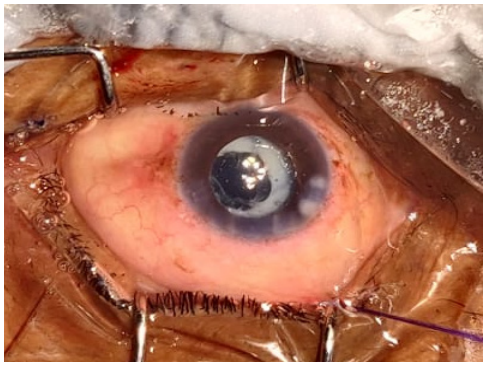

Figure 3-Posterior capsulorrhexis

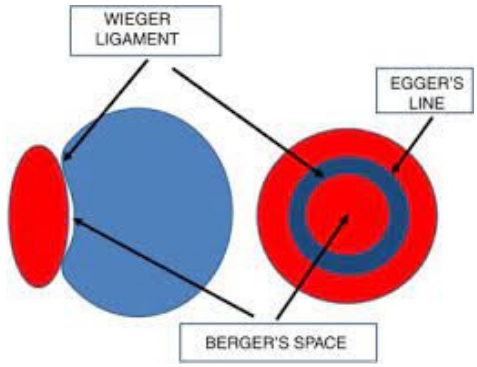

Figure 4 - Berger's space

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OV Shilovskih, AN UlyanovOphthalmology in Russia 2020 – Posterior Capsulorhexis for Draining Berger's space

Dr.Suvira Prof. Venkatesh Lensmatter trapped in Berger's space

ONE MINUTE TIP

Tips To Perform Biometry In Difficult Situations

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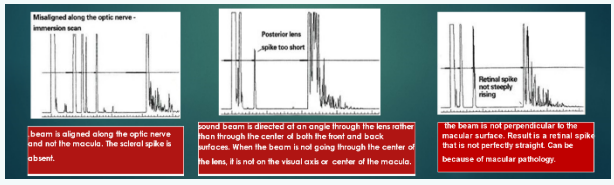
Though much advancement has been made in IOL power calculations, there are certain situations where the power calculation becomes difficult. It is because of changing axial length, irregular corneal surface, or previous corneal surgeries. This article will discuss each scenario one by one.

IMPORTANCE OF GOOD BIOMETRY

- 54% of refractive errors are due to distorted axial length
- 38%of refractive errors are due to inaccurate determination of the ACD (Oslen)
- A 1-mm error in AL results in
    - Approx..2.35 D error of IOL power (average eye of 23.5 mm)
    - Approx. 3.75D in a 20 mm eye and much more in the very short eyes
- Errors of 2D or more are always axial length related (Holladay)
- 1mm Error of ACD can result in 1.5 D of Refractive Error
- Deviation in K reading alters IOL power in 1: 1 ratio

Ideal A scan

- Anterior lens echo is 90% or more of the maximum
- Posterior Lens eco-is 50% or 75% of the Mac anterior
- Retina echo is 75% or more of maximum,scleral echo well identified
- Orbital fat should descend quickly
- Echo rise angle must be clear. The takeoff of the retinal spike must be clear and form a 90° angle from the baseline. No scleral orbital fat echoes beam is aligned with ON rather than macula.



Some Formulae

	Examples
Historical/refraction-based formulae	IOL power = 18.00 + (1.25 × preoperative spherical equivalent)
Regression formulae	SRK-I, SRK-II
Vergence formulae	
2-variable formulae	Holladay 1, SRK -T, Hoffer Q
3-variable formulae	Haigis, Ladas Super Formula
5-variable formulae	Barrett Universal II
7-variable formulae	Holladay 2
Artificial intelligence-based formulae	Clarke neural network, Hill-RBF calculator
Ray tracing	Olsen, Okulix, PhacoOptics

IOL -Intraocular lens, RBF - Radial basis function

BIOMETRY IN DIFFICULT SITUATIONS:
APHAKIA

- The immersion method is preferred over contact biometry.
- Modern/Optical biometers have inbuilt modes for aphakia and are the most accurate method
- Sound velocity is different in aphakic eyes

CORNEAL ECTASIA / KERATOCONUS

- Suboptimal keratometric and axial length readings are a major concern in such cases. .
- Topographers that measure the anterior as well as the posterior curvature of the cornea like Pentacam are of value.
- In non availability of the topographers K readings of the fellow eye or the hard contact lens method by taking the base curve of the best fitted lens as the K reading can be used.
- As cornea in keratoconus is steep, using keratometric reading of such eyes will lead to overestimate readings due to ELP calculation error and underestimate the final IOL power resulting in postoperative hyperopia.
- Modern topographers with newer IOL formulas like Barett universal II ,Hill RBF, Ladas super formulae are good.

- Formulas considering only axial lengths not K readings in calculating the ELP will give good results Eg. Hoffer Q and Haigis Formula
- Literature suggests the role of corneal collagen cross-linking and intracorneal ring segments before cataract surgery to stabilize keratometry.

- Barrett Universal II had the least error in mild and moderate keratoconus.
- For severe keratoconus, all formulae had similar error rates.
- Toric IOL are preferred only for milder keratoconus with relatively milder irregular astigmatism and good spectacle-corrected visual acuity

POST-RADIAL KERATOTOMY / POST LASER REFRACTIVE PROCEDURES

Sources of error :

- Keratometry /radius measurement error
- Algorithm measurement error / ELP error
- Keratometry index error (Gullstrand index error)

- Cause hyperopic error in myopic Lasik and myopic error in hyperopic LASIK.
- In RK both antertior and posterior corneal surface are flattened so theoretically K- readings do not require any adjustments.
- If previous documents available: history method.
- If K not available: do topography and average the power of central 4mm
- Newer : pentacam keratomery and IOL master based formulas eg. HagisL
- Double-k formulas are recommended for IOL power calculation due to their improved accuracy, while double-k SRK/T is not recommended.
- Haigis-L formula, if available, is recommended in eyes with no history data and has been widely used.
- Single-K Hoffer Q formula would be a good choice if there is no fourth-generation formula.
- Recent years, Barrett True-K formula has gained popularity.
- In post RK cases the lack of precision of the IOL Power calculations, diurnal fluctuation of refractive power and spherical aberrations precludes the use of diffractive/refractive multifocal IOLs.

SILICON FILLED EYES

- The refractive index of the oil is much less than that of the vitreous, hence using the standard sound velocity can give error of upto 8 mm
- Phakic eyes sound velocity=1550m/s
- Silicon filled eye = 980 m/s and 1040m/s
- In the velocity conversion method , true Axl may be calculated by determining ACD, LT, and corrected VCD(vitreous cavity distance)
- Corrected VCD = velocity of silicon oil/velocity in vitreous * calculated vireous length
- This method not reliable as viscocity of silicon oil may differ and the cavity may not be fully filled by the oil giving false reading
- IOL power needed is generally 2-3 diopters more than the indicated standard IOL power calculation.
- A-scan ultrasound biometry has
  - false longer eyes
  - presence of multiple fluid interfaces,

- poor penetration from sound absorption by oil .
- Optical biometer less affected by silicon oil

EXTREMES OF AXIAL LENGTH

SHORT EYES

- Problem with short eyes is due to
  - higher optical power of the required IOL gives more weight to any error in the predicted IOL position.
  - the higher probability of having a steep corneal and a shallow anterior chamber depth
  - IOLs over 30 D are only required to be within ±1.00 D of the labelled power compared with ±0.50 D for IOLs less than 30 D
- Method : optical /immersion
- Formulas : Haigis, Hoffer Q, and Holladay 2 formulas for IOL prediction in short eyes.
- Newer formulas : Olsen, Hill RBF, Barrett have good accuracy.

LONG EYES

Difficulty: long Axial lengths with posterior staphylomas, flatter corneas, thinner crystalline lenses, and deeper ACDs

- Long axial lengths with inconsistent findings in both measured eye and the fellow eye the longest reading
- Paraxial measurements can give refractive surprises
- Methods:
  - Optical biometry by IOL master 700 gives significantly better refractive outcome by directly visualizing Fovea on the OCT image during measurement than ultrasound biometry
  - Immersion vector A/B scan
  - immersion with fixation on the fixation light of the probe,
  - select most consistent readings even if spikes are saw toothed
- Formulae: Barrett Universal II, Haigis (with optimized constants), Olsen, and the old stand-by SRK/T .

SECONDARY IOL PLACEMENTS MODIFICATIONS OF IOL

s.no.	Original power(in the bag)	Modifications needed for the position of IOL
1.	0 to +9D	No Change
2.	⁹.5 to +18D	Reduce by 0.5
3.	+18.5 to +27 D	Reduce by 1
4.	Above +27D	Reduce by 1.5
5.	Haptic in sulcus with optic capture	No change
6.	ACIOL	Reduce by 3.5

Circumstance	Choice of formula
AL < 20 mm	Holladay II/ Hoffer Q
20– 22 mm	Hoffer Q
22– 24.5 mm	SRK/ T; Holladay
24.5– 26 mm	Holladay I
> 26 mm	SRK / T ; Holladay I

PIGGYBACK IOL

- Calculation done by
  - Holladay Vergence formulae
  - Refraction of the patient.
- IOL power in Myopic patients -spherical equivalent x 1.2
- IOL power in Hyperopic pateints- spherical equivqlent x 1.5
- Ideally one acylic and one silicon lens to avoid interlenticular opacification
- Divide the power between the IOL and reduce 1D for sulcus placed IOL

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11.Intraocular Lens power calculation after laser refractive surgery: A Meta-Analysis

ONE MINUTE

Practical Tips for Using Different IOL Power Calculation Formulas

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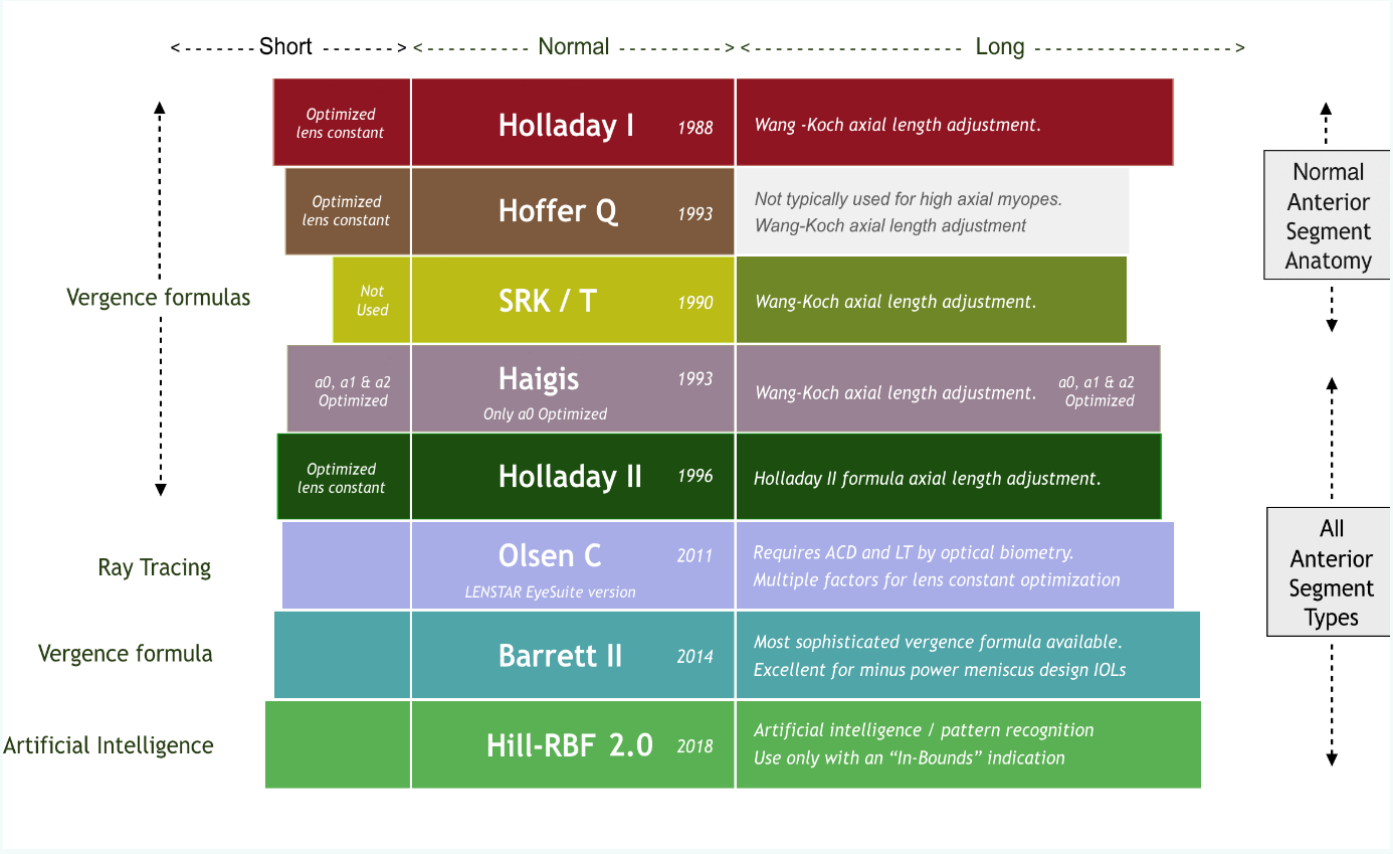
Success of modern day cataract surgery is increasingly defined by the refractive outcome. For targeting emmetropia and minimising the prediction error in cataract surgery, the use of appropriate IOL power calculation formula is necessary.

Current IOL Power Calculation Methods



Picture courtesy: www.doctor-hill.com

Formula preferences: -

- Short Eyes(<22.0mm) : Hoffer Q
- Average Eyes (22.0 – 24.5mm) : Holladay I, Hoffer Q, SRK/T (Show similar efficacy)
- Medium Long Eyes (24.5-26mm): Holladay I, SRK/T
- Long Eyes (>26mm) : SRK/T, Holladay I

Holladay II and Haigis Formula (with optimised a0, a1 and a2 constants) work well for all axial lengths.
Modern IOL Calculation Formulas include:

- **Barrett Universal II Formula v1.05**
  -*One of the best formulas for all eyes regardless of axial length*
  -It can be accessed for free on www.apacrs.org
  -Mandatory variables are: axial length (AL), keratometry (K), Optical anterior chamber depth (ACD).
  -Optional variables: Lens Thickness (LT) and White to White (WTW)
  -Studies show Barrett Universal II to have one of the lowest prediction errors.

- **EVO (Emmetropia Verifying Optical) Formula v2.0**
  -It can be accessed for free on www.evoiolcalculator.com
  -Mandatory variables : AL , K , ACD
  -Optional variables : LT , CCT

- **Kane Formula**
  -Uses the same variables as EVO Formula, as well as the patient's biological sex
  -Can be accessed for free on www.iolformula.com

- **Ladas Super Formula v1.0b**
  -Artificial Intelligence (AI) based
  -Assembly of portions of five modern IOL formulas (Hoffer Q, Holladay I, Holladay I with Koch adjustment, Haigis, SRK/T)
  -Available at www.iolcalc.com

- **Hill RBF (Radial Basis Activation Function) v3.0**
  -Based on AI and pattern recognition
  -Available for free on www.rbfcalculator.com
  -It is the only IOL power calculation formula that provides the user the reliability of result, showing the Boundary Status as 'In Bounds' or 'Outside Bounds'.

- **Toric Calculators**
  -All modern IOL formulas have a toric version such as Barrett Toric Calculator v1.05
  -Alternative is to use toric calculators on IOL company website (Alcon/Abbott/Care group etc).

Special Situations:-

1. **Post refractive surgery cases:**
   -Use >1 method to measure the central corneal power. Select the flattest K value.
   -Use >1 formula (Barrett's True K/ Online ASCRS calculator/ Holladay II/ Haigis L/ Shammas-PL formula/ Hoffer Q etc). Select the highest IOL power thus obtained, as it is better to hedge in the direction of residual myopia.
2. **Very Long Eyes:**
   -In the setting of posterior staphyloma, optical biometry is preferable because it gives foveal centred measurement of axial length. Alternatively, immersion vector A/B scan can be used
   -Modern formulas like Barrett Universal II, Hill RBF can be used without any modification. Alternative is the Wang- Koch adjustment of axial length for Holladay I or SRK/T.
3. **Post- vitrectomy Eyes with Silicone Oil:**
   -Optical biometry is preferable in eyes with early/ immature cataracts.
   -During ultrasound biometry, use the silicone oil mode, or use the conversion factor of 0.71 multiplied by the measured axial length.
   -IOL power can be calculated using any standard formula (SRK/T)
4. **Piggyback IOL:**
   - Barrett RX formula for secondary piggyback IOL
   - For residual hyperopia, piggyback IOL power = desired spherical equivalent x 1.5
   - For residual myopia, piggyback IOL power = desired spherical equivalent

Key points -

- For biometric measurements, use ≥1 device/ method. Optical biometry is recommended. For ultrasound biometry, immersion is preferable over contact.
- Use >1formula (ideally 3-4) to cross check your results for each case.
- A-constants supplied by the lens manufacturer are not be considered definitive. Lens constant optimization / personalization can be done by tracking the post-operative refractive outcomes over 25-30 cases, and adding the mean error to the lens constant.
- The residual refraction of the eye first operated can be used to fine tune the refractive outcome of the fellow eye, provided there is interocular symmetry (comparable K, AL). For this, 50% of the prediction error should be added to the IOL power calculation of the second eye (for standard formula like SRK/T, Hoffer Q and Holladay I). For Barrett Universal II, the factor comes to 0.3
- For unusual eyes, such as those with flat K readings and long AL, or very steep cornea (as in keratoconus), it is better to choose a formula which delinks the effective lens position (ELP) calculation from keratometry such as Haigis (triple optimized), Barrett Universal II.
- Most modern formulas such as Barrett Universal II, EVO formula etc. work well with immersion ultrasound biometry also, with the use of appropriate A- constant.

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ONE MINUTE TIP

CORRECT MARKING FOR TORIC IOLs: MY WAY!

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We can achieve accurate toric marking and alignment with both manual and digital tools. For manual marking we should always be very meticulous.
Regular toric marking is a 2-step procedure, to avoid cyclotorsion in supine position. First step (Reference marking) is 3, 6 & 9 o' clock marking in sitting position with the help of reference marker. Second step (Axis Marking) is done in supine position in the operation theatre with the help of Mendez ring and axis marker.

My way (OPAI technique- introduced in 2012) of correct Toric marking is a single step procedure in sitting position with the help of Slit lamp.

Method:

1. Ask the patient to sit upright and place the chin on slit lamp's chin rest, after instillation of Proparacaine eyedrops.
2. Wire speculum is applied.
3. Slit beam of the slit lamp is rotated at the desired axis of primary incision and a single mark with the help of ink painted sinskey hook is applied.
4. Now the slit beam of the slit lamp is rotated at the desired axis of toric IOL placement and 2 marks, 180 degrees apart at both the ends of slit beam are marked with the help of sinskey hook.
5. All these slit beams should pass through the center of the cornea, where we can align with purkinje images.
6. At the time of marking ask the patient to see towards the fixation light of slit lamp or other ear of the doctor through the other eye, so that eyes are in the straight gaze.
7. Remove the speculum and after a min or two again reconfirm the marks with straight position of patient's head.
8. Sometimes when we shift the patient in the OT, the marks may be faded. So before starting the surgery, these faded marks can be darkened under the microscope.

Advantages:

1. Only 3 marks are needed, so the chances of reduplicating the error with reference marks in eliminated.
2. No need of any marking set needed.
3. Much easier procedure with least learning curve.
4. Can be done at any remote place having a slit lamp with axis marks.
5. We have compared it with digital toric markers and the results were comparable.
6. Toric lens stability can be checked immediate post op as well as in future with the help of slit lamp.

Figure 1: Link to YouTube Tutorial Video of OPAI technique

ONE MINUTE TIP

HOW TO PROCEED WITH FLOPPY IRIS SYNDROME

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INTRODUCTION

Intraoperative floppy iris syndrome (IFIS) is a clinical entity described by Chang and Campbell in 2005[1] and is characterized by the triad of intraoperative signs:

- Billowing of a flaccid iris in response to intraocular fluid currents
- Propensity for iris prolapse toward the incision ports
- Progressive miosis

In contrast to other causes of small dilated pupil and progressive intraoperative miosis, IFIS is characterized by an elastic iris which does not dilate with mechanical stretching. Therefore, it is important to anticipate IFIS and use pupil expansion devices as a preventive measure in the beginning of surgery itself

The reported overall prevalence of IFIS in patients undergoing phacoemulsification is variable, ranging from 2% to 12.6% [3].

Difficulties associated with IFIS –

1. Inappropriate capsulorrhexis
2. Impaired visualisation of lens and capsular bag
3. Difficulty in hydrodissection

PREVENTIVE MEASURES:

PREOPERATIVE -

- **Discontinuation of medication:** No clear evidence demonstrates that discontinuation of drugs (7-14 days) associated with IFIS prior to surgery fully eliminates the severity of IFIS.
- **Pupillary dilation:** Standard measures include the application of topical mydriatics (such as high concentration cyclopentolate 2% and phenylephrine 10%). Some favour the addition of preoperative epinephrine and topical nonsteroidal anti–inflammatory drugs (e.g. flurbiprofen, ketorolac), due to its advantage in the blockage of prostaglandins which cause miosis during surgery.

INTRAOPERATIVE -

- **Intracameral injection of epinephrine and phenylephrine:** promote maximal dilation, augment iris muscular tone and therefore reduce the propensity for iris billowing.
    - **Intracameral epinephrine**: Use a diluted mixture to avoid corneal endothelial damage [e.g. dilution 1:3 with balanced salt solution (BSS)][5].

- **Intracameral phenylephrine**: It has been proposed that 0.25 mL of phenylephrine 2.5% should be increased to 2.0 mL using BSS for at least 30 seconds[6].

- **Sub-Tenon injection of 2.5 ml of 2% lidocaine:** was found to decrease the incidence of IFIS.
- **Surgical techniques modification**:
  1) Appropriate sized tunnel anterior to iris root. Prevent premature entry and wound leak.
  2) Use of chohesive ophthalmic viscosurgical devices (OVDs) – effectively dilates the pupil and creates physical barrier to prevent iris billowing
  3) Limited and careful hydrodissection
  4) Bevel up cartridge for IOL implantation
  5) Use of pupil enlargement devices – pupil expansion rings and iris hooks. As initially reported in 2005, sphincterotomies (including partial thickness) and mechanical stretching of the pupil are not effective and may exacerbate IFIS.
  6)

COMPLICATIONS

Complications during phacoemulsification surgery in IFIS patients include iatrogenic iris injury, wound dehiscence, hyphema, iridodialysis, nuclear drop, posterior capsule rupture and vitreous loss. Furthermore, the propensity of the iris to prolapse towards the phaco tip and to the incisions increases the risk of postoperative uveitis and permanent pupil distortion with glare and photophobia[5]. Other long-term consequences include retinal-detachment, cystoid macular oedema and limited visual recovery due to endophthalmitis[7]. Adequate preoperative evaluation and use of preventive measures anticipating IFIS significantly reduces the rates of complications[1].

CONCLUSION

IFIS remains highly attributable to the drug-induced blockage of α1-1A receptor found in the iris dilator muscle, with a large proportion of patients under or with history of previous treatment with tamsulosin. It is important to take proper history and recognize potential IFIS cases. Discontinuing tamsulosin prior to surgery has no significant benefit and does not prevent IFIS.

Anticipation of IFIS before surgery should be part of ophthalmologists' preoperative assessment in order to achieve appropriate preparation for the procedure. Lack of preoperative prophylaxis is linked to higher rate of complications and worse visual outcomes.

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ONE MINUTE TIP

Tips and Tricks for Anterior Vitrectomy

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The goal of anterior vitrectomy is the complete removal of the vitreous from the anterior chamber without damaging the capsular rhexis or causing traction onto the retina. In addition, it allows for the safe placement of the intraocular lens in the sulcus.[1]

In the event of PCR, immediately removing the irrigation/phaco probe results in sudden decompression of the anterior chamber leading to enlargement of PCR and vitreous prolapse.[2] Hence, the phaco probe must be kept inside with the foot pedal in position one , and a dispersive viscoelastic (OVD) is injected through one of the side ports. The OVD seals the PCR, preventing further vitreous prolapse. Further, the bottle height is reduced to avoid turbulence in the anterior chamber and hydration of the vitreous.

The anterior vitrectomy can be done through the limbal or pars plana route, although most surgeons prefer the limbal route.[3]

The technique
The anterior vitrectomy should always be performed with an automated vitrectomy probe in a closed chamber using a bimanual technique. The vitrectomy **cut rate is generally kept at the maximum** available in the machine. Most modern devices allow a cut-rate between 2500-5000 cuts/min; accordingly, the vacuum setting is adjusted between 150-250 mm Hg.[4]

The irrigation cannula is held in the anterior chamber with its **tip pointing towards the angle and away from the rent**, such that the Eddy current of irrigation fluid prevents further vitreous prolapse.
Any vitreous prolapsed out of the wounds is removed first. Then, the vitrectomy cutter probe is kept at the centre of the torn posterior capsule, and vitrectomy is initiated. With the complete removal of the vitreous, the rent margins come towards the centre and are freely mobile. **Staining with triamcinolone acetonide** may help identify the vitreous and allow for its complete removal.

Following a complete anterior vitrectomy, the **residual cortex** is removed using the aspiration/cut mode. Caution must be exercised not to damage the rhexis margins or zonules while removing the residual cortex.

IOL implantation should be attempted if one is sure of the intactness of rhexis. If IOL is implanted, it is better to perform an optic capture to reduce the risk of postoperative decentration. [4]

In case of a nucleus fragment/cortical matter drop, a retina specialist consultation must be sought to facilitate the removal from the posterior route. **No attempt should be made to retrieve the nucleus from the vitreous cavity**.

Postoperatively in all cases of PCR and anterior vitrectomy, a thorough **fundus evaluation** must be done to look for any retinal tear or dropped cortex/nucleus fragment.

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ONE MINUTE TIP

How to prevent Argentinian Flag Sign?

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Cataract surgery is one of the most efficient and safe surgical interventions but it is dependent on the surgeon's skill and experience especially in difficult cases like intumescent cataracts. Surgery in intumescent cataracts pose a challenge in many ways as the anterior chamber is shallow. Due to high intralenticular pressure extension of the capsulorhexis to the periphery and occurrence of Argentinian Flag sign is high.[1]

The term "Argentinian flag sign" is used to describe this condition due to its resemblance of the blue-white-blue Argentinian flag colour pattern after capsular staining with trypan blue. [2]

Once this occurs, the cataract surgery may become extremely difficult due to poor construction of the capsulorhexis, and possible rupture of posterior capsule.[3]

Argentinian Flag sign occurs in intumescent cataracts due to the hyperhydration of the lens fibers. These hydrated lens fibers create anterior and posterior pressures within the capsule separated by an equatorial cortex that has yet to liquefy and thus is still in contact with the capsule. During capsulotomy when the anterior intralenticular pressure which is high dissipates into the anterior chamber, a difference in pressure caused by the remaining posterior intralenticular pressure causes the lens to be displaced anteriorly placing strain on the capsule and thus leading to its tear. [4]

Incidence of incomplete capsulorhexis associated with intumescent cataracts is variable and ranges from 3.85% as reported by Jacob et al. [2] to 28.3% by Chakraborty et al [5]

Several approaches are described in literature to achieve a continous capsulorhexis and to avoid its extension to the periphery like use of trypan blue dye, use of high viscosity OVDs, 2 stage capsulorhexis , aspiration of fluid cortex by 30 gauge needle, use of anterior Yag Capsulotomy, capsulorhexis using microcapsulorhexis forceps and femto assisted capsulorhexis.[6]

Coelho et al [7] and Porwal et al [8] reported that preoperative Nd:YAG laser anterior capsulotomy represents a safe and easy option for white intumescent cataracts after conducting a study in 11 eyes. The use of a single central disruptive pulse of energy may maintain an equal distribution of vector forces, preventing uncontrolled splitting of the anterior capsule to the periphery. When the Nd:YAG laser is done preoperatively and in the presence of an intact anterior chamber, the intraocular pressure helps in keeping a balance such that the intralenticular pressure is regulated as per the pressure inside the eye in the anterior chamber and the posterior chamber. The intraocular pressure thus prevents an inadvertent tear and would also guarantee the escape of the fluid from the lens which would therefore collapse and the intralenticular pressure would reduce.

Lens decompression can also be done with a 24G needle mounted on a 2cc syringe. Needle is pierced in the centre of anterior capsule just beneath the anterior capsule and lens matter is aspirated so as to reduce the intralenticular pressure.

2 step capsulorhexis is also helpful in achieving lens decompression. Here initially a small rhexis is done, the cortical matter is aspirated thus reducing the intalenticular pressure and then the rhexis is enlarged to the desired size. [3]

Lens decompression techniques reduce the need for repeated entry of instruments in the anterior chamber. A perfect central opening is achieved in a single attempt. Not only the complication rate is least, but there is a significant increase in the anterior chamber depth and which in turn increases the ease and comfort of surgery and reduces the surgical time

My One Minute Tip:

Intralenticular decompression of mature intumescent cataracts either with Nd: YAG laser or needle decompression or a 2 step method plays a vital role in preventing Argentinian Flag Sign.

These techniques are a very helpful tool in the armamentarium of a cataract surgeon as it reduces the risk of capsular radial tears and conversion to SICS during phacoemulsification of intumescent cataracts.

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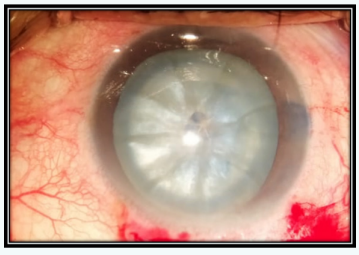

Figure 1: Post Nd:YAG anterior capsulotomy

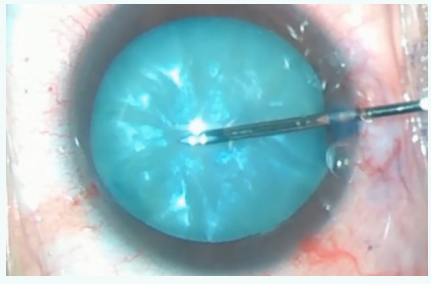

Figure 2: Intralenticular decompression with 24G needle.

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PEARLS TO DEAL WITH PAEDIATRIC CATARACT

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The goal of cataract surgery in infants and children is to clear the visual axis and to monitor and treat postoperative complications. In addition, early detection and treatment of pediatric cataracts are crucial in preventing the development of visual deprivation amblyopia.1

Examination of a child with cataract

Detailed history, including family history, maternal drug use, illnesses, and birth history, should be obtained. All children with cataracts must undergo a thorough ocular examination. The visual acuity assessment is done by noting fixation behaviour, fixation preference, and objection to occlusion or using age-appropriate charts. The red reflex test can be a simple tool to detect cataracts in children. Measuring the IOP, corneal diameter, size, location, and density of lenticular opacity is essential. Any capsular or zonular abnormalities must be documented. Whenever possible, a detailed fundus examination must be performed. In eyes with significant media haze, an ocular B scan must be done to rule out posterior segment pathologies.

Cataracts in children that can be observed or managed medically

Zonular and lamellar cataracts of less than 3mm in diameter with preserved accommodation can be observed. (dynamic retinoscopy in younger children and near vision in older children).[2] In eyes with small Posterior subcapsular cataracts with good vision, a glare test should be performed to check for the quality of vision. Oil droplet cataract is typically seen in galactosemia and is reversible with early dietary modification. Sunflower cataract is seen in Wilson's disease and can be treated with penicillamine. A diabetic cataract is reversible with blood sugar control in the early stages.

Investigations

They are not required routinely in healthy infants and children. Specific testing, e.g. TORCHS 3-6, Urine screening for reducing substances, urine for amino acids, serum calcium, phosphorus and glucose, should be tailored based on the child‘s systemic exam.

Indications of surgical intervention in Children with Cataracts

- Presence of cataracts involving more than 3 mm of the central visual axis
- Cataracts near or involving nodal point

- Presence of nystagmus and or strabismus
- Cataracts with Poor fixation
- Retinal details are not visible with a direct ophthalmoscope

Surgical management

1. Timing of surgery

Unilateral congenital cataracts should be operated within the first 4-6 weeks, and bilateral congenital cataracts within 6-8 weeks of life to prevent amblyopia.[7,8]

2. Considerations for IOL Implantation in Infants

Primary IOL implantation in infants is debatable. However, it can be safely done in eyes with a corneal diameter > 10 mm and an axial length of more than 17 .5 mm. The authors prefer to implant IOL in infants only if in-the-bag implantation of IOL is possible.

3. Biometry & IOL power calculations

One major challenge in managing congenital or developmental cataracts is that the IOL power needs to be adjusted to account for the growing eye. [9] Generally, the IOL power is under-corrected in children under eight years to compensate for the myopic shift. Therefore, the IOL power is reduced by 20% in children under two years and 10% in children between 2- 8 years of age (Dahan et al.). [10]

To avoid significant anisometropia (>4D), in unilateral cases, the IOL power adjustment is made according to the refraction of the other eye. The Infant Aphakia Treatment Study (IATS) recommends SRK/T and Holladay [1] formula for IOL power calculation in infants. [11]

4. Type of IOL

Single-piece acrylic hydrophobic IOL is the preferred IOL for in-the-bag implantation and three-piece acrylic hydrophobic IOL for sulcus implantation. If sulcus implantation is done, posterior optic buttonholing should be done to stabilize IOL and prevent pupillary optic capture. The use of toric and multifocal IOLs in children is debatable due to unpredictable refractive growth and the loss of contrast sensitivity.

5. Surgical technique

Incision

A superior incision is preferred, given the less risk of injury and postoperative endophthalmitis. Similarly, all wounds must be sutured. We prefer 10-0 vycril over nylon sutures; this avoids reintervention and the need for general anaesthesia for suture removal.

Capsulotomy

Continuous curvilinear capsulorhexis (CCC) is a prerequisite for in-the-bag lens implantation. However, peripheral extension of CCC is not uncommon in children due to highly elastic and thick anterior capsule, high intra-lenticular pressure, vitreous upthrust, and peripheral zonular tension. Maintenance of a deep anterior chamber using high molecular weight viscoelastic, starting with smaller CCC and pulling free rhexis margin towards the centre, help to reduce chances of extension. We prefer to initiate the CCC with cystitome and complete it with Utrata forceps using the grasp re-grasp technique. The ideal size of CCC is 5-5.5 mm, which will circumferentially wrap a 6mm IOL and reduce the chances of posterior capsular opacification.

Posterior capsule management

Posterior capsular opacification is universal and occurs rapidly after cataract surgery, especially in younger children[12]. Hence, it is necessary to perform a Primary posterior capsulotomy (PPC) along with anterior vitrectomy (AV) in younger (< 6 years) children. It is also indicated in older children who are poor candidates for Nd - YAG laser capsulotomy. The size of PPC should be 4-4.5 mm. Anterior vitrectomy should be done using a 2500-4000 cut rate and 300 vacuum in cut I/A mode. It can be done before or after IOL implantation (figures 1and 2).

Fig 1: CONVENTIONAL PPC : Before IOL Implantation

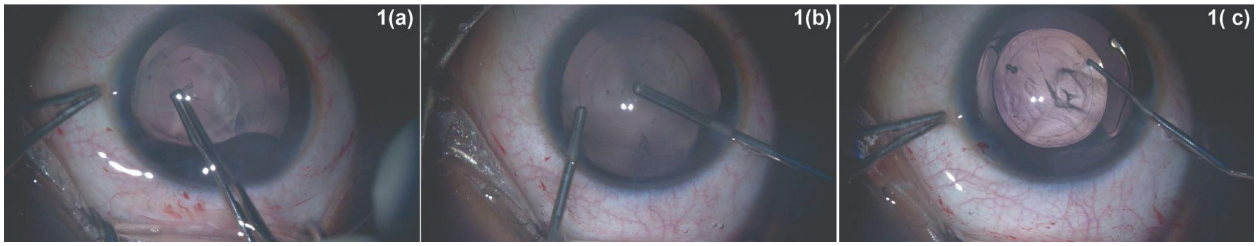

Fig1(a)PPC with utrata forceps before IOL Implantation Fig 1(b)Anterior Vitrectomy Fig 1(c) In the bag IOL implantation

Fig 2: Limbal Approach Retrolenticular Vitrectomy (LARV)[13]

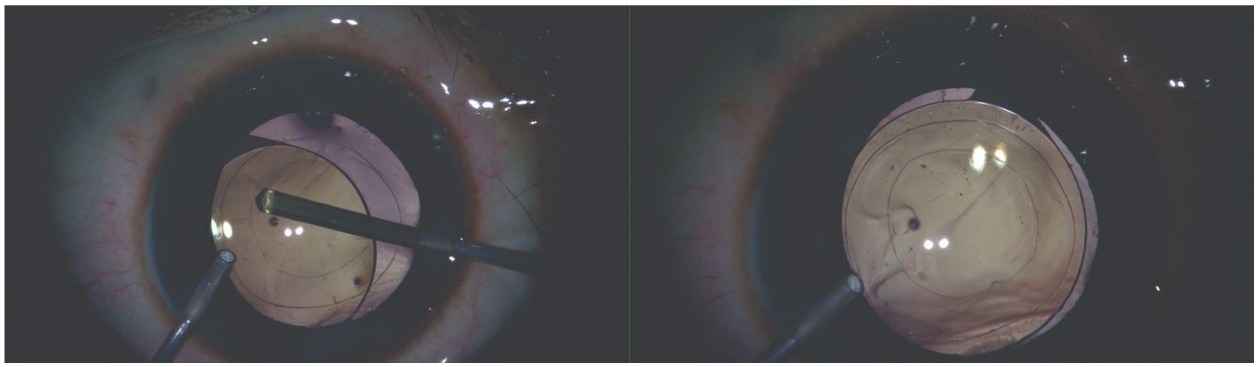

Fig 2(a) PPC+AV with vitreous cutter after IOL implantation Fig 2 (b) Completed LARV

Postoperative complications

Postoperative inflammation should be managed with short-term systemic steroids and frequent topical steroids. These children must be followed up lifelong to look for glaucoma, PCO and retinal detachment development. Any unexpected myopic shift or frequent change in refraction points towards the development of glaucoma and must be thoroughly investigated. As mentioned, PCO is ubiquitous if primary PCC is not performed. However, PCO in children must be addressed sooner than later due to the tendency of posterior capsular fibrosis. A thin PCO can be managed with YAG capsulotomy, however, thicker fibrosed PCO requires surgical membranectomy.

Visual rehabilitation

Visual rehabilitation after paediatric cataract surgery is done using glasses or contact lenses. Monofocal aphakic glasses with intermediate correction are prescribed in children up to 2 -2 .5 years, and bifocal glasses after that. Rigid gas-permeable contact lenses are preferred in children if left aphakic.[14] Amblyopia, if present, should be managed with refractive correction followed by occlusion therapy. Educating parents about the importance of lifelong follow-up is crucial.

Summary

Cataract surgery in children can be challenging. The key to successful outcomes is detecting and treating these cases as early as possible. Age adjustment of IOL power, primary posterior capsulotomy, post-operative inflammation control, correction of refractive error, amblyopia management and early detection and management of glaucoma are some of the essential considerations in the management of pediatric cataracts.

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SURGICAL SECRETS

IOL MANAGEMENT IN TRAUMATIC CATARACT: SURGICAL SECRETS

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Ocular injuries make approximately 1.6 million people blind globally. [1] The incidence of ocular trauma in India is around 1–5%. [2] These injuries affect the psychological status of an individual, the vocational development of school-college-going students, impart an economic burden due to the loss of working days at work, and cause the dependency of a person on family members or caretakers, especially in cases of bilateral ocular injuries. The common sources of injury in our country are wooden sticks, stones, cricket balls, road traffic accidents, vegetative matter, thorns, tree branches, metallic objects like nails, rods, and splintered iron particles, usually in factory workers. [3] They are more common in men compared to women and in younger age groups, i.e., 16–25 years of age. [3]

Trauma to the eye can be **blunt or penetrating**, which causes diverse presentations ranging from mild superficial injuries to vision threatening complications. One of the common occurrences in both modes is lens opacification, which causes cataract formation. Cataractous lenses are usually subluxated or dislocated, depending on the extent of traumatic zonular dehiscence and the impact of injury.[4]

Pre-operative examination in ocular trauma is extremely crucial. The main aspects to consider are lid, corneal, and scleral integrity or infection, gonioscopy to rule out angle recession, presence of RAPD, presence of hyphaema, type of cataract with zonular status, and iris trauma or uveal tissue prolapse (Fig 1). A gentle and sterile ultrasound would give an idea about the status of the vitreous (vitreous haemorrhage: VH), retinal detachment (RD), incarceration, or retained intraocular foreign bodies (IOFB).

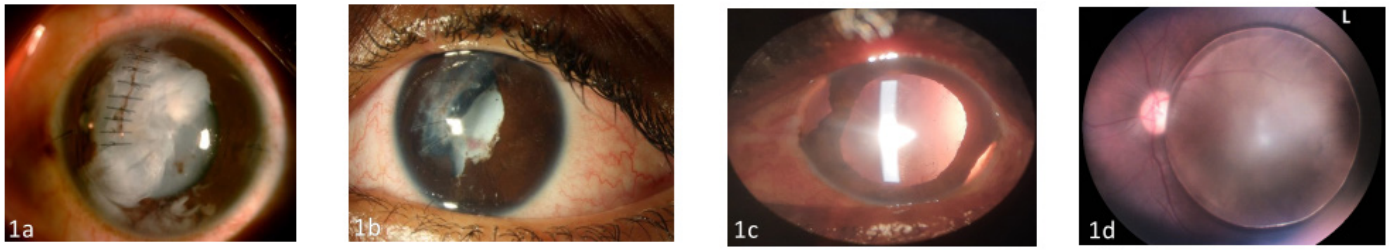

Fig 1 Preoperative imaging of post trauma patients (a) Repaired corneal tear with traumatic cataract with ruptured anterior capsule (b) Repaired corneal tear with subluxated cataract with sphincter tear (c) Iridodialysis with aphakia (d) Posterior dislocated nucleus .

Cataract management can be achieved in two ways:
1. Primary IOL implantation: This can be done in cases of blunt trauma (closed globe injuries) with no evident ocular surface or posterior segment complications.
2. Secondary IOL implantation: This is to be done in cases where a primary surgery is required to close the wounds (corneal/scleral tears) or posterior segment complications (RD, IOFB, VH) have to be dealt with. Once the primary surgery is done, a minimal gap of 6–8 weeks is ideal to let the inflammation settle down, and then a secondary IOL can be planned.

In traumatic cataracts, the **IOL power calculation** can be mysterious, and often we tend to land up with surprises. In these cases, I prefer to compare the IOL power with the other eye. In case the other eye is already injured, a keratomery value of 44D is taken, that is considered an average value. [5]
The **choice of anaesthesia** is general, but in cases that is not feasible, I prefer minimal peribulbar or sub-tenon anaesthesia (4-6 cc) with no massage and adequate systemic sedation so as to make the patient comfortable and simultaneously avoid positive posterior pressure. [5]

I use **various techniques and approaches**, depending on the presentation scenario of the patient. Some of them are described below:
1. Cataract with zonular dialysis less than 6 hours: Phacoemulsification + CTR + foldable IOL implantation in the bag.
2. When there is a partial anterior and posterior capsular rupture with lens matter or vitreous in the anterior chamber (AC): Irrigation and Aspiration (Bimanual/Simcoes) + 3-piece IOL in the sulcus/optic capture + Peripheral iridectomy.
3. Subluxated lens with more than 6 clock hours of dialysis or Dislocated lens: : Lensectomy + Vitrectomy + Scleral fixated IOL
4. Iris tear or dialysis with cataract: Lensectomy + Vitrectomy + Scleral fixated IOL + Pupilloplasty/Iris repair
5. Silicone filled aphakic eyes with an intact capsule: Silicone oil removal + Foldable IOL in bag + Posterior surgical capsulotomy + Fluid air exchange
6. Silicone filled aphakic eyes with no capsule: Silicone oil removal + Scleral fixated IOL + Fluid air exchange
7. Aniridia with subluxated/dislocated cataract: Lensectomy + Vitrectomy + Aniridic Scleral fixated IOL

Types of SFIOL techniques that can be used are the conventional 4-point fixation using prolene 9-0 suture, 2-point fixation using Gortex suture, Yamane technique or Tuck SFIOL technique.

Fig 2(a)Traumatic subluxated cataract with aniridia; (b) & (c) 6 weeks post operative status of the same patient with implantation of aniridic SFIOL

Whatever technique is being used, it's vital to ensure that at the end of the surgery, the optical axis is in the centre, the pupil is round, there is no vitreous in the AC or in the wound margin, the IOL is stable, and the retina is well

attached with no peripheral breaks. I personally prefer to do a complete vitrectomy and check for peripheral breaks in all cases where posterior segment is involved, and do an endolaser if need be.

The **role of topical and systemic steroids and mydriatics** is extremely critical, as ocular trauma incites tremendous ocular inflammation, which needs to be dealt with at the right time.

Overall, traumatic cataract management differs from the senile cataract management in **terms of adopting a more holistic approach**. It is not just the IOL that the surgeon has to place, but make sure that the orbit, the anterior and the posterior segment are working in a balanced manner to provide a satisfactory visual acuity to the patient. To conclude, adequate pre and post op **counselling with realistic expectations** are of paramount significance in dealing with a patient with traumatic cataract.

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SURGICAL SECRETS

How to proceed with IOL implantation without posterior capsule support

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INTRODUCTION

Implantation of an intraocular lens in the absence of capsular support has developed enormously in the last few years. A myriad of lens options are available to the surgeon and can be broadly divided into anterior chamber lenses, iris fixated lenses and scleral fixated lenses based on their anatomical placement. Although most patients present for secondary IOL insertion following complex cataract surgery or trauma, there are a number of other conditions that can predispose to unstable or dislocated lenses in both phakic and pseudophakic patients. In patients with weak zonular fibers (High Myopia, Pseudoexfoliation, Marfan's syndrome and Ehlers–Danlos syndrome etc.), the whole lens and capsule may dislocate from its normal anatomical position, either spontaneously or post trauma. Let's discuss the options available for IOL implantation surgery without posterior capsule support.

• Modern ACIOL (Anterior Chamber IOL) - This method is being used when both the capsular supports are inadequate. These lenses are typically flexible and open loop with a supporting base at the end of each haptics. These haptics are inserted in the anterior chamber angle against the scleral spur, anterior to the iris diaphragm. Although the modern design of open-loop AC IOL is less likely to cause corneal decomposition than older closed-loop models, this is rarely practiced now days.

• IOL placement in the sulcus – This is the standard care of treatment in absence of posterior lens capsule support. Acrylic three-piece lenses work better in the sulcus than most one-piece lenses. The IOL can be optic captured behind the anterior capsulorhexis for better and long term stability.

• Iris suture fixation of haptics (McCannel Iris Sutured IOL) – Almost any three-piece IOL can be iris-sutured. The 10-0 Prolene suture is used to tie IOL haptic with iris using the McCannel technique. Iris fixation of the IOL is good if there is at least some degree of capsular rim support. If there is zero capsular support, just relying on these two sutures may not be sufficient to hold the IOL and the IOL may dislocate after just a few years. In eyes with zero capsular support, a scleral-fixated IOL may be a better option.

• Iris Claw (ICIOL) - IC-IOLs are classified into anterior chamber IC-IOLs and retropupillary IC-IOLs. Secondary

implantations of retropupillary Iris Claw IOL have been the preferred procedure in cases where iris support is feasible. As **Iris Claw IOL is attached to the midperiphery of the iris**, the complications related to the size of IOL and damage to the angle of anterior chamber and the root of iris are negligible. The implantation of a retropupillary IC-IOL combines the advantages of a PCIOL and a short operation time as well as an easy operation technique. The main advantage of this technique is having a short learning curve.

• Scleral fixation of IOL (SFIOL) – This is one of the most commonly used techniques in the absence of both anterior and posterior capsule. Sutured and sutureless SFIOL are the two main approaches utilized. In this technique, the optic of the IOL is placed in the posterior chamber. At the same time, the haptic is fixed to the sclera approximately 1.5 to 2 mm from the limbus, which is the external landmark for the ciliary sulcus. Placement of IOL in the sulcus region is considered safer for the corneal endothelium and iris. Haptics are usually fixated in the horizontal direction at 3 and 9 o'clock direction. Relative contraindications for the procedure include scleral thinning, scleritis, uveitis, advanced secondary glaucoma, corneal pathology and any pre-existing retinal disorder.

• Intrascleral tunnel haptic placement (Sutureless SFIOL) – There are two methods of intrascleral fixation to consider, the Glue and Yamane techniques. Both techniques have their own advantages and limitations.

• Flange Technique- This is an easy and fast technique of sulcus fixation of SFIOL. In this technique 6-0 Prolene suture is used for Scleral fixation by creating 4 flanges.

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• Triamcinolone assisted anterior vitrectomy, peripheral iridotomy, use of AC maintainer are a few steps which need to be followed in case of IOL implantation without posterior capsular support.

• **ACIOL** - Accurate measurement of the anterior chamber diameter is imperative for choosing the appropriately sized ACIOL. Different manufacturers have various sizing options. The most common method of sizing an ACIOL is by determining the white-to-white diameter with calipers and adding 1mm to the reading. Wound construction is important in placing an anterior chamber intraocular lens. Standard ACIOLs are made of PMMA and therefore are not foldable. Adequate wound incision, peripheral iridotomy, proper lens orientation and haptic placement, vitrectomy, wound closure with nonabsorbable suture are a few tips to remember for successful ACIOL implantation.

• **IOL placement in the sulcus** – 3-piece IOLs with an acrylic optic and PMMA haptics or Single piece PMMA IOLs are suitable options. In most cases, the lens power can be reduced by 0.50 D compared to the power predicted to reach the target refraction when the same lens is placed in the capsular bag. It is important to account for the change in A-constant if a different type of IOL is being placed. Use of a dispersive ophthalmic viscous device to create space between the iris and the anterior capsule allows for better placement of the leading haptic into the sulcus. It's important to make sure that the eye has enough of an anterior capsular support to allow sulcus placement

• **Iris suture fixation of haptics (McCannel Iris Sutured IOL)** –The first step of this technique is to fill the anterior chamber with an ophthalmic viscosurgical device (OVD). Once filled, capture the optic of the IOL anterior to the iris, so it is better not to dilate or give a miotic once you have control of the lens. Leave the haptics posterior to the iris. Using a 10-0 Prolene with a long needle (curved or straight), a pass is made in the midperiphery of the iris, not near the pupil margin. The 10- 0 Prolene suture can then be tied around the haptic using a sliding knot or externalized through an additional incision and tied using the McCannel technique. Multiple paracentesis incisions can be made for access. There are many complications reported with this technique- iritis, secondary

cystoid macular oedema, suture lysis and dislocation, haemorrhage from the iris and pigment dispersions are among a few of them.

• **Retropupillary Iris Claw IOL** - In this procedure two paracentasis are made at 9 and 3 o'clock positions. Intracameral pilocarpine is used whenever required. Holding the optic with a special lens forceps, one haptic is tilted down and pushed under the iris with gentle manipulation. A sinskey hook is passed through the same side port. Now the direction of force will be opposite, anterior to posterior by sinskey hook through iris tissue while the Claw lens is pushed from posterior to anterior plane at the same time ; thus the iris is enclaved in between the claw of an IOL. A similar maneuver is done on the other side port after switching the hands. This unique enclavation system allows centration of the IOL in the pupillary axis, which is important in eyes with decentered pupils.

• **SFIOL** - Sutures used for SFIOLs are 10-0 polypropylene, 9-0 polypropylene, 8-0 polypropylene and 8-0 polytetrafluoroethylene (PTFE). The use of 10-0 polypropylene for fixation sutures is less durable and may be associated with high suture breakage and degradation-related complications. The points of fixation on the haptic can vary from two-point to four-point fixation. The two-point fixation method is quick and more commonly used but is associated with an increased incidence of IOL tilt and decentration compared to 4point fixation. The techniques for sutured SFIOLs can broadly be classified into ab externo and ab interno techniques. Endoscopy-assisted sutured scleral fixation of IOL has also been described. A potential complication for any kind of sutured SFIOL techniques is knot erosion through the conjunctiva after surgery. This can be associated with an increased risk of endophthalmitis. To avoid this, knots can be covered with partial-thickness scleral flaps, buried in the sclera or covered using corneoscleral pockets (Hoffman technique).

• **Glued IOL**- It is another technique of sutureless SFIOL with scleral flaps. In this procedure, two partial-thickness scleral flaps are made 180 degrees apart at 3 and 9 o'clock positions. Then, two ab externo sclerotomies are made under the scleral flaps 1.5 mm from the limbus using a 24 G needle. Scleral side pockets parellel to the limbus are made at the edge of the scleral flap near the sclerotomy sites with the help of a 26 G bent needle on either side in opposite direction. A three-piece IOL is inserted through the main corneoscleral incision, and the haptic is externalized by micro forceps using the handshake technique. Silicone retainer tires can be used from iris hooks to secure the leading haptic while the trailing haptic is being externalized. Once both the haptics are externalized, it is inserted into the side pockets. The area is dried, and fibrin glue is put under the sclera flaps. The major advantage of this technique is that foldable IOLs can be used and all the maneuvers are done under direct visualization but fibrin glue is an extra economic burden.

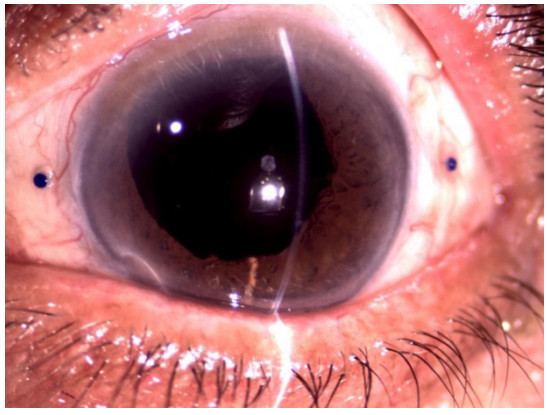
• **Yamane Technique of sutureless SFIOL** – A flapless, sutureless transconjunctival technique using a 30-gauge needle is very popular now-a-days. A three-piece IOL is inserted into the anterior chamber using an injector, and the trailing haptic is kept outside to prevent the IOL from falling into the vitreous cavity. An angled sclerotomy is made through the conjunctiva 2 mm from the limbus using a 30-gauge needle with an ultra-thin wall. The leading haptic is threaded into the lumen of the needle using forceps. A second sclerotomy is then made with another needle that is 180 degrees apart from the first sclerotomy. The trailing haptic is inserted into the lumen of the second needle. Then, both of the haptics are externalized onto the conjunctiva. The ends of the haptics are cauterized using an ophthalmic cautery device to make a flange with a diameter of 0.3 mm. The flange of the haptics is pushed back and fixed into the scleral tunnels. It is currently the fastest method of sutureless PCIOL intrascleral haptic fixation. Chances of IOL tilt is more with this technique.

• **Carlevale intraocular lens for sutureless scleral fixation** - Recently a new design of the lens, also known as the Carlevale lens, has been described. It is a 13.2-mm-long single-piece hydrophilic acrylic IOL with a 6.5-mm-

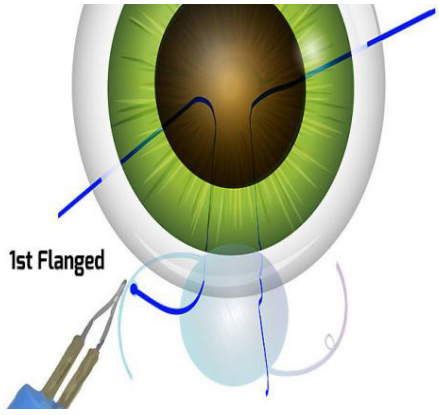
wide optic plate featuring T-shaped harpoons protruding off the closed haptics to allow self-anchoring on the sclera without the need for sutures. A scleral flap is needed to cover the harpoons.

• **Four-flanged intrascleral fixation of IOL** - Dr. Sergio Canabrava introduced a novel sutureless 4-flanged technique for scleral fixation of an IOL. It uses a 5-0 polypropylene suture to simplify and improve the safety of scleral fixation of single-piece non-foldable IOLs. First, a sclerotomy is made transconjunctivally, approximately 2.0 mm from the limbus, using a 26-gauge needle. A 5-0 polypropylene monofilament suture is placed into the needle's lumen through the empty syringe without plunger. The threaded needle is then passed ab externo and suture is grasped with the help of microforceps from posterior chamber through main incision. This is repeated on opposite site,180º from the first sclerotomy. The sutures are then passed through the IOL eyelets and heated to create flanges. The IOL is then placed in the sulcus and positioned using the externalized sutures. Finally, 2 more flanges are created on the external part of the suture till it reaches the scleral surface. The flanges are buried into the scleral tunnel (figure 1 (A and B). This is the preferred technique of the author (TA) since it is fast with minimal complications. Flanges can be covered with partial thickness sclera flap or conjunctiva also for better security.

To conclude, none of the lens fixation methods described above are perfect; each technique and method has its own set of advantages and disadvantages. The ideal lens for implantation may be influenced by age, hobbies, occupation, refractive expectations, and systemic and ocular comorbidities of the patient. In an elderly patient with no previous history of glaucoma and systemic comorbidities where the priority is having a single procedure with little chance of future lens dislocation, sulcus implantation of a 3-piece lens or flange technique of Sulcus fixation may be the most appropriate lens choice. In a young patient with a history of uveitis and with a hobby of football or other contact sport, a sutured lens might provide the best form of the secondary lens as there is less iris touch and less chance of dislocation following trauma.



1 (A)



1 (B)

Figure 1 (A and B). A Case of complicated aphakia with dropped IOL managed with four flanged technique of SFIOL

SURGICAL SECRETS

PHACOEMULSIFICATION FOR CATARACT IN VITRECTOMIZED SILICONE OIL FILLED EYES

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INTRODUCTION

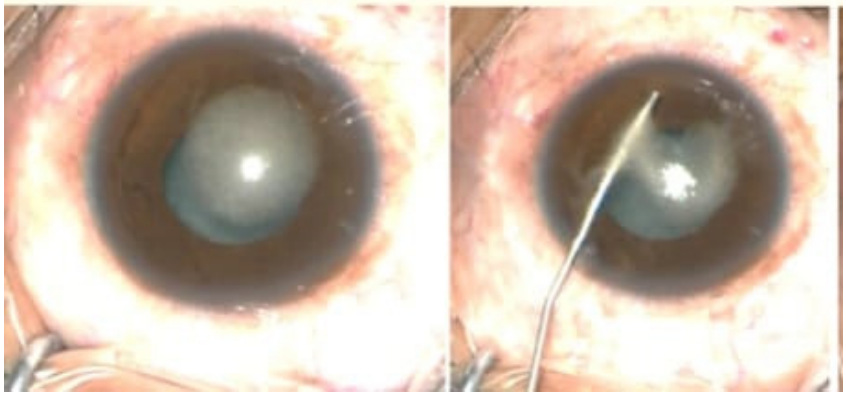
- The development of cataract is the most frequent complication associated with parsplana vitrectomy.(1). RISK FACTORS includes age, extensive surgical manipulation, high fluid flow during the procedure and repetitive fluid air gas exchanges.[2,3,4]. A lens touch during parsplana vitrectomy is a serious complication. It nearly always results in rapid cataract formation and bears the potential of capsular damage .Postoperative development of cataract in silicone oil filled eyes is mainly malnutritional due to inhibition of lens metabolism.[5]
- Vitrectomized silicone oil filled eyes account for some of the most challenging cataract surgery cases. They present higher risk for complications due to residual effects of previous surgery, inflammation and associated co-morbidities, have an increased likelihood for denser cataract and lack the physical support of the vitreous gel.
- Several pre, intra and post-operative considerations can help surgeons achieve successful outcomes in these difficult cases.
- A detailed patient history including the nature of vitreoretinal pathology and extent of previous surgery are mandatory.

Surgical technique

- Clear corneal incision is preferred as increased episcleral scarring and bleeding are common in these patient.
- Always keep a positive pressure in the anterior chamber by keeping it filled with viscoelastic.
- **To Manage obstacle hindering visualisation**

Emulsified silicone oil at the back of the cornea

- Inject viscoelastic into the anterior chamber directing the ulsified oil out of one of the corneal wounds.



- Figure 1: Emulsified silicone oil at the back of the cornea-managed by injecting viscoelastic into the anterior chamber directing the emulsified oil out of one of the corneal wounds.

- **Migration of big silicone globules to the anterior chamber**

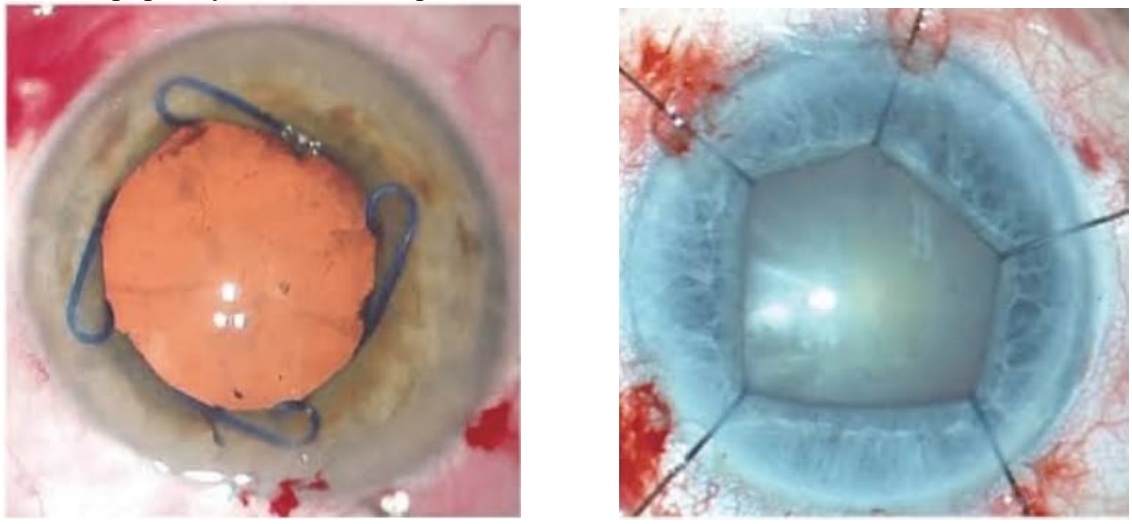
  Continuously reform the anterior chamber with viscoelastic during all steps of surgery.

Extensive posterior synechiae

- Inject viscoelastic in anterior chamber followed by breaking the posterior synechiae with an instrument.

Non dilating pupil

- Mechanical pupillary stretch technique can be used.



- **Figure 2: Mechanical pupillary dilatation**

The flotation force of silicone oil continuously pushes the lens iris diaphragm anteriorly , shallowing the anterior chamber and posing difficulty for all steps of surgery this can be managed as follows;

- DURING CAPSULOREHEXIS

After Staining the anterior capsule, Inject enough viscoelastic in the anterior chamber to flatten the anterior lens surface and to prevent extension of the capsular flap peripherally. A 5 -5.5 mm rhexis is usually sufficient.

- DO A GOOD HYDRODELINEATION

This facilitates the dislodging of nucleus from the posterior cortex and nuclear fragment emulsification in the pupillary plane away from the posterior capsule

- DURING IOL INSERTION

While injecting the IOL keep some viscoelastic in the injector in front of the IOL to open the capsule bag and push the posterior capsule posteriorly, try to let the IOL enter totally in the bag with injector to avoid further rotational manipulations.

- **POSTOPERATIVE COMPLICATIONS**

1. INTRA OCULAR PRESSURE RISE –Due to Viscoelastic remnants
2. Rubeosis iridis.

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PEARLS OF WISDOM

Effective Management Strategies for Combined Cataract and Glaucoma

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Introduction:

Cataract and glaucoma are two prevalent eye conditions that often occur simultaneously, presenting unique challenges for patients and ophthalmologists alike. Cataract is the clouding of the eye's lens, leading to blurred vision, while glaucoma refers to a group of diseases characterized by progressive optic nerve damage, often associated with elevated intraocular pressure (IOP). The coexistence of cataract and glaucoma poses complex management considerations, necessitating careful planning and specialized strategies to optimize patient outcomes. In this article, we will explore some effective management strategies for individuals facing combined cataract and glaucoma.

Comprehensive Evaluation and Diagnosis:

Accurate diagnosis is essential in determining the severity and progression of both cataract and glaucoma. A comprehensive evaluation should include a detailed medical history, visual acuity assessment, IOP measurement, gonioscopy to evaluate the drainage angle, and optic nerve assessment. Sophisticated diagnostic tools such as optical coherence tomography (OCT) and visual field testing can provide valuable information for assessing structural and functional changes associated with glaucoma.

Sequential versus Simultaneous Surgery:

When cataract and glaucoma coexist, the timing and sequence of surgical interventions should be carefully considered. In some cases, a sequential approach may be appropriate, addressing the more pressing condition first, followed by the other surgery. However, recent studies suggest that simultaneous surgery, combining cataract extraction with glaucoma procedures such as trabeculectomy or tube shunt implantation, can be a viable option, providing improved patient convenience and potentially reducing healthcare costs. The decision should be made on an individual basis, considering factors such as disease severity, IOP control, visual impairment, and patient preferences.

Collaborative Management:

To achieve optimal outcomes in cases of combined cataract and glaucoma, a multidisciplinary approach involving collaboration between ophthalmologists, glaucoma specialists, and cataract surgeons is crucial. Close communication and coordination among healthcare professionals allow for comprehensive assessment, personalized treatment plans, and effective postoperative care. Shared decision-making involving the patient ensures that treatment goals and expectations are aligned and helps in managing potential risks and complications.

Minimizing Intraocular Pressure Fluctuations:

In individuals with combined cataract and glaucoma, it is essential to maintain stable intraocular pressure levels both preoperatively and postoperatively. Fluctuations in IOP can have a significant impact on the optic nerve and visual function. Surgeons should carefully choose the type of intraocular lens (IOL) to minimize potential IOP changes after cataract surgery. Additionally, optimizing glaucoma management with appropriate medications, laser therapy, or surgical interventions can help maintain stable IOP levels and preserve optic nerve function.

Cataract Surgery:

If the cataract significantly affects vision and contributes to elevated IOP, cataract surgery may be recommended. Phacoemulsification with intraocular lens (IOL) implantation is the preferred technique. During surgery, it is important to minimize IOP fluctuations to avoid worsening glaucoma. Techniques like the use of viscoelastic devices, low-energy ultrasound, and avoiding the use of miotic agents can help maintain stable IOP.

Glaucoma Surgery:

Depending on the severity of glaucoma and IOP control requirements, glaucoma surgery may be necessary in addition to cataract surgery. Options include trabeculectomy, tube shunts, or minimally invasive glaucoma surgery (MIGS) procedures like iStent, trabectome, or Xen gel stent. The choice of procedure should be based on individual patient factors and the surgeon's expertise

Patient Education and Follow-up Care:

Adequate patient education plays a vital role in managing combined cataract and glaucoma. Patients should receive comprehensive information about their conditions, treatment options, potential risks, and expected outcomes. Clear communication about the importance of regular follow-up visits, postoperative care, and compliance with medication regimens is crucial. Encouraging patients to actively participate in their treatment and educating them about self-monitoring techniques such as IOP measurements can improve treatment adherence and overall management.

Conclusion:

Managing combined cataract and glaucoma requires a tailored approach that takes into account the unique characteristics of both conditions. Through comprehensive evaluation, collaborative management, appropriate surgical timing, stable IOP control, and patient education, ophthalmologists can optimize treatment outcomes and improve the quality of life for individuals with combined cataract and glaucoma. By staying up-to-date with the latest research and advancements in both fields, eye care professionals can continuously refine their management strategies and enhance patient care for this challenging condition

Remember, the management of combined cataract and glaucoma requires individualized treatment plans based on the specific needs of each patient. Consulting with a qualified ophthalmologist who specializes in both cataract and glaucoma is crucial for the best outcomes.

EVIDENCE BASED APPROACH

OPTICAL BIOMETRY

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INTRODUCTION

Ocular biometry refers to the measurement of anatomical dimensions of the eye, which include corneal curvature (keratometry), axial length, and anterior chamber depth. These measurements are primarily used to calculate the appropriate power of the intraocular lens (IOL) to be implanted during cataract surgery.[1]

Given the technological advances in cataract surgery, and the introduction of premium intraocular lens implants, patient expectations continue to rise, and refractive error following cataract surgery is no longer tolerated. Therefore, it is of utmost importance to obtain accurate biometric readings to optimize postoperative refractive outcomes.[2]

Biometry is performed during the pre-operative assessment for all patients undergoing cataract surgery. The measurements obtained are used to calculate the appropriate intraocular lens for each patient. Since its inception, the formula for calculating lens power has evolved, with numerous proposed formulas. One classic formula is the SRK formula, which was developed by Sanders, Retzlaff, and Kraff.[3] This formula uses two biometric values, the axial length and the corneal power, to calculate the intraocular lens power. The SRK formula is stated in the following format:

- $P = A - 0.9\ K - 2.5\ AL$

A is the A constant, K is the average keratometry value in diopters, and the AL is the axial length in millimeters (mm).

The A-constant is a theoretical value that relates the lens power to the axial length and keratometry. It is a value specific to the lens manufacturer and type and varies depending on multiple factors, including refraction index and placement within the eye. The A-constant varies approximately in a 1-to-1 ratio with the power of the lens.[2]

Keratometry is the measurement of the power of the cornea, which is based on the corneal curvature. This measurement (expressed in diopters) can be accomplished with either a manual or automated keratometer. In keratometry, the cornea is assumed to be a spherocylinder with a fixed ratio between the anterior and posterior corneal curvature.[4] The cornea then serves as a convex mirror, which leads to a virtual image from which the

anterior corneal curvature is calculated based on the 3 mm diameter mid-peripheral zone area.[3]

Keratometers are limited in accurately measuring the power of the cornea because they do not directly measure the posterior corneal curvature, and they are not able to accurately measure the central zone of effective corneal power, which is of particular concern in patients who have undergone keratorefractive surgery.[5] Topography is a corneal map that utilizes Scheimpflug principles to measure the anterior and posterior radii of corneal curvature, the corneal thickness, and the corneal power in diopters.[4] However, detailed discussions of corneal power measurements are beyond the scope of this article.

The axial length, measured in millimeters, is defined as the distance from the anterior surface of the cornea to the retinal pigment epithelium. The axial length can be measured using either ultrasound biometry (accomplished via direct contact or immersion) or optical biometry.

The SRK formula is useful for illustrating the relationships of different variables that contribute to the refractive state. However, newer formulas have been developed to measure IOL power. These formulas consider additional variables such as anterior chamber depth and lens thickness to estimate the effective lens position (ELP), a parameter that leads to improved accuracy in IOL selection.[3]

Accurately measuring the axial length is crucial, as a 1 mm error can change the IOL power by nearly 2.5 times.

CLINICAL SIGNIFICANCE

Ultrasound Biometry

Ultrasound biometry uses a high-frequency sound wave generated by a handheld probe to measure the axial length of the eye and various internal structures. The sound wave travels through the eye from anterior to posterior, passing through the cornea, anterior chamber, lens, and vitreous before reaching the retina. These different structures manifest as sharp spikes on the A-scan, with the initial spike being the probe tip on the surface of the cornea, followed by the anterior lens capsule, posterior lens capsule, retina, sclera, and the orbital fat. (Figure 1)

When the spikes are high and steep, the ultrasound beam is on the axis. If the sclera or orbital fat spikes are absent, the ultrasound beam is likely aligned with the optic nerve rather than the macula, and adjustment of the probe is necessary. The machine subsequently measures the transit time of the wave as it deflects from the internal structures of the eye. By assuming the velocity of the sound wave, the total distance traveled, which is the eye's axial length, can be calculated.[6][7]

In addition to the axial length, ultrasound biometry can measure the anterior chamber depth and the lens thickness. Ultrasound biometry does not provide keratometry measurements, so corneal power must be measured with a keratometer or topographer to calculate the IOL power.

There are two types of ultrasound biometry available; contact type and immersion type. Contract ultrasound biometry involves placing a probe directly onto the cornea. After administering topical anesthetic drops, the user must align the probe with the visual axis without applying pressure onto the cornea. A misaligned probe or inadvertent compression of the cornea may result in axial length measurements that are too low and, as such, an intraocular lens power that is too high. Because the probe is in direct contact with the eye, there is a potential risk

of transmitting infection if it is not properly sanitized between patients.

Immersion ultrasound biometry involves placing a scleral shell filled with saline between the probe and the eye. Axial length measured with immersion may be more reliable than contact ultrasound because there is no risk of corneal compression. However, proper alignment is still necessary for accurate results. Some studies have found immersion to be more accurate than contact biometry - likely because it is not prone to compression errors.[8] However, other studies have found no difference between the two.[9] Because the probe does not come into direct contact with the eye, the risk of infection is negligible.

Optical Biometry

Optical biometry is a non-contact automated modality used for measuring optical biometric parameters. Two models are widely available that employ two different techniques: Laser partial coherence interferometry (PCI) and optical low-coherence reflectometry (OLCR).[10][11] Both techniques carry the advantage of performing keratometry in addition to measuring the axial length.

The PCI uses a 780 nm infrared laser in a dual-beam setup. In this setup, the eye and the photodetector are located at each leg of the interferometer, and both partial beams are reflected at the corneal surface and the retinal pigment epithelium. (Figure 2) Interference will occur if the path difference between the beams is smaller than the coherence length, and the photodetector will detect this interference signal. Because the position of the interferometer mirror is known, the machine can measure the optical length between the corneal surface and the retina. It can then derive the geometric intraocular distance based on the refractive indices of the ocular media (cornea, aqueous, lens, vitreous humor), with a resulting resolution of 12 microns.[12][13]

The OLCR uses an 820 nm superluminescent diode in a standard Michelson interferometer setup. (Figure 3) In this biometer, the optical-path-length measurements are aligned on the visual axis of the patient's eye, and a specialized rotating glass system embedded in the machine changes the optical path length. Doing so measures not only the axial length and corneal curvature but also the central corneal thickness, lens thickness, retinal thickness, and pupil diameter.[14]

Because the OLCR-based device takes more anatomic measurements, the process takes twice as long as the PCI-based device.[15][16] Another important point differentiating PCI from OLCR is how the anterior chamber depth is measured. In the OLCR-based device, ACD is measured as the distance from the corneal endothelium to the anterior lens surface, whereas the PCI-based device measures ACD from the corneal epithelium to the anterior lens surface. Therefore, clinicians should note that the measurements among different machines may not be interchangeable.

Since the introduction of optical biometry, numerous studies have compared the different methods. In one study, both the OCLR-based and the PCI-based devices had comparable performances in determining the axial length and keratometry.[17] Another study that compared optical biometry to traditional ultrasound found no statistically significant differences in axial length measurements and anterior chamber depth but found that optical biometry was easier to use than ultrasound biometry.[18]

Other advantages of optical biometry result from its non-contact methodology; the risk of patient cross-contamination is eliminated, and there is no need for topical anesthesia. Unlike ultrasound biometry, optical biometry performs keratometry, so additional instrumentation is not necessary when calculating the IOL power.

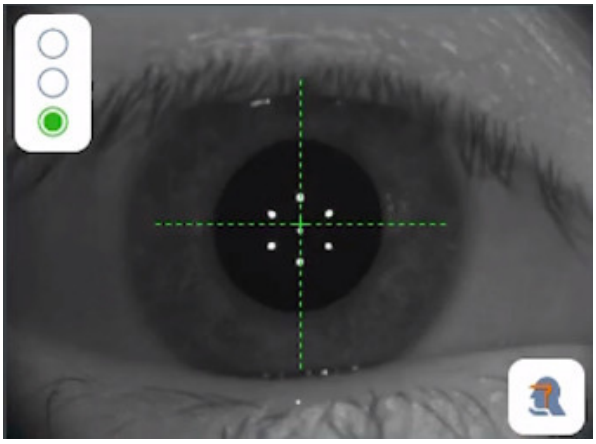
There are situations in which the ultrasound method is preferred. Because both the PCL-based device and the OLCR-based devices require an adequate foveal fixation for optimal alignment, eyes with a visual acuity of worse than 20/200, corneal scarring, macular degeneration, and eccentric fixation can all lead to inaccurate measurements. Additionally, optical biometry provides less accurate axial length measurements in eyes with very dense or posterior subcapsular cataracts because the laser beams do not penetrate the lens as well as the ultrasound waves. Ultrasound biometry, therefore, is not obsolete and should be considered to be complementary to optical biometry.[13]

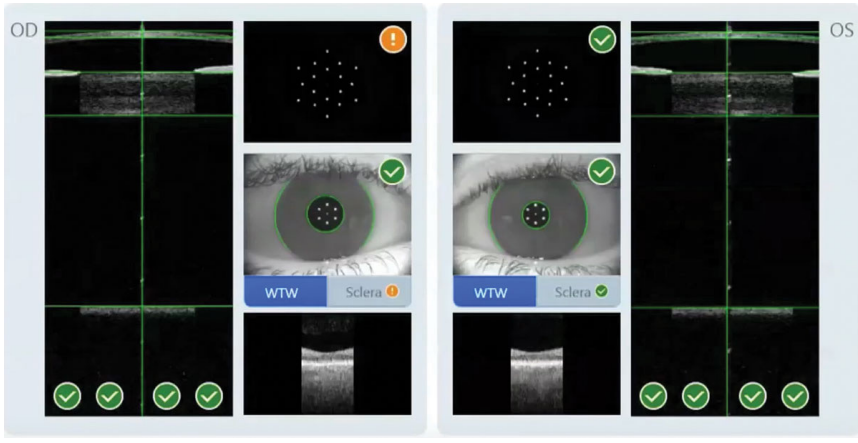
Ever since Harold Ridley implanted the first intraocular lens in 1949, cataract surgery has continued to advance. The development of optical biometry combined with improved formulae for calculating IOL power has allowed for precise refractive outcomes. The goal of surgery is no longer simply to achieve the functional vision but rather to achieve the ideal post-operative refractive state based on patient preferences and expectations. Biometry is performed during the pre-operative assessment for all patients evaluated for cataract surgery. While optical biometry has become the mainstay in modern ophthalmology, ultrasound biometry plays a role in certain situations.

IOL MASTER

Before the introduction of biometry using partial coherence interferometry (PCI), ultrasound measurements were considered the gold standard for axial length and anterior chamber depth measurement.1 In 2000, the PCI-based IOLMaster optical biometer was introduced.2-4 With this device, the measurement process was not only fast, but the non-contact method reduced the risk of infection and increased patient comfort during measurements. Initial reports suggested that the IOLMaster had the same accuracy as immersion ultrasound systems.3 Subsequently, refractive outcomes using the IOLMaster have been shown to be consistently superior to those based on ultrasound, either immersion or applanation.5-8 The IOLMaster has now been in use for over a decade and achieves measurements for axial length, anterior chamber depth and corneal curvature with high precision and good resolution.2, 4, 9, 10 Consequently, measurement devices based on PCI with integrated keratometry are being used exclusively by many ophthalmologists to retrieve axial length and keratometry values and to calculate IOL power.11 Indeed, the 2010 Survey of ASCRS members, reports that 81% of surgeons use the IOLMaster as their preferred method of axial length measurement for IOL calculations.

While only the mean corneal power is of significance in the IOL power calculation of spherical IOLs, the power and axis of the corneal astigmatism plays an additional important role in the implantation of toric IOLs. As such, surgeons are using automated keratometry more frequently than ever for the calculation of toric IOL power. As summarized in Table 1, evidence for this trend is provided by the 2010 Survey of ASCRS members, which reports that 32% of surgeons use the IOLMaster as their preferred method of keratometry for toric IOL calculations (www.analeyz.com). Around half of ESCRS surgeons state the IOLMaster is their preferred method. While spherical IOL power calculations are generally performed on ultrasound or optical biometry devices such as the IOLMaster 500 using standard formulas, for toric IOL calculation manufacturers indicate the use of their own toric IOL calculation methodology, usually in the form of an online toric lens calculator. In the US, the most frequently used calculators are the AcrySof Toric IOL Web Based Calculators (reference http:// www.acrysoftoriccalculator.com/). In contrast to spherical IOL power calculation, these calculators are concerned with the astigmatic component (i.e. cylinder and axis) of the IOL power only and rely on the surgeon's preferred standard formula for the spherical equivalent component of the toric IOL. It is plausible that the first choice of most surgeons for calculation of IOL spherical power (P-IOL) of their toric IOL is the IOLMaster given its wide range of formula options and comprehensive set of optimized lens constants. This is also supported by the 2010 ASCRS survey that shows that 71% of surgeons use the IOLMaster as the preferred method of keratometry for spherical IOL power calculation.





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EVIDENCE BASED APPROACH

SELECTION OF INTRAOCULAR LENS IN CATARACT SURGERY: A BIRD'S EYE VIEW

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INTRODUCTION

Patient selection for intraocular lenses (IOLs) is an art as well as a science because it is essential to understand objective and subjective characteristics of the patient. Objective patient-specific characteristics include medical history; the health of the eye, especially that of the ocular surface and macula; corneal power and astigmatism; biometry; and any other relevant ocular history, such as prior corneal refractive surgery. Subjectively, patient centered considerations, including visual goals, lifestyle, personality, profession, and hobbies are key elements for the surgeon to assess and factor into a recommendation for the patient. When these factors are thoroughly considered, personalized selection of an IOL can be made, and patients should have the results they want and expect.

CLASSIFICATION OF INTRAOCULAR LENSES

BASED ON FOCALITY:

1. Monofocal Lens: Simple and Toric
2. Multifocal Lens: Simple and Toric
    - Bifocal
    - Trifocal
3. Extended Depth of Focus (EDOF) lens

BASED ON MATERIAL:

1. PMMA
2. Silicone
3. Acrylic:
    - Hydrophilic
    - Hydrophobic
    - Combined Hydrophilic and Hydrophobic

BASED ON OPTIC SPHERICITY:

1. Spherical
2. Aspheric

SELECTION OF INTRAOCULAR LENS BASED ON PATIENT PERSONALITY:

Patient personalities play a role in the IOL selection process. The level of visual function and the personality traits influence patient satisfaction with visual function after implantation with different multifocal IOLs. The subjective satisfaction or dissatisfaction of patients after multifocal IOL implantation is related to certain personality traits: patients with neuroticism as the dominant personality trait were least happy with the postoperative outcomes, whereas patients with conscientiousness and agreeableness as dominant personality traits demonstrated the highest satisfaction with the postoperative outcomes.[1]

To help understand patient personalities better, patient questionnaire(s) may provide insight into personality type. Patients with perfectionist personalities, especially those with perfect visual needs, are more likely to be dissatisfied with the surgical outcome with a multifocal IOL implant. Although patients with this type of personality are not precluded from having presbyopia correcting IOLs, preoperative counseling will be needed. However, patients with more easygoing personalities may be more likely to accept the compromises in visual quality they are making for additional spectacle independence.[2]
An interesting survey among ophthalmologists suggested that majority (>61%) would prefer a monofocal IOL (either corrected for distance or as monovision) if they had to undergo the surgery themselves.[3]

MONOFOCAL VS MULTIFOCAL: WHICH IOL TO CHOOSE?
Since the introduction of the first multifocal IOLs in the 1980s, the technology developed for presbyopia-correcting IOLs has significantly evolved. This design evolution has been driven by demand for greater spectacle freedom throughout the visual range within the contemporary patient population. As the ASCRS Cataract Clinical Committee stated, "not every currently available IOL is suitable for every patient."
It is important that a detailed history enquiring about the age, work, visual expectations, hobbies, and lifestyle is taken to know the patient's visual requirements and their suitability for a presbyopia-correcting IOL. The need of spectacle independence should receive more importance over the need to implant a more expensive lens. Patients who desire sharp vision, lesser visual disturbances, good contrast, a more active and dynamic lifestyle and only a relative desire to be spectacle independent will fare well with a routine monofocal IOL or a refractive EDOF IOL like the Tecnis Eyhance IOL or the Alcon Vivity IOL. On the other hand patients whose desire to be spectacle independent supercedes their visual expectations, have a more sedentary lifestyle, lower overall postoperative expectations will do better with multifocal lenses. The working distance and use of intermediate vision should be factored in so that appropriate EDOF or trifocal lenses can be suggested. Spending more time with counselling and understanding the patient's needs and demands goes a long way for the eventual goal of a satisfied patient.
Overall, any abnormality which affects the cornea, retina, macula, or optic nerve might restrict the potential visual function after presbyopia-correcting IOL implantation. Thus a thorough examination to rule out concurrent ocular disease is paramount.

SELECTION OF IOLS IN VARIOUS OCULAR CONDITIONS:[4]

1. DRY EYE DISEASE
   Understanding the patient's ocular surface is of critical importance because ocular
   surface pathologic features can lead to false corneal power and induced astigmatism. Pre-existing DED is a significant risk factor for postoperative DED. Epitropoulos et al[5]
   demonstrated that tear hyperosmolarity leads to significantly greater variability in keratometry values, which ultimately results in variability in IOL power calculations and a potential source of a refractive surprise outcomes. Dry eye disease is one of the leading causes of dissatisfaction after uneventful cataract surgeries, especially after multifocal IOL implantation. Hence, the DED should be treated before planning surgery and it represents a relative contraindication to the implantation of MFIOLs.

2. OTHER OCULAR SURFACE DISORDERS
   In addition to DED, understanding patients' ocular surface pathologic features includes addressing anterior basement membrane dystrophy (ABMD), epithelial basement
   membrane dystrophy, Salzmann nodular degeneration (SND), and pterygium. These are common sources of false or induced astigmatism. They also can mimic or exacerbate
   DED. It is important to carefully look at the cornea and peripheral cornea by lifting the upper eye lid before surgery as choosing an MFIOL or even a toric IOL may give unpredictable results. the surgical and
   IOL options for the cataract patient with a pterygium will depend on how symptomatic the pterygium is and the degree to which pterygium is encroaching onto the cornea. If the pterygium is treated first, full healing should occur before cataract surgery is performed, which may require 1 to 3 months. If the pterygium encroaches more than 2 mm onto
   the corneal surface, astigmatism correction should not be performed at the time of cataract surgery. Phacoemulsification may be performed alone with the pterygium, without astigmatism correction. The presence of a larger pterygium

may affect the IOL power selection for the patient. Koc et al[6] showed that the recommended IOL power will be less accurate if a pterygium encroaches more than 2.4 mm onto the corneal surface.

3. PREVIOUS CORNEAL REFRACTIVE SURGERY:
Patients who have undergone myopic LASIK tend to have higher expectations regarding the refractive outcome. Intraocular lens calculation for these patients is challenging because it is
difficult for most devices to calculate the true corneal power. When estimating the effective
lens position, it may not be helpful to use the simulated keratometric value after LASIK, as is done in most of the third-generation formulas. Modern IOL formulas, such as the Barrett True-K, and advanced optical biometers can provide greater refractive predictability.
Regarding eyes that have undergone LASIK, presbyopia correcting IOLs may be used in certain eyes that have a well-centered ablation bed, more regular corneal astigmatism,
and lower amounts of higher-order aberrations.
Cataract surgery can be less predictable refractively in patients with previous radial
keratotomy (RK). It is important to recognize that a hyperopic outcome occurs early on after surgery because of flattening of the RK incisions.[7] Thus, a surgeon may consider a longer interval of waiting in between eyes for refractive accuracy and assessment of first-eye surgical outcomes. Selecting the minimal keratometry values for central corneal curvature and calculation of the IOL power using the Sanders-Retzlaff-Kraff trial equation with a reservation of -1.00 to -2.00 D can ensure better the safety of the procedure and avoid the occurrence of hyperopia of more than +3.00 D. The use of intraoperative aberrometry, careful preoperative diagnostics, or both with modern IOL formulas, that is, the Barrett True-K or Haigis for RK, can provide more accurate outcomes.[8] Advanced optical biometers may be able to image the total corneal power, and this also can aid more accurate refractive outcomes. The use of presbyopia-correcting IOLs in eyes that have undergone RK is off label, with a smaller body of evidence available on its use and results thereafter. Thus, surgeons
should exercise caution, using their best judgement based on patient-specific and corneal characteristics, and advise patients accordingly.

4. CORNEAL TRANSPLANT
An IOL maybe implanted as a staged procedure or in some cases in a “TRIPLE” procedure. Implanting an IOL during a penetrating keratoplasty warrants a monofocal IOL which is either PMMA or a 3 piece IOL. The IOL power calculation in such cases relies on taking keratometry values from the other eye and hence a considerable refractive surprise maybe expected post surgery. In a staged procedure, cataract surgery should preferably be planned after selective suture removal and stabilization of corneal astigmatism and a corneal topography should be performed. Toric monofocal IOL can be planned in such cases to achieve minimum possible postop refractive error. Similarly in a DALK and a DSAEK or DMEK, a staged procedure is always preferable to select a more accurate IOL power. In triple procedures, a more myopic target should be aimed as hyperopia can occur postoperatively due to changes in anterior corneal curvature. Hydrophobic IOLs should be preferred as opacification and calcification of hydrophilic IOLs has been documented in eyes with intracameral/intravitreal injection of gas/air. Needless to say presbyopia correcting IOLs are an absolute contraindication in post keratoplasty eyes.

5. GLAUCOMA:
The potential to affect contrast sensitivity, scotopic or mesopic vision, visual field testing,
and structural imaging, as well as for anatomic features relevant to glaucoma patients, such as small pupils and capsular and zonular issues, to affect vision outcomes must be taken into account when choosing an IOL. Glaucoma patients and ocular hypertensive patients with no disc or visual field damage who have been stable may be candidates for multifocal IOLs. Within reason, multifocal or EDOF IOLs may be used in those patients with milder forms of glaucoma. In contrast, various studies have demonstrated that multifocal IOLs can lead to a reduction in visual sensitivity indices seen on automated visual field perimetry. Patients with pseudoexfoliation syndrome frequently have small pupils, zonulopathy, risk of postoperative change in lens position and a more complicated cataract surgery and hence monofocal IOLs maybe the best bet in such cases. Because of a lack of scientific evidence in the form of large trials on the impact of multifocal IOLs in glaucoma, decisions regarding the implantation in a glaucoma patient should be tailored according to the patient’s motivation and the rate of glaucoma progression.

6. AGE RELATED MACULAR DEGENERATION:

Age-related macular degeneration (AMD), particularly the severity of the disease and whether it is exudative or nonexudative, can lead to vision issues that impact IOL selection.

Blue-light filtering IOLs may be beneficial in protecting the macula from further progression of AMD.[9] Multifocal IOLs generally are not recommended for patients with AMD

because pre-existing pathologic features are a contraindication. Clinical results in patients with severe AMD have been described for several types of IOLs recommended for AMD,

including an implantable miniature telescope, IOL-VIP System (Soleko, Pontecorvo, Italy), Lipshitz macular implant (OptoLight Vision Technology, Herzliya, Israel), sulcus-implanted Lipshitz macular implant, Fresnel Prism IOL (Fresnel Prism and Lens Co., Bloomington, MN), iolAMD (London Eye Hospital Pharma, London, UK), and Scharioth Macula Lens (Medicontur, Geneva, Switzerland). Further independent clinical studies with longer follow-up

data are necessary.

7. DIABETIC RETINOPATHY

Patients with diabetic retinopathy are inherently at risk of a more complicated cataract surgery, postoperative inflammation, cystoid macular edema, worsening of retinopathy status and posterior capsular opacification. In general, a multifocal lens is better avoided in patients with visible diabetic retinopathy but exceptions can be made in early retinopathy and a well controlled glycemic status. Again, a hydrophobic lens is preferable over hydrophilic lenses especially in cases undergoing combined cataract and retinal surgery.

8. EPIRETINAL MEMBRANE

The presence of an epiretinal membrane (ERM) can lead to more unpredictability with the spherical power of the IOL selection and its refractive outcome. In a study that evaluated the accuracy of postoperative refractive outcomes of combined phacovitrectomy for ERM in comparison with cataract surgery alone, combined phacovitrectomy for ERM resulted in significantly more myopic shift of postoperative refraction compared with cataract surgery alone. Any type of ERM makes a patient a poor candidate for a multifocal IOL because of the decreased predictability of spherical power, the ultimate contrast sensitivity, potential metamorphopsia, and increased risk for postoperative cystoid macular edema and lower VA

gain.

RECOMMENDATIONS ON SELECTION OF TORIC IOLS[10]

Uncorrected refractive astigmatism degrades visual acuity. Spherical intraocular lenses (IOLs) leave astigmatic errors resident in the cornea manifest in refractive astigmatism. Toric IOLs, correcting for this corneal astigmatism, contribute to spectacle-free vision in the pseudophakic eye. For the insertion of a toric IOL to be appropriate, the minimum requirement is that the predicted remaining astigmatism is less than the predicted post-operative corneal astigmatism and the patient receives a refractive benefit. At what point above this minimum a toric IOL is indicated, in terms of unaided visual acuity, is disputed. One limitation on toric IOL step selection seems to be the commonly held, but erroneous, view that the corneal astigmatism should not be overcorrected. Flipping of axis doesn't lead to visual aberrations and is preferred with toric IOL implantation if it leads to lesser residual astigmatism. Toric IOLs are generally indicated if the difference between the maximum and minimum keratometry values is >0.75D. In some cases where the difference is less than 0.75D also a toric IOL can be planned especially if it eases the incision site selection. For example a patient with superior steep cornea by 0.5D may end up getting a higher astigmatism if operated on a temporal incision and may get a flipped postoperative astigmatism if operated from a superior incision. In such a case, a toric IOL planned through a temporal incision will give a better outcome. It is imperative to note than any patient being planned for a multifocal IOL with an astigmatic cornea should be offered a toric multifocal option as the goal is to achieve spectacle independence.

MONOVISION[4]

Pseudophakic monovision goals can be successful with cataract surgery, but 2 specific considerations should be

taken into account in the patient selection process and subsequent conversations: (1) pseudophakia leads to absolute presbyopia and (2) the depth perception consequences of monovision. Monovision generally uses traditional monofocal lens implants to treat the dominant eye for emmetropia and the nondominant eye for myopia to enhance intermediate or near vision. However, determination of the dominant eye may not be straightforward. Monovision may show lower results with near and night vision, which generally is acceptable, and using aberration-free monofocal IOL allows for the residual normal positive corneal aberration that may augment the effect of monovision. Monovision can sacrifice a degree of depth perception and clarity. Therefore, a trial with monovision contact lenses is recommended in potential surgical patients.

CONCLUSION

In conclusion, the IOL selection process for patients requires objective assessment of patient-specific ocular characteristics, including the quality and quantity of the corneal astigmatism, the health of the ocular surface, and other ocular comorbidities. These objective factors, combined with their visual goals and personalities, assist surgeons in personalizing the IOL recommendation for optimal surgery outcomes. Potential issues that could be considered complications after cataract surgery should be addressed proactively. This holistic approach will help surgeons to achieve optimal surgical outcomes and meet and even exceed the high expectations of patients. Newer generation IOLs will expand options for refractive accuracy
and presbyopia correction.

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IMAGE ESSAY

Rosette cataract following High Voltage Electric Current

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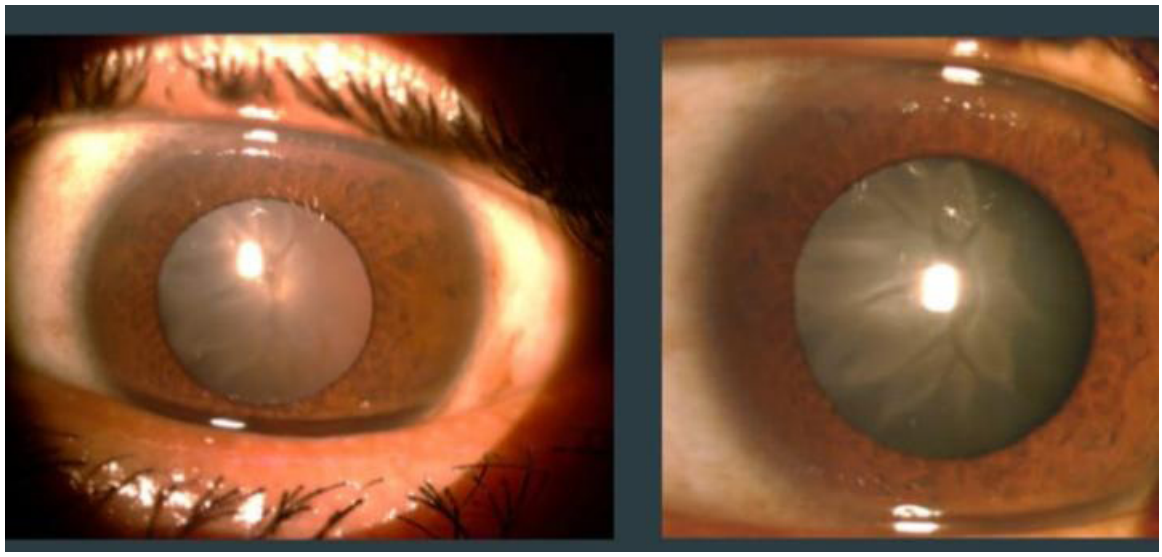
Presentation

A 19 years old male presented with complaints of progressive diminuation of vision after accidental high voltage electric burns following contact with a transformer while catching ball. BCVA was RE counting finger and LE No perception of light .On examination there were full thickness burns on upper half of left side of face, lids and left leg involving 3rd, 4th and 5th toes. Slit lamp examination of both eye revealed rosette cataract which progressed to mature cataract within 3 months .RE Bscan was normal. LE Bscan showed Retinal detachment. He underwent RE cataract surgery ,developed PCO and after YAG- BCVA was 6/6 and N/6 in RE 6 months following trauma . Three surgeries were performed by the plastic surgeon for overall aesthetic look. RE regained vision following cataract surgery but there was cosmetic and functional loss of left eye.



Discussion

Electrical injury is not rare but only few cases of electrical cataract have been reported because very few patients survive after a high electric voltage, that is needed to induce cataract [1].

Ocular high voltage electric burns may manifest in the form of , corneal opacities, cataract, retinal edema, papilledema, chorio-retinal necrosis/atrophy, retinal detachment and optic atrophy. Lenticular opacities following electrical trauma usually occur with a latency period varying from immediately after injury to a few years[2].The crystalline lens is a good conductor of electric current because of its high water content. Electrical injury seems

to change the capsular permeability directly or indirectly [3]. Osmotic changes results in Opacities formation in the capsule , anterior subcapsular cortex and Posterior cortex . The cataract may remain stationary for a long time or progress slow or progress fast. The amount and rapidity of changes in the lens bears no relation to the strength of the current.[4]The lens in younger patients is more liable to damage than that of old age[5]

Typical electric cataract starts as snowflake-like anterior subcapsular lens opacities but our case presented with well formed rosette cataract.

High - voltage injury patients usually present with severe burns requiring prolonged hospitalization. Referral to an ophthalmologist and careful follow-up is recommended in all cases of ocular / scalp electrical injuries.

Phacoemulsification followed by foldable in the bag implantation of posteriorchamber intraocular lens resulted in stable and good visual acuity in this case. Thus, proper surgical management of electric cataract will result in a good visual rehabilitation if the eye has no additional damage as in this case.

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BEYOND EYE

HOW TO PROCEED WITH NABH ACCREDITATION

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NABH accreditation for hospitals has become popular to the extent that it is now almost a necessity for any hospitals to have accreditation for competing in healthcare market. Hundreds of hospitals have applied and are making effort to bring them up to the level expected by NABH. There are different ways in which hospitals prepare themselves for accreditation. Some put up their own team to understand and implement standards while others hire a consultant to help them towards this. Chain hospitals replicate their accreditation work of one of their oher hospitals in other units. Irrespective of the method adopted, preparation for accreditation requires substantial resources, proper planning and dedicated efforts on part of the organization. Preparing for accreditation is like a journey with milestones to achieve and unless the path and approach chosen is correct, reaching the milestones can become very difficult.
With my short experience with NABH accreditation, this could be very helpful for those hospitals preparing for accreditation. It is equally important to prevent yourself from wrong ways of preparing.

A Healthcare Organization (HCO) preparing for accreditation must go through following steps. In eye hospital for full NABH accreditation we have to apply in HCO standards .For pre entry we have to apply under SHCO. As eye set ups are very small of many individuals so pre entry is possible to achieve.

1. TAKING A DECISION:
The first and most careful step to be taken towards accreditation preparation is to take a firm decision to go for it. Since the time, money and efforts involved in accreditation preparation can be substantially high for many HCO, the decision of going for accreditation should be taken cautiously. Often HCO arbitrarily decides for preparing for accreditation and later realize the true difficulty in completing the process and as a result, their accreditation journey remains half-way. As organizations fails to get accredited which causes lack in motivation, smaller developments they made towards its preparation also starts receding and efforts and resources spent for those development gets wasted. There are hundreds of HCO in the country who has applied for accreditation years back but have not been able to complete, as they are stuck at some level in the process. Common reasons for not successfully completing the accreditation process are financial constraints, infrastructural problems, unavailability of sufficient expertise, and lack of time and motivation. An HCO should be aware of reasons of failure and prevent them from getting affected by one of them. A firm decision for preparing for accreditation which is based upon a fairly good idea of resource and effort requirement can help HCO overcoming most of the road blocks mentioned above.

2. BASELINE GAP ASSESSMENT

Once the decision is taken, the initial step in accreditation preparation is baseline gap assessment of the HCO in comparison to accreditation requirements. This helps in determining technical and financial feasibility of accreditation preparation. Besides, the assessment also lays foundation for accreditation preparation and serves with useful information to plan out entire preparation exercise. In order to get a good idea about the present status and preparation required for accreditation the baseline gap assessment should be focused upon those aspects that consumes more time, money and efforts for addressing. Following sub-sections provide an understanding on how to conduct a useful baseline gap assessment. For it a proper team should be made.

Team:

Accreditation preparation is a team work and it starts right from the baseline gap assessment. Since the exercise involves assessing different disciplines of the HCO, a relevant working team should be formed for this. The team should consist at-least one person who has significant knowledge and understanding of accreditation requirements. He/she should be supported by members who are knowledgeablein field of civil engineering, legal requirements, human resources, bio-medical equipment and clinical care. List of standards and objective elements can be used as a checklist to conduct the assessment. If required help of an external consultant should be taken to get the gap assessment done.

Physical facility gap assessment:

One of the important aspects to be assessed is the physical facility including all its engineering installation. Since they are difficult to modify and cost involved is high, assessment should carefully identify if there is any deficiency with respect to accreditation requirements. One should note that accreditation requirements may not be providing any specification related to physical facility, but could be interpreted based upon the process related requirements.

Human resources gap assessment:

Fulfilling HR requirements are also cost intensive and time consuming. Hence the assessment should at the first place identify gaps related to HR requirement. Similar to physical facility accreditation standards may not give specifications of HR or numbers required but will indicate about it. The team should refer other guidelines and work out specific HR needed to fulfil accreditation requirements with special reference to staff nursing and technical staff required as per bed strength and scope of organization.

Regulatory requirements gap assessment:

Obtaining legal clearances, licenses, permits can be a time consuming task and at times be extremely difficult. Through baseline gap assessment the team should assess if the HCO meets all regulatory requirements and possess necessary documents for the same.

Bio-medical equipment gap assessment:

This is another area which is cost intensive and hence should be included in the assessment. Few important biomedical equipment related points that should be checked during the assessment is given in the link above.

Baseline gap assessment report:

The assessment finding should be documented as a report which should list out gaps in physical facility, legal requirements, HR and bio-medical equipment. Each area of the HCO should be assessed and gaps of each area should be separately documented in the report. Additionally, the gaps can be highlighted as critical, semi-critical

and non-critical from accreditation point of view. This report can then become a checklist of major things to be done for accreditation preparation. Make a checklist of important points to be covered in baseline assessment.

3. ASSIGNING RESPONSIBILITIES

After baseline gap assessment is done and a decision continues to go for accreditation preparation, it's time to assign responsibility for this work. While it requires every body's involvement in accreditation, somebody who is responsible for driving the effort is an essential thing to do and team leader should be made. Also, considering the amount and level of work involved in accreditation the responsibility should be taken by some one senior in the organization who has necessary authority.

Designating accreditation co-ordinator:

Accreditation coordinator is overall responsible for planning and preparation of accreditation requirement across the organization. A senior person from the organization with requisite knowledge of accreditation and quality should be designated as accreditation co-coordinator. He/she is also responsible for communicating with accreditation agency and handling external assessments.

Core team:

Depending upon the size of the hospital and baseline assessment a team of working executives should be formed to work towards accreditation.

Quality improvement committee:

This committee should be formed to play the advisory and monitoring role towards accreditation preparation. (See for all hospital committees and teams that needs to be formed for NABH)

Department coordinator: For each department one staff can be designated as co-ordinator or facilitator to undertake accreditation related activities in their department.

4. ACCREDITATION TRAINING:

Before the preparation of accreditation work started the core team should assess their need of obtaining necessary training with respect to accreditation. There are several training programs conducted by accreditation agencies which can be attended by core team including accreditation coordinator. If possible, HCO may invite an expert to conduct an in-house training works on accreditation, which can be attended by larger number of staff, including department coordinators. If there is an in-house availability of a person who has expertise in accreditation he/she can be involved in core team or in training or as an advisor.

5. PLANNING AND TIMEFRAME:

Baseline gap assessment identifies major time consuming work required to be done. In addition a process gap assessment should be done at initial stage of preparation to identify the processes and systems that needs to be developed or modified. This should be done in a proper manner so as it will lead to formation of plan of preparation. The process gap assessment can be done by core team in consultation with department coordinators. The accreditation standards and objective elements should be used as a checklist. Based upon process gap assessment a plan with time frame should be developed by the core team. The plan should list out the preparatory activities required and start and end time for the same. The plan should be carefully developed to be comprehensive and realistic. If required the plan should be shared with quality committee to seek multiple inputs. All coordinators should be given time frame for task about regular meetings to be done for feedback on task.

The plan should be used as a tool to check if required progress is being made within time line for accreditation.

The development in preparation should be reviewed periodically to match it with plan and wherever required appropriate steps should be taken. Plan can be modified if required with justifiable reasons.

6. PREPARATION AND APPROACHES:

There are two basic approaches to carry out the activities in the accreditation preparation plan. Centralized and DE-centralized approach. They are discussed in below sub-sections.

Centralized approach: Primary responsibility of undertaking and completing activities in plan is with core team and is done centrally, while department coordinator and other staff are minimally involved. The policy, process, documentation and specific details related to an activity are majorly done by the core team for all departments with help of inputs and information collected from departments. This approach better ensures compliance to plan and its timelines and also provides uniformity in systems and processes across the HCO. However, since the involvement of department staff and coordinators are minimal, and also sometimes the centrally developed policy may not be conducive to practical requirements in department, implementation can become difficult.

Decentralized approach: In this responsibility of undertaking and completing specific tasks are given to departments with core team only playing the role of support and coordination. The approach builds better involvement of all staff and practically useful systems and processes can be created. The disadvantage however is difficulty in maintaining uniformity and sticking to timelines.

While both approaches have its own advantage and disadvantage, an HCO can decide upon a mix of both. Activities that require high level of uniformity and critical to accreditation can be handled centrally, while activities that are technical-operational can be decentralized. For example documentation can be done centrally after collecting relevant information from departments while responsibility for things like meeting regulatory requirements can be given to department primarily.

7. PHASING PROCESS OF ACCREDITATION

While achieving accreditation is the final milestone of preparation, some milestones can be created in between the journey to get a sense of progress and achievement. This can be done by phasing out the preparation plan with each phase representing a milestone to be achieved.

Documentation:

In this phase major focus of accreditation preparation is on creating relevant documents. Documentation prepares the systems and processes to be implemented in the HCO to meet accreditation requirements.

Training:

Training phase is directed towards implementing the documented systems and procedures across the organization. A training plan that contains list of trainings, names of trainers, trainees and evaluation of training should be developed. Although documentation and trainings are continuous activity, a completion of stage should be defined. Internal audits---This phase is directed to check whether or not the documented systems have been effectively implemented. Each department should be audited based upon a relevant checklist. The exercise may be repeated if required. This is an important phase as its successful completion enables HCO to go for administrative process of accreditation

Accreditation phase:

In this phase activities related to external assessments and addressing the non-conformity are majorly handled. This is a final phase as after its successful completion accreditation is granted to the HCO.

Other activities:
A range of other activities should be done parallel to the phases described above. These activities are determined out ofbaseline gap assessment and process gap assessment and are not included in any of the phases above.

8. KEY TO SUCCESSFUL PREPARATION:
Success of accreditation preparation is majorly determined by whether or not the HCO gets accredited. Some key points that help in making the preparatory activities a success are given below -

Dedicated and motivated core team: Core team plays the major and important role in accreditation preparation and hence having a dedicated team for this purpose is the key to success. Motivation of the team is equally important. While working towards a tangible result in itself is a motivation, appreciation and recognition of their work benefits a lot.

Involvement of staff: Implementation of accreditation requirements is the ultimate check, which cannot happen without sufficient involvement of most of the staff. Closer connect with staff on the job and with their in-charges and supervisor is essential in implementation

Continuity of effort: Most of the time HCO starts with full force but gradually the level of effort declines. Sustaining the effort till the end is what can result in success

Expertise: Correct understanding of accreditation requirements and how to address them is another key to successful preparation. Thus having an expert of the subject in core team or as advisor makes it more likely to result in success

Management support: Keeping accreditation as a priority and having necessary cooperation from management is essential in prepare.

MPSOS ACTIVITIES

MID TERM MPSOS AT JABALPUR (9-4-23)

MID TERM MPSOS AT JABALPUR (9-4-23)

121 registrations with 5 national faculties and around 80 state faculties

Cultural night

FINAL Preceptors of future at MIDTERM MPSOS, JABALPUR (9-4-23)

PRECEPTORS OF FUTURE

Scientific competitive webinars for PGs of divisional societies of MPSOS

JUDGES	Dr Ajay Aurora	Dr Arup Chakrabarti, Dr Prashant Bawankule, Dr Tejas Shah
CHAIRPERSONS	Dr Pradeep Vyas	Dr D K Shakya
MODERATOR	Dr Vinita Ramnani	
Coordinators	Dr Praveen Khare	Dr Manav Setiya

FINAL - PHYSICAL (09-04-2023, SUNDAY)

IMA BUILDING, Jabalpur, HALL B, TIME - (11 am - 1 pm)

S NO	PG NAME & COLLEGE	MENTOR	Division
1	Dr Amir Munshi (GMC)	Dr Suraj Kubrey	Bhopal Division (Webinar Date - 15-01-23)
2	Dr Sadyjaya Smita (GRMC)	Dr D K Shakya	Gwalior Division (Webinar Date - 22-01-23)
3	Dr Trisha Yadu (MGMMC)	Dr Shweta Walia	Indore Division (Webinar 29-01-23 / 12-03-23)
4	Dr Palak Patwa (NSCBMC)	Dr Navneet Saxena	Jabalpur Division (Webinar - 19-02-23)
5	Dr Aashi Jain (SSMC)	Dr Sujata Lakhtakia	Rewa Division (Webinar Date - 26-02-23)
6	Dr Shivangi Sahu (RDGMC)	Dr Shubhra Mehta	Ujjain Division (Webinar Date - 12-03-23)
TOTAL	6 presentations 4 min each case		2-min rapid fire after each presentation

Coordinators for Preceptors of Future PGs Program


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•Dr Pankaj Choudhary (Mob 9826468847)


•Dr Aditi Dubey (Mob 9340787807)

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Dr Amit Porwal, Indore


Dr Himanshu Shukla, Jabalpur


Dr Rakesh Shakya, Rewa


Dr Praveen Khare, Sagar


Dr Shubhra Mehta, Ujjain

Congratulations to all winners....

1. Palak Patwa
2. Ashi Jain
3. Shivangi Sahu
4. Trisha Yadu
5. Amir Munshi
6. Satyaja Smitha

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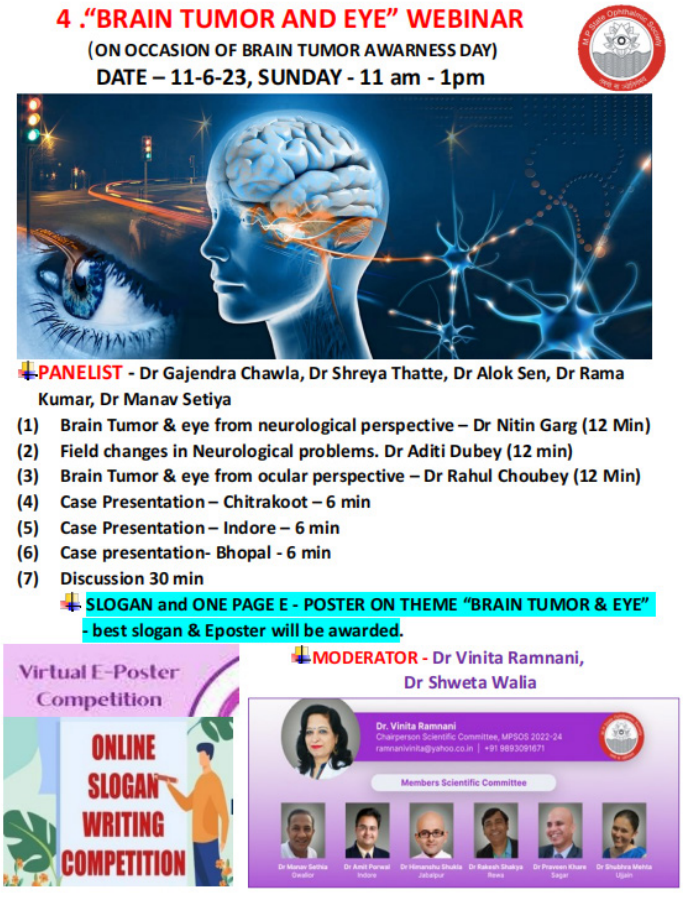

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