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GLAUCOMA IN SPECIAL SITUATIONS

Dr Manav Deep Singh, New Delhi

Focus: Pregnancy and Keratorefractive Surgery

Managing glaucoma during pregnancy presents unique challenges, requiring careful consideration of both maternal and fetal safety. The frequency of glaucoma in pregnant women is increasing, and clinicians must proactively counsel women of childbearing age who require medical treatment. Drug selection should be tailored to each trimester. In the first trimester, brimonidine is considered the safest, while beta-blockers, carbonic anhydrase inhibitors (CAIs), and prostaglandin analogs (PGAs) are generally avoided due to teratogenic risks.

During the second trimester, brimonidine remains the first-line option; beta-blockers can be introduced with fetal monitoring, and drugs like brinzolamide, PGAs, and pilocarpine may be used cautiously as second-line agents. In the third trimester, topical CAIs, beta-blockers, or brimonidine may be used with caution, although brimonidine should be discontinued in late third trimester due to the risk of central nervous system depression in the newborn. PGAs are best avoided at this stage because of their potential to induce premature labor. In the postpartum and lactation period, beta-blockers and CAIs are considered safe per AAO guidelines, while brimonidine is contraindicated.

A multidisciplinary approach is essential, with emphasis on using the safest drugs at the lowest effective dose and duration. Measures to reduce systemic absorption are important. Laser trabeculoplasty offers a safe and effective nonpharmacological option, while surgical intervention is ideally performed prior to conception or, if needed during pregnancy, in the second trimester, which is considered the safest window.

HAVE LIGHT, ZAP, MIGS TRIALS CHANGED MY CLINICAL PRACTICE?

Dr Sirisha Senthil, Hyderabad

Minimally invasive glaucoma surgeries (MIGS) are gaining prominence in managing both primary and secondary open-angle glaucoma (OAG), often as low-cost options tailored to specific patient profiles. MIGS procedures are frequently performed in conjunction with phacoemulsification and intraocular lens (IOL) implantation.

Postoperative considerations include intraocular pressure (IOP) spikes, steroid response, and hyphema. Guidelines from the World Glaucoma Association (WGA) and the European Glaucoma Society (EGS) define surgical success based on achieving IOP reductions (<21 mmHg and at least a 20% drop from baseline).

The AAO PPP (American Academy of Ophthalmology Preferred Practice Pattern) uses a 2-year success probability as a key efficacy marker. For standalone MIGS, a minimum clinical improvement difference (MCID) of 50% is proposed, whereas MIGS with capsular exchange-IOL suggests a 65% MCID. Reporting parameters include visual acuity, IOP, and antiglaucoma medication use at key intervals up to 2 years, ensuring comprehensive outcome tracking.

IMPACT OF VISION MORBIDITY – A CLINICAL PERSPECTIVE

Dr Kalpana B Murthy, Bengaluru

Vision morbidity deeply affects not only the patient but also their caregivers. Patients often experience a range of emotional challenges, including fear, anxiety, sadness, and frustration over an uncertain future. The diagnosis can feel unjust, and the cost of treatment adds further stress. Medically, these patients undergo complex evaluations and deal with side effects from long-term medications such as steroids. Frequent lab tests, follow-ups, and time away from work or school disrupt daily life. Visual symptoms like blurriness, floaters, or photophobia can lead to functional disability.

Academically, children with visual conditions may struggle with reading, seeing the board, or engaging in classroom activities. Frequent absences for treatment and social withdrawal can affect their academic performance and emotional well-being. They may also miss out on sports and peer interactions, making the transition to adulthood even more difficult.

For caregivers, managing a child with vision issues often means sacrificing career goals and adjusting lifestyles.

The emotional toll can lead to relationship stress and burnout. Financial concerns and the need for constant support create additional pressure. Overall, vision morbidity demands a multidisciplinary approach that considers not just the medical aspects but also the emotional, social, and academic impact on patients and their families.

CHALLENGING THE CHALLENGES

Dr Vaishali Vasavada, Jaipur

A 64-year-old male underwent phacoemulsification with trifocal toric IOL implantation in his right eye. One week postoperatively, his uncorrected visual acuity (UCVA) was 6/6p, N/6, with a pinhole visual acuity also measuring 6/6p. Autorefraction revealed a mild residual refractive error (+0.75/–0.75 × 70), but the best corrected visual acuity (BCVA) was plano with excellent distance and near vision.

However, the patient reported binocular UCVA of 6/6p, N/6 with some visual strain despite being comfortable with binocular correction. The left eye (OS) showed BCVA of 6/6p with a refractive error of –2.00/–2.25 × 80.

While managing unanticipated challenges in ophthalmic surgery, ophthalmologists should remember to remain calm, as composure is key to making clear, effective decisions. Leveraging the right techniques, technologies, and adjuncts can significantly limit any inflicted damage and improve outcomes. In this particular case, a timely pars plana anterior vitrectomy played a crucial role in salvaging the situation, underscoring the importance of being prepared with the right tools and mindset to adapt when things don't go as planned.

UPDATE ON GLAUCOMA THERAPIES: WHAT'S NEW AND WHAT'S ON HORIZON?

Dr Sushma Tejwani, Bengaluru

The primary aim of glaucoma medications is to reduce IOP by decreasing aqueous humor production, enhancing outflow through the uveoscleral pathway, or improving drainage via the trabecular meshwork. Newer agents, such as triple-action Rho kinase (ROCK) inhibitors, offer additional benefits by relaxing the trabecular meshwork, thereby increasing outflow. Norepinephrine transporter inhibitors further help reduce aqueous production and episcleral venous pressure. These drugs are also being explored for endothelial healing in Fuch's dystrophy and reducing diabetic retinopathy progression.

Neuroprotection in glaucoma aims to preserve the health of the optic nerve. The clinical use of neuroprotective agents depends on specific receptor targeting, laboratory evidence of injury resistance, availability at pharmcological levels in the optic nerve, and proven efficacy in randomized trials. Gene therapy-based neuroprotective systems include non-viral systems like lipid nanoparticles, small interfering RNA (siRNA), and short hairpin RNA (shRNA) for gene silencing. CRISPR-Cas9-based disruption of aquaporin 1 has shown IOP reduction in animal studies, while adeno-associated viral (AAV) gene therapy targeting brain-derived neurotrophic factor has demonstrated neuroprotection in mouse models.

Antioxidant-based neuroprotective strategies, such as *Ginkgo biloba*, melatonin, and saffron (*Crocus sativus*), are currently being explored for their potential benefits in glaucoma management. Looking ahead, the focus is shifting toward personalized, patient-specific treatment approaches that target key biomarkers like interleukin (IL)-18, hepatocyte growth factor, soluble intercellular adhesion molecule-1, interferon-gamma, and IL-6. These evolving strategies aim to:

- Support prognostication and risk stratification in clinical settings.
- Validate the inter-regulatory roles of these biomarkers through *in vivo* and *in vitro* mechanistic studies.
- Assess the effectiveness of single versus combinatorial targeting in glaucoma models.
- Explore causal roles and identify novel therapeutic targets through experimental research.
- Integrate targeted modulation—via topical or intravitreal delivery—with IOP-lowering drugs and neuroprotective agents to optimize treatment outcomes.

ANTERIOR SEGMENT RECONSTRUCTION AFTER TRAUMA

Dr Fasika A Woreta, USA

Anterior segment reconstruction plays a vital role in treating conditions like corneal scarring, traumatic mydriasis, iridodialysis, cyclodialysis cleft, and lens-related injuries, including traumatic cataracts and aphakia.

For successful iridodialysis repair (separation of the iris from its attachment to the ciliary body), follow these steps:

- Perform conjunctival peritomy.
- Use multiple 10-0 Prolene sutures on double-armed, long straight needles, passing them through a paracentesis opposite the iris insertion.

- Tie the sutures with gentle tension using a 3-1-1 knot, bury the sutures, and close the peritomy.

When there is a lack of capsular support, options include anterior chamber IOL, sutured iris fixation, and scleral fixation (sutureless Yamane or sutured Envista, CZ70BD).

Proper surgical planning and understanding intraoperative challenges are essential to optimize outcomes in anterior segment injury reconstruction.

WHAT FACTORS BESIDES CONVENTIONAL IOP LOWERING SHOULD I DISCUSS WITH MY PATIENT

Dr Tanuj Dada, New Delhi

- **Peak IOP often missed during clinic hours:** A single IOP measurement taken between 7 AM and 9 PM has over a 75% chance of missing the peak of the diurnal IOP curve, highlighting the need for round-the-clock monitoring in some patients.
- **Antihypertensive medications may increase glaucoma risk:** Long-term use of calcium channel blockers has been linked to a higher risk of OAG after 6.5 years of follow-up. These medications lower blood pressure without affecting IOP, thereby reducing ocular perfusion and increasing the risk of glaucomatous damage.
- **Watch for sleep disorders:** Sleep-disordered breathing (SDB) is highly prevalent in patients with primary open-angle glaucoma (POAG). Chronic hemodynamic fluctuations and repeated severe hypoxia associated with SDB may contribute to anoxic optic nerve damage.
- **Continuous positive airway pressure (CPAP) therapy and IOP spikes:** CPAP therapy, particularly when used at night, can lead to IOP spikes. Patients using CPAP should undergo regular screening for visual field defects and optic nerve changes.

Pillars of Glaucoma Management

Conventional therapy	Systemic disease control	Lifestyle changes	Support network
• Glaucoma drugs • Lasers and surgery	• Diabetes • Hypertension • COAD • CAD • Depression • Sleep disorders	• Meditation • Exercise • Vitamins/ Supplements • Dietary modifications	• Psychologist • Social support • Financial support • Caregiver burden • Rehabilitation • Health educator

HOW TO PROCEED WHEN THERE IS STRUCTURE-FUNCTION DISCORDANCE – STRUCTURE-STRUCTURE DISCORDANCE: WHEN RNFL AND MACULAR GANGLION CELL COMPLEX EXAMINATION DO NOT AGREE?

Dr Ronnie George, Chennai

In cases where the optic disc appears clinically healthy but a visual field defect is present, several factors must be carefully considered. For instance, if there is a family history of glaucoma, the patient has been diagnosed as a glaucoma suspect elsewhere, and the IOP is 20 mmHg with a repeatable field defect, further evaluation is crucial.

When assessing the GCC (ganglion cell complex) defect, it's important to recognize its significance if it extends from the disc. The combined GCA (ganglion cell analysis) and RNFL (retinal nerve fiber layer) deviation maps should be analyzed while ignoring the normal GCC. The RNFL defect may be narrow, located in a more peripheral RNFL bundle, and correspond to the most suspicious area on the disc.

While making a decision:

- Rule out other causes for discordance
  - Anatomical: e.g., peripapillary atrophy
  - Pathological causes.
- Assess if there is true discordance
  - Review the pano map for a complete picture.
- Treatment decisions should consider additional risk factors.
- If in doubt, wait and reassess – glaucoma progression is usually slow.

TRANSLATING NOREPINEPHRINE INHIBITION TO TREAT *PSEUDOMONAS AERUGINOSA* KERATITIS

Dr Wai Kit Chu, Hong Kong

Contact lens wear (CLW) is a major risk factor for bacterial keratitis. It is believed to contribute to the condition through multiple mechanisms, including mechanical injury, hypoxia, alteration in tear fluid composition and function, and changes in the ocular microbial composition and virulence. Studies in mouse models have shown elevated corneal norepinephrine levels associated with CLW. Norepinephrine has been found to promote *Pseudomonas aeruginosa* adhesion and biofilm formation on contact lenses. Topical application of norepinephrine further enhances *P. aeruginosa* keratitis.

Additionally, norepinephrine promotes neutrophil infiltration throughout the full thickness of the cornea,

exacerbating inflammation. In contrast, depletion of norepinephrine has been shown to alleviate *P. aeruginosa*-induced keratitis.

MIGS IN DEVELOPING NATIONS LIKE INDIA: DIFFERENCES, OUTCOMES, AND ECONOMIC CONSIDERATIONS

Dr R Venkatesh, Puducherry

In developing countries such as India, traditional glaucoma surgeries like trabeculectomy and tube shunts remain the mainstay due to their proven efficacy.

However, these procedures are often associated with longer recovery times and both early and late post-operative complications, which can significantly affect a patient's quality of life.

MIGS presents a promising alternative. It offers a high safety profile, moderate IOP reduction, and a much faster postoperative recovery. MIGS is particularly suitable for patients with mild to moderate glaucoma or ocular hypertension and is relatively more appropriate in elderly individuals or those with comorbidities where aggressive surgery is risky.

However, the cost-effectiveness of MIGS remains a major barrier. For instance, the cost per mmHg IOP reduction after 1 year is significantly higher with MIGS devices like the iStent ($1376 or ₹1,19,641) compared to trabeculectomy ($190 or ₹16,520).

Looking ahead, long-term randomized controlled trials are needed to better define success rates and ideal patient profiles. Improving infrastructure, enhancing MIGS training, and subsidizing MIGS devices are crucial steps for wider adoption in resource-limited settings like India.

INTERPRETATION OF OCTA FINDINGS IN SETTING OF ARTIFACTS

Dr Ritesh Narula, Hyderabad

Optical coherence tomography angiography (OCTA) is an excellent tool, especially as its resolution and field of view continue to improve. It is a noninvasive imaging technique that provides high-resolution, depth-resolved visualization of the retinal and choroidal vasculature. However, no other retinal imaging modality has sparked as much discussion regarding interpretation as OCTA.

Interestingly, the "A" in OCTA could also stand for Artifacts, given the significant impact artifacts have on image interpretation. The reported prevalence of artifacts in OCTA ranges from 72% to 100%.

It is essential to note that all OCTA images are susceptible to artifact risk; therefore, clinicians should carefully review all interpretation-related articles before reporting. Artifacts may arise from various sources, including patient-related factors, limitations of the imaging device, and image processing algorithms.

When interpreting OCTA images in the presence of artifacts, consider their potential impact and take appropriate steps to mitigate their influence.

Guidelines for Interpreting OCTA with Artifacts

- Consider the clinical context.
- Corroborate findings with other imaging modalities.
- Use clinical judgment to distinguish true pathology from artifacts.

A strong understanding of artifact types, their sources, and their limitations can significantly improve the accuracy and reliability of OCTA interpretation.

Managing Artifacts: Practical Tips

- **Patient-related artifacts:** If the area of interest is missing or fixation is poor, reacquire the images. Repeat image acquisition is especially important when critical areas are not captured. For patients with fixation issues, consider using smaller scan sizes. Knowing your machine and understanding its limitations is key.
- **Segmentation artifacts:** Always use the correct preset slab to identify the lesion of interest. Employing en face imaging for proper slab selection, along with manual adjustments to conform to the area of interest, can further enhance identification.

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