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# The ABCs of Ocular Imaging

A lowdown on the latest in anterior segment imaging and their real-world applications

by **Hazlin Hassan**

**On Day 3 of the Asia-Pacific Academy of Ophthalmology Congress (APAO 2023), ophthalmologists shared their experiences about real-world applications of anterior segment imaging in yet another information-packed Ocular Imaging Symposium.**

One of the most commonly used devices for anterior segment imaging is the anterior segment optical coherence tomography (AS-OCT). But for patients with primary angle closure glaucoma, gonioscopy is usually the gold standard to diagnose narrow angles.

## AS-OCT or gonioscopy: This or that?

However, AS-OCT is known to have higher sensitivity when detecting angle closure as compared to gonioscopy. Dr. Kyung

Cont. on Page 3 >>



**Newly donned APAO President Ava Hossain, speaking to Matt Young on MICE TV, is the first woman president of the APAO. Congratulations Prof. Hossain!**

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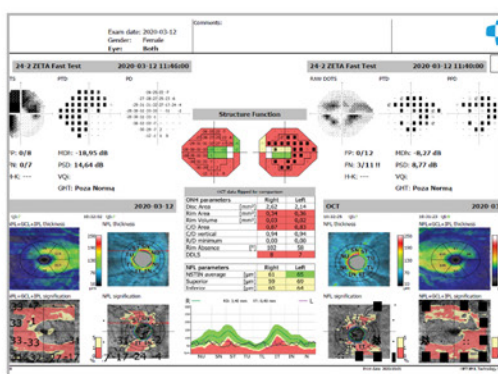
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Cont. from Page 1 >>

Rim Sung, from Asan Medical Center, South Korea, talked about the use of AS-OCT in angle closure glaucoma. “In the diagnosis of angle closure glaucoma, gonioscopy has its limitations,” she said.

It is examiner-dependent and there is direct contact, raising the risk of infection. There is also no quantification or real-time documentation. Whereas with the AS-OCT, quantitative measurement of the AC angle is possible with in-built software. “The biggest advantage of the AS-OCT is the quantitative assessment. Both strategies can be used together,” she concluded.

### All about bleb

Up next, presenting on the use of AS-OCT in post-filtering blebs was Dr. Ng Hong Kee, a glaucoma specialist at Hospital Raja Permaisuri Bainun in Malaysia. He talked about how AS-OCT is useful in differentiating a functioning bleb from a failed bleb. A thicker bleb wall, higher maximum bleb height, higher subconjunctival lagoon height, larger stripping phenomenon, and microcystic area size are the features of a functioning bleb.

Bleb failures are mainly due to subconjunctival or episcleral fibrosis, and need to be rectified early. “The AS-OCT enables visualization of internal bleb morphology. It is non-contact, easy, and quicker to perform with

higher resolution images compared to ultrasound biomicroscopy (UBM),” he continued.

“It can assist us in our clinical decisions on wound-modulating procedures — for example, needling or laser suture lysis (LSL). It can guide us in managing over-filtering blebs,” he shared.

### OCT angiography, a promising technology

A session entitled, *The use of Optical Coherence Tomography Angiography in Corneal Disease* was presented by Assoc. Prof. Marcus Ang, head of the Cornea and External Eye Disease Services, Singapore National Eye Centre (SNEC).

According to him, OCT angiography for the cornea is still in its early developmental stages but is a promising disruptive technology. “OCT angiography really is quite a simple concept. It doesn’t just image structure, it also gives us information on blood flow,” he explained.

It is non-invasive and fast and can be used in various anterior segment indications, including glaucoma. It can increase the understanding of the physiology or pathology of the vascular anatomy of the cornea.

Dr. Ang shared the results of a pilot study on *En face optical coherence tomography angiography for corneal vascularization*, conducted on 20 patients.

“What we found is that these systems are good at detecting not just the location of the vessels, but also the depth of the vessels — and that helps guide us in terms of treatment,” he continued. It helps in surgical planning by providing surgeons with the size, location, and feeder vessels of lesions. It has potential as an adjunctive or additional imaging modality, but not necessarily to replace existing techniques, he noted.

Potential clinical applications in cornea include the delineation of corneal vascularization and guiding treatments — for example, fine needle diathermy, response to anti-angiogenic therapy, ocular surface evaluation in chemical injuries, and monitoring infections or inflammation.

### Management of ocular trauma

“Ocular trauma is one of the most common reasons for ophthalmology consultation in the emergency department,” shared Dr. Eli Pradhan from the Tilganga Institute of Ophthalmology in Nepal, in her presentation entitled, *Diagnostic Imaging in Ocular Trauma*.

Imaging is necessary to assess the extent of injuries because of surrounding periorbital soft-tissue swelling and other associated injuries. However, physical examination of the globe is difficult in the setting of acute trauma. Patient cooperation may also be limited by unresponsiveness or sedation.

Ultrasonography is a non-invasive, simple, and effective diagnostic method that enables visualization and evaluation of intraocular injuries in opaque media.

The CT orbit can detect many abnormalities and complements bedside ophthalmic examinations, which are limited in the setting of trauma, she noted. Magnetic resonance imaging (MRI) is also an important modality in special circumstances, such as soft tissue assessment or with organic foreign bodies. 🍷

**Congratulations APAO 2023! Terima Kasih! We look forward to seeing you all again next year in Bali.**

**- Team Media MICE**



# The Digitalization of Eye Care

Teleophthalmology — are we ready for it? Ophthalmologists think so

by Chow Ee-Tan

***On Day 3 of APAO 2023, an international panel of ophthalmologists shed light on the topic “Telemedicine and Digital Ophthalmology During COVID-19 Pandemic Crisis” with information drawn from their home countries.***

In his session, *Teleophthalmology in Singapore: Lessons from COVID*, Dr. Gavin Tan, associate professor at the Singapore National Eye Centre, said the COVID-19 pandemic had one step further increased the adoption of teleophthalmology, changing the traditional ophthalmology screening process into digital — from gathering history examination, interpreting clinical data, and implementing treatments.

## Ophthalmology goes digital in Singapore

“In Singapore, we have a customized teleophthalmology platform for performing fundus photography screening for diabetic retinopathy. For this kind of repeated screening work, photos are read by non-physician graders and with deep learning algorithm,” he shared.

Dr. Tan continued, “We now have a huge amount of cross-sectional data which, eventually, we would try to use AI to build deep learning models, so that we can improve the interpretation of these images, reduce the human workload, or maybe even give us more information on patient’s condition.” He said by digitizing the process, doctors can potentially increase the turnover time of patients. And the transition has been aided by the easy availability of cloud computing, high-speed internet systems, and electronic medical records.

Multimodal imaging and teleophthalmology can be used synergistically to develop new models of care. AI can be applied to improve the efficacy of these imaging models of care, while data and imaging can be used for system and predictive AI algorithms

“The availability of these tools and telemedicine platforms enable us to replace physical clinical visits, saving cost and time,” Dr. Tan shared.

## Telemedicine is evolving in Malaysia

“In Malaysia, telemedicine has been slowly evolving over the years,” said Dr. Nor Fariza Ngah, national head for Ophthalmology Services, Ministry of Health, Malaysia. “During the pandemic, it provided the best alternative in bringing healthcare to patients and bridging the gap between patients, physicians, and health system.”

She said that from a recent survey of 395 doctors in Malaysia, 66% agreed that the benefits of telemedicine had been unquestionable during the COVID-19 pandemic and will remain a fundamental tool in practice.

While telemedicine has a host of benefits, Dr. Nor Fariza noted some challenges specific to teleophthalmology, such as accessibility to get tests done, financial

constraints for the test to be done elsewhere, and communication with the test providers.

Looking ahead, she reckoned there is a promising future for telemedicine in Malaysia.

“However, we have to educate our doctors and patients, and we have to educate our policymakers as well to ensure that healthcare is made more accessible to all levels of vision. This will reduce the long waiting time, which is the most common complaint in regard to health care in Malaysia,” she said.

## Telemedicine: Preferred channel for prescription care in the US

Dr. Robert Chang, an ophthalmologist from Stanford University, United States, said telemedicine has reached the 80% adoption mark overall from 71% last year, and it is the preferred channel for prescription care, such as refilling medicines, and managing minor illnesses.

“AI is the enabler for telemedicine in the future. This includes AI Image Classification, which can assist, triage, and reduce time with normal or low-risk patients, and AI Content Generation for patient education and compliances,” he shared. 📌



# Updates on GA and IRD

Advancements in therapy and treatments of geographic atrophy and inherited retinal diseases

by Khor Hui Min

**Geographic atrophy (GA) is an advanced form of dry age-related macular degeneration (AMD), where areas of the retina experience cell death. In the medical retina symposium on “Geographic Atrophy and Inherited Retinal Diseases,” experts discussed the latest research, clinical trials, and treatments available.**

Geographic atrophy is an advanced, vision-threatening form of AMD affecting approximately five million individuals worldwide.<sup>1</sup> It usually develops in the presence of early disease alterations at the level of the retinal pigment epithelium (RPE) and Bruch's membrane with funduscopically visible drusen and/or pigmentary alterations.<sup>2</sup>

## Approved therapies and treatments

Dr. Suber S. Huang from the United States talked about the first FDA-approved therapy for the treatment of GA associated with AMD. FDA approval was given on February 17, 2023.

“In the 20-year history of immunomodulatory therapy for AMD, Pegcetacoplan is the first FDA-approved therapy for the treatment of GA associated with AMD. It is well tolerated and safe in line with anti-VEGF studies,” shared Dr. Huang.

“Safety data was collected in a real-world population of over 1,200

patients with nearly 12,000 injections studied for over two years. Minimal inflammation was observed at 1.0% to 3.8%,” he added.

Meanwhile, Dr. Hendrik P. N. Scholl from Switzerland presented *Treatments for Stargardt Disease*. He said that the TEASE study was the first successful randomized, double-masked, placebo-controlled treatment trial in atrophic Stargardt disease.

“ALK-001, taken as one pill per day for 24 months, led to over 20% slower growth rate of atrophic lesions compared to placebo. IOB in collaboration with Beam Therapeutics developed an adeno-associated virus (AAV)-based editing strategy for the most common mutation in Stargardt disease and established several models, including mutation-carrying human retinal organoids and humanized mutation-carrying mice,” shared Dr. Scholl.

“Editing rates were found to be ~50% in cones, ~25% in rods, and ~60% in retinal pigment epithelium (RPE) after

in vivo injections in the non-human primate (NHP) macula. These results establish an *in vivo* proof-of-concept for therapeutic adenine base editing for Stargardt disease,” he continued.

In addition, Dr. Hwei Wuen Chan from Singapore shared that Luxturna® (Spark Therapeutics, Pennsylvania, USA) is the first approved ocular gene therapy, used to treat patients with confirmed biallelic RPE65 mutation-associated retinal dystrophy.

There are many ongoing clinical trials, and the therapeutic future is bright for inherited retinal disease (IRD).

## The latest in retina cell therapy

In his presentation entitled, *Retina Transplantation Update*, Dr. Mandeep S. Singh from the United States explained that there is at present no FDA-approved stem cell therapy for any retinal indication.

“Retina cell therapy products are being evaluated in Phase 1/2 clinical trials, where safety and potential efficacy data are emerging. Concerns about delivery-related adverse events are also being studied. There has also been recent exciting progress on in vivo biomarkers, synaptogenesis, and cellular material transfer,” said Dr. Singh.

He explained that there has been a recent FDA crackdown on unapproved and unregulated stem cell treatment centers.

With FDA-approved therapies and clinical trials on the horizon, there is hope for those suffering from GA to improve their condition and attain a better quality of life. 🍁



Panel of experts convened on February 25, 2023 at APAO 2023 in Kuala Lumpur, Malaysia to discuss the latest in GA and inherited retinal diseases.

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# What's New in Ocular Imaging?

The latest methods for diagnosis make it easier for clinicians to diagnose and treat diseases

by Hazlin Hassan

**New diagnostic criteria for polypoidal choroidal vasculopathy (PCV), myopia as a glaucoma risk factor, and non-invasive options for the detection of proliferative diabetic retinopathy (PDR) were hot topics of discussion during the APOIS symposium on Day 3 of APAO 2023.**

The Asia-Pacific Ocular Imaging Society (APOIS) is a newly-formed associate member society of the Asia-Pacific Academy of Ophthalmology (APAO) to advance the research and education of scientific knowledge relevant to ocular imaging, with a focus on common Asian ocular diseases.

APOIS proposes that optical coherence tomography (OCT) features should be included in diagnostic criteria for PCV for clinical care, shared Prof. Dr. Gemmy Cheung, head and senior consultant, Medical Retina Department, Singapore National Eye Centre (SNEC).

## ICGA: The gold standard in diagnosing PCV

Indocyanine green angiography (ICGA) is the gold standard in diagnosing PCV due to better imaging of choroidal structures. But it is an invasive procedure that may not be widely available.

Prof. Cheung presented a real-world set of nine non-ICGA diagnostic criteria to identify PCV: Sharp-peaked pigment epithelial detachment

(PED), sub-RPE ring-like lesion, complex or multilobular PED, double-layer sign, thick choroid with dilated Haller's

layer, fluid compartment, en face CT-complex RPE elevation fundus/CFP features, extensive subretinal hemorrhage, and orange nodules.

Validation of this testing set was carried out in 80 independent eyes from Singapore and Italy.

## Imaging updates on myopic glaucoma

Meanwhile, Dr. Henry S-L Chen, from Chang Gung Memorial Hospital in Taiwan, presented his talk, entitled *Imaging Updates on Myopic Glaucoma by the APOIS Myopic Glaucoma Workgroup*.

There is a significant increase in the prevalence of myopia and high myopia globally, affecting nearly 5 billion people and 1 billion people, respectively, by 2050.

While there is strong epidemiologic evidence linking myopia with glaucomatous disease, normal tension glaucoma (NTG) with myopia seems to have a slow progression rate even without glaucoma medication.

This may indicate that axial elongation is not a lifelong process but stops with aging.

The key takeaways from his presentation? Myopia is a glaucoma risk factor, with diagnosis and management proving to be challenging. Macular measurements have superior diagnostic value for

identifying myopic glaucomatous changes.

Adjusting normative mGCC thickness data for long AL or high myopia patients would have better OCT diagnostic ability for glaucoma detection. Longitudinal follow-up in the setting of myopia with glaucomatous findings may be necessary to confirm the diagnosis.

## Newer, non-invasive options for PDR detection

Prof. Jakob Grasland, chief physician at the Department of Ophthalmology and Steno Diabetes Center Odense, University of Southern Denmark, presented his talk, *Proliferative Diabetic Retinopathy*.


If untreated, 30% of patients risk severe visual loss due to vitreous hemorrhage or tractional retinal detachment. PDR can be detected with the use of fundus photography, wide-field imaging, fluorescein angiography, OCT, CT angiography, and artificial intelligence.

A national study on five-year risk factors was conducted on 170,237 Danish patients. PDR was predicted by type 1 diabetes, duration, insulin, and hypertension. Non-surgical options in PDR are panretinal photocoagulation, which are long-lasting and low-cost. However, it has potential side effects (loss of visual field, night blindness) and may have lower efficacy in DME.

Intravitreal VEGF inhibitors have fewer side effects and higher efficacy, but they require repetitive treatment with a higher price, and sometimes have a higher risk in non-adherence.

In summary, the highest risk for PDR is in long-lasting, insulin-treated, hypertensive type 1 diabetes. There is a lower risk of missing peripheral lesions with wide-field imaging.

"There is potential for newer non-invasive options for detection and monitoring, namely OCT, OCTA, and AI segmentation," he shared.

Treatment options include PRP, intravitreal therapy, and vitrectomy. 



# Stem Cell Therapy

Understanding the transformative power of regenerative medicine in ophthalmology

by Tan Sher Lynn

***Delve into the limitless possibilities of regeneration with “The Next Frontier of Vitreo-retina: Stem Cells and Retinal Regenerative Medicine” symposium, happening today at Meeting Rooms 401-402.***

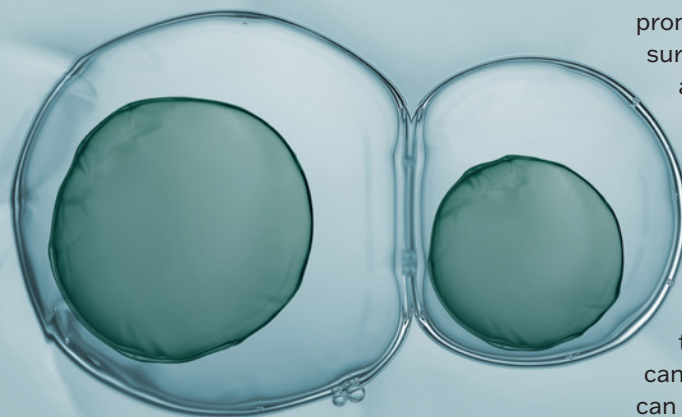
**A**ge-related macular degeneration (AMD) is one of the most common causes of irreversible blindness due to retinal pigment epithelium (RPE) degeneration. Thankfully, recent progress in stem cell research has allowed the regeneration of RPE cells from human pluripotent cells, both embryonic stem cells (ESCs) and induced pluripotent stem cells (iPSC).<sup>1</sup>

## Restoring vision with iPSC

The use of ESCs, however, is associated with ethical limitations and immunological complications. Since iPSC can be obtained from somatic cells, and their derivation does not require destruction of embryos, ethical issues are avoided.

Moreover, using iPSCs provides other benefits, such as a high degree of dedifferentiation, a high proliferation rate, and self-renewal ability.<sup>2,3</sup> With the iPSC technology, the structure and function of the retina can be restored, and vision can be regained.

On the other hand, besides having reduced immunogenicity, umbilical cord IPSC has the advantage of being multi-potent stem cells whereby its source is medical waste and inexpensive — where billions of cells can be isolated and its stemness retained after 30 replication cycles.<sup>4</sup>



Get the latest updates and developments in the field of iPSC-derived RPE cell therapy from Dr. Yasuo Kurimoto in his talk, “Retinal Regenerative Medicine Using iPS Cells”. Another noteworthy session to look out for is “Cord-Lining iPSC – An Alternative Hypo-Immunogenic Stem Cell for Retinal Therapy” by Dr. Xinyi Su.

## The revolutionary technology of CRISPR

The clustered, regularly interspaced, short palindromic repeats (CRISPR) and CRISPR-associated protein (CRISPR/Cas9) technology represent one of the most powerful gene editing tools today, being versatile for gene editing and transcriptional control as well as epigenetic modulation.<sup>5</sup>

Moreover, the fusion of iPSC with CRISPR/Cas9 has important implications for scientific research.<sup>6</sup> It also allows for the transportation of patient cells to where genome editing is practicable, before using them for autologous cell transplant.

Learn more about this brilliant technology and its great potential in Dr. Raymond C. B. Wong’s talk, “Using CRISPR Technology and Biomaterial to Direct iPS Cell Differentiation.”

## Repairing the optic nerve with MSC

Damage to the optic nerve is associated with blindness or significant visual impairment and has long been held to be irreversible. However, a study on adult rats demonstrated that human mesenchymal stem cell (MSC) therapy promotes retinal ganglion cell (RGC) survival and targets reconnection after optic nerve crush.<sup>7</sup>

In the study, treatment with human-derived MSCs promoted sustained neuroprotection and regeneration of RGCs after optic nerve injury, suggesting that with MSCs, the optic nerve can be salvaged after all and vision can be preserved.

Understand more about MSC therapy in Dr. Mae-lynn Catherine Bastion’s talk, “Mesenchymal Stem Cell Therapy for Optic Nerve Injury.”

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# Let's Hear It from the Experts

Alcon's latest innovations create a wonderful experience for surgeons and patients

by Tan Sher Lynn

***On Day 3 of APAO 2023, experts shared how the latest technologies from Alcon (Geneva, Switzerland) increase patient satisfaction and make surgery more enjoyable for surgeons.***

**T**he AcrySof IQ Vivity® IOL is a presbyopia-correcting non-diffractive extended depth-of-focus (EDoF) vision intraocular lens (IOL) that provides cataract patients with a continuous range of vision after cataract surgery. Meanwhile, the AcrySof® IQ PanOptix® is a trifocal lens that reduces the need for glasses or contact lenses after cataract surgery and provides clear vision at all distances. These and more are just some of Alcon's cutting-edge IOLs and innovations that were put in the spotlight during an Alcon-sponsored symposium yesterday.

## A balancing act

In his talk, Dr. Thomas Kohnen from Germany shared his experience in correcting presbyopia with both lenses. He said he used multifocal lenses for patients who wanted to have spectacle independence, and non-diffractive lenses for those who were not keen on having multifocal lenses — noting that mini-monovision with non-diffractive EDoF lenses might provide spectacle-free near vision for this group of people.

According to him, EDoF IOLs provide excellent distance visual

acuity, improved visual acuity in the intermediate range, as well as functional near visual acuity. In addition, the non-diffractive EDoF lens has the benefit of causing less halos compared to a diffractive EDoF as well as a multifocal lens. The non-diffractive EDoF also fares better when it comes to driving at night than the multifocal. However, the multifocal lens has better near vision acuity (VA) than the non-diffractive. Nevertheless, the mini-monovision approach enhances near VA when used with the AcrySof IQ Vivity® IOL, Dr. Kohnen noted.

Furthermore, he shared that in all the IOL implantations he did with the femtosecond laser from 2013 to 2022, the use of CLAREON® PanOptix® IOLs has remained about the same from 2016 to 2022 after an increase in 2015 to 2016, while the use of AcrySof IQ Vivity® IOLs has been increasing sharply since 2019.

In terms of real-world evidence, the AcrySof IQ Vivity® and AcrySof IQ Vivity® Registry Study have demonstrated that the lenses provided good VA for distance vision. "Looking at spectacle independence at three to six months, in summary, most patients did not need glasses to see far away or at arm's length in bright and dim conditions. Ninety one percent of patients reported being satisfied



with their sight at present. And most importantly, 91% reported no halos, glare, or starbursts,” Dr. Kohnen shared.

Looking at the cohort of patients with prior history of myopic post-refractive surgery (n=23), most patients do not need to wear glasses to see far away in bright or dim conditions.

Comparing both lenses, “Vivity gives you less optical phenomena and more spectacle independence, while PanOptix gives you more optical phenomena and more spectacle independence,” he said.

Dr. Kohnen also shared that he and his colleagues are doing a study looking at AcrySof IQ Vivity® implantation in post-LASIK eyes and CLAREON® PanOptix®, a new material, namely the Clareon material, which is currently being evaluated and had good outcomes so far.

### Excellent patient satisfaction with Vivity

Next, Dr. Soon-phai Chee from Singapore shared various cases in which she implanted AcrySof IQ Vivity®.

Patients are generally happy because not only do they get excellent distance vision, they are also able to read newspapers without glasses and do not experience halos and glares, she noted.

Moreover, the IOL can be used in eyes with conditions like intumescent cataract and irregular astigmatism due

to a previous pterygium surgery, mild non-proliferative diabetic retinopathy (NPDR), and epiretinal membrane, as demonstrated by the case studies.

“When targeted at the first minus, Vivity delivers the ‘functional near’ without compromising far because of the flat landing zone. It can be the presbyopic-correcting IOL of choice for the imperfect eye, such as those with mild macular disease or glaucoma, and when an assessment of the fundus is not possible,” Dr. Chee shared.

“When biometric inaccuracies are anticipated, or mild corneal aberrations are present, such as post myopic laser vision correction, or where optical biometry is not possible, AcrySof IQ Vivity® is forgiving. AcrySof IQ Vivity® is a better alternative to a monofocal IOL and should be offered whenever a monofocal IOL is considered,” she concluded.

### Making surgery an enjoyable experience for the surgeon

Alcon's LuxOR® REVALIA™ Ophthalmic Microscope and Centurion® Vision System with ACTIVE SENTRY® Handpiece is the ‘perfect pair’ in cataract surgery, according to Dr. Anurag Mishra from India.

The LuxOR® REVALIA™ Ophthalmic Microscope's customized LED illumination provides options of warm white (which enhances the red contrast when viewing red reflex), cool white (which enables one to see neutrally colored structures, like the sclera, in their true color), and mixed

white (which customizes the contrast of both central and peripheral field of view when viewing red reflex and lens zonules).

“It provides exceptional brilliance to the surgeon, while to the patient, illumination is low in order to ensure comfort,” Dr. Mishra shared. It also provides a wide-field red reflex and has separate sources for coaxial and oblique illumination, resulting in a 6x-larger red reflex area during cataract surgery.”

The thing that Dr. Mishra loves about the microscope is the objective lens, which is placed above the light source, creating an extra 33% of enhanced depth of field (DOF). “The whole of the lens tissue, from the cornea to the posterior capsule, is clearly visible to you. You don't need to move the head of the microscope up and down at all,” he said.

Meanwhile, the Centurion® Vision System automatically adapts to the eye's changing conditions, providing smoother fluidics, anterior chamber stability, and surgical precision. It also has efficient sentinel in active sentry as well as active surge mitigation. The ACTIVE SENTRY® Handpiece, on the other hand, works with QuickValve™ technology to provide real-time surge minimization, ensuring more consistent volume and IOP maintenance.

“All in all, these two technologies provide a wonderful experience to me while ensuring proper deliverance of promise made to each patient that walks into my office,” he concluded. 🍌



The Alcon-sponsored symposium showcased the company's latest innovations on February 25, 2023 at APAO 2023 in Kuala Lumpur, Malaysia.

# Botched Operation

## Things that mess up cataract surgery and how to resolve them

by Tan Sher Lynn

***On the third day of APAO 2023, experts discussed some complications that can occur after seemingly 'perfect' cataract surgery, and what to do about them.***



"The key thing to remember is, the sooner you give these treatments, the better the outcome. As much as possible, try to give within a month of presentation," he advised, adding that for stubborn cases, further surgical management may be needed to correct the inciting event, be it a malpositioned IOL, incarcerated vitreous, vitreous adhesions, or retained lens material.

**Y**ou think things went pretty well with your cataract surgery, but a few weeks later, the patient came back complaining of problems... This can happen. While most patients fully recover after cataract surgery, a small percentage sometimes experience complications.

### Convergence insufficiency

Visual disturbance after multifocal cataract surgery is very common, and it is very important not to assume that the problem comes from the implanted lens, noted Dr. Choong Yea Fong from Malaysia.

According to him, convergence insufficiency may actually be the issue. The condition is characterized by a decreased ability to converge the eyes and maintain binocular fusion while focusing on a near target.

Thus, doing a proper orthoptic assessment before treatment is crucial when patients complain of symptoms after multifocal surgery. "Some patients are erroneously diagnosed and treated with intraocular lens (IOL) replacement," he said.

Convergence insufficiency can be treated with conservative treatment (observation for at least three months, monocular occlusion, convergence exercises, and fusion functional training) or surgically (if symptoms persist above six months), which includes lateral rectus recession or medial rectus resection, and mini-tenotomy under topical anesthesia for small angle strabismus with diplopia.

### Postoperative cystoid macular edema

Meanwhile, Dr. Harvey Uy from the Philippines described postoperative cystoid macular edema (PCME) as the most common cause of blurred vision after uneventful cataract surgery.

Usually occurring a few months after the operation, the condition is characterized by postsurgical macular thickening/accumulation of fluid within the intracellular spaces of the retina, resulting from perifoveal capillary leakage. Diagnosis is fairly easy. Post-surgery fluorescein angiography (FA) can detect up to 20% to 30% of PCME in patients who have undergone cataract surgery, while optical coherence tomography (OCT) can detect 40%, according to him.

Prevention is always better than cure. "When we see patients with risk factors, it is a good practice to minimize trauma and control uveitis for several months before attempting surgery, which is usually with non-steroidal anti-inflammatory drugs (NSAIDs). Fortunately, the majority of cases resolve spontaneously," Dr. Uy shared. For cases that don't, a wide range of therapies is readily available, and a stepladder approach may be appropriate.

Treatments include topical NSAIDs, topical oral acetazolamide, periocular or intravitreal triamcinolone acetonide (which may work better than periocular steroid), intravitreal dexamethasone implant, and intravitreal anti-vascular endothelial growth factors (anti-VEGFs).

### Postoperative diplopia

Postoperative diplopia can be a cause of dissatisfaction for patients as well. According to Dr. Thomas Kohnen from Germany, there are five main reasons for postoperative diplopia: diplopia masked by cataract, optical aberrations, dislocated IOL, side effects of local anesthesia, and residual astigmatism.

Diplopia masked by cataract is a severe situation that can be prevented with better preoperative assessment or resolved by performing another surgery. Meanwhile, optical aberrations can be corrected with contact lenses or excimer laser surgery.

On the other hand, IOL in the wrong position can cause different refractions by light passing through the edge of the optic. The solution is usually to constrict the pupil using pharmacological agents. There are also surgical options, which include a capsular tension ring, IOL/capsular bag fixation, and secondary IOL implantation.

Dr. Kohnen mentioned that anesthesia side effects can be a cause, but it doesn't usually happen nowadays as most cataract surgeries are performed under topical anesthesia.

Lastly, toric IOL rotation after cataract surgery can cause residual astigmatism. In such cases, he said he would usually wait one to two weeks before repositioning the lens. 🐾



# AI in Retinal Diagnostics

What you need to know about artificial intelligence-powered disease detection for the retina

by Khor Hui Miin

**Artificial intelligence (AI)-based retinal analyses are diverse and evolving at a rapid pace. In the medical retina symposium on “AI in Retinal Diagnostics,” held yesterday, researchers and doctors talked about the latest advancements in AI-powered disease detection for the retina.**

**M**ajor advances in diagnostic technologies are offering unprecedented insight into the condition of the retina, and digital images providing millions of morphological datasets can quickly and non-invasively be analyzed in a comprehensive manner using AI. Methods based on machine learning (ML) and particularly deep learning (DL) can identify, localize, and quantify pathological features in almost every macular and retinal disease.\*

## Latest advancements in AI diagnostics

In her presentation, *Deep Learning of Myopic Maculopathy (MM) Due to Pathologic Myopia*, Prof. Kyoko Ohno-Matsui from Japan said that pathologic myopia (PM) is ranked as the second to fifth most common cause of blindness in the four studies of white populations (6.0% to 9.1%), and was the most common cause in the Chinese study (26.1%), as well as in the Japanese study (22.4%). She shared about the automated detection of myopic maculopathy based on fundus photos and OCT images (soft label).

“We used a large scale of fundus images of highly myopic patients to train deep learning models for recognizing MM, myopic traction maculopathy, and PM. The novel models and system achieved high sensitivity and specificity,” said Prof. Ohno-Matsui.

“We believe that our work will assist the screening of PM and subsequently protect patients from low vision and blindness caused by MM. Future work will address the applicability of the Meta-PM CS in healthcare settings,” she added.

## AI for blindness prevention in babies

Dr. John Campbell from the United States discussed retinopathy of prematurity (ROP) blindness prevention. He said that 50,000 babies go blind from ROP every year, and all those cases can be prevented. He divided the preventive measures into three levels — primary, secondary, and tertiary.

“In the primary level, we need to improve oxygen monitoring, and AI can be used to help in the population-level assessment of disease epidemiology. The secondary level involves timely and accurate ROP screening, where AI can assist in real-time, objective diagnosis, which will lead to improved risk monitoring. The tertiary level involves consistent treatment and identification of complications, where AI can be used to determine objective

treatment thresholds, standardization of treatment between clinicians, and identification of treatment failures,” explained Dr. Campbell.

He discovered that the primary level (improve oxygen monitoring) was the most crucial, and a population-level assessment could contribute to a better understanding of ROP epidemiology, as well as reduce the population at risk and incidence of severe ROP. It might even contribute to the end of the ‘third epidemic’ of ROP.

## The potential impact of AI chatbots

In his presentation entitled, *Potential Impact of AI Chatbots: For Editors, Authors, and Readers of Peer-Reviewed Ophthalmic Literature*, Prof. Dr. Neil Bressler revealed that AI chatbots can have factual errors, and may be dangerous when used to seek a diagnosis, prognosis, or disease management, and should be overseen by a physician who takes responsibility for the content, including its integrity.



“An AI chatbot can’t be an author, as it can’t be accountable for the parts of the work the AI chatbot has done. We can’t have confidence in the integrity of the contributions of any co-authors’ work written using AI chatbots,” explained Prof. Dr. Bressler, who is the Editor-in-Chief of *JAMA Ophthalmology*.

The use of AI has been instrumental in carrying out large-scale health screening programs, and retinal disease screening in particular. As technology progresses and we move one day from Industrial Revolution 4.0 to 5.0, we will expect greater things from more advanced AI-assisted diagnostics to detect diseases and earmark them for early intervention and treatment. 🦋

## References

\* Schmidt-Erfurth U, Sadeghipour A, Gerendas BS, et al. Artificial intelligence in retina. *Prog Retin Eye Res*. 2018;67:1-29.



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