Free paper session provides updates on late-breaking news

by Liz Hillman EyeWorld Senior Staff Writer

Attendees of a free paper session Sunday morning were caught up on some of the most recent news in the world of ophthalmic research.

Several studies focused on different possible treatments for dry eye disease. Anne-Marie Bleau, PhD, Madrid, Spain, described a new class of RNA interferon (RNAi) drugs that could use a natural pathway to block several of the symptoms associated with dry eye. RNAi drugs, Dr. Bleau explained, act upstream of traditional medications, are long-lasting, very specific, and have few side effects.

Tivanisiran (Sylentis, Madrid, Spain), according to Dr. Bleau, inhibits the transient receptor potential cation channel subfamily V member 1 (TRPV1) protein synthesis, which she explained is an “important mediator of ocular pain signal.” She said it is thought that topical Tivanisiran could reduce ocular pain and proinflammatory mediators and could modulate production of mucin protein to improve tear quality. Phase 1 studies showed systemic and ocular tolerance in healthy volunteers. Two Phase 2 studies compared different doses (0.75% and 1.125%) with placebo. Overall, 1.125% was effective in significantly decreasing visual analogue scale measurements, improving hyperemia (50% of treated eyes), improving corneal staining as measured by the Oxford Scale by at least 2 degrees, and significantly increasing tear breakup time (TBUT). The lower dosage also improved TBUT and conjunctival hyperemia.

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Paper session continues to bring the latest research to attendees

by Liz Hillman EyeWorld Senior Staff Writer

The second part of the late breaking news paper sessions Sunday morning informed patients about many different topics in ophthalmic research.

Ivana Kim, MD, Boston, Massachusetts, U.S., introduced light-activated AU-011 (Aura Biosciences, Cambridge, Massachusetts, U.S.) as photosensitive intravitreal injection that is then activated through laser application to treat ocular melanomas. Human trials for this treatment are underway.

Viral nanoparticles are injected into the vitreous and bind to the surface of tumor cells in the choroid, Dr. Kim explained. An ophthalmic laser at 689 nm then activates the drug, which disrupts the tumor cell membrane and leads to cell death.

The Phase 1b/2 open label study, which has to date enrolled 20 patients with choroidal melanoma and is evaluating the safety and efficacy of different drug dosages, number of weekly treatments, and number of laser administrations, has found no serious adverse events related to the treatment. Patients’ baseline vision was preserved in all patients followed to at least 6 months, even in those with juxta-foveal tumors and tumors touching the optic disk, Dr. Kim said. There was mild anterior chamber inflammation but that resolved over time. Reduced tumor thickness was seen in the first multiple dose cohort, Dr. Kim added, and a stable tumor response with vision preservation up to 12 months was seen in the single treatment cohorts.

“We are very excited about following the results of this treatment even further,” Dr. Kim said.

Other research presented by Seyedeh Maryam Hosseini, MD, Mashhad, Iran, described the potential for crocin supplements (a compound found in Crocus sativus, or saffron) as a possible additive treatment and preventative therapy for diabetic retinopathy. Saffron is known to have analgesic, anti-inflammatory, and antioxidant properties, Dr. Hosseini said, adding that it also has the potential for neuroprotection and increasing blood flow to the retina.

She described a randomized, continued on page 3
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A human trial using this technique is underway. Currently, five patients with moderate to severe dry eye disease have been recruited, treated in one eye, and followed out to 3 months. Fluorescein staining was reduced in all treated eyes within the first week, with the most prominent results after 2 months, Dr. Bar said. Three out of five patients reported a reduction in eye lubricant use by at least half, and one patient taking cyclosporine for dry eye said the drug no longer stung upon application in the treated eye. Relief of symptoms was reported within 3–4 weeks. Recruitment for another 25 patients in this trial is ongoing.

“We strongly believe this treatment modality will be able to provide those many patients who suffer from dry eye disease on a daily basis some relief that will be long lasting," Dr. Bar said.

A third study about a possible dry eye therapy was presented by Jieli Wu, MSc candidate, Xiamen, China. Ms. Wu described paeonol, a compound found in peony plants and also described as a compound isolated from a Chinese herb, and how it has been used to treat various disorders. She and coinvestigators looked at paeonol and its possible anti-inflammatory potential as it pertains to ocular surface disease in a mouse model. Overall, they saw a decrease in inflammatory factors, such as MMP-3 and MMP-9, in the corneal endothelium, as well as reduced cell apoptosis in the ocular surface in mice treated with topical paeonol. Other factors that have previously been shown as elevated in dry eye disease patients (IFN-γ, TNF-α, and IL-17A) were reduced in paeonol-treated eyes. Ms. Wu said these effects are achieved by blocking the NF-kB signaling pathway.

Joo-bin Hooshmand, MD, South Launceston, Tasmania, described Zepto (Mynosys, Fremont, California), a device that is inserted through a 2.2 mm incision and applies brief pulses of energy to create a capsulotomy. In a prospective case study of 100 eyes, Dr. Hooshmand said 70 complete capsulotomies were created, 27 were incomplete (17 had focal attachment, 10 broad attachment), four capsule tears occurred, and treatment failed in three eyes. While animal and cadaver studies have shown perfectly rolled edges of the capsulotomy on scanning electron microscopy, Dr. Hooshmand said they saw some irregularly rolled edges and other defects on their ex vivo human specimens. This, he noted, could have been due to inconsistent distribution of energy or that Viscoat (Alcon, Fort Worth, Texas, U.S.) used might have interfered with suction of the device. Passing this information onto Mynosys, Dr. Hooshmand said several changes were made to Zepto and a new study of 52 eyes resulted in a 96% rate of complete capsulotomy. While Dr. Hooshmand said Zepto shows promise as an innovative device, he thinks it requires more investigation in terms of safety and noted cost as being a barrier over manual capsulotomy creation.

Other presentations focused on a new modality to allow comparison of defocus curves of different multifocal lenses, a drug that could improve visual function in patients with advanced glaucoma, enhancement after small incision lenticule extraction, and more. EW
Second ‘landmark achievements’ session highlights topics in IOL complications, surgical retina, and more

by Ellen Stodola EyeWorld Senior Staff Writer/Digital Editor

The second “Landmark Achievements” session of the day reviewed some of the most important achievements in managing IOL complications, choroidal diseases, surgical retina, and clinical trials and management of uveitis from 2016–2018.

Lisa Arbisser, MD, Salt Lake City, U.S., highlighted three key papers during her presentation. The first she discussed was the extensive study from the Aravind Eye Hospital on “Endophthalmitis Reduction with Intracameral Moxifloxacin Prophylaxis: Analysis of 600,000 Surgeries.” The purpose of this study, Dr. Arbisser said, was to compare the rate of postop endophthalmitis before and after initiation of intracameral (IC) moxifloxacin prophylaxis. This was a retrospective clinical registry of 617,453 cases over a 29-month time, about half before and half after initiation of IC moxifloxacin, she said.

Dr. Arbisser also discussed the method: 0.1 ml moxifloxacin 0.5% was instilled into the anterior chamber at the conclusion of cataract surgery. Topical ofloxacin was used pre- and postop for all patients, and data was collected prior to and after beginning intervention. The study was started in August 2014 in 10 Aravind centers for both charity and paying patients, and endophthalmitis rates were evaluated for all cohorts.

Results found that there were no adverse events, no TASS, and no corneal decompensation, she said. Both groups had comparable rates of complications. The overall rate of endophthalmitis after initiating IC moxifloxacin declined from 0.071% to 0.020%, Dr. Arbisser said. There was a 3-fold reduction in the MSICS patients and a 6-fold reduction in the phaco patients. Overall, there was a 3.5-fold decrease in endophthalmitis.

Next, Dr. Arbisser discussed a systematic review and meta-analysis of “Intraocular lens dislocation complications, surgical retina, and management of uveitis from 2016–2018.” The session’s co–moderator, David Mackey, MD, Perth, Australia, who spoke on ocular genetics, highlighting the most cited papers from the past 2 years. Studies point toward a major new understanding in the genetic mechanism of AMD (with a common gene being identified in most AMD patients), glaucoma (three new genes identified for POAG and five identified for PAGC), myopia, cataract, diabetic retinopathy, and inherited retinal diseases (NGS technology very promising).

Dr. Mackey showed how stem cells provide disease in a dish model and the prospect of replacement cells, for instance for retinitis pigmentosa. CRISPR/ CAS9 may have the potential to correct genetic defects in vivo and AAV gene therapy was seen to improve vision in TRDs. Finally, a new treatment with vitamin B3 may help glaucoma and was possibly the most popular paper of all.

On another front, achievements in ocular oncology were presented that are making definitive strides in addressing treatments and saving lives. The session’s co–moderator, Carol Shields, MD, Philadelphia, Pennsylvania, U.S., showed developments in the treatment of conjunctival tumors, retinoblastoma, lymphoma, choroid melanoma, and in tumor biomarkers. She said that the three “biggies” were ocular surface squamous neoplasia (14%), melanoma (12%), and lymphoma (7%). Ocular surface squamous cell carcinomas were generally large, recurrent, bilateral, and very invasive, and had both surgical and non–surgical treatment options. Non–surgical options included MMC, 5–FU, and interferon (strongly preferred), among others. Dr. Shields said that retinoblastomas hardly lead to enucleation anymore thanks to today’s standard of intra-arterial chemotherapy, reducing deaths from retinoblastoma in the U.S. to 12%. Finally, a new agent (AU–011) is under trial in the U.S. for the treatment of choroidal melanoma, which once injected and light–activated, ultimately causes the targeted necrosis of tumor cells.

E. Randy Craven, MD, Baltimore, Maryland, U.S., spoke about the exciting prospects offered by MIGS. Comparing landmark trials revealed that the iStent (Glaukos, San Clemente, California, U.S.), CyPass (Transcend Medical, Menlo Park, California, U.S.), and Hydrus (Ivantis, Irvine, California, U.S.) all showed >20% IOP reduction over phaco, fulfilling the primary study goals, with iStent achieving a reduction of 53%, CyPass 77%, and Hydrus 77% at 24 months. MIGS with medications after prior failed trabeculectomy achieved the IOP goal of 12–13 mm Hg with few secondary interventions. Dr. Craven said that quality of life studies with the Hydrus showed visual acuity recovery to be on par with phaco and comparison of QoL outcomes between MIGS and trabeculectomy were similar. He noted that IOP tended to stay down when more than one iStent was used. Looking to the future, he sees all three devices on label for mild to moderate open angle glaucoma, but feels that larger studies are needed on their stand–alone efficacy and other indications.

Finally, achievements in cornea and the external eye began with a discussion on a new herpes zoster vaccination, essential to protect us from the most common worldwide disease. George Florakis, MD, New York, New York, U.S., explained that there is an increasing rate of varicella-zoster virus worldwide and that herpes zoster ophthalmicus arises in up to 76% percent of these individuals. A new recombinant, adjuvanted zoster vaccine has shown 97% efficacy for rash prevention, and 91% for post–herpetic neuralgia. Dr. Florakis also described a novel and exciting approach to treat endothelial dysfuction known as Descemet’s Strip Peeling Only (DSO) for the treatment of Fuchs’ endothelial dystrophy that has the advantages over DMEK of no: rejection, donor infection/ex– pense, rebubbles, refractive shift, or chronic steroids.

Progress that will change the future

by Stefanie Petrou Binder EyeWorld Contributing Writer

Sunday morning’s first session of WOC Day of Landmark Achievements reviewed the most important achievements in ocular genetics, ocular oncology and pathology, MIGS, and cornea and external eye disease from 2016–2018. Starting off the set was the session’s co–moderator, Lisa Arbisser, MD, Philadelphia, Pennsylvania, U.S., who presented a summary of key papers during her presentation.

Dr. Arbisser also discussed the extensive study from the Aravind Eye Hospital on “Endophthalmitis Reduction with Intracameral Moxifloxacin Prophylaxis: Analysis of 600,000 Surgeries.” The purpose of this study, Dr. Arbisser said, was to compare the rate of postop endophthalmitis before and after initiation of intracameral (IC) moxifloxacin prophylaxis. This was a retrospective clinical registry of 617,453 cases over a 29-month time, about half before and half after initiation of IC moxifloxacin, she said.

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A review of the most important achievements in new imaging modalities, anterior segment imaging, choroidal diseases, and refractive surgery from 2016–2018 was presented on Sunday afternoon as part of the third session of the WOC Day of Landmark Achievements. Co-moderator David Huang, MD, PhD, Portland, Oregon, U.S., discussed new imaging modalities, observing that just when you thought you reached the ceiling in terms of what the technology can do, a new development comes along that allows us to go even further. He discussed large strides in OCT in that allow us to image the anterior chamber better than ever before. OCT angiography may well be the most important improvement made in the past 2 years for clinical interventions due to the increased speed of OCT systems, he said. Scan interventions due to the increased speed of OCT systems, he said. Scan

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Anterior segment imaging achievements of the last 2 years were shown by co–chair Christopher Leung, MD, Hong Kong, who highlighted swept-source OCT and aqueous angiography as invaluable modalities in glaucoma diagnostics. Anterior segment imaging with swept-source OCT has provided an efficient and reliable approach for measurement of the anterior chamber angle for 360 degrees, corneal topography, and lens biometry. Specifically, such measurements as iris volume, anterior chamber volume, and imaging of peripheral synchiae have been achievable using OCT.

Aqueous angiography with confocal scanning laser ophthalmoscopy and OCT-A allows functional evaluation of the aqueous outflow pathway and may play an important role in the surgical planning of MIGS. Aqueous angiography has the added advantage of being performed during cataract surgery and, according to Dr. Leung, will continue to gain in importance for the functional evaluation of aqueous outflow. Jay Chhablani, MD, Hyderabad, India, spoke on achievements made in choroidal diseases, highlighting OCT techniques that can now image choroidal volume, choroidal vascularity, and show automated choroidal segmentation. In his own studies, Dr. Chhablani created a choroidal vascularity map and used wide-field choroidal vascularity images to demonstrate the choroidal vessel layer and a 3-D reconstruction of the choroid. OCT angiography is useful to visualize choroidal voids and to identify choroid neovascularization and its progression. New diseases identified include dome-shaped maculopathy, focal choroidal excavation, and choroidal caverns.

Landmark achievements in refractive surgery according to Jodhbir Mehta, MD, Singapore, included a wide array of improvements in surgery and diagnostics. Refractive surgery has developed significantly over the last 5 years. Contemporary laser refractive surgery has never been safer, with good outcomes both objectively (clinical assessment) but also subjectively. Improvement in laser nomograms and better diagnostics have improved the safety of these procedures even further. The development of SMILE has been interesting and further development is coming along that will improve its safety and efficacy. The use of lenticule repurposing is an exciting new field, not only in keratoconus patients but also in the area of presbyopia. Lens-based surgery has become more refractive, with many new lenses treating ametropia as well as presbyopia. Newer lenses are in development that offer a brighter future.

Diagnostics make huge strides

by Stefanie Petrou Binder EyeWorld Contributing Writer

Monday WOC 2018

A message from the WOC2020 President

by Ellen Stodola EyeWorld Senior Staff Writer/Digital Editor

Following the conclusion of WOC2018 in Barcelona, Spain, people can start thinking ahead to WOC2020 in Cape Town, South Africa, in June 2020. WOC2020 President Kgao “Eddie” Legodi, MD, Pretoria, South Africa, discussed how he’s already preparing and what he’s looking forward to in just 2 years.

“I hope that ophthalmologists will be able to attend WOC2020. All eyes will be on Africa,” he said, adding that the Vision 2020, a global initiative by the World Health Organization (WHO), is particularly relevant in Africa, will conclude that year.

Dr. Legodi said that he will be happy to have so many ophthalmologists come to Africa and invest in Africa in terms of money, knowledge, training, teaching, etc. The main aim is not just to have an impact for those 4–5 days but to have a lasting effect in Africa, he said. Dr. Legodi believes that being in Africa may be eye opening, even for those who have attended WOC before.

Dr. Legodi has been involved with ICO since 2009. In his role as WOC2020 President, he said he will mainly be acting as an ambassador for ophthalmologists, for patients, and for encouraging members to come and invest in ophthalmology in Africa, he said.

He said it’s important to encourage unity among ophthalmologists from around the world who will come to this meeting in order to work together toward the one goal of eliminating avoidable blindness. A lot of people are blind because of cataracts, and the surgical procedure is such an easy operation, he said, adding that it’s needed in Africa, in addition to training for ophthalmologists.

He added that he hopes to feature as many sessions as possible at WOC2020 and noted that cataract topics will definitely be a big draw at the meeting.

Dr. Legodi said that Cape Town is a very attractive tourist area. “It’s a bucket list place you should visit before you die,” he said. It has everything from the ocean, safaris, great people, great wine, and great food, and it’s very cheap to visit, he said.

Dr. Legodi had one message for those not coming to experience all that WOC2020 will have to offer: “You snooze, you lose,” he said.
Late Saturday afternoon, Rafael Barraquer, MD, PhD, Barcelona, Spain, gave the AOI Lecture on “The Evolution of Surgical Techniques in Cataract Surgery: the Challenge, the Conquest, the Optimization, the Future.”

Cataracts are the number one cause of world blindness and severe visual impairment, he said. We can see four patterns throughout history of how we’ve dealt with this problem, he said. The pattern starts with couching, then moves to extraction (extracapsular), to total extraction (intracapsular), and finally to microsurgery (which includes extracap, IOLs, and phaco).

Couching has been practiced since antiquity, Dr. Barraquer said, highlighting its use in history. He then went on to discuss the advent of cataract extraction, noting that incomplete extraction could have complications.

For this reason, there was a new challenge to remove the cataract completely and cleanly at the beginning of the 20th century, Dr. Barraquer said. Another challenge to total extraction was resistance of the zonules, Dr. Barraquer said, and people often had to wait, sometimes for decades, until the cataract was “mature enough” (until the zonules were weak enough) to be removed. Enzymatic zonuloysis, created by Dr. Barraquer’s father, Joaquin Barraquer, MD, aided in this effort.

But still, the lens was missing, Dr. Barraquer said, describing early intraocular lenses (in the 1950s and 1960s).

He moved on to discuss microsurgery, highlighting anesthesia, micro sutures, microscopes, micro instruments, instrumental fluids, and more.

Dr. Barraquer also discussed the future and trends in microsurgery. Cataract surgery should be effective and safe, he said, which it is.

There are a flurry of ideas to be applied to lenses in the future, he said, and we can expect that some of these ideas will work.

But still, we have the challenge of blindness from cataracts, he said. If we don’t do anything, the natural pressure of the population will make the problem even worse, he said. In addition to being safe and effective, cataract surgery also needs to be universally available and affordable, he added.

We have learned to live with machines, Dr. Barraquer said, but the result has been that we’re working in an operating room populated by machines. If we follow this pattern, we might be replaced by machines, he said. “To remain human, we have to preserve what the machines are never going to do – our relationships with our patients,” he said. EW
Sunday morning session chaired by Arthur Cummings, MD, Dublin, Ireland, and Sheraz Daya, MD, London, U.K., focused on surprise and unexpected outcomes and featured case presentations, with panelists also weighing in on how they would have handled certain aspects of the case.

Dr. Daya began with a case of a 57-year-old woman who presented in March 2017 after having hyperopic LASIK in 2001. The patient had hyperopic regression and was wearing contact lenses but wanted freedom from optical aids. Dr. Daya shared corneal OCT and other scans that he had done, asking the panel how they would proceed.

In this case, Dr. Daya first acted to regularize the left cornea and did a superficial keratectomy. He planned manual removal +/- PTK, removed the Salzmann’s sheet, and found the edge and peeled away. The flap was still scarred, he said, and he put a bandage lens on.

After good results with the superficial keratectomy, Dr. Daya did a refractive lens exchange with trifocal lenses in both eyes. He noted that you should not use multifocal IOLs following LASIK, and you should not use aspheric lenses in those who have had hyperopic LASIK.

Dr. Daya’s second case presentation focused on a patient who was post-high hyperopic astigmatic LASIK in 2007. The patient came back in with poor vision and wanted a refractive lens exchange and trifocals.

At 5 months post-LASIK, after well-centered treatments, that patient had a good outcome, however, several years later, the patient came back with problems.

After looking at the topography, it was clear something was wrong, as there was steepening in both eyes, Dr. Daya said, and the problem actually turned out to be irregular astigmatism from irregular epithelium.

To remedy this, Dr. Daya did epithelial debridement in both eyes (1 week apart, using 18% alcohol for 30 seconds). He removed the bandage contact lens at 5 days. A week later, the patient was much better, Dr. Daya said, and this was a much easier solution than the initial refractive lens exchange and trifocal option the patient had requested.

Dr. Daya noted that for irregular astigmatism post-LASIK, you should consider the epithelium and also treat the ocular surface.

Meanwhile, Dr. Cummings decided to do a refractive lens exchange, and he noted that the cornea was already pretty steep. Additionally, the anterior chamber dimensions were narrow, and the corneal epithelium was thin apically. In terms of IOL choice, he said, monovision or a multifocal are both options. But Dr. Cummings ultimately decided to use the IC-8 pinhole IOL (AcuFocus, Irvine, California, U.S.).

The patient was delighted with the result of bilateral use of the IC-8 IOL, Dr. Cummings said. This option greatly reduced dysphotopsia, and there was a great increase in vision and visual quality/contrast sensitivity. The patient also had no complaints whatsoever of reduced light/dimness, Dr. Cummings said.

Also during the session, Dan Reinstein, MD, London, U.K., shared a case of the decision-making process for dealing with high myopia treatment and Dr. Cummings discussed topography-guided PRK for keratoconus, mentioning the potential for combining topography-guided treatment with crosslinking.
Dozens of pearls for refractive cataract surgery

by Liz Hillman  EyeWorld Senior Staff Writer

Seven speakers took to the podium Saturday afternoon to offer their top five pearls for refractive cataract/IOL surgery. Co-chair of the session David Chang, MD, Los Altos, California, U.S., described this as cutting right to the conclusion.

George Beiko, MD, St. Catharines, Canada, kicked things off offering his pearls for arcuate incisions.

1. We do not need to target zero cylinder. Dr. Beiko described how research has found that about 0.75 D cylinder begins to have a visual impact. He also noted a survey that found 90% of patients with 1 D of sphere or cylinder postop did not want corrective intervention.

2. Limbal relaxing incisions (LRIs) can be as effective as toric IOLs. Specifically, Dr. Beiko said, an LRI can be as effective as torics with up to 1–1.5 D of astigmatism, which accounts for about 92% of astigmatic patients.

3. Expensive technology is not required for effective outcomes. According to research, laser AKs are only slightly better over manual AKs. A metal keratome could be just as effective as a diamond keratome, provided the nomogram is changed, Dr. Beiko said.

4. Use and refine a chosen nomogram.

5. Determine the amount of treatment using an astigmatism calculator and consider posterior corneal curvature. Use a calculator and consider posterior corneal astigmatism.

Warren Hill, MD

Following, Mitchell Weikert, MD, Houston, Texas, U.S., shared his thoughts on toric IOL challenges.

1. Measure twice, cut once. Dr. Weikert mentioned the different methods available for measuring corneal curvature and power, stating that he likes a combination of measurements including auto Ks, corneal topography, and tomography.

2. Consider other sources of astigmatism. In addition to astigmatism on the anterior surface of the cornea, Dr. Weikert said the posterior cornea and IOL tilt could be sources of astigmatism as well.

3. Don’t ignore preoperative manifest refraction. This can provide clues to overall astigmatism of the eye, such as posterior corneal astigmatism and lens tilt.

4. Know your calculators. No calculator is perfect but they keep getting better, Dr. Weikert said.

5. IOL toricity is not one size fits all. Dr. Weikert said a conservative approach should be taken in short eyes with high IOL powers because these could exhibit a greater toric effect.

Bruna Ventura, MD, Recife, Brazil, provided her pearls for presbyopia-correcting IOLs, specifically as it pertains to patient selection.

1. Obtain reliable biometric measurements. Each device gives different ways to analyze these measurements, but Dr. Ventura said to pay attention to quality of biometric measurements, including topography, and make sure at least two devices agree on measurements.

2. Identify good candidates. Those with minimal or regular/symmetric astigmatism can be candidates for these IOLs, but plan for less than 0.5 D of residual astigmatism and be sure to factor in posterior corneal astigmatism.

3. Exclude inadequate cases. These include patients with ocular surface disease, rheumatologic disease, corneal alterations (such as post-RK), compromised zones, and macular alterations.

4. Understand your patient’s personality.

5. Assess the patient’s motivation. Some patients will accept some compromise on quality of vision because they are motivated enough to get out of glasses.

Post-LASIK patients can be more challenging when it comes to choosing the right IOL, but Warren Hill, MD, Mesa, Arizona, U.S., provided his advice on this front.

1. Select the appropriate IOL type following refractive surgery. A lens with negative spherical aberration can be better for patients with prior myopic surgery, while aberration neutral or spherical IOLs can be better for those who had hyperopic correction, Dr. Hill said.

2. Obtain a corneal aberration profile prior to refractive IOL surgery. Elevated higher order aberrations “can be a killer” for multifocal lenses and they can derail toric IOLs as well.

3. Try to show the patient what the issues are via image simulation. Dr. Hill said this is the most important thing he does with these patients because it helps them understand what’s going on with their eyes and shows you’re sympathetic with the symptoms they’re having. You can also show them what their vision might look like postop.

4. Use the ASCRS post-refractive IOL power calculator.

5. Look to the Barrett True K and Masket formulas for myopic LASIK.

Various pearls related to postoperative refractive enhancement were presented by Kendall Donaldson, MD, Plantation, Florida, U.S., who turned her five pearls into questions that need to be answered with these patients.

1. Why is there a residual refractive error? The cause of residual refractive error needs to be determined, if possible, before deciding upon an enhancement procedure. Most sources of error, Dr. Donaldson said, can be attributed to poorly tear film/dry eye and non-optimal topography. She uses select technicians to perform measurements, making sure that patients are measured before drops and that unusual eye measurements are repeated.

2. How large is the residual refractive error? If it’s small, treating ocular surface disease, neuroadaptation, or laser vision correction can be enhancement options. Larger refractive error could merit IOL exchange, piggyback IOL, or laser vision correction.

3. Myopic or hyperopic? Residual myopia is easier to treat with LASIK and is more tolerable to the patient, while hyperopia is more difficult to treat with LASIK.

4. Spherical or cylinder? Determine whether toric IOLs need to be rotated.

5. Who is the patient? Is the patient 20/happy or angry? Talking to patients can determine if they want enhancement or not and can help you better understand what their expectations were, and if those expectations were set by the surgeon preoperatively. Talking about the potential for enhancement preoperatively can be helpful as well.

In addition Jose Guell, MD, PhD, Barcelona, Spain, shared his pearls for achieving successful monofocal monovision and Samuel Masket, MD, Los Angeles, California, U.S., discussed managing unhappy refractive IOL patients. EW
Understanding the pitfalls of glaucoma surgery

By Stefanie Petrou Binder

Microinvasive glaucoma surgery is presenting a huge amount of relief for IOPs in patients with mild to moderate glaucoma, however they do not solve everyone’s problems. On Saturday afternoon, experts convened at a WOC session to review current glaucoma surgery management and discuss how to optimize outcomes. Addressing the pitfalls of ocular surface disease, the session’s co-chair Christophe Baudouin, MD, Paris, France, told WOC attendees that despite the many advances made in glaucoma surgery, we are still facing major challenges to IOP outcomes due to bleb fibrosis. Ocular surface disease with acute and chronic inflammation affects surgical outcomes. He explained that conjunctival microcysts were greatly decreased in eyes with ocular surface disease, as were gobelin cells and both were decreased in non-functioning and encapsulated blebs. Ocular surface disease can be induced or induced by medications. Microcysts are markers of efficacy and are good prognostic factors for postoperative IOP.

Managing filtering bleb complications is an ongoing dilemma. Dr. Baudouin’s co-chair, Amel Ouerhani, MD, Tunis, Tunisia, explained that filtering blebs are dynamic, evolve over time, and must be monitored. The success of surgery often depends on appropriate and timely postoperative intervention. Blebs form during the first week until roughly 3 months after surgery and become slightly opalescent. Early detection of filtering bleb failure involves progressive and irreversible IOP rise during the second to fourth weeks. The presence of blood, development of tenon cyst, and progressive bleb flattening are bad signs. A shallow anterior chamber, goniosynechiae, corneal decompensation, choroidal detachment, and maculopathy are signs of hypotony. Prevention includes minimizing surgical trauma, careful closure of scleral flap, watertight conjunctival closure, and careful use of antifibrotics.

Refractory glaucoma is a progressive complication that can result out of almost any type of glaucoma. According to Sidi Mohammed Ezzouhairi, MD, Mohammedia, Morocco, the aim of the glaucoma specialist is to never give up and to preserve visual function in his patients at all costs. When IOP is refractory to medical therapy, laser, and filtering surgery, the clinician’s options are limited. Beyond prevention, Dr. Ezzouhairi believes that surgical solutions, such as MIGS, glaucoma drainage devices, ultrasound ciliary plasty, and cyclophotoagulation can help.

Olfa Fekin, MD, Tunis, Tunisia, described another dreaded entity characterized by a shallow anterior chamber, increased or normal IOP, the absence of pupillary block, and the absence of posterior segment pathology, known as malignant glaucoma. The precise etiology and pathophysiology remain unclear and resolution depends on timely intervention. Therapy consists of breaking the vicious cycle that ensues from transvitreal pressure, displacement of the lens-iris diaphragm, AC shallowing, and increased IOP to restore aqueous flow.

The XEN Gel Stent (Allergan, Irvine, Calif.) offers new options in glaucoma surgery to achieve large pressure reductions very quickly. It is the only ab-interno stent that utilizes the conjunctival drainage system, and according to Ahmed Elkarmouty, PhD, London, U.K., not only does the implant reliably reduce IOP but if a patient needs a trabeculectomy anyway, he still can perform one. Studies have documented a reduction in IOP in excess of 30% 6 months after XEN implantation. Dr. Elkarmouty offers the XEN to anyone in whom trabeculectomy is indicated, but also to his very old and very young patients, in the latter particularly as a means to preserve the conjunctiva.

Finally, Sihem Lazreg, MD, Bli da, Algeria, discussed pseudoxefoliation syndrome as the most common identifiable cause of open-angle glaucoma worldwide. It is particularly aggressive and runs a faster course of progression with a poorer response to medical therapy. The condition predisposes to capsular rupture, zonular dehiscence, and vitreous loss during cataract extraction. Although there is no consensus on the best course of therapy, Dr. Lazreg recommended laser trabeculoplasty, filtering surgery, and tube shunt implantation.

Eyeing the future of ophthalmology

By Stefanie Petrou Binder

The Robert Ritch Forum on Medicine of the Future kicked off on Sunday morning exploring the fields of nanotechnology, tissue bioengineering, and artificial intelligence. For the first time at the WOC, an entire forum was dedicated to groundbreaking advances in medicine, in association with the International Council of Ophthalmology (ICO), that experts are predicting will impact ophthalmology in the coming decades. Co-moderating the session was Robert Ritch, MD, New York, New York, U.S., who believes that these new technologies may well pervade all aspects of our lives in the future. “We are bringing together leading creative speakers to speculate on what the future could hold,” Dr. Ritch told the symposium attendees. “ICO created a massive thrust for global education especially on developments in medicine far into the future, on the horizon of ophthalmology.”

Speaking on hacking cell biology to create human tissue, Zev Gartner, PhD, San Francisco, Calif., U.S., explained his strategies for building tissues and organs, which he believes might be transformative in the field of regenerative medicine. Learning how to build tissues might not only allow us to use the tissues where needed but also to develop the drugs needed to treat them. His studies are based on the capability of “self-organization” of tissues, which is how our pluripotent stem cells guide their own development to become tissues and organs. Using a model of the intestinal villus, Dr. Gartner explained how cells set up lines of communication with one another and, when placed in a self-reinforcing environment, develop into specific tissue/tissue systems. Taking a closer look at collagen, he was able to understand the intercellular interactions that led to cell movement, tension, and bending of cell groups. He predicts being able to apply these highly controlled, engineerable procedures will help us understand the development of ocular tissues. Creating functional tissues could allow us to replace diseased or damaged tissues and avoid rejection. The potential to recreate corneal tissue, which is a relatively simple organ, was discussed as an exciting option, realizable by studying corneal formation and imposing boundary conditions.

Artificial intelligence in ophthalmology was the next topic at the forum. Tien Yin Wong, MD, Singapore, explained that the evolution we have seen over the past decades began with artificial intelligence, which developed into machine learning and was then redefined by deep learning. Artificial intelligence is a breakthrough innovation and technology that has substantial potential to impact on ophthalmology, he said. For ophthalmology, artificial intelligence-based deep learning systems have improved cost-effectiveness and sustainability of diabetic retinopathy screening in developed countries and are a platform for opportunistic screening in low-resource countries. It has been shown to provide the ability to diagnose and stratify normal and abnormal OCT images and predict outcomes of treatment in AMD and DME. Dr. Wong believes that the challenges of artificial intelligence are largely non-technical and require the “hard work of translation.”

Most importantly, however, the data input needs to be clear, testing in real-world scenarios is vital, and we need to overcome the fear of the “black box,” that machine that’s trying to tell us what to do. In some cases, it would seem that we may want to trust our own instincts, as physicians. The challenges of artificial intelligence revolve around realistic expectations between computer scientists, clinicians, and health payers.
A message from the incoming Scientific Program Chair

by Ellen Stodola, EyeWorld Senior Staff Writer/Digital Editor

**Monday WOC 2018**

Marie-Jose Tassignon, MD, Antwerp, Belgium, will serve as the WOC Scientific Program Chair for the next WOC meeting in 2020 in South Africa. She spoke to EyeWorld about the WOC 2018 and how she’s already preparing for Cape Town in 2020.

Dr. Tassignon said that she generally participates in a lot of sessions during the WOC meeting, but this year, she plans to attend sessions that she wouldn’t usually attend to really try to experience everything that the program has to offer. There are so many subspecialties involved, she said, adding that she expects to attend many of these sessions beyond her personal interests of cataract, refractive, and cornea surgery.

“I think that the most important thing is I would like to really look at the meeting in Barcelona through different eyes,” she said. The program includes a wide array of topics, including sessions on education and research, as well as clinical topics. Attending a variety of sessions on the program in Barcelona, Dr. Tassignon thinks, will help prepare for Cape Town in 2020.

She also noted that Vision 2020, a global initiative by the World Health Organization (WHO), will conclude in 2020, so she expects this will play a large role at the next WOC meeting.

The keynote speaker at a World Ophthalmic Education Colloquium (WOEC) luncheon was Glenda Eoyang, PhD, founding executive director of Human Systems Dynamics Institute, who discussed “Dealing with Uncertainty in Medicine and Medical Education.”

There is something special about those of you who have chosen a path in education, she said, adding that there are not enough ophthalmologists to do the work that needs to be done. Education has levels of complexity and uncertainty, she added.

With changing demographics, relationships, and the global connection we’re building, being sensitive to culture is a really important issue, Dr. Eoyang said. “Culture itself is shifting,” she said. We find that we used to think about categories of culture, and there were clear descriptions of what different cultures look like, but that approach, simple and check listed, is no longer enough, she said.

“We also find that in medicine, there are many things we can know for sure, and yet, the things that you do not know are the most interesting,” she said. In the past, when there was uncertainty, what we did was to build more and more technology, Dr. Eoyang said.

She then discussed uncertainty in human systems.

She said there are two ways to go wrong in a human system: by not looking at any uncertainty or by drowning in uncertainty. She added that you need to find the in-between and use what you know to move forward but still stay curious.

Dr. Eoyang also offered four rules to help manage uncertainty by leveraging what you don’t know to use what you do know.

1. Ask good questions.
2. Experiment and learn.
3. Expect the unexpected.
4. Stay connected. **EW**

Keynote speaker at WOEC lunch addresses uncertainty in medicine and medical education

by Ellen Stodola, EyeWorld Senior Staff Writer/Digital Editor

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Check out some of the many shopping areas the city has to offer. Whether you’re looking for high-end brands, souvenirs, or food items, there are many places to find what you’re looking for in Barcelona.

**Arenas de Barcelona Shopping Centre**
This location opened as a shopping center in 2011. Previously, it was a bullring and musical venue. It’s located on the Gran Via de les Corts Catalanes. It’s open every day except for Sunday from 9:00 a.m. to 9:00 p.m. It includes a variety of stores, as well as restaurants, cafes, and fast food.

**Avinguda Diagonal**
This shopping area is advertised as popular among tourists, as it includes many well-known, expensive, brand-name stores. The Avinguda Diagonal is a large street that crosses the city from east to west. Shops here include shopping centers like L’illa Diagonal, El Corte Ingles, and Centro Comercial Gran Via 2. Other stores include Primark, Hermes, Superdry, Calvin Klein, Gucci, and Giorgio Armani.

**Bulevard Rosa**
This shopping area is located on Passeig de Gràcia in the Eixample neighborhood. It has over 100 stores, including large name brands and smaller boutique shops. This shopping center was built in the 1980s and also includes a variety of restaurants.

**Gothic Quarter**
This area is a great stop in Barcelona to marvel at the sites, but you may also want to check out some of the shops. In the Gothic Quarter, there is a mix of chain stores and smaller specialty shops. You may want to visit the hat shop, Sombrerería Obach, or look for vintage and retro clothing at some of the many shops. Those looking for antiques may also be successful shopping in the Gothic Quarter.
Barcelona Tours/Excursions

There are a plethora of tours and day trips to take from Barcelona. Here are just a few possible destinations.

Cadaqués
Located about 2.5 hours northeast of Barcelona, Cadaqués is home to Salvador Dalí’s Portlligat Museum-House. The area features many beaches, as well as the Cap de Creus Natural Park on the Costa Brava.

Figueres
About 1.5 hours from Barcelona, Figueres is located in the Girona province. It is the birthplace of Salvador Dalí. The Dalí Theatre and Museum, a large museum designed by Dalí, is located here in the former municipal theatre. Dalí is also buried there.

Girona
This city is located just over an hour from Barcelona and features many Romanesque and Gothic-style buildings. Popular sites include the Girona Cathedral, Sant Pere de Rodes (a former monastery), and many museums, including the Girona History Museum, Museum and Cinema, and Museum of Jewish History.

Montblanc
Around 1.5 to 2 hours from Barcelona, Montblanc is located in the Catalonia region. This medieval town includes a number of popular sites to visit, including the Convent de la Serra, Santa Magdalena Hospital, the church of Santa Maria, Casa Alenyà, and more.

Montserrat
Located just about an hour outside of Barcelona, Montserrat means “ser- rated mountain.” There are many options for hiking and climbing in this area, and visitors may also want to see the Santa Maria de Montserrat Abbey with its famous Virgin of Montserrat statue. The funicular Sant Joan also offers great views.

Pals
About 2–3 hours outside of Barcelona is Pals. It has a medieval-type village, with many sites of interest, including the Torre de las Horas, the mirador Josep Pla, the church of Santa Pere, and more. There are also many shops and art galleries in the vicinity. Also of note are the rice fields near the town.

Sitges
Located to the southwest of Barcelona, the coastal town of Sitges is about 45 minutes outside the city. There are many places to explore here, including the Maricel Museum and Cau Ferrat Museum, both of which feature Spanish art. The town is known for its beaches, and visitors may also want to check out the many shops and restaurants.

Tarragona
Located about an hour to an hour and a half southwest of Barcelona, Tarragona located on the sea. Tarragona features many Roman ruins, including an amphitheatre, colosseum, churches, and more. The town also features a Museum of Archeology.

Vic
This town is located a little over an hour north of Barcelona. Popular sites in the town include the Episcopal Museum of Vic, the Roman temple, Vic Cathedra, the Museum of Leather Artistry, and more. Its history includes inspiration from Roman, Gothic, Baroque, and modern periods.

Las Ramblas
This is a popular tourist destination spot. Las Ramblas features a central street lined with many trees, restaurants, shops, and vendors. It’s a good stop for those travelers looking for souvenirs. Also along Las Ramblas are street performers, artists, and human statues. Many websites note to pay attention to your surroundings on Las Ramblas, especially in the evening, and this area may be more expensive than some other shopping areas because of the large number of people who visit this spot.

Maremánum
Located near Barcelona Port Vell, this shopping center features two floors of shops selling a range of goods, including clothing, toys, shoes, jewelry, homeware, and other accessories. It also includes various restaurants and food stores and a cinema. Maremánum is open Monday through Sunday from 10:00 a.m. to 10:00 p.m.

Mercat de la Boqueria
This market is also referred to as La Boqueria and features a wide variety of food stands selling fresh produce and other foods. This market has been around for hundreds of years and is one of the city’s most popular tourist landmarks.

3-D LIVE SURGERY
Monday, 18 June, 14:00 - 17:00

The Barraquer Institute offers a 3-D Live Surgery event that will for sure catch your attention.

Experience cutting-edge surgery in real time. Watch and learn as expert ophthalmologists at the Barraquer Institute use the latest techniques and tools to conduct cataract, corneal transplantation, refractive, micro-invasive glaucoma, vitreoretinal, and other surgeries on real patients. An onsite facilitator will describe the procedures as they happen concurrently in three operating rooms, and attendees at the Fira Gran Via Convention Center will be encouraged to engage and ask questions. The 3-D live surgery event is open to all WOC registrants.
Expanded Hill-RBF

Expanded Hill-RBF-Method based on artificial intelligence now uses 4x more information. This IOL calculation method provides an excellent accuracy for all eye lengths. The unique boundary model improves the safety by identifying unusual cases and warning the user. The Lenstar is the world’s only biometer with the Hill-RBF Method built in.

T-Cone Toric Platform

True Placido-Topography of the optional T-Cone complements the Lenstar measurement palette. The powerful IOL Toric Planner, featuring the Barrett, Hill-RBF and Olsen toric solutions enabling spot on calculation considering the posterior cornea.