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Advances and Latest Developments in Ophthalmology and Visual Sciences

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This special issue of the *Asia-Pacific Journal of Ophthalmology* (*APJO*) on advances and latest developments in ophthalmology and visual sciences comprises a series of articles on various aspects of ophthalmology. In the article about retinal dystrophies and their treatment, Boon and Talib[1] emphasize that mutations in the same gene can lead to different diagnoses, such as retinitis pigmentosa or cone dystrophy, and vice versa, mutations in different genes can lead to a similar phenotype. These diseases also show a marked interindividual variability in the age of onset and rate and characteristics of peripheral and central vision loss. While hitherto for most forms of these retinal dystrophies no therapy has been available so far, preclinical studies and phase I to III gene therapy trials have recently started for several subtypes of these retinal dystrophies and affected genes, such as *ABCA4*, *CNGA3*, *CNGB3*, *CRB1*, *PDE6B*, *RLBP1*, *MERTK*, and *MYO7A*. Accordingly, the first retinal gene therapy using voretigene neparvovec-rzyl (Luxturna) has been approved by the US Food and Drug Administration for the treatment of *RPE65*-associated retinal dystrophies. The article further describes the clinically important variation in the clinical appearance of the disorders and lists ongoing and future gene or cell-based therapy trials.

Labkovich et al[2] describe and summarize the effect of ginkgo biloba extract in ocular and systemic diseases, in particular on normal-tension glaucoma. Although the reduction in intraocular pressure (IOP) has so far been the only proven and accepted therapy to prevent or reduce the risk of progression of glaucomatous optic neuropathy, other treatment modalities are needed, since the majority of Asian patients with glaucomatous optic neuropathy have an IOP within the statistically normal limits. Labkovich et al explore in the article the potential neuroprotective effects of ginkgo biloba extract for glaucoma therapy.

In the article about the association of high myopia and glaucoma-like optic neuropathy, Jonas et al[3] stress the relatively high likelihood of a co-existence of high myopia and optic nerve damage, with the potential risk factors of an elongation and thinning of the lamina cribrosa with a steepening of the translamina cribrosa pressure gradient, an elongation and thinning of the peripapillary scleral flange as the biomechanical anchor of the lamina cribrosa and as the ophthalmoscopical equivalent of the parapapillary delta zone, and an increased distance of the peripapillary arterial circle of Zinn-Haller to the lamina cribrosa. Clinical risk factors for glaucoma-like optic neuropathy in highly myopic eyes are thus an enlargement of the optic disc and an enlargement of parapapillary delta zone. In addition, a large parapapillary gamma zone may be a risk factor for a nonglaucomatous optic nerve damage in highly myopic, since the increased optic disc-fovea distance in eyes with a large gamma zone may lead to a lengthening and stretching of the retinal ganglion cell axons. At the bottom line, in any highly myopic eye, an optic nerve damage should specifically be ruled out.

McAllister[4] describes and summarizes the value of a chorioretinal anastomosis for the outcome of central retinal vein occlusions. In addition to the intravitreal application of anti-vascular endothelial growth factor (VEGF) agents, the creation of a laser-induced chorioretinal anastomosis between the obstructed high-pressure retinal venous circulation and the unobstructed low pressure choroidal venous circulation may lead to a reduction in the elevated central vein pressure and reduce the macular edema.

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Huang[5] in his article "Future Vision 2020 and Beyond—Five Critical Trends in Eye Research" gives an overview of innovative translational research in clinical ophthalmology, including gene therapy of Leber's congenital amaurosis and the use of pluripotent stem cells, immunomodulation, and computational biology.

Samanta et al[6] describe emerging therapies in neovascular age-related macular degeneration, including Abicipar pegol as an intravitreally administered anti-vascular endothelial growth factor (VEGF) agent which is based on DARPins (Designed Ankyrin Repeat Proteins protein), conbercept as an anti-VEGF agent, and faricimab that is a biospecific synthetic antibody designed specifically to neutralize both VEGF-A and angiopoetin-2.

Grzybowski et al[7] reviewed the pharmacological presbyopia treatment and summarized the main results of clinical trials.

Kanclerz et al[8] described the extended depth-of-focus intraocular lens (IOL) technology for the treatment of presbyopia. In contrast to multifocal IOLs, extended depth-of-focus lenses create a single elongated focal point rather than several foci. The advantage of a potential reduction in photic phenomena, glare, and halos may be combined with a potential disadvantage of a decrease in the retinal image quality due to an increase in aberration.

The clinical importance of minimally invasive glaucoma surgery is discussed by Gillmann and Mansouri.[9] In a literature review, the weighted mean IOP reductions from all analyzed studies on minimally invasive glaucoma surgery were 15.3% for the iStent, 29.1% for the iStent inject, 36.2% for the ab interno canaloplasty, 34.4% for the Hydrus device, 36.5% for the gonioscopically assisted transluminal trabeculotomy, 24.0% for the trabectome, 25.1% for the Kahook dual blade, 30.2% for the Cypass device, 38.8% for the XEN stent, and 50.0% for the Preserflo device. Gillmann and Mansouri conclude that high-quality data are still required to further elucidate the field.

An update on new IOL formulas and calculations is given by Xia et al.[10] These formulas include biometric parameters such as the anterior chamber depth, lens thickness, white-to-white distance measurement, and age. Newer formulas differ from the classic regression and vergence-based algorithms by increasingly utilizing exact ray-tracing data, more modern regression models, and artificial intelligence. Previously, refractive outcomes of cataract surgery have been relatively unpredictable in eyes with unusual biometry, corneal ectasia, a history of refractive surgery, and in pediatric patients. An improved biometric technology may allow an improvement in the refractive outcomes in these clinical situations.

Last but not least, Orellanos-Rios et al[11] present the new translational retinal imaging technique of quantitative autofluorescence imaging, that is available for clinical investigation and which has already changed the understanding of the role of lipofuscin in the pathogenesis of age-related macular degeneration. The hyperspectral autofluorescence imaging may unravel the molecular basis of fluorescence of the retinal pigment epithelium and may clinically serve for an early detection of age-related macular degeneration. Other new translational retinal imaging techniques include ophthalmic endoscopy for vitreous surgery, and remote retinal imaging (tele-imaging) coupled with deep learning artificial intelligence.

In summary, this special *APJO* issue provides an overview of selected new developments in clinical ophthalmology, translating basic research into clinical application and opening avenues for new approaches toward therapies of so far insufficiently or not even at all treatable disorders.

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