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ORIGINAL ARTICLES

- **1 Gender inequality in global burden of uncorrected refractive error.** *Lixia Lou, Xi Liu, Xiajing Tang, Linyan Wang, and Juan Ye*

Gender inequality in global burden of uncorrected refractive error has persisted over the past few decades, with female individuals bearing more burden than male individuals. Older age and lower socioeconomic status are related to greater gender inequality. The findings of this study highlight the importance of making gender-sensitive health policy to manage global vision loss caused by uncorrected refractive error.

- **8 Progression of diabetic microaneurysms according to the internal reflectivity on structural optical coherence tomography and visibility on optical coherence tomography angiography.** *Mariacristina Parravano, Daniele De Geronimo, Fabio Scarinci, Gianni Virgili, Lea Querques, Monica Varano, Francesco Bandello, and Giuseppe Querques*

This study suggests that the reflectivity pattern at the spectral-domain optical coherence tomography (SD-OCT) of microaneurysms as well as the presence of flow on cross-sectional scan and the localization at the level of the deep capillary plexus on optical coherence tomography angiography at baseline are strongly associated with extracellular fluid accumulation at 1 year on SD-OCT. In particular, hyperreflective microaneurysms, characterized by a high blood flow rate, seemed to be significantly associated with extracellular fluid accumulation at 1 year follow-up.

- **17 Use of the crystalline lens equatorial plane as a new parameter for predicting postoperative intraocular lens position.** *Young-Sik Yoo, Woong-Joo Whang, Kyu-Yeon*

Hwang, Marjorie Lazo, Je-Hyung Hwang, Choun-Ki Joo, and Geunyoung Yoon

To predict the postoperative position of the intraocular lens (IOL), preoperative parameters related to the crystalline lens geometry were measured using optical coherence tomography. Among them, the preoperative lens equatorial plane (LEP) had the strongest correlation with postoperative IOL position. LEP is a promising measurement for predicting postoperative IOL position and could serve as a new parameter to improve the accuracy of IOL power calculation in cataract surgery.

- **25 Persistent fetal vasculature with elongated ciliary processes in children.** *Nichelle Warren, Rupal H. Trivedi, and M. Edward Wilson*

This study analyzes persistent fetal vasculature with elongated ciliary processes in infants less than 7 months old who were operated on. Children with elongated ciliary processes are frequently excluded from other studies. The conclusion is that patients with elongated ciliary processes are unlikely to achieve visual acuity greater than 20/200 (18%) and are more likely to develop visual axis opacification (60%).

- **30 Sarcoidosis-related uveitis: Clinical presentation, disease course, and rates of systemic disease progression after uveitis diagnosis.** *Shirley P. Ma, Sophie L. Rogers, Anthony J. Hall, Lauren Hodgson, Jessica Brennan, Richard J. Stawell, and Lyndell L. Lim*

One question that faces ophthalmologists when making the diagnosis of sarcoid uveitis is when, if ever, the patient will develop systemic manifestations of sarcoidosis. The present study found that patients who present with sarcoid uveitis have high prevalence rates of concurrent undiagnosed systemic sarcoidosis and subsequent systemic

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progression. Clinical suspicion of systemic sarcoidosis should be maintained within 5 years of uveitis onset.

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- **37 Diabetes alone does not impair recovery from uneventful cataract surgery.** *Reeta Danni, Claudia Taipale, Lotta Ilveskoski, and Raimo Tuuminen*

Diabetes itself, insulin-dependence, poor glycemic control, and diabetic ocular manifestations are all considered risk factors for pseudophakic cystoid macular edema (PCME). Register-based studies may overestimate the risk of PCME in diabetic patients. When diabetes is appropriately managed, in eyes without posterior segment manifestations clinical outcomes after uneventful cataract surgery may be comparable to outcomes in nondiabetic controls.

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- **45 Super-thick amniotic membrane graft for ocular surface reconstruction.** *Paul T. Finger, Puneet Jain, and Sri Krishna Mukkamala*

This retrospective, single center, interventional case series highlights the novel use of Super-Thick Amniotic Membrane Grafting (ST-AMG) for ocular surface reconstruction.

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- **54 Laboratory results, epidemiologic features, and outcome analyses of microbial keratitis: A 15-year review from St. Louis.** *Hugo Y. Hsu, Benjamin Ernst, Eric J. Schmidt, Rohit Parihar, Chelsea Horwood, and Sean L. Edelstein*

This 15-year retrospective review of microbial keratitis in St. Louis found a high percentage of *Pseudomonas*, fungi, and oxacillin-resistant organisms. Gentamicin efficacy against gram-positive organisms decreased over time. Multivariate logistic regression found that a large ulcer was a universal predictor of poor outcomes while fungal infections, comorbid ophthalmic conditions, and age ≥ 60 years were also contributory factors.

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- **63 A spectrum of regression following intravitreal bevacizumab in retinopathy of prematurity.** *Tiffany A. Chen, Ryan A. Shields, Zachary H. Bodnar, Natalia F. Callaway, Ira H. Schachar, and Darius M. Moshfeghi*

Treatment of retinopathy of prematurity (ROP) with intravitreal bevacizumab (IVB) leads to a spectrum of regression patterns that includes full vascular maturity, vascular arrest alone (VAA), vascular arrest with persistent tortuosity (VAT), and reactivation. Aggressive posterior ROP, Asian ethnicity, and area of retinal ischemia were found to be strongly associated with ROP reactivation. Multivariate logistic regression modeling revealed that younger gestational age at birth is an independent predictor of persistent tortuosity (VAT vs VAA).

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- **70 Intake of vegetables, fruit, and fish is beneficial for age-related macular degeneration.** *Alexandra P.M. de Koning-Backus, Gabriëlle H.S. Buitendijk, Jessica C. Kieft-de Jong, Johanna M. Colijn, Albert Hofman, Johannes R. Vingerling, Elizabeth B. Haverkort, Oscar H. Franco, and Caroline C.W. Klaver*

Studies have provided evidence that nutrition can influence the risk of age-related macular degeneration (AMD). Although it is clear which micronutrients are important for AMD, translation of these findings into clinical recommendations remains challenging, and exact composition of a beneficial diet is still unclear. We investigated the effect of diet recommendation by Health Councils on AMD. Vegetables (200gr/day), fruit (2/day), fish (2/week) is associated with significant reduced risk of AMD.

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- **80 Predictive factors of response to mineralocorticoid receptor antagonists in nonresolving central serous chorioretinopathy.** *Elodie Bousquet, Myriam Dhundass, Raphaël Lejoyeux, Ari Shinojima, Valérie Krivosic, Sarah Mrejen, Alain Gaudric, and Ramin Tadayoni*

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This study included 59 patients with central serous chorioretinopathy treated with eplerenone or spironolactone for 3-6 months. A complete resolution of the subretinal detachment was detected in 38% and 40% of eyes at 3 and 6 months. The baseline choroidal thickness was the only factor associated with a treatment response in the multivariate analysis. This study suggests that the treatment is more effective in cases with a thicker baseline choroid.

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- **88 Histoplasmosis following systemic immunomodulatory therapy for ocular inflammation.** *Matthew R. Starr and Wendy M. Smith*

This manuscript describes the clinical details of 9 patients who developed pulmonary or disseminated Histoplasmosis infections while receiving systemic immunomodulatory therapy for non-infectious uveitis or scleritis. This paper highlights an important infectious complication that ocular inflammation patients can develop. Due to the recent FDA approval of adalimumab as treatment for non-infectious uveitis, it is likely that use of this systemic medication will increase.

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- **97 Aqueous humor analysis identifies higher branched chain amino acid metabolism as a marker for human leukocyte antigen-b27 acute anterior uveitis and disease activity.** *Fleurieke H. Verhagen, Edwin C.A. Stigter, Mia L. Pras-Raves, Boudewijn M.T. Burgering, Saskia M. Imhof, Timothy R.D.J. Radstake, Joke H. de Boer, and Jonas J.W. Kuiper*

To advance our understanding of the biology of acute anterior uveitis, the metabolic profile of aqueous humor of patients with HLA-B27 associated anterior uveitis and idiopathic anterior uveitis were characterized using two individual rounds of Direct Infusion Mass Spectrometry and validation by Liquid Chromatography tandem Mass

Spectrometry. Differences included an increase of branched-chain amino acid biosynthesis, that might reflect disease activity in acute anterior uveitis.

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- **111 Natural history study of retinal structure, progression, and symmetry using ellipsoid zone metrics in RPGR-associated retinopathy.** *James J.L. Tee, Yesa Yang, Angelos Kalitzeos, Andrew Webster, James Bainbridge, and Michel Michaelides*

Gene therapy trials for RPGR-associated retinopathy are underway, however the natural history of this condition has not been fully elucidated. This study provides protocol-driven, prospectively acquired structural data on baseline dimensions and progression rates, as characterized by two ellipsoid zone based metrics, namely ellipsoid zone width and ellipsoid zone area. Good functional correlation is seen. These findings will enhance knowledge about the condition, and further inform design and interpretation of current and future treatment trials.

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- **124 Corneal densitometry as a predictive diagnostic tool for visual acuity results after Descemet membrane endothelial keratoplasty.** *Friederike Schaub, Fanny Gerber, Werner Adler, Philip Enders, Silvia Schrittenlocher, Ludwig M. Heindl, Claus Cursiefen, and Björn O. Bachmann*

The purpose was to investigate correlations between preoperative corneal backscatter with visual acuity results following Descemet Membrane Endothelial Keratoplasty (DMEK) in eyes with corneal endothelial disorders. Moderate associations to postoperative visual acuity results could predominantly be found between densitometry values of the anterior and central layer of the cornea more pronounced in the center of the cornea for all postoperative timepoints. Therefore, early DMEK surgery seems to have a positive impact on longterm BSCVA results.

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- **130 Reevaluation of current prism standards with recommendations to increase accuracy in the measurement of strabismus.** *Kenn Freedman, Coby Ray, and Declan Kirk*

Optical calculations and bench measurements using current glass and acrylic clinical prisms demonstrate that some of the accepted standards for holding prisms are inadequate for the accurate measurements of strabismus. Recommendations to standardize and improve strabismus measurements are made, including limiting the use of clinical glass prisms and reinforcing the exact positioning of acrylic prisms.

- **136 Using deep learning and transfer learning to accurately diagnose early-onset glaucoma from macular optical coherence tomography images.** *Ryo Asaoka, Hiroshi Murata, Kazunori Hirasawa, Yuri Fujino, Masato Matsuura, Atsuya Miki, Takashi Kanamoto, Yoko Ikeda, Kazuhiko Mori, Aiko Iwase, Nobuyuki Shoji, Kenji Inoue, Junkichi Yamagami, and Makoto Araie*

Accurate diagnosis of early glaucoma can be made using optical coherence tomography and the Deep Learning and the transfer learning.

- **146 Ocular and periocular tumors in xeroderma pigmentosum: A study of 120 Asian Indian patients.** *Swathi Kaliki, Sai Divya Jajapuram, Arpita Maniar, and Dilip K. Mishra*

Of 120 cases with xeroderma pigmentosum, 34 (28%) patients developed no ocular/adnexal tumor, 86 (72%) developed ocular surface malignancy, 15 (13%) developed eyelid malignancy, and 22 (18%) developed other head and neck malignancies with events of ocular surface tumor recurrence (44%), eyelid tumor recurrence (31%), locoregional lymph node metastasis (2%), systemic metastasis (1%), and death (1%) over a mean follow-up period

of 61 months (median, 36 months; range, 6 to 349 months).

- **154 A new SITA perimetric threshold testing algorithm: Construction and a multicenter clinical study.** *Anders Heijl, Vincent Michael Patella, Luke X. Chong, Aiko Iwase, Christopher K. Leung, Anja Tuulonen, Gary C. Lee, Thomas Callan, and Boel Bengtsson*

This paper describes a new time-saving threshold visual field testing strategy, SITA Faster, intended to replace SITA Fast. Modifications applied to SITA Fast to produce the new algorithm are detailed, and results of a prospective multi-center cross-sectional comparison of SITA Faster, SITA Fast and SITA Standard are reported. SITA Faster saved considerable test time and gave almost identical results to those of SITA Fast.

- **166 Pre-eclampsia/eclampsia as a risk factor of noninfectious uveitis among postdelivery women.** *Wei-Dar Chen, Yao-Hsu Yang, Chung-Yuan Lee, Chien-Hsiung Lai, Chia-Yen Liu, and Li-Ju Lai*

This study investigated the incidence and risk of non-infectious uveitis among postdelivery women with a history of preeclampsia/eclampsia by using the nationwide healthcare database in Taiwan. The results demonstrated that postdelivery women with preeclampsia/eclampsia had a significantly higher risk of the occurrence of non-infectious uveitis compared to those without preeclampsia/eclampsia. Preeclampsia/eclampsia could be a potential risk of non-infectious uveitis.

- **174 Cytokine levels in the aqueous humor are associated with corneal thickness in eyes with bullous keratopathy.** *Natsume Suzuki, Takefumi Yamaguchi, Shinsuke Shibata, Toshihiro Nagai, Hisashi Noma, Kazuo Tsubota, and Jun Shimazaki*

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Central corneal thickness was significantly correlated with the levels of interleukin-13, and soluble intracellular adhesion molecule-1 in the aqueous humor of the eyes with pseudophakic bullous keratopathy.

• **181 Comorbidities and prescribed medications in patients with or without dry eye disease: A population-based study.** *Reza Dana, John L. Bradley, Annie Guerin, Irina Pivneva, Amber M. Evans, and Ipek Özer Stillman*

A retrospective claims analysis is used to characterize the burden of a wide range of comorbidities among those with dry eye disease relative to those without dry eye disease across a wide range of ages and geographic regions in the United States.

• **193 Reclassifying idiopathic uveitis: Lessons from a tertiary uveitis center.** *Rene Y. Choi, Erick Rivera-Grana, and James T. Rosenbaum*

This retrospective study looked at what percentage of patients initially diagnosed as idiopathic, noninfectious uveitis referred to a tertiary uveitis center were subsequently found to have an identifiable cause of uveitis. This study emphasizes the importance of identifying an underlying condition associated with uveitis when possible, as it can be potentially lifesaving for some illnesses.

• **200 Prevalence of diabetic retinopathy and associated mortality among diabetic adults with and without chronic kidney disease.** *Meda E. Pavkov, Jessica L. Harding, Chiu-Fang Chou, and Jinan B. Saaddine*

This study examines the prevalence and severity of diabetic retinopathy among adults with diabetes and with or without chronic kidney disease, and the associated risk of mortality. Findings show that nearly one third of adults with diabetes had diabetic retinopathy, with a higher prevalence in those with than without chronic kidney disease. The risk of death was highest when both

microvascular complications of diabetes were present. Most risk factors are common and modifiable.

• **209 Incorporating optical coherence tomography in the cataract preoperative armamentarium: Additional need or additional burden?** *Aditya Sudhalkar, Viraj Vasavada, Deepak Bhojwani, C.V. Gopal Raju, P. Vasudev, Shraddha Jain, and Mamidipudi R. Praveen*

The study looks at the incidence of retinal lesions that may not be evident clinically but are detectable on optical coherence tomography (OCT) examination and may or may not negatively influence the postoperative visual outcomes in the short term. The study also discusses whether routine incorporation of OCT examination preoperatively in every patient undergoing cataract surgery actually yields any benefits or is an unnecessary burden.

• **215 Frequency of intraocular lens dislocation and pseudophacodonesis, 20 years after cataract surgery – A prospective study.** *Eva Mönestam*

The cumulative incidence of surgical attention needed to correct in-the-bag intraocular lens (IOL) dislocation/decentration, 20 years after cataract surgery, was low in this population-based cohort with high prevalence of pseudoexfoliations before cataract surgery. Prognosis after treatment is generally favorable. However, the potential burden to society caused by dislocated IOLs is relatively large because of the large number of people worldwide with previous cataract surgery.

AOS THESIS

• **223 Validated prediction models for macular degeneration progression and predictors of visual acuity loss identify high-risk individuals.** *Johanna M. Seddon and Bernard Rosner*

Predictive factors and risk scores for conversion to overall advanced age-related macular degeneration, geographic

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atrophy, neovascular disease and loss of vision were determined and validated in an external cohort. A composite model which included 13 genetic loci had an AUC = 0.900 in a derivation cohort and 0.896 in an independent validation cohort. Identifying high risk individuals at an earlier stage using predictive modeling could lead to improved preventive and therapeutic strategies in the era of precision medicine.

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- 262 **Conbercept for treatment of neovascular age-related macular degeneration: Results of the randomized phase 3 phoenix study.** *Dan Călugăru and Mihai Călugăru*
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