Current Practices in Ophthalmology

Series Editor

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Vitreoretinal Disorders

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Preface

The management of vitreoretinal disorders has undergone a renaissance over the past two decades. Historically, like many other surgical subspecialties, the retinal physician's relationship with patients was brief and treatment options were limited. Laser photocoagulation and retinal detachment surgeries were reserved for conditions that were immediately vision threatening. Less severe conditions were more difficult to diagnose, and progressive degenerative conditions had little to no available therapies. These conditions changed with the fortuitous and concurrent development of optical coherence tomography (OCT) and anti-vascular endothelial growth factor (anti-VEGF) therapies. OCT revolutionized the diagnostic capabilities of retinal clinicians, allowing them to not only detect but accurately quantify small changes in the macula. At the same time, intravitreal anti-VEGF agents dramatically expanded the therapeutic armament, allowing both neovascular and exudative diseases to be reversed. These advances worked together hand-in-hand, launching the field into a new era of diagnosis and management. Retina clinics expanded rapidly with patients seeking injections, which for the first time demonstrated visual recovery beyond just functional stability. OCT imaging allowed clinicians and patients to see the anatomic response to these agents together, asserting retinal specialists' evolving role in longitudinal, long-term eye care.

In recent years, the advent of these technologies has provided a platform for even more breakthroughs in retinal diagnostics and therapies. OCT technologies have continued to evolve, with enhanced-depth imaging and swept-source technologies helping us to look deeper into the choroid, and OCT angiography revealing vessel and flow without the need for contrast dye. Ultrawide-field imaging and angiography is expanding our view of the peripheral retina, providing a glimpse of peripheral pathologies never before seen on clinical examination alone. Although some physicians lament the dying art of a good clinical exam, ocular imaging technologies provide the much-needed consistency and transparency in exam documentation. Particularly in conditions such as retinopathy of prematurity, where variability in examination skills can lead to dire consequences in a child's visual prognosis, ocular imaging allows the democratization of exam findings and development of more standardized treatment paradigms. Importantly, ocular imaging allows the potential for implementing tele-ophthalmology, expanding the availability of specialty eye care to underserved communities and underdeveloped nations. Finally, advances in technologies such as fundus autofluorescence and adaptive optics are

allowing researchers to correlate changes in lipofuscin pigment or individual photoreceptors with disease progression, providing deeper insight into the pathophysiology of retinal conditions from a molecular and cellular level.

Beyond expanding our diagnostic capabilities, advances in medical retinal therapies are also progressing at a rapid rate. Despite the success of anti-VEGF treatments, frequent injections pose a high cost to healthcare and a significant burden for both patients and providers. To address this, pharmaceutical companies are leading the way for developing less invasive or sustained drug delivery systems. Translational researchers are also targeting other biological pathways that may provide synergistic and additional benefits. Perhaps the most exciting is the rise of gene and stem cell therapies. Patients with inherited retinal diseases had historically relegated themselves to the unavoidable fate of eventual blindness. However, faster and cheaper options for genetic testing are allowing clinicians to better diagnose and classify various subtypes of retinal degenerations. The FDA approval for the first viral-mediated gene therapy for Leber Congenital Amaurosis has given new hope to patients with RPE65 gene mutations, and even to patients with other genetic retinal disorders who are eagerly awaiting the myriad ongoing clinical trials. The recent discovery of CRISPR-based gene editing technologies, which allow a defective gene to not just be augmented but directly repaired, is also bringing excitement both for basic scientists and translational researchers. Yet, despite these many advances, applications of new technologies may also be vulnerable to unforeseen adverse events. Enthusiasm for human trials with stem cell technologies, for example, has been dampened by reports of alarming complications from some poorly regulated treatment centers. Nevertheless, as a well-circumscribed and immune-privileged organ system, the eye is still a highly effective entry point for implementing novel therapies, and new treatments for retinal diseases remain at the forefront of modern personalized medicine.

As the medical retina field continues to progress, vitreoretinal surgeons are also keeping up with the pace of technological advances. Intraoperative OCT and 3D heads-up viewing technologies are broadening the surgeon's capabilities to visualize retinal anatomy. Newer instrumentation and robotic surgical systems are also allowing finer, more precise maneuvers to be performed. Finally, smaller gauge and faster cutting technologies are improving the safety and recovery speed for patients, while also slowly supplanting older surgical techniques such as scleral buckling.

Although OCT and anti-VEGF therapies have already transformed the retinal landscape in recent years, we are at the precipice of many new advances on the horizon. This book reviews not only up-to-date practices in the management of vitreoretinal diseases but also new technologies in ocular imaging, pharmacotherapies, drug delivery, gene therapy, and microsurgery that are changing the way we practice and care for patients. The pace of these advances will likely make some of the information presented here obsolete before long. But I hope that our selection of topics will give you a glimpse into this rapidly evolving field and encourage you to partake in my excitement for what's to come.

Sacramento, CA Glenn Yiu, M.D., Ph.D.

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About the Editor

Glenn Yiu is a clinician-scientist and Assistant Professor of Ophthalmology at UC Davis, where he combines clinical practice in vitreo-retinal surgery with laboratory research studying the pathogenesis and treatment of age-related macular degeneration (AMD) and other retinal diseases. He obtained his medical and graduate degrees from Harvard Medical School, then underwent residency training at the Massachusetts Eye and Ear Infirmary, followed by fellowship in vitreo-retinal surgery at Duke. Dr. Yiu has published numerous peer-reviewed scientific papers and book chapters and has given lectures nationally and internationally. He is a reviewer for several ophthalmology journals and is a course lecturer at the American Academy of Ophthalmology. He has also been the recipient of numerous prestigious awards including the Ronald G. Michels Foundation Fellowship Award, the Heed Ophthalmic Foundation Fellowship Award, the Retina Society Fellowship Research Award, and the Macula Society Evangelos S. Gragoudas Award. In 2016, he was named as one of 21 "Emerging Vision Scientists" by the National Alliance for Eye and Vision Research for his cutting-edge research.