

# ADVANCES IN

## Ophthalmology And Optometry

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Myron Yanoff

Looking Backward and Forward

### **Optometry**

#### **Bioptic Driving in the United States**

Laura Windsor and Richard Windsor

The concept of bioptic driving began in the United States after the development of a practical bioptic system by William Feinbloom, OD, PhD. A bioptic telescope is a telescope mounted in or at the top of the spectacle lenses, allowing the wearer to view underneath it, through the carrier lenses, and to intermittently tip their head down to quickly view through the telescope. The bioptic telescope is used for spotting signs, traffic lights, and other objects in the distance when driving. Mild to moderately visually impaired patients have been using bioptics for more than 50 years to drive. Most states have regulations on bioptic driving, but the rules vary greatly. Proper candidate selection, fitting of the bioptic, and training are crucial for the driver's success and safety on the road. Patients should be considered on a case-by-case basis to determine their eligibility to drive. More naturalistic research, that is, in the real world, is needed to further validate the safety of bioptic driving, the training needed, and to look at state vision regulations for driving.

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**The Use of B-Scan Ultrasound in Primary Eye Care**

Elena Z. Biffi, Benjamin Young, Joseph Edward Kane Jr., and Mehdi Najafi

B-scan ultrasound has been a part of an eye care provider’s armamentarium of ophthalmic imaging techniques dating back to at least the 1950s. Even with the advent of newer imaging devices, B-scan ultrasonography serves an important adjunct role in assessment of various ophthalmic conditions. Relatively benign ocular conditions as well as potentially life-

threatening pathologies may be identified and assessed using this procedure. A thorough understanding of the principles and practical applications of B-scan ultrasonography is essential to maximize use of this technique in patient management.

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## **Nonsurgical Treatment of Strabismus**

Marie I. Bodack

Nonsurgical treatment options for esotropia and exotropia may be indicated for some patients to improve outcomes presurgery or postsurgery or in lieu of surgery. The ideal outcome is for a patient to have binocularity and excellent alignment. Current nonsurgical treatment options for patients with esotropia and exotropia include lenses, prisms, occlusion, and vision therapy.

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## Pediatric

### Update on Pediatric Optic Neuritis

Sravanthi Vegunta

Pediatric optic neuritis (ON) is a condition with a broad differential including demyelinating syndromes, astrocytopathies, and infectious processes. Many retrospective studies have been published on the similarities and differences between pediatric ON secondary to clinically isolated syndrome, multiple sclerosis, myelin oligodendrocyte glycoprotein, and neuro-myelitis optica spectrum disorder. The presentations, visual outcomes, and laboratory testing, and imaging findings have significant overlap but important differences. This article details how to distinguish between various causes of autoimmune ON to provide the appropriate acute and chronic therapies to patients. Gaps in our current knowledge and suggestions for future studies are discussed.

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### Genetics of Congenital Cataract

Reddin Ahmad, Suzannah Bell, and Mariya Moosajee

Up to 40,000 children are born with cataracts annually worldwide. In the UK, children presenting with bilateral cataract most commonly have a genetic basis. Mutations in genes involved in lens-specific proteins or regulation of eye development can cause isolated cataract, those associated with more complex ocular defects and/or syndromic features. Early surgery and frequent follow-up are vital to avoid amblyopia and optimize visual potential. Routine genetic testing is important to allow accurate diagnosis and personalized management of patients including tailored genetic counseling. Multidisciplinary care is vital, including clinical genetic

and ophthalmic teams, pediatricians, school, and local pediatric visual support services.

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## **Pediatric Graft-Versus-Host Disease**

Kerri McInnis-Smith, Holly K. Miller, and  
Aparna Ramasubramanian

Even with the support of evidence-based medicine available, the proper diagnosis and treatment of graft-versus-host disease (GVHD) and its ophthalmologic manifestations, especially in the pediatric population, is quite nuanced. The wide array of disease presentations, the existence of confounding factors such as underlying disease and concurrent treatment, and the challenge of

children accurately conveying their symptoms can further contribute to the difficulty in effectively managing young patients with chronic GVHD. Clinicians must consider the expert recommendations for management while choosing diagnostic approaches and therapeutic regimens according to the individual patient.

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## **Ophthalmic Pathology & Ocular Oncology**

### **Fluorescence In Situ Hybridization in Ocular Oncology**

Seema Sen, Shahzan Anjum, and Mehar Chand Sharma

Fluorescence in situ hybridization is a useful tool to visualize and map the genetic material in an individual's cells, including specific genes or portions of genes. This technique has diagnostic and prognostic implications for a variety of ocular malignant tumors because genetic mutations detected by FISH provide useful information for better management including targeted therapy. Chromosomal abnormalities including t(14;18) translocation in lymphoma, monosomy of chromosome 3 in uveal melanoma, and t(6;9) translocation in adenoid cystic carcinoma of lacrimal gland are some of the common genetic hallmarks of these malignancies.

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## **Intra-arterial Chemotherapy for Retinoblastoma: An Update**

Bhavna Chawla, Navneet Sidhu, and Shailesh Gaikwad

Retinoblastoma is the most common primary intraocular tumor in children. It also is one of the most successfully treated tumors using various treatment strategies. Conventional globe salvage treatments include the use of focal therapies in combination with systemic chemotherapy. Intra-arterial chemotherapy (IAC) is a comparatively newer treatment modality used primarily for globe salvage in refractory retinoblastoma. It involves the direct administration of chemotherapy drugs into the ophthalmic artery to achieve a high local intraocular concentration. IAC has been found to successfully treat retinoblastoma, and a few newer modifications are being tried. Our article discusses the significance of IAC, technique employed, drugs used, and newer advances in its administration.

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## **Advances in Pediatric Periocular Vascular Neoplasms**

Kasturi Bhattacharjee, Aditi Mehta, and Vatsalya Venkatraman

Pediatric periocular vascular neoplasms originate from transformed endothelial cells showing increased proliferation. Commonest of these is infantile hemangioma, which presents in the first year of life. The lesion exhibits initial rapid growth followed by spontaneous regression. Locally infiltrative and malignant tumors, although rare, may exhibit metastatic

potential. Neoplasms need to be differentiated from congenital vascular malformations, which are noninvoluting, exhibit growth commensurately with age, and do not demonstrate endothelial proliferation. Timely treatment of periocular lesions obscuring the visual axis helps prevent amblyopia. Systemic involvement or presence of large lesions (>5 cm) warrants assessment of cardiac function as the high-flow lesions may produce high-output cardiac failure. Mass effect of extensive perioral/nasal/subglottic lesions may compromise the airway. A multidisciplinary approach is important for optimizing treatment outcomes. Propranolol has gained FDA approval in 2017 as the first-line therapy for infantile hemangioma. In contrast, malformations are difficult to treat, and therapy mostly is symptomatic.

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## **Cataract & Refractive Surgery**

### **Femtosecond Laser-Assisted Cataract Surgery**

Emily Chang and Amy Zhang

Since femtosecond laser-assisted cataract surgery (FLACS) first became commercially available approximately a decade ago, it has continued to provoke much interest as well as controversy. As femtosecond laser technology continues to evolve, FLACS has shown to be a safe alternative to the conventional phacoemulsification surgery. However, the successful adoption of a new technology requires both cost efficiency and significant improvement over conventional techniques. This article summarizes the utilization of femtosecond laser technology in certain steps of cataract surgery and reviews its safety and efficacy in each step.

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## **Advanced Technology Intraocular Lenses**

Mariam S. Hamid, Man Li Jin, and Kevin J. Everett

Recently developed advanced technology intraocular lenses (IOLs) aim to provide patients with the ability to see in-focus images at multiple distances to mimic the natural accommodative function of the eye. Multifocal IOLs use diffractive, refractive, or hybrid technologies to allow images from multiple focal points to be simultaneously focused on the retina. This inadvertently causes photic side effects including glare or haloes and reduced contrast sensitivity, and therefore, careful patient selection and consent are indicated. Extended depth-of-focus IOLs use a single, elongated focal point to reduce photic side effects, though often at the expense of near vision compared with multifocal IOLs. This article will review recent developments in advanced technology IOLs such as multifocal, accommodative, and extended depth-of-focus IOLs and discuss their visual outcomes and side effects.

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## **Vitreoretinal Disease**

### **Diagnostic and Treatment Considerations for Macular Holes**

Rupak Bhuyan, Jeffrey Brown, and Robin Ginsburg

 Video content accompanies this article at <http://www.advancesinophthalmology.com>

Macular holes are foveal neurosensory disruptions that can impair vision and cause symptoms such as metamorphopsia and scotomas. Stages 1A and 1B should be observed. Stage 2 can be treated with multiple modalities including topical dehydration agents, pneumatic vitreolysis, and surgery. Surgery remains the most used treatment, because it can prevent additional vision loss from progression to stages 3 and 4. Surgery is also the recommended treatment of stages 3 and 4. Inverted internal limiting membrane flaps, human amniotic membrane plugs, mesenchymal stem cell injections, and autologous retinal transplants are newer adjunctive treatments that offer encouraging results.

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## **Peripheral Retinal Degenerations and Treatment Options**

George Jiao, Marib Akanda, and Ronni M. Lieberman

There are numerous pathologies that can be found in the peripheral retina, including degenerative disease. Involvement of the vitreoretinal interface and certain intraretinal degenerations can lead to retinal tears or detachments. The standard of care for diagnosing and monitoring these peripheral retinal degenerations is dilated fundus examination, but current technologies may aid us when the diagnosis is unclear. Prophylactic treatments may be warranted in many cases of predisposing lesions. Definite treatments for retinal tears are important in preventing retinal detachments.

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## Update on Retinal and Ocular Imaging

Samuel Gelnick, Minh Trinh, and Ronni M. Lieberman

Retinal imaging has experienced rapid growth over the past decades. An increase in resolution, field of view, and accessibility has led to an increase in the use of retinal imaging in clinical practice across all specialties of ophthalmology. Understanding the advantages and disadvantages of these retinal imaging modalities is crucial to obtaining the appropriate studies to diagnose and monitor retinal pathologies. In this article, we review common imaging modalities, including their evolution and clinical applications.

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## Glaucoma

### 30-Gauge Needle in Glaucoma/Anterior Segment Management

Ramesh Ayyala, Alireza Baradaran-Rafii, and Jacob Liechty

 Video content accompanies this article at <http://www.advancesinophthalmology.com>

Many clinical presentations and complications of glaucoma, whether acute or chronic, including bleb fibrosis, encapsulation, and so forth along with anterior segment surgeries can be managed at the slit lamp with the help of a 30 gauge (G) needle. This article presents the indications and techniques involved in the use of 30G needle at the slit lamp in the management of a myriad of ophthalmologic presentations and complications.

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## Neuro-ophthalmology

### Screening for Plaquenil

Pushpinder Kanda, Stuart Coupland, Chloe Gottlieb,  
Lynca Kantungane, and Rustum Karanjia

Hydroxychloroquine use needs to be carefully monitored for retinal toxicity that can lead to significant visual impairment. This review summarizes the current screening guidelines and imaging modalities recommended by the American Academy of Ophthalmology and highlights future research trends for improving test sensitivity. It also discusses the utility of using mfERG for detecting early retinopathy and research supporting its use as a primary screening tool.

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### Update on Optic Neuritis in Adults: Multiple Sclerosis, Neuromyelitis Optica Spectrum Disorder, and Myelin Oligodendrocyte Glycoprotein Antibody–Associated Disease

Serena Li, Rahul A. Sharma, and Benson S. Chen

This review provides an update on the diagnosis and management of inflammatory optic neuritis in adults, focusing on presentations associated with multiple sclerosis, neuromyelitis optica spectrum disorder, and myelin oligodendrocyte glycoprotein antibody–associated disease. Clinical clues that enable early recognition of these distinct disorders are discussed, including patient demographics, clinical features, and radiologic findings. The use of corticosteroids, plasmapheresis, and other acute management treatment strategies for optic neuritis are appraised, followed by an overview of long-term management, specifically strategies for immunosuppression including when to initiate and with which therapies. Finally, prognosis and future avenues are considered.

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## **Efficacy and Safety of Tocilizumab in the Treatment of Ocular Manifestations in Giant Cell Arteritis**

Nooran Badeeb and Rustum Karanjia

Vision loss in GCA is an ophthalmic emergency that requires prompt medical intervention. The goal of the treatment is to preserve the remaining vision and prevent further systemic complications. Corticosteroids are the first-line treatment for GCA but are prone to cause iatrogenic side effects. In this review, we discuss the role of other immunosuppressant medications, especially Tocilizumab in controlling cases of GCA with ocular involvement and review the literature on the indication, guidelines of administration, and safety of Tocilizumab.

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## **Coronavirus Disease 2019–Related Health Disparities in Ophthalmology with a Retrospective Analysis at a Large Academic Public Hospital**

Y. Grace Chung, Christie M. Person, Jacquelyn O'Banion, and Susan A. Primo

The coronavirus disease 2019 pandemic has disproportionately affected racial and ethnic minorities in the United States. Although recent meta-analyses have identified the prevalence of ocular manifestations in severe acute respiratory syndrome coronavirus 2 infection, no studies with these potential findings have been implemented in examining ophthalmic disparities in racial and ethnic minorities. It is additionally clear that patient access to eye care from coronavirus disease 2019 has been disproportionate in underserved communities. Large public hospitals and urban academic medical centers provide a unique opportunity to further study ocular disease presentation and health disparities from coronavirus disease 2019 in these populations.

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## **Cornea and External Diseases**

### **Stepwise Approach to the Diagnosis and Management of Dry Eye and Ocular Surface Disease**

Jennifer B. Nadelmann, Angela Gupta, Caroline W. Chung, and Stephen E. Orlin

Dry eye disease (DED) is a multifactorial disorder caused by abnormalities of the tear film that causes damage to the ocular surface. Screening tools are helpful in making the diagnosis and in determining disease severity. It is important to take a careful history and to evaluate meibomian gland physiology, tear film quality, meibomian gland status, and tear production. Clinicians should take a stepwise approach in treating DED. Treatments vary for evaporative dry eye, aqueous deficiency, and/or inflammatory DED. For patients with symptoms that have not improved following conservative measures, prescription medications, blood products, procedures or devices can be considered.

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## **Update on the Classification and Management of Corneal Dystrophies**

Vivian L. Qin, Devin Cohen, Tomas Andersen, and Stephen E. Orlin

The most recent IC3D classification (2015) categorizes the corneal dystrophies based on genetic, clinical, and histologic characteristics. Here we review the classification of the corneal dystrophies as epithelial and subepithelial, epithelial-stromal *TGFBI*, stromal, and endothelial. We discuss the variety of available medical and surgical treatment modalities based on symptomatology and anatomic area of the cornea affected. We explore the recent advancements in the area of corneal regeneration without the use of donor grafts, including injection of cultured endothelial cells and gene therapy.

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## **Surgical Management of the Aphakic Eye**

Tianyu Liu, Brian J. Nguyen, Samantha L. Marek, and Stephen E. Orlin

Current approaches to the surgical correction of aphakia include anterior chamber intraocular lenses (IOLs), iris-fixated IOLs, sulcus IOLs, and scleral-fixated IOLs with

or without sutures. Anterior chamber and iris-fixated IOLs are technically easier to place but are associated with risks including corneal decompensation, uveitis, and glaucoma. Sulcus placement of IOLs can achieve physiologic positioning of the lens but requires adequate capsular support. Overall, current approaches to correction of aphakia have comparable efficacy and safety outcomes, and the advantages and disadvantages of each technique should be considered in light of patient and surgeon factors in surgical planning.

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## Oculoplastics

### **Teprotumumab: A Major Advance in the Treatment of Thyroid Eye Disease Management**

Caroline Y. Yu, Jamie A. Keen, and Erin M. Shriver

Thyroid eye disease (TED) is an uncommon orbital inflammatory disease that can lead to disfigurement and permanent vision loss. Traditional therapies such as glucocorticoids and orbital radiation primarily were used to treat inflammation during the active phase of the disease. Teprotumumab, the first Food and Drug Administration-approved medication for TED, targets the insulin-like growth factor-1 receptor and has been shown to decrease proptosis, diplopia, and clinical activity score. In this review, the pathophysiology and treatment landscape of TED are summarized, and the mechanism, clinical data, and associated adverse events of teprotumumab are described in detail.

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## **Diagnosis and Management of Irritated Eyelids**

Christine Ryu and Rao V. Chundury

Eyelid irritation is one of the most common complaints encountered by eye care providers. The cause can be divided into 5 broad categories of blepharitis, immunologic, inflammatory, infectious, and neoplastic. Some of the most common causes include staphylococcal blepharitis, seborrheic dermatitis, posterior blepharitis, allergic contact dermatitis, atopic dermatitis, and rosacea. Steroids have been the first-line treatment of immunologic and inflammatory conditions, but newer steroid-sparing agents such as pimecrolimus and tacrolimus also are proving effective. Patients with atypical presentations or symptoms refractory to treatment should be evaluated for possible malignancies.

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## **Uveitis**

### **Uveitic Glaucoma**

Erick Rivera-Grana and Stephanie M. Llop

Uveitic glaucoma is a complex disease whose pathogenesis and treatment differ greatly from other glaucoma syndromes. Intraocular pressure elevation can be due to open-angle, closed-angle, or mixed mechanisms and steroid-induced processes. Up to 20% of patients with uveitis develop glaucoma. It is important to adequately recognize the differences in the treatment of this disease to accurately manage both glaucoma and ocular inflammation. We provide a review of the most common inflammatory etiologies that cause glaucoma and different treatment modalities used to manage it, both medical and surgical.

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## **Solo Private Practice Journey**

Priya Kalyam

On completing medical training, physicians have little to no experience with choosing their future job. Much of their experience has been tied up with choosing a career and then competing for the best training experience. This article provides the author's insight into the path of entering solo practice.

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