SPRING/SUMMER 2026

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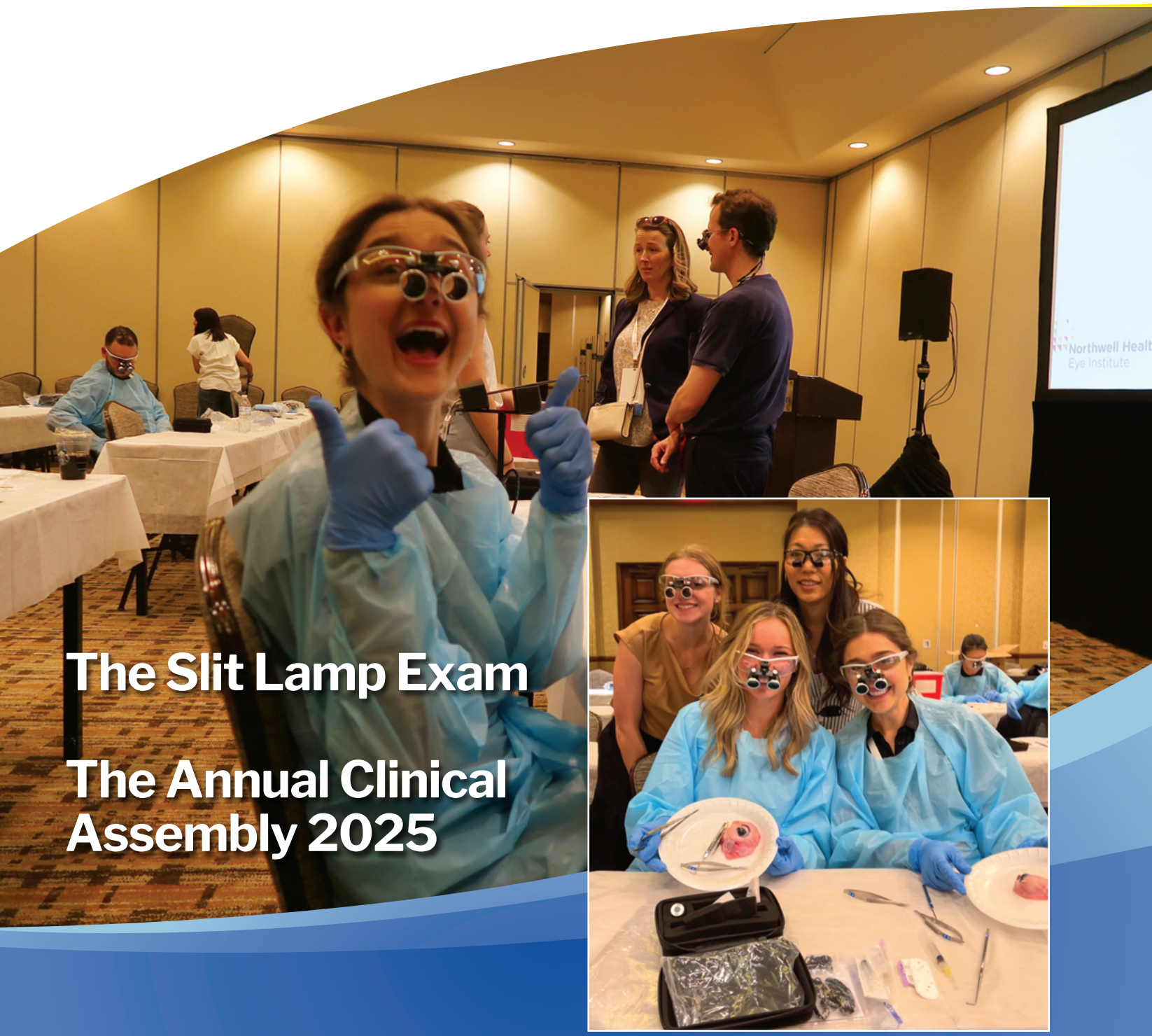


The Slit Lamp Exam

The Annual Clinical Assembly 2025

AMERICAN OSTEOPATHIC COLLEGES OF OPHTHALMOLOGY AND OTOLARYNGOLOGY–HEAD AND NECK SURGERY

contents

Your Journey. Our Shared Commitment:
The road ahead for our profession

By AOA CEO Kathleen S. Creason, MBA

AOA CEO Kathleen S. Creason, MBA, outlines the AOA Strategic Plan for 2026-2029, which is centered on raising the profile of osteopathic medicine, lifelong professional development and physician leadership.

Every journey in osteopathic medicine is distinct. A first-year student finding her footing in an anatomy lab. A resident learning to lead a care team at 2 a.m. A physician two decades into practice who still makes time to mentor. What unites every one of these journeys is the philosophy at the core of osteopathic medicine: care for the whole person at every stage of life and practice.

That understanding sits at the heart of the, which we are proud to share with the profession this month. Its theme, "Your Journey. Our Shared Commitment," is more than a tagline. It is a promise that wherever you are on your path, the AOA will meet you there. And it names a truth worth saying out loud: this profession moves forward when we move together.

Built by the profession, for the profession

This plan was not drafted in a conference room and handed down. It took shape over months of work by our Strategic Planning Committee and Board of Trustees, with meaningful contributions from affiliate leaders across our divisional societies and specialty societies and from voices at every stage of the career continuum. The Board of Trustees approved it and the AOA House of Delegates ratified it. That matters, because the goals in this plan do not belong to the AOA alone. They belong to all of us.

Four goals will guide our work through 2029:

Support the career journey of osteopathic physicians and students around the world.

From the first day of medical school through residency, board certification and a lifetime of learning, the AOA will serve as a trusted resource at every stage. That means strengthening the education continuum alongside our partners, making high-quality CME easier to access, smoothing the transition from student to resident to attending, and continuing to grow OMED as the home for our profession's biggest conversations.

Communicate the value of osteopathic medicine.

Patients everywhere deserve to know what DOs bring to their care. We will expand public awareness, grow the reach of Find a DO, elevate patient stories, protect and advance practice rights at home and internationally, and amplify the excellence of osteopathic physicians and students in national media.

Strengthen the osteopathic body of knowledge through education and research.

Our distinctiveness rests on evidence as well as philosophy. We will support consistent integration of osteopathic principles and practice across education and training, build sustainable research infrastructure and work to increase both funding for osteopathic research and the presence of DO scientists in the rooms where research priorities are set.

Invest in physician leadership development.

Healthcare needs osteopathic voices at every table. We will advocate for greater leadership opportunities for students and physicians, expand experiences for early-career DOs and deepen the engagement of osteopathic medical students throughout the AOA.

What leaning in looks like

A strategic plan is only as strong as the people who bring it to life, and that is where you come in. Over the next three years, our team will report regularly on our progress and hold ourselves accountable to the outcomes this plan defines. But the AOA cannot, and should not, do this work alone.

So here is my ask. Lean in. Share your story, and encourage your patients to share theirs, so the public sees what osteopathic care makes possible. Register for this October and bring a colleague or student with you. Say yes when your divisional society or specialty society asks you to serve. Mentor a student or resident who is standing where you once stood. Pursue and maintain your AOA Board Certification with pride. Raise your hand for leadership in your community, your hospital, your state and this association.

None of these actions are small. Each one strengthens the profession, and together they create momentum no single organization could build on its own.

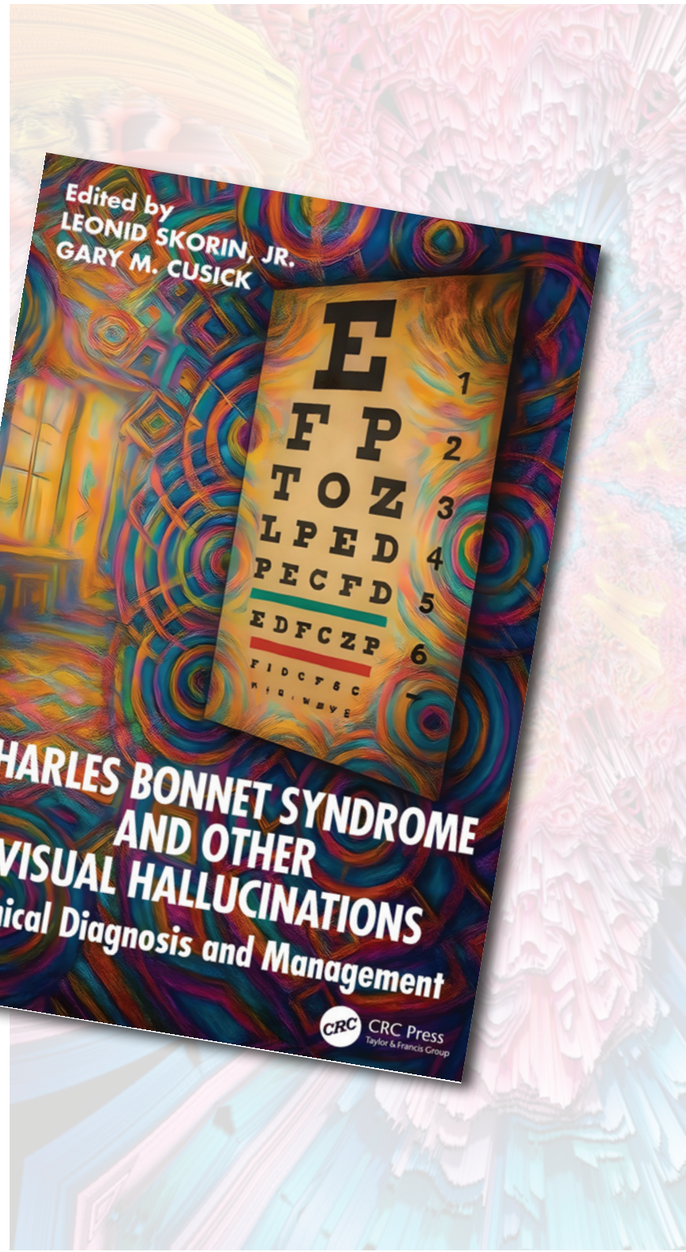
The road ahead

Our vision is bold on purpose: to be the global leader and unifying home for the osteopathic profession. I believe we will get there, because I have seen what this community does when it moves with shared purpose. The next three years are an invitation to every DO and every student to help write the profession's next chapter.

Your journey is your own. Our commitment to it is shared. Read the full plan on and let's get to work. □

A New Clinical Textbook

By Leonid Skorin, Jr., DO / AOCOO-HNS Member



Charles Bonnet Syndrome And Other Visual Hallucinations: Clinical Diagnosis and Management

Leonid Skorin, Jr., DO, has published his seventh medical and scientific textbook. This book examines Charles Bonnet Syndrome and other visual hallucinations and illusions beyond the basic neuroscience concepts by providing the ophthalmologist with a prevailing clinically relevant overview. It is a practical guide for those clinicians' assessing patients who present with visual hallucinations and requires additional evaluation to make a diagnosis and help the eye doctor to formulate a clear management approach. In addition, there is a useful narrative section with multiple case analyses that assist ophthalmologists, current patients, and their caregivers to understand how others have personally dealt with these problems and which treatment modality has worked best for them.

A unique feature of this book is that multiple DO medical students and ophthalmology residents have either co-authored chapters or contributed illustrative clinical cases. Dr. Skorin's idea was to not only give these future doctors the opportunity to participate in a scholarly endeavor, but also to expose them to the intricacies of Charles Bonnet Syndrome and other visual hallucinations which are often unrecognized, underdiagnosed and potentially misdiagnosed. Other osteopathic ophthalmologists, MD retina specialists, psychologists, occupational

therapists and optometrists have additionally contributed to this volume.

Key features:

• Discusses medical, surgical, optical and psychological treatment plans. Well-illustrated.

• Appeals to practicing neuro-ophthalmologists, ophthalmologists, neurologists, psychologists, psychiatrists, optometrists, low vision specialists, occupational/physical therapists and rehabilitation counsellors.

• Uses multiple clinical cases and scenarios as illustrative examples.

• Uses current technology to illustrate visual hallucinations as seen by patients.

• Can be used as a teaching tool for the patient and their caregiver.

• Useful narrative section for current patients and caregivers.

The paperback and eBook versions can be purchased through the 30th of September 2026 with a 20% discount for all readers of The SCOPE at when using discount code 26AFLY2. □

The Slit Lamp Exam:

A Beginner's Guide for Medical Students

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Introduction

For many medical students, the slit lamp is a beacon of simultaneous inspiration and intimidation. There are knobs everywhere, you are unsure how to correctly set your pupillary distance, and if positioning is off, you are gearing up for an ergonomically challenging exam session before you've even looked through the optics. Although the learning curve feels steep, proficiency in this skill is achievable and worth the growing pains! We hope this article helps you build a foundational understanding of the standard slit lamp exam that you can continue to expand upon and develop into your own flow.

The Set Up

The slit lamp is one of the most valuable tools in ophthalmology because it combines focused illumination, binocular magnification, and mechanical precision to evaluate structures from the eyelids all the way to the anterior vitreous.

Proper slit lamp preparation matters more than you may think! The patient should sit comfortably with their chin firmly in the chin rest and forehead against the support bar. The lateral canthi should align with the slit lamp markers, room lights should be dimmed, and the examiner should ensure the oculars and pupillary distance are adjusted appropriately. These small adjustments dramatically improve visualization and reduce unnecessary frustration, discomfort, and head-scratching for both the examiner and the patient. There are many free resources online that provide visualization of proper positioning and slit lamp setup.1,2

A systematic approach to the slit lamp exam is essential. One practical sequence (and the approach this article will follow) is to examine external structures first, followed by the lids and lashes, conjunctiva and sclera, cornea, anterior chamber, iris, lens, and vitreous. Staying systematic prevents pathology from being overlooked and helps to organize your patient presentation more clearly.

External & Lids and Lashes

An initial external inspection can reveal valuable clues regarding systemic or ocular disease. The very beginning of the exam is a great time to evaluate facial symmetry, eyelid position, lash abnormalities, swelling, erythema, and lesions. Common abnormal findings may include blepharitis, chalazia, hordeola, ptosis, entropion, ectropion, and lagophthalmos. Xanthelasma, for example, may suggest underlying dyslipidemia, while chronic meibomian gland dysfunction often contributes to evaporative dry eye disease.

One commonly taught ophthalmology pearl is to always evert the lower eyelid to inspect the palpebral conjunctiva and to evert the upper lid when clinically indicated.3 Foreign bodies, papillary reactions, and conjunctival pathology can be missed without lid eversion!

Conjunctiva and Sclera

The conjunctiva and sclera are examined next. Students should look for conjunctival injection, chemosis, subconjunctival hemorrhage, pingueculae, and pterygia. Pingueculae and pterygia are frequently confused. A pinguecula is a yellowish conjunctival degeneration that does not extend onto the cornea, whereas a pterygium crosses the limbus and grows onto the corneal surface.

Pathology Pearl

A helpful way to remember the difference between pingueculae and pterygia is through knowing that "pteryx" in Greek means "wing," reflecting the wing-like extension of a pterygium onto the cornea. Both are associated with chronic ultraviolet light exposure, so wearing sunglasses is a great, easy, and practical preventive recommendation.

Cornea

The corneal examination is often where students first appreciate the true utility of the slit lamp. By increasing magnification, narrowing the slit beam, increasing brightness, and angling the beam approximately 30 degrees, examiners can visualize the cornea in optical cross section. This technique allows differentiation of the epithelium, stroma, and

endothelium and helps localize pathology more precisely. Seeing the layers of the cornea for the first time is breathtaking!

Common corneal findings include abrasions, ulcers, edema, scarring, and punctate epithelial erosions (PEEs). PEEs are especially important in dry eye disease and are best visualized using fluorescein staining. When presenting corneal pathology, students should describe findings using clock-hour location and indicate whether lesions are central, paracentral, or peripheral. Learning this terminology early makes clinical presentations sound more polished and precise.

Arguably one of the most critical fluorescein findings is the Seidel sign. In the setting of trauma, streaming or dilution of fluorescein dye from a corneal defect suggests aqueous humor leakage and raises concern for an open globe injury, an ocular emergency. If an open globe is suspected, avoid placing pressure on the eye, refrain from checking intraocular pressure, shield the eye, and ensure consultation is established with ophthalmology quickly.

Anterior Chamber and Iris

Examination of the anterior chamber (AC) and iris can provide insight into inflammatory, traumatic, and vascular pathology. You can assess for cell and flare, hyphema, hypopyon, and chamber depth. Cell and flare are hallmark findings in uveitis and represent inflammatory cells and protein within the aqueous humor. A shallow AC may indicate angle-closure risk and should prompt caution prior to pharmacologic dilation. If you suspect a shallow AC, always triple check with your attending or a resident before placing any dilating drops.

Rule of Thumb

Obtain confirmation from an overseeing physician before administering any drop into the eye (regardless of a shallow AC) … A wise resident advised that, *'the last thing you want to do is something you cannot undo."*

The iris examination includes evaluation of pupil shape and symmetry, heterochromia, posterior synechiae, transillumination defects, and iris neovascularization. Rubeosis iridis is particularly important because it often reflects significant retinal ischemia, commonly associated with proliferative diabetic retinopathy or retinal vein occlusion.

Lens and Vitreous

Finally, the lens and vitreous should both be examined carefully. Students should identify whether the patient is phakic, pseudophakic, or aphakic and check for cataract formation or posterior capsular opacification. Nuclear sclerotic, cortical, and posterior subcapsular cataracts each have distinct appearances and clinical implications.4 The ability to grade nuclear sclerotic cataracts is a strong suit on rotations and can be practiced by searching pictures and videos online if you do not have the ability to see patients in clinic during busy didactics or non-ophthalmology clerkship schedules.

Helpful Resource

The American Academy of Ophthalmology provides a free, downloadable Anki deck that cavers a broad, foundational overview of core concepts and ocular pathologies and includes numerous clinical images illustrating cataracts, retinal disease, glaucoma, and more.5

The vitreous examination may reveal hemorrhage, inflammatory cells, or pigment cells. Of particular importance is the Shafer sign, also known as "tobacco dust." This refers to brown pigment granules suspended in the anterior vitreous and strongly suggests a retinal tear. In patients presenting with acute flashes and floaters, identifying a Shafer sign should prompt urgent retinal evaluation.

Conclusion

Although the slit lamp initially feels technical and overwhelming, many attendings and residents have stressed that skill and proficiency develop with repetition. So, keep up the positive outlook even during the blurry views! This is the start of a lifelong pursuit to perfecting this craft. It won't happen overnight, but by consistently using a systematic approach, expanding your ophthalmic vocabulary, and remaining excited to learn new things every day, you'll soon feel right at home behind the slit lamp!

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Artificial Intelligence Disclosure

Artificial intelligence was used for clarity and tone in the creation of this article.

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Invasive Aspergillus Rhinosinusitis With Orbital and Cavernous Sinus Involvement in an Immunocompetent Patient: A Case Report

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Abstract: An immunocompetent 76-year-old caucasian male presented with signs and symptoms concerning for Tolosa Hunt syndrome. Further laboratory evaluation and imaging studies revealed invasive aspergillosis, with intraorbital extension. Intraoperative cultures grew Streptococcus intermedius, Staphylococcus epidermidis and Aspergillus spp. The patient's condition improved following surgical debridement and administration of metronidazole, vancomycin, isavuconazole, and amphotericin B. Invasive fungal sinusitis is a potentially life threatening condition, predominantly occurring in the immunocompromised. However, rare cases have occurred in immunocompetent patients, making it imperative for ophthalmologists to keep aspergillosis on the differential for patients presenting with severe headache, sinus tenderness, extraocular movement abnormalities, chemosis, and proptosis.

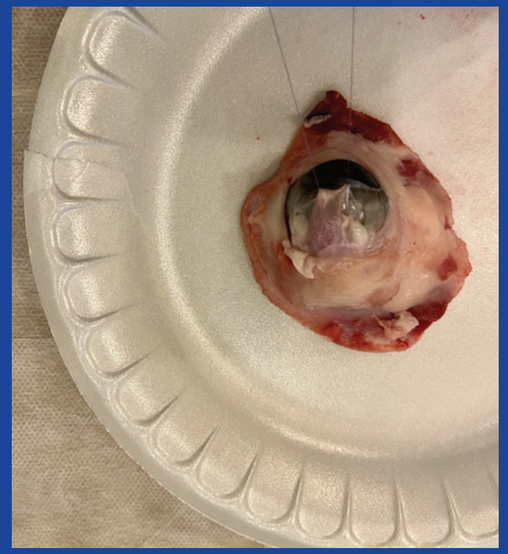
Key words: Aspergillosis; invasive fungal rhinosinusitis; orbital cellulitis; cavernous sinus thrombosis; immunocompetent; proptosis; ophthalmology

Introduction

Aspergillosis is a fungal infection caused by Aspergillus spp, an opportunistic fungus found in both indoor and outdoor environments. Clinical presentation often depends on the immune status of the host as well as the mode of contraction of the fungus. In the immunocompetent, exposure to aspergillus does not typically cause illness; however, the severely immunocompromised are susceptible to rhinosinusitis, with symptoms including sinus tenderness, proptosis, necrosis of sinus mucosa, teeth hypersensitivity, and cranial nerve deficits if cavernous sinus invasion occurs. We present a rare case of aspergillosis rhinosinusitis in an 76-year-old immunocompetent male, who presented to the emergency department with a reported three week duration of headache. Soon after, he passed out during an outpatient ophthalmology visit. Requiring readmission, it was found that he had a fever, leukocytosis, proptosis, and right eye ptosis, indicating cranial nerve involvement. MRI showed severe sinus involvement, with bilateral cavernous sinus thrombosis, orbital cellulitis, and bilateral ophthalmic vein thrombosis. During an emergent ENT debridement surgery, cultures grew strep intermedius, staph epidermidis and Aspergillus spp.

Case Presentation

At first admission in early February, the patient presented with a severe headache and was subsequently given three days of 8 mg dexamethasone three times a day, followed by a merlon deposal to taper at discharge.



2026 ACA

Failure to improve and syncopal event at outpatient ophthalmology appointment led to his readmission, upon which he was found to have a fever of 101.1 degrees Fahrenheit and a leukocytosis of 31,600, with markedly increased neutrophils. Proptosis was noted and he tested positive for Streptococcus pneumonia. MRI showed sphenoid sinusitis, bilateral cavernous sinus inflammation with associated thrombosis, bilateral ophthalmic vein thrombosis, bilateral orbital cellulitis and ocular myositis, confirming proptosis. Emergent debridement surgery was performed, including bilateral nasal endoscopy sinus surgery with bilateral total ethmoidectomy with frontal recess exploration, bilateral sphenoidotomy with tissue removal, bilateral maxillary gastrotomy, bilateral submucosal resection of inferior turbinates, and septoplasty. The sphenoid and posterior ethmoid sinuses were found to have copious purulent material and fungal elements; intraoperative cultures were positive for aspergillus spp, Staphylococcus intermedius, and Staphylococcus epidermidis. Our patient was treated with metronidazole, vancomycin, and isavuconazole. Following surgery, he was administered amphotericin B and purulent pockets were washed out from the sphenoid sinus. There were a few instances of epistaxis, but our patient was stable for the remainder of his stay. There was new ptosis noted in the right eye, but his vision was much improved. At ophthalmology follow-up a few days later, he exhibited bilateral chemosis, more pronounced on the right side. Upon discharge, he was instructed to continue timolol for his previously diagnosed glaucoma as well as take voriconazole 300 mg twice daily and ceftriaxone 2 g twice daily for 30 days.

Discussion

To our knowledge, this is one of the few documented cases of severe, invasive aspergillosis rhinosinusitis occurring in an immunocompetent individual, contributing to the clinical understanding of this entity. The management of this case required a multidisciplinary team of specialists, each contributing their unique expertise, and underscored the significant relevance of this disease within the field of ophthalmology. Therefore, we believe it is important for ophthalmologists to further expand their knowledge of this pathology to enhance their ability to identify and effectively treat aspergillosis.

Aspergillus species are ubiquitous in the environment, and their conidia (spores) are routinely inhaled by healthy individuals without consequence. In the immunocompromised, there is a risk of invasion ensuing severe disease and potentially death [11]. While the systemic symptoms are often reported in clinical databases, the ocular manifestations of rhinosinusitis due to aspergillus are less widely communicated and can include visual disturbance, proptosis, periorbital swelling, and periorbital pain [3]. In fact, one study suggested that proptosis is the initial symptom to present in immunocompetent patients with fungal sinus infections [8]. A review of chronic invasive fungal rhinosinusitis in 17 immunocompetent patients assessed the most common presenting symptoms, with proptosis and nasal congestion ranking highest, each observed in 64.7% of cases. The study also found that vision loss was the next most common symptom, affecting 41.2% of patients to varying degrees, with 5.9% experiencing blurred vision [1]. Orbital

cellulitis may arise from Aspergillus rhinosinusitis if the infection spreads to the orbital muscles and fat. This can be deceptive, as ophthalmologists might initially misdiagnose it as bacterial orbital cellulitis, leading to a delay in appropriate antifungal treatment. [10].

The spread of aspergillosis into the cavernous sinus can be due to its close proximity to the structures around it including the orbit, sinuses, middle ear, and teeth. Cavernous sinus thrombosis typically presents with orbital pain, chemosis, proptosis, ptosis or ophthalmoplegia [4]. Sinusitis is an uncommon cause of cavernous sinus thrombosis in developed countries. When it does occur, Staphylococcus aureus is the most frequent pathogen in acute cases, while Gram-negative rods are more commonly linked to chronic cases. Fungal infections, such as those caused by Aspergillus, can also lead to cavernous sinus thrombosis but are a rarer cause [4]. According to S. Chandra et al., aspergillosis of the cavernous sinus should be considered in the differential diagnosis for any patient—whether immunocompromised or immunocompetent—who presents with secondary cavernous sinus disease symptoms, particularly cranial nerve deficits affecting cranial nerves III, IV, and VI [4]. The occurrence of ophthalmic vein thrombosis in an immunocompromised patient with aspergillosis-related cavernous sinus thrombosis is rarely documented but is associated with a poor prognosis in immunocompetent patients [7].

Diagnosis is confirmed by culture of endoscopically excised samples. Involvement of the sinuses and orbit can be determined using CT and MRI, which show heterogenous and hypointense infiltration, respectively [10]. The treatment for aspergillosis rhinosinusitis can vary depending on the location of infection, but involve an antifungal at minimum. Surgical

debridement via endoscopy should be performed, followed by 6-12 weeks of amphotericin B, itraconazole, or voriconazole [6]. Of these antifungal agents, amphotericin B has proven to be the most effective in treatment of ocular aspergillosis, however, its side effects are severe. Some studies have shown that itraconazole alone can be effective, but its use is complicated by its high cost [10]. The Infectious Disease Society of America

recommends that corticosteroids be discontinued or reduced, as their immunosuppressive effects may be conductive to aspergillus growth. Another reason for their elimination is that their levels are increased with coadministration of azole drugs, leading to excessive corticosteroid exposure [9]. Our patient was initially treated with high-dose steroids under the assumption of status migrainosus, which may have accelerated the progression

of his clinical deterioration. Fungal rhinosinusitis typically progresses slowly, with the acute form developing over weeks and the chronic form evolving over several months [2].

CT and MRI imaging of our patient showed evidence of chronic fungal sinusitis with bilateral cavernous sinus thrombosis, orbital cellulitis proptosis, and bilateral pterygoid and temporalis myositis. Our patient underwent emergent endoscopic sinus surgery which included frontal recess exploration with bilateral total ethmoidectomy, bilateral sphenoidotomy, bilateral maxillary antrostomy, bilateral submucosal resection of inferior turbinates, and septoplasty. Cultures were collected during this procedure which grew aspergillus spp. During his hospital stay, our patient received metronidazole, vancomycin, isavuconazole and amphotericin B; he was administered timolol, but switched to cosplot for better intraocular pressure control. Home care includes voriconazole 300 mg twice daily and ceftriaxone 2 g twice daily for 30 days, and erythromycin ointment twice daily and artificial tears four times daily, with continued use of timolol.

Although there is limited data regarding the precise incidence of its occurrence, clinical data has shown that aspergillosis rhinosinusitis with ocular involvement is a rare and potentially life threatening condition to occur in an immunocompetent individual. Of the cases that are documented, the majority are of individuals living in hot and humid climates [5], making our case even more rare as our patient's symptoms took place in Dayton, Ohio throughout the months of January and February. Therefore, cases such as ours contribute to the limited data on the ophthalmic manifestations of this disease. Due to its deceptive presentation, it is crucial for ophthalmologists to be aware of the ocular manifestations of aspergillosis in order to provide earlier and more effective treatment for their patients.

Conclusion

It is imperative for ophthalmologists to keep aspergillosis on the differential for patients presenting with severe headache, sinus tenderness, chemosis, and proptosis.

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Statement of Ethics: Written informed consent was obtained from the patient for publication of this case report.

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Conflicts of Interest: The authors have no conflicts of interest to declare.

Data Availability Statement All data analyzed during this study are included in this article. Further enquiries can be directed to the corresponding author. □

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The Pressure Is On:

A Medical Student Guide to Tonopen Use

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Abstract

Intraocular pressure (IOP) measurement is a critical component of ophthalmologic screening and emergency evaluation. The Tonopen is a handheld applanation tonometer and serves as a portable, rapid alternative to the traditional Goldmann applanation tonometer (GAT). This article provides a practical, step-by-step guide to Tonopen use for medical students in ophthalmologic settings. We review device calibration, topical anesthetic selection, proper measurement technique, result interpretation, and the recognition of common errors. Understanding how to accurately measure IOP using the Tonopen enables earlier detection of elevated IOP, a key risk factor for glaucoma, and facilitates appropriate referral and urgent management.

Introduction

Glaucoma represents one of the leading causes of irreversible blindness worldwide, affecting an estimated 80 million individuals globally.1 Elevated IOP remains the most significant modifiable risk factor for glaucomatous optic nerve damage. Early detection of elevated IOP is therefore essential for timely intervention and prevention of vision loss.

While the GAT mounted on a slit lamp remains the gold standard for IOP measurement, it can slow down clinic flow and is a difficult skill to master as a medical student.2 In contrast, the Tonopen is a compact, handheld tonometer that allows rapid IOP measurement in a wide variety of clinical settings, including ophthalmology clinics, primary care offices, emergency departments, urgent care centers, postoperative recovery, and inpatient hospital wards.

Device Overview: The Tonopen

The Tonopen is a handheld, battery-operated applanation tonometer designed to measure IOP through contact with the corneal surface. It uses a micro-strain gauge transducer to detect the force required to applanate a small area of the cornea, from which IOP is calculated.

Key Features

- Portable, battery-operated and therefore, suitable for bedside, emergency, and clinic use
- Disposable latex covers protect against cross-contamination
- Provides a digital readout with a confidence interval indicator within seconds
- Requires topical anesthesia prior to use
- Averaging function: takes approximately 10 readings and displays the mean IOP

Tonopen vs. Goldmann Applanation Tonometry

Feature	Tonopen	Goldmann (Gold Standard)
Portability	Handheld, portable	Slit-lamp mounted, stationary
Training required	Minimal — teachable in minutes	Difficult and time consuming to master
Accuracy	Good for screening	Most accurate method available
Anesthesia needed	Yes	Yes
When to escalate	Extremely high readings	Confirmatory/definitive measurement

Clinical Pearl: If pressures return extremely elevated despite multiple Tonopen checks, confirm with Goldmann applanation tonometry.

Clinical Significance of Intraocular Pressure

Normal Values

IOP is measured in millimeters of mercury (mmHg). Normal IOP ranges from 6 to 21 mmHg, with a population average of approximately 16 mmHg. Values outside this range warrant clinical attention, though interpretation must account for individual variation.

Elevated IOP

An IOP greater than 21 mmHg is considered elevated and represents a significant risk factor for the development of glaucoma. However, elevated IOP alone is not diagnostic of glaucoma.

In the setting of acute eye pain with elevated IOP, closed-angle glaucoma must be considered. This is an ophthalmologic emergency requiring urgent intervention to prevent permanent vision loss.

Clinical Pearl: Elevated IOP is a risk factor for glaucoma, but it is not diagnostic. Conversely, normal-tension glaucoma can occur with IOP within the normal range. Always correlate with the full clinical picture.

Asymmetric Readings

An IOP difference of greater than 3 mmHg between the two eyes is considered clinically significant and should prompt repeat measurement in both eyes. Persistent asymmetry warrants ophthalmology referral.

When to Be Concerned: Summary

- IOP > 21 mmHg: repeat measurement; refer if persistent
- IOP difference > 3 mmHg between eyes: repeat both; consider referral
- Acute eye pain + elevated IOP: urgent ophthalmology evaluation (possible closed-angle glaucoma)
- Extremely elevated IOP despite multiple checks: confirm with Goldmann tonometry

Step-by-Step Technique

The following steps outline the recommended procedure for measuring IOP with the Tonopen. Familiarity with each step improves both accuracy and patient comfort.

Step 1: Turn On and Calibrate the Device

Hold the Tonopen with the tip pointing perpendicular to the floor (straight down). Press the activation button. The device will power on and display two rows of dashed lines when calibration is confirmed as seen below. Do not proceed until calibration is successful. It should look similar to the image here.

Step 2: Apply Topical Anesthetic Drops

Topical anesthesia is required prior to corneal contact. Ensure the patient is not wearing hard or soft contact lenses. If they are wearing contacts, have them remove their contact lenses. The most commonly used anesthetic agents are listed below:

Agent	Concentration	Notes
Proparacaine	**0.5%**	**Most commonly used; rapid onset**
Tetracaine	0.5%–1%	Slightly longer duration
Lidocaine	2%–4%	Alternative option (if allergic to agents listed above)
Chloroprocaine gel	3%	Gel formulation available
Bupivacaine	0.75%	Longer-acting; less commonly used

Clinical Pearl: Keep the anesthetic bottle sterile. Do not allow the dropper tip to contact the eye, eyelids, or eyelashes. Inform the patient that the anesthetic lasts only a few minutes, and they will be able to drive afterward.

Step 3: Install the Disposable Tip

Place a new, sterile disposable tip onto the Tonopen before each use. This protective cover prevents cross-contamination between patients and is required for safe use. Discard the tip after each patient encounter, and reload the tip for the next time you use it, leaving the cardboard applicator on the Tonopen to preserve cleanliness.

Step 4: Obtain the Measurement

Proper technique at this step is critical for accurate IOP measurement.

1. Position the patient: Ask the patient to look straight ahead and focus on a distant object. Most patients are uncomfortable with an object approaching their eye — distraction techniques are helpful (see Pearls section).

2. Recalibrate the Tonopen once more if it does not show two rows of dashed lines. Often, the Tonopen must be recalibrated right before checking pressures. See “Step 1: Turn On and Calibrate the Device” for how to calibrate.

3. Stabilize your hand: Rest your dominant hand on the patient's right (OD) infraorbital rim to steady your approach, and add slight traction to the patient’s upper eyelid, resting your non-dominant thumb or finger on the supraorbital rim. Do not apply pressure to the periorbital soft tissue as this will falsely elevate the IOP reading.

4. Align the tonometer: Position the Tonopen so it will contact the center of the cornea. Central corneal measurement is the most accurate location and where the device is calibrated to read.

5. Tap the cornea: Gently tap the corneal surface repeatedly until the device registers a pressure reading (approximately 10 taps). The device will display the average IOP with a confidence indicator once you have successfully taken the pressure.

6. Record and repeat: Document the reading. If the value appears unexpectedly elevated, repeat the measurement, otherwise proceed to the left eye (OS). Capture the left eye recordings using the same steps.

Clinical Pearl: Always begin with the right eye (OD), as IOP is conventionally recorded right eye first (OD before OS) in clinical documentation.

Clinical Pearl: If the patient is non-compliant, ask them to tap their foot and count to 100, or to read or describe a distant object. These distraction techniques reduce the blink reflex and improve measurement success.

Interpreting Results and Next Steps

The results should look similar to the example below:

IOP is reported in large numbers on the left. The battery status is indicated with the battery icon. The confidence of the measurement is measured on the bottom right. This measurement, for example, would indicate an IOP of 16 with 95% confidence that this is a correct reading. If the confidence number is low, you should retake the pressure. The ideal confidence number is greater than 90.

After obtaining IOP measurements bilaterally, interpret results in the context of the patient's symptoms, history, and examination findings.

It is important to note that glaucoma can occur even with normal IOP (normal-tension glaucoma). A single normal IOP reading does not exclude glaucomatous disease. Comprehensive ophthalmologic evaluation, including optic nerve assessment and visual field testing, is required for definitive diagnosis.

Pearls and Pitfalls

Clinical Pearls

• Have the patient remove hard or soft contact lenses to avoid false readings.

• Always begin with the right eye; IOP is conventionally documented OD before OS.

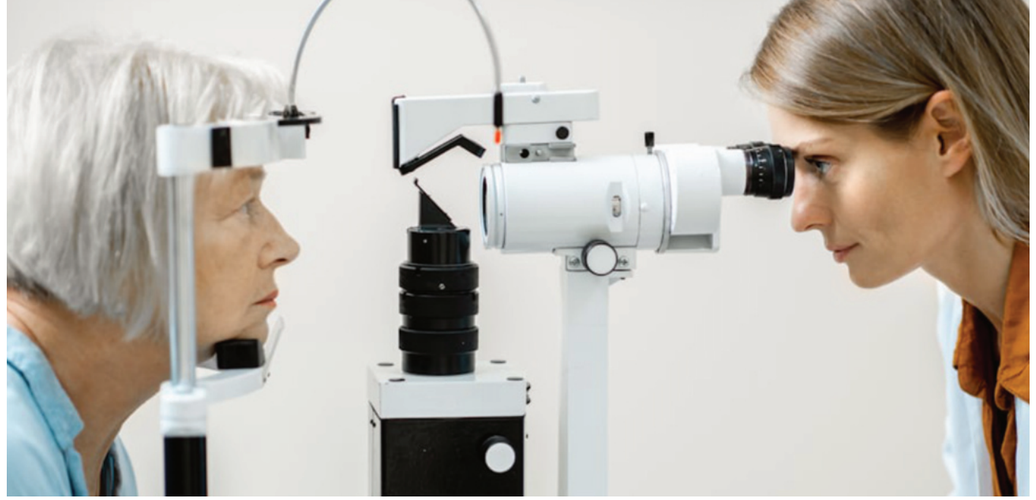
• Ask them to count, read a distant sign, or tap their foot. This reduces blink reflex and involuntary eye movement.

• Resting fingers on the periorbital fat pads will compress the globe and artificially elevate the IOP reading. Always stabilize with fingers/hand on the orbital rim.

• An initial high pressure may reflect technique error. Always repeat before acting on an unexpectedly elevated result.

• If the two eyes differ by more than 3 mmHg, repeat measurements in both eyes before documenting.

IOP Finding	Action
6–21 mmHg (normal)	Document; no further action if asymptomatic
> 21 mmHg	Repeat measurement; refer to ophthalmology if persistent
Asymmetry > 3 mmHg	Repeat both eyes; consider ophthalmology referral
Extremely elevated (regardless of symptoms)	Confirm with Goldmann tonometry; urgent ophthalmology evaluation
Elevated IOP + acute eye pain	Closed-angle glaucoma emergency — urgent ophthalmology



Common Pitfalls to Avoid

• Attempting IOP measurement without topical anesthesia causes significant patient discomfort and artifacts due to movement.

• Allowing the anesthetic dropper to contact the eye introduces infection risk and may compromise subsequent measurements.

• Always confirm the two rows of dashed calibration lines before measuring.

• Peripheral corneal measurements are less accurate; always target the central cornea.

Conclusion

The Tonopen is a practical, portable tool that enables quick IOP measurement. Mastery of this device allows students to screen for elevated IOP, recognize the signs of acute angle-closure glaucoma, and facilitate timely referral. The technique is learnable in a single skills lab session and represents a valuable addition to the clinical toolkit for students and residents across specialties.

As with all screening tools, results must be interpreted in clinical context and confirmed with GAT when values are unexpectedly elevated or when definitive measurement is required. With appropriate training and attention to technique, the Tonopen provides a reliable, efficient method for IOP screening.

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Artificial Intelligence Disclosure

Artificial intelligence was used to aid in translating this article from a presentation to document and for clarity and tone in the creation of this article.

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The Midyear
From the American Academy of Ophthalmology

By Don Morris, DO, President of the Pa Academy of Ophthalmology

Why I am exhilarated and depressed at the same time after the American Academy of Ophthalmology Midyear?

I have just returned home from the academy midyear. Like any meeting that has discussions about the state of medicine and ophthalmology, there were of course some good and bads.

One of the goods for me is the chance to interact with the Advocacy Ambassadors. When I get a chance to sit down with these residents, I am so impressed with their medical knowledge, with the surgical skills they are learning , and their enthusiasm for the profession. I am also so impressed with their drive to gain knowledge to learn about advocacy. Medically and surgically they are learning to do things that only the most amazing surgeons with incredible amounts of experience did when I was resident. I am sure I could learn a thing or two from them. I am also thrilled that I can help to educate them about how advocacy can affect the political issues of medicine and more specifically ophthalmology. For many of the residents, this is the first exposure to the political side of the profession and they accorded themselves well. The group that I led to our congressional meetings did an amazing job (as I am sure the other groups did too) in discussing our issues. The issues we discussed with our representative's staff included medicare physician payment reform, VA and veterans health, prior authorization, funding for the NIH and NEI, and screening and early detection for children's eyesight issues.

Each resident that I was with, had a chance to speak on one of these issues, and they did a fantastic job in relaying to the legislative aids the relevant information and our recommendations for congress. Watching and working with all of these extraordinary young doctors always gives me hope for our profession and medicine in general. Their next job is taking all of this information and knowledge back to their friends and programs and to continue being an advocate throughout their careers. This was a chance for them to learn how important this aspect of medicine also is. Advocacy gives us a chance to teach the legislature about things that impact our patients safety and well being, and it gives a way to affect things that help so many people across the country. Seeing one patient at a time and helping them is an incredibly fulfilling and worthwhile aspect of our profession, but helping millions at one time is also an incredibly fulfilling and worthwhile part of our profession.

The Academy Midyear forum is made up of three parts. Congressional advocacy day is the first part which I just wrote about in the previous paragraphs. The midyear forum is the second part,and touches upon topics affecting our daily lives and the lives of our patients. The council meeting is the third part of the weekend. The council is a body constructed of councilors from each state and subspecialty society that is part of the academy. I was the councilor for the Osteopathic College of Ophthalmology. My term ended last year and Austin Taylor DO is now our current counselor. He did a fantastic job at representing us this year. I am currently President of the Pennsylvania Academy of Ophthalmology and was there as part of the Pennsylvania delegation. The two midyear forum discussions that I attended this year were about health care for underserved communities and the decreasing amount of ophthalmologists taking emergency call.

The discussions about helping underserved areas ranged from screenings, to there not being enough residencies for the amount of ophthalmologists needed, to establishing new programs or training sites. They also talked about ophthalmic hospitalists and how this helps the continuity of care while patients are in the hospital. Pennsylvania was mentioned at the midyear regarding our diabetic eye screening day across PA that Allen Ho established in Philadelphia a few years ago and with PAO assistance spread across PA last year. This year it was diabetic eye screening day across PA and Delaware with an additional site in NY. It occurred on April 25th of this year. The house of representatives of the state of PA proclaimed April 25 2026 as diabetic eye screening day across PA. This statewide screening shows how we can provide a fantastic service to the citizens of our state and by expanding this to other states provide incredible service to their citizens by finding and treating this preventable cause of blindness early.

Dr Rapuano MD , the current American Academy of Ophthalmology president, discussed how the decrease in ophthalmologists taking ER call is creating issues in care and coverage for many hospitals and communities across the country. This is also creating an increase in transfers to ER's at teaching institutions which is overwhelming

the institutions and the residents in some areas of the country, leading to early burnout. This is also increasing the amount of time on call for those physicians taking call among other issues. Burnout and lack of adequate compensation for call are two big reasons for the decrease in ophthalmologists willing to take call. There are no easy answers to this, but it is an important topic that warrants more discussion and solutions.

The last part of the midyear was the council meeting. This is a chance for the state and subspecialty societies to give input to the academy board through regional discussion and submitting Council Advisory Recommendations. The discussion at the regional meetings were regarding the questions of what role

ophthalmology societies could play in improving access to urgent or emergent eye care, particularly through technology enabled solutions or collaborative regional systems, and what keeps people involved in organized ophthalmology, and how can we help more colleagues discover the same sense of purpose and connection. There were 11 CARS (council advisory recommendations) discussed at the council meeting ranging from Pediatric Ophthalmology medical decision making, the ER call coverage issue, diabetic screening opportunities and methods, and ways to foster open discussion on issues that societies feel are important even when they have been discussed before. The complete list can be found on the Academy's web site.

A recurring theme throughout the weekend was talking about the issues with the medicare physician payment and the continued cuts and efficiency adjustments, and how when adjusted for inflation physicians have had a 33 percent pay cut in the last 20 years while practice costs have increased by at least 50 percent in that time. Unfortunately the answer to this from the academy leadership and the politicians is that fixing this takes time. It requires what we have been doing, which is making the decision makers aware that practices are closing and the ability for patients to get timely care is being compromised. This in turn is making what should have been mild issues into more severe issues and leading to more loss of sight. Continuing to see the legislators and discussing these points will at some point lead to relief. I wish I could tell you that will happen soon, but I don't have a good answer to that. I do know that without doing what we have been doing, things would be way worse than they are now.

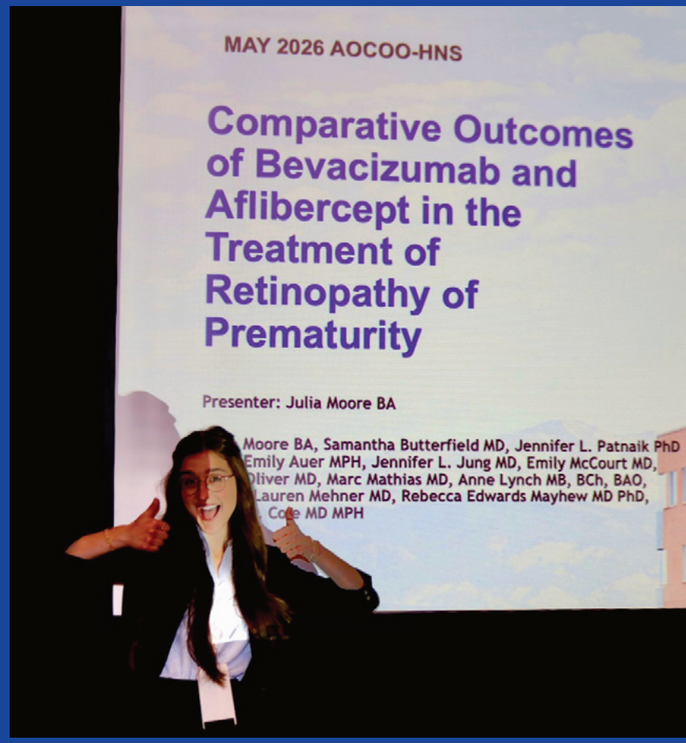
I also know that the advocacy ambassadors understand why it is important for all ophthalmologists but specifically younger ophthalmologists to get involved. All of this is going to affect their patients safety, their careers, their ability to earn a living, and their ability to do the research they want to do. This affects independent physicians, private equity physicians, and academic physicians. Those of us who are fighting for you, will continue to fight, but ultimately this affects those of you who fit in the young ophthalmologist class and residency class more than any of us who do a significant part of the advocacy work. We are closer to the end of careers than the beginning. It is your future and something that you should be a part of making the decisions about. So if you are a member of your state organization, and your subspecialty society, that is the Osteopathic Colleges of Ophthalmology and Otolaryngology in our case, thank you. If you are not a member, you should be. We are all stronger the more voices we have. You need to be a part of ensuring your future.

As part of this, there is an opportunity for a resident or residents to represent the colleges as advocacy ambassadors. If you are interested and have questions, I am happy to answer them.

Have a wonderful spring.

Best,

Don Morris, DO, past president of the AOCOOHNS and current president of the Pa Academy of Ophthalmology □



2026 ACA

Smart Glasses:

Are They Practical for Charles Bonnet Syndrome Patients?

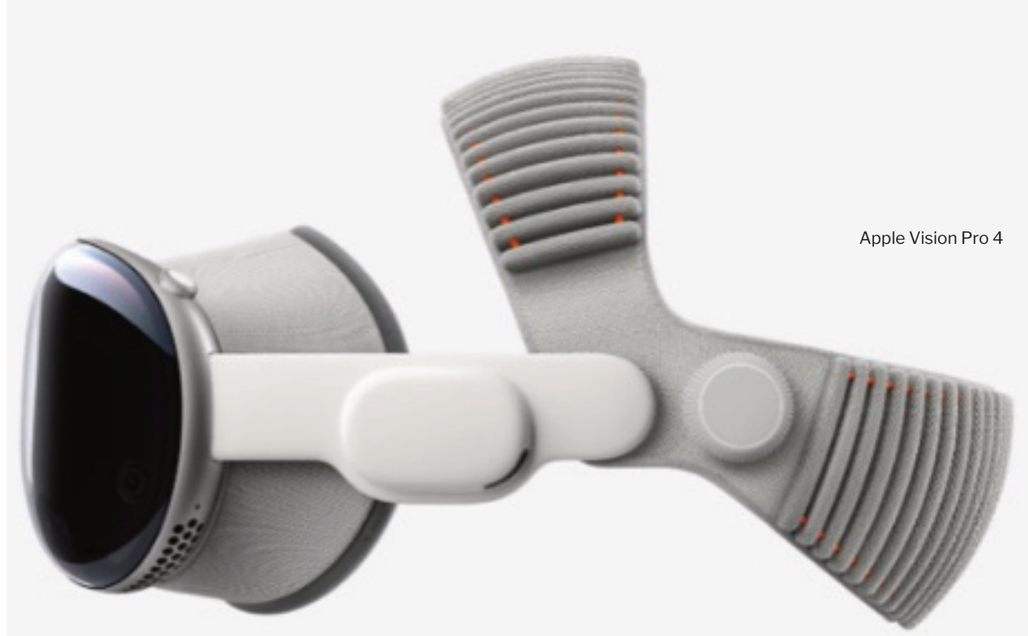
By Neil Patel, BA, and Leonid Skorin, Jr., DO, OD, MS, FAAO, FAOCO

Abstract:

Charles Bonnet Syndrome (CBS) was first named in 1936 by the Swiss neurologist, Georges de Morsier in honor of Charles Bonnet, a legendary polymath who wrote on the theory of parthenogenesis and published research and his own studies in the areas of botany, entomology, psychology, philosophy (metaphysics), and the law.1 Charles Bonnet saw a number of fantastic objects that he recognized to be illusory after his own vision loss later in his life.1 CBS always occurs in individuals with vision loss. Vision loss risk factors include cataracts, retinitis pigmentosa, glaucoma, central retinal artery occlusion, cortex pathology, age-related macular degeneration, and diabetic retinopathy.1 CBS can be aggravated by social isolation and low light environments. The incidence of CBS ranges from 0.5% to 40%, depending on the specific patient population. Patients with CBS report seeing an immersive/360° environment which fits rather seamlessly with smart glasses functionality. This paper aims to examine the applications of smart glasses in visual reframing and visual restoration in Charles Bonnet Syndrome.

Keywords: Charles Bonnet Syndrome, AR/VR, Vision loss preventative & restorative potential, Motion Planning, long horizon interaction, computer vision, real-time navigation,

Echovision [2,3]



Apple Vision Pro 4

Hybrid-Augmented Reality (AR), Blind-Assistive Technology, Potential Regain of Function, Multi-Sensor integration, OCR Technology, Transformer Models, Vision Transformers, Diffusion Transformers, Latent Diffusion Models, 3D Mapping, Facial Recognition, Prescription Lens Compatibility,

CBS Theories1:

1. **Ocular Pathology (most common):** Disease sequalae, stroke, or trauma resulting in injury to the visual tract may cause CBS. Due to underreporting of the condition, subject acquisition in CBS studies is difficult. Thus, there may be an overrepresentation of individuals with macular and retinal diseases in the more recent studies.1

2. **Deafferentation Theory (Phantom Vision Theory):** CBS images are produced as compensation for decreased sensory input due to vision loss, reducing the threshold of activation of the visual pathways in CBS patients and resulting in cortical hyperexcitability/reduction of sensory inhibitory networks that are ordinarily in force, this theory is also supported by functional neuroimaging.1

3. **Release Theory:** The loss of sensory input rather than physical damage in vision loss is the cause of visual images and correction of a patient's vision may halt the visual images. Sensory deprivation and bereavement studies have shown that individuals without visual impairment may experience visual images. Thus, the loss of visual input can minimize potential hallucinatory perception to a type of baseline memory which releases engrams, physical and chemical changes with new memory associations.1

4. **Irritative Theory:** Spontaneous epileptiform discharge from vascular dysfunction, cranial arteritis, or other lesions induces the visual hallucinations yet the variety of images and neuroimaging suggests otherwise, as visual pathways without injury are active.1

5. **Neuromatrix Theory:** This theory postulates CBS occurs as a "neuro signature" due to a network of neurons imparting a pattern when visual information is received and that any sensory input changes will modulate the sensory output eliciting hallucinations.1

Current Devices:

Key Selective Differentiating Features of Nu Eyes Pro 44 vs Esight Go5 vs Echovision2,3

Key Selective Differentiating Features of Nu Eyes Pro 4 vs Esight Go vs Echovision				
	Apple Vision Pro 4	**Nu Eyes Pro 4[4]**	**Esight Go[5]**	**Echovision[2,3]**
Best For/ Ideal Use Cases:	-Everyday Users - Visual Impaired Users	-Central Vision Loss (Primarily Macular Degeneration, Stargardt's Disease, & Retinitis Pigmentosa) -Everyday Living	-Seeing Better -Low Vision Users (Moderate to Severe Low Vision) -Central Vision Loss - Day to Day Use (Work, Reading, Leisure, Classroom, etc.)	-Blind Assistive Technology
Core Strength:	• (Hybrid Augmented Reality-AR) for work & social environments • Built-in support for vision, hearing, mobility, hearing, and learning • Lightweight (28.2 oz ~800 grams) • Portable & Convenience	• (Hybrid Augmented Reality-AR) for work & social environments • Enhanced Visual Clarity • Restoring Visual Independence • Portable & Convenience	• True Visual Enhancement	• Designed by the Blind for the Blind • Lightweight & Fashion Friendly • Feels like Regular Sunglasses
Key features:	❑ Iris-based Biometrics ❑ AR/VR (Virtual Reality) ❑ Text to Speech Technology (OCR) ❑ TrueDepth Camera (Multi-Sensor Integration) ❑ Built in Apps ❑ Video Mirroring ❑ 20 % Recycled Content & 100% fiber based packaging	❑ Usable Vision ❑ AR Features and captioning ❑ Text to Speech Technology (OCR) ❑ Magnification Range of 1x to 12x ❑ Media Streaming ❑ Samsung Phone Integration ❑ Portable Hands-Free Magnification ❑ Lightweight Ergonomic Design	❑ FDA-cleared medical technology ❑ High-speed front-facing camera ❑ Dual OLED (Organic Light-Emitting Diode displays ❑ Adjustable zoom, contrast, and color filters	❑ Live Descriptive Assistance ❑ Hands-Free Remote Assistance ❑ Open-Ear Bluetooth Audio ❑ Prescription Lens Compatibility ❑ Companion App ❑ Facial Recognition ❑ Scenic Description for Blind Users ❑ Live AI (Artificial Intelligence) mode ❑ Text to Speech Technology (OCR) ❑ Transit Mode ❑ Remote Visual Interpreter
Limitations:	Cost: ($3499-3899)	-Higher cost ($5995)	-High cost ($4950) -Not suitable for totally blind users	+ $599 (Pre-order $449-599) +No Subscription fees -Shipping Fees
Task-Specific Use:	Creative, Medical, & Enterprise Settings	Medical & Enterprise Settings (VR Headsets also available)	All Day Use	-Blind/Low Vision Assistive Technology for everyday use (Scenic Description, Facial Recognition, Transit Mode)

Smart Glasses Devices: NuEyes Pro 44 (Low Vision) (Top Left), Apple Vision Pro 4 (Top Right), Esight Go5 (Bottom Left), and Echovision2,3 (Bottom Right)

-Integrating Technology into Ophthalmic Practice6,7:

Integration of this technology could practically bridge the gap in clinical areas and rapidly improve therapies. These tools could benefit CBS patients in maximizing their daily life, quality of life, eliminating the risk of social withdrawal, and provide extensive reassurance. While patients can rapidly benefit from visual and conversational assistance, they may very well become tools in patient-centered clinical office workflows. The novelty of these items provides a multimodal segue for patients to become re-integrated and fully functional.

This technology could also further clinical evaluation procedures by providing a novel tool geared towards patient care in CBS.

1. Fulfilling the need and deliver functionality to motivate patients to regain function by potentially de-engaging these hallucinations in multiple real-world optimally conducive environments and enable productive long horizon interactions.

NuEyes Pro 4[4] (Low Vision)

2. Providing a simple and structured method to integrate Validated-Assessment Tools7 such as Northeast Visual Hallucination Interview and the Questionnaire de Reperage du Syndrome de Charles Bonnet for research and detailed characterization.

3. Incorporate a structure with staff that can document, provide optimal patient education, and run demonstrations.

4. Streamline CBS management and provide additional avenues of care to allow for demarcation of other ocular and concurrent conditions.

5. Provide further illumination, breadth, and depth on the pharmacological and physiological mechanism that underly this condition. Pairing alongside electroencephalograms and ocular diagnostic exams may also enhance this understanding.

Conclusions:

- While no definitive treatment for CBS exists, these smart glasses could offer robust therapeutic and preventative potential that may de-engage/eliminate images by de-engaging triggers and re-engaging stimulation of the occipital lobe visual cortex, providing a new innovative medical tool for clinicians, researchers, and patients.

- Future areas of exploration may also include coupling smart glasses in noted cases of brimonidine tartrate induced CBS that would spontaneously resolve post-cessation of the drops in certain patients with glaucoma and diabetic retinopathy to explore the smart device-driven audio-visual and chemical interplay to expound multiple future treatment modalities and determine accurate onset alongside other conditions.

Esight Go[5]

- Smart Glasses that aim to engage the senses in a relaxed, serene format may provide panoramic, panoptic assistance to CBS patients as the fluid and smooth engagement of the device will eliminate the need to produce CBS visual images. Examination of the operation system compatibility (Samsung vs Google) and (UX)-user experience may also influence the immersion and learning curves for said devices. Ultimately, even everyday users may benefit from the comprehensive cortical and optical stimulation providing a myriad of age-related benefits (perception, attention, memory, and executive reasoning, coordination, sensory integration, audio-visual-spatial-temporal-lingual cognition). As UX refinement continues to develop, these benefits will only further deepen in their effect.

- Continuing areas of integration and development include Haptic Feedback (Piezo Electric Actuators, Vibrotactile, Electro-tactile, Kinesthetic Feedback for Navigation, Multimodal AI), further synchronization with wearables (Phones/Tablets/Watches/ Locks/Cars, etc.), and Customized AI training models for live user environments may further promote aforementioned and synergistic benefits, advance novel modalities of interaction, and ultimately deepen recovery. □

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