Department of Ophthalmology

First Eye Hospital in America Turns 200

FALL 2020
NYEE evolution involved a内科 exclusive specialty surgical care for the rest of the country and the Americas, which was badly needed. The NYEE’s medicine brought a much-needed light to the clinical darkness prevailing in the 1820s. The NYEE’s dedication to providing a beacon of hope and help in the face of a_decking medical care was unwavering, and it continues to this day. While the NYEE’s history is marked by numerous firsts, scientific breakthroughs, a world-class training and educational program, and eminent alumni and faculty, it has left its mark on the lives of patients at NYEE and the fields of ophthalmology and otolaryngology. While this is certainly an extraordinary chapter in NYEE’s history, it serves as a reminder of the importance of continuous learning and improvement, and the need for ongoing innovation and adaptation in healthcare.

The journey from a clinic in a two-bedroom rental suite to a world-renowned specialty hospital with an international reach and a commitment to diversity and inclusion has been marked by numerous firsts, including the establishment of the first specialty hospital in America and its growth to prominence—bringing to life a rich tapestry detailing the founding of the first specialty hospital in North America, the evolution of healthcare, and the rise of academic medicine as a powerful force in healthcare. Throughout this history, NYEE has been a leader in defining specialty surgical care for both patients and the field of ophthalmology.

In conclusion, the NYEE’s evolution from a humble beginning to a world-renowned specialty hospital has been marked by dedication, innovation, and a deep commitment to excellence. As we look forward to the future, we are inspired by the NYEE’s legacy of dedication and commitment, and we are confident that the NYEE will continue to be a beacon of hope and help for generations to come.
Celebrating the Life of an Iconoclast: America’s First Black Ophthalmology and ENT Specialist

In August 2020, NYEE held a painting dedication ceremony to recognize an emblematic physician who practiced at the New York Eye and Ear Infirmary, Dr. David Kearny McDonogh, America’s first Black ophthalmology and otolaryngology specialist and protégé of our founder Dr. John Koplin, MD. For the past 200 years, NYEE has been an incubator of the newest ideas, and its doors were open to those who, regardless of their race, color, religion, or financial status, said Dr. Tsi.

Dr. McDonogh’s life and legacy continue to illuminate the path forward for us all, and we must learn from his story to work together to dismantle systemic racism, sexism, violence, plantation capitalism, and heath care disparities, explained Dr. Larry Atkinson, Clinical Professor of Ophthalmology at the Icahn School of Medicine at Mount Sinai and cataract and glaucoma surgeon at NYEE. He and his wife, Marjorie, commissioned the painting, called “Tribute to David Kearney McDonogh, MD” by Leroy Campbell and donated it to NYEE.

Unfortunately, there are no known portraits of Dr. McDonogh. But in his absence has always been able to capture something much more interesting than a mere likeness of his spirit. The abstract representation of Dr. McDonogh is intertwined with historical references to Impotep, the first named physician, an African from 2500 BCE; early cataract surgery being performed in the Nile Valley; abolitionists; and the progress of contemporary Black ophthalmologists in America today. Dr. Koplin described the painting, called “The Source of the Nile” by James T sai, to honor the man who had opened doors when all others had shut.

For Daniel Laroche, MD, the story of Dr. McDonogh has long served as a source of inspiration, a feeling the man and his institution, working together, pushed against the forces of prejudice and fighting for justice and equity for all, regardless of their sex, religion, race, or financial status,” said Dr. Tsi.

Born into slavery in 1821, Dr. McDonogh fought the racial prejudices of his time to determine his own course in life. He was the first Black graduate from Lafayette College, finishing second in his class. Denied entry into New York medical schools, the aspiring physician attended classes at Columbia’s College of Physicians and Surgeons unofficially. From this support and mentorship of his, he became active in the abolitionist movement and a champion of workers’ rights, equality, and providing health care for all. When Dr. Rodgers, an active in the abolitionist movement and a champion of workers’ rights, equality, and providing health care for all. His legacy is an important part of American history. Many of the issues he faced back in 1838 continue to be relevant today. While we have made progress by dismantling slavery and a legal segregation, we must all continue to work together to dismantle systemic racism, sexism, violence, plantation capitalism, and heath care disparities,” explained Dr. Larry Atkinson, Clinical Professor of Ophthalmology at the Icahn School of Medicine at Mount Sinai and cataract and glaucoma surgeon at NYEE. He and his wife, Marjorie, commissioned the painting, called “Tribute to David Kearney McDonogh, MD” by Leroy Campbell and donated it to NYEE.

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Left: In 1934, NYEE acquired New York City’s first eikonometer.
The concurrence of the New York Eye and Ear Infirmary of Mount Sinai (NYEE) bicentennial and COVID-19 reinforces, more than ever, the vision that NYEE would always be present to our patients. In the wake of the pandemic, we were able to maintain our services to our patients through telemedicine and other innovative approaches. This was possible because the NYEE leadership has always been forward-thinking and visionary, and we have been able to adapt to new challenges and opportunities.

As we look beyond our bicentennial, the next decade will bring change unlike any we have seen in the past. NYEE is committed to not just being part of but playing a leadership role in that transformation. We will intensify our regional, national, and even international reach, leveraging our partnership with the Mount Sinai Health System to impact individual patient care as well as entire populations through our cutting-edge research, technology, and training of tomorrow’s leaders.

For all of us who have proudly enveloped ourselves in the culture of NYEE, the changes on the horizon will do little to diminish our commitment to the ideals that led 200 years ago to the birth of America’s first specialty hospital to meet the needs of New York City’s population. Our link to the community remains stronger today than ever, as seen, for example, in the robust family of local physicians who regularly volunteer their time and expertise as valuable markers for early diagnosis, especially in individuals who are shown to have a more aggressive form of the disease.

Research from our labs over the past year showcased other ways we are advancing diagnosis and treatment of some of the most serious eye disorders. For example, we developed the first device in a series of Orion nanoscale aids that identify patients at risk of adult macular degeneration (AMD), as well as those who are likely to progress to late-stage AMD in two to three years, with 95 percent accuracy. Another study uncovered more than 150 genes for primary open-angle glaucoma which could serve as valuable markers for early diagnosis, especially in individuals who are shown to have a more aggressive form of the disease.

As we look beyond our bicentennial, we are building on our role as an innovator in American ophthalmology, for the past two centuries, NYEE has been at the forefront of exploring the vast potential of microsurgical procedures, the robot will open the door to future applications that transform the fields of retinal, corneal, and glaucoma surgery. A team of experts from NYEE will begin exploring the exciting possibilities through a variety of investigative trials that are FDA approved.

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NYEE Warmly Welcomes the Newest Addition to Its Staff: a Robot

The journey from Amsterdam to New Amsterdam on the 200th anniversary of New York Eye and Ear Infirmary of Mount Sinai (NYEE) couldn’t have been more symbolic. America’s first micro-interventional robot for ophthalmic surgery became the newest arrival from the Netherlands to the shores of New York this past July—a genuine cause for celebration by its new hosts.

“The significance of the moment was not lost on us,” acknowledges Tsontscho (Sean) Ianchulev, MD, MPH, Professor of Ophthalmology at the Icahn School of Medicine at Mount Sinai, who was among the robot’s jubilant greeters. It was Dr. Ianchulev’s six-year collaboration with the creator of the device, the Dutch medical robotics company Preceyes BV, and a grant from the RICBAC Foundation to two principal investigators, Dr. Ianchulev and Joseph Panarelli, MD, that has led up to the project’s goal of advancing innovation and excellence in ophthalmology. “Because the robotic assistant can increase the precision and resolution of surgical interventions by 20 to 30 times, it will open a new chapter for micro-interventional ophthalmic surgery in this country and globally,” said Dr. Ianchulev. “This is the first ophthalmic clinical microsurgical robotic eye system in the United States, and only the third in the world, along with the ones at Oxford (England) and Rotterdam (Netherlands).”

Before that can happen, however, much work remains. Partnering with engineers from Preceyes is a team of ophthalmic surgeons from NYEE who are collecting data necessary for the U.S. Food and Drug Administration (FDA) to approve the microsurgical clinical use of the device. Potentially it will have applications in the fields of retina, cornea, cataract, and glaucoma surgery. The first clinical trial, expected to begin next year, will use the robotic surgical system for retinal surgery, whose micron-level demands on hand movement far exceed the limits of even the best surgeons. “The stability of even a master surgeon’s hands is in range of a 100-micron tremor, which comes from just the blood pumping through your fingers,” points out Richard Rosen, MD, Chief of Retina Service at Mount Sinai Health System and Vice Chair and Director of Ophthalmic Research at NYEE. “With the robot, that tremor is reduced to between one to two microns.”

“This is the first ophthalmic clinical microsurgical robotic eye system in the United States, and only the third one in the world, along with the ones at Oxford (England) and Rotterdam (Netherlands).” — Sean Ianchulev, MD
that epiretinal membrane peeling. To minimize the most surgical manipulations, like intraoperative inflammation. These functions suggest that they may also role in various physiological and pathological processes in the eye, including secretion of various growth factors, cytokines, chemokines, and proteins, which may trigger an immune reaction. This process includes attracting various immune cells from the blood to eliminate invading pathogens, which is critical for fighting ocular infectious disease. Occasionally, however, scleral melanocytes, through their secretion of cytokines and chemokines, may trigger an intense inflammatory or autoimmune reaction referred to as a sarcoid.

"We still have a lot to learn about how melanocytes can behave like immune cells in various pathological processes," says Dr. Hu, lead author of the study. Research from the lab of Dan-Ning Hu, MD, Research Professor of Ophthalmology at Icahn School of Medicine at Mount Sinai, has found that the melanocytes in the posterior sclera may be involved in the development of myopia, while human scleral melanocytes are associated with the development of myopia. "Scleral melanocytes perform similar functions in the sclera as melanocytes in other tissues, such as the skin," says Dr. Hu. "They could pose a new target for the prevention and treatment of various diseases of the sclera."

Fig. 1

Microscopic view of scleral melanocytes and fibroblasts in different areas of the sclera stained by hematoxylin-eosin (MMP-2) plays an important role in the development of myopia, while human scleral melanocytes are associated with the development of myopia. Since scleral melanocytes derive from the uveal tract, it is possible that they could be involved in the remodeling and weakening in the sclera that's characteristic of severe forms of myopia.

Researchers believe the similarity between uveal and scleral melanocytes might have implications for other ocular pathologies. For example, the tissue inflammation and fibrosis that occurs in diabetic retinopathy may involve similar types of cytokines and chemokines that may trigger an immune reaction. This process includes attracting various immune cells from the blood to eliminate invading pathogens, which is critical for fighting ocular infectious disease. Occasionally, however, scleral melanocytes, through their secretion of cytokines and chemokines, may trigger an intense inflammatory or autoimmune reaction referred to as a sarcoid.

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NYEE’s Trauma Team Works Its Magic On a Patient’s Eye-Shattering Injury

In a terrifying instant, a deer head mounted on the wall of a backyard workshop became a flying projectile that radically changed Matthew Dzierzanowski’s world. When the deer head was dislodged by a tarp that Mr. Dzierzanowski mindlessly flung over his shoulder, his first thought was for the safety of his two-year-old daughter, who was by his side. Only then did the horror of what had occurred—imploding the eye, piercing the cornea, sclera, iris, and lens—begin to register in his brain. His previously scary situation got scarier by the second. “An extremely scary situation got scarier by the second,” remembers Mr. Dzierzanowski, describing how he crawled on his knees the short distance back to his house in upstate New York with his daughter in tow. There, he confronted his petrified wife, Gina, who immediately summoned an ambulance.

By the time Ronald Gentile, MD, a retinal surgeon at New York Eye and Ear Infirmary of Mount Sinai (NYEE), saw the patient and his wife in his Manhattan office, they had endured a harrowing five weeks following the May 2019 accident. Mr. Dzierzanowski had been emergency airlifted to Westchester Medical Center, where a team of surgeons closed the 10 mm wound, but said he had no better than a slim chance of saving vision in the eye. He was advised to find a retinal specialist, and when his wife approached a relative at Mayo Clinic for a recommendation, Dr. Gentile’s name headed the list of surgeons who could give the 49-year-old his best shot at seeing again.

Still battling intense pain and headaches and seeing nothing more than blackness from the damaged eye, Mr. Dzierzanowski, a conductor for Metro-North Railroad, recalls that first visit with Dr. Gentile as “a marriage made in heaven,” adding, “he really took charge, explaining everything in clear terms, and giving me a fighting chance, without promising anything.”

For Dr. Gentile, Co-Director of Posterior Segment Trauma for NYEE’s Eye Trauma Service who has honed his skills on the toughest of the tough cases, Mr. Dzierzanowski was anything but business as usual. “In cases when the globe of the eye is damaged and the injury hits the retina, there’s a high likelihood of blindness or substantial loss of vision,” he explains. “It’s mostly rare, the outer portion of the eye which wasn’t injured was the optic nerve. This was a pretty devastating injury—one of the worst I’ve seen. The chance of recovering useful vision from this injury was less than 2%.”

On June 13, Dr. Gentile began the intricate repair of the internal tissue of the eye. This invasive task was addressing the blood that filled the eye, a not-uncommon condition after trauma where the blood vessels rupture and retinal and macular vision cannot be salvaged, “Typically, I use a vitreous cutter and very fine forceps to uncover the retina and repair it,” he explained. “I combined with laser surgery to allow the retina to seal back in place.”

But this case went well beyond standard repair: the tip of the falling antler had perforated the retina and eyeball, forcing retinal tissue and vitreous gel into the wound site. The delicate six-hour procedure to reattach the retina required removing not just the debris and blood but all tissue that developed as the retina tried to heal itself, and also involved suturing a lamellar to the side of the eye, which greatly pushed against the detached retina.

The surgery was revealing to Dr. Gentile in a crucial way. “When you start to do internal reconstruction and see that the optic nerve and the macula aren’t damaged, it gives you hope that the patient has a chance,” he explains. In Mr. Dzierzanowski’s case, that revelation came one hour into the procedure. The next morning, when Dr. Gentile removed the patient’s bandages, his hunch proved well-founded. “As soon as they came off, I was able to see what resembled a gentleman sitting in the room,” Mr. Dzierzanowski recalls. “I couldn’t start to see shapes and colors out of the eye, and while they weren’t all that clear, after months of darkness it was very exciting.”

The patient’s rehabilitative journey was just beginning, though. Joining the trauma team now was John Aljian, MD, a cornea specialist and Co-Director of Anterior Segment Trauma for NYEE’s Eye Trauma Service. For Mr. Dzierzanowski, a baseball player and basketball player and a hardcorer who needed a corneal transplant.

Mr. Dzierzanowski back to work as a train conductor at metro North Railroad following eye trauma.

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—Ronald Gentile, MD

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Macrophage-Like Cell Imaging Opens a Bold New Window on Retinal Disease

Macrophage-like cells are known to play an important role in immune surveillance, disease, altering their shape, density, and distribution in response to external and internal stimuli. Indeed, we have now opened a revealing new window on how these cells may help researchers better understand retinal disease. This technology has enabled the NYEE team to visualize in the en face perspective how two cell types that are members of the macrophage family—microglia and hyalocytes—react to internal and external stimuli in the eye environment, regulate immune reactions, and effective tissue repair. We have been able to visualize in the living eye, how these cells move around in response to different types of retinal disease, something we have never seen before in actual patients,” noted Richard Rosen, MD, Chief of the retina service at Mount Sinai Health System. Rosen is also the lead author of the OSV study. “This cellular-level imaging has allowed us to see actual changes in the shape and spatial distribution of these macrophage-like cells as they become activated.” Indeed, NYEE researchers have imaged red blood cells and adherent monocytes in the macrophage-like cells of patients with various retinopathies. These cells appear to aggregate toward the surface of the retina and toward blood vessels, reducing their density in the neighboring unaffected areas. By better understanding and characterizing the patterns of change in these cells under different disease states, we may be better able to consider them with activity of various retinal diseases, according to Dr. Rosen, who also serves as Vice Chair and Director of Retinal Ophthalmology Research at NYEE. “They could potentially be used as biomarkers of early activation or inflammation within the retina,” he noted. “By seeing changes in the shape and spatial distribution of macrophage-like cells, for example, we will be able to detect early retinal involvement in patients with diabetes before there are more macroscopic signs of retinopathy such as new blood vessel formation or hard exudates.”

Prior studies of retinal macrophages have been performed predominantly in animal models, and used only OCT-D scan or en face OCT reflectance imaging with relatively limited resolution as a study tool, making it difficult to recognize these cells. “We developed an imaging processing approach in our lab that examines a very thin slice at the retinal surface enhanced by color-coded views of the macrophage-like cell layer and retinal vascular network,” explained Yael Feng Tse Chui, PhD, Professor of Ophthalmology and Associate Professor of Ophthalmology at the Icahn School of Medicine at Mount Sinai. “The novel technology that we have developed allows us to image the macrophage-like cells from background tissue, and visualize their spatial relationship in tremendous details.”

Those relationships—the interaction of macrophage-like cells with basement membranes, fibrotic walls of blood vessels, retinal nerve fibers, and vessels that could potentially allow clinicians in their offices one day to make more informed decisions on the best ways to monitor and treat disease.” And actually, things that previously could only be seen in a few research centers, “And we think it’s only going to get easier,” said Rosen. “We’re still at a very early stage of macrophage-like cell imaging, but OCT is allowing us to visualize, with equipment that’s standard in thousands of clinics and labs worldwide, things that previously could only be seen in a few research centers,” said Rosen. “And that could potentially allow clinicians in their offices one day to make more informed decisions on the best ways to monitor and treat their patients.”

Clinical first use OCT image of individual macrophage-like cells and associated retinal blood vessels in a human subject, located to the left of all images.

-Side by side in the operating room were Drs. Allen and Gentile, who did their residency together at NYEE some 25 years earlier. That time the vision was to concentrate the highest level of subspecialty care possible in the same ophthalmology, working outside and inside the retinal surface enhansed by color-coded views of the macrophage-like cell layer and retinal vascular network, enhanced predictive research, retinal angiography, and retinal-related health outcomes. Those relationships—the interaction of macrophage-like cells with basement membranes, fibrotic walls of blood vessels, retinal nerve fibers, and vessels that could potentially allow clinicians in their offices to one day make more informed decisions on the best ways to monitor and treat disease. We developed an imaging processing approach in our lab that examines a very thin slice at the retinal surface enhanced by color-coded views of the macrophage-like cell layer and retinal vascular network, explaining Yael Feng Tse Chui, PhD, Professor of Ophthalmology and Associate Professor of Ophthalmology at the Icahn School of Medicine at Mount Sinai. “This novel technique that we have developed allows us to image the macrophage-like cells from background tissue, and visualize their spatial relationship in tremendous details.”

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As COVID-19 was shutting down most non-emergent ophthalmic care this spring, telemedicine emerged overnight as a mainstream way for patients to access our services. Scheduled video visits and telephone calls became valuable social distancing tools to reduce coronavirus exposure to physicians, staff, and patients at our high-volume walk-in clinic in downtown Manhattan, while allowing for quicker and more effective triage of patients. Telemedicine is here to stay and as Louis Pasquale, MD, Chair of Ophthalmology, The Mount Sinai Hospital and Mount Sinai Queens, observed, “the technology is on a roll that is halted only by the timidity of the physicians.”

Thanks to the overwhelming acceptance of telemedicine by patients and providers alike, New York Eye and Ear Infirmary of Mount Sinai (NYEE) is committed more than ever to bringing innovative new applications and technologies to everyday clinical practice and making it a permanent part of the patient service. Following are several ways in which our efforts are already making a difference in patient care:

Emergency Room Consults

Few emergency rooms come equipped with an on-site ophthalmologist—a disconnect that too often leads to considerable waits for an ophthalmologist to arrive to treat trauma or other severe eye injuries. A telemedicine-driven project underway in the ERs at several hospitals is now offering a highly promising new model. The pilot at Mount Sinai Morningside and Mount Sinai West is streamlining emergent care through a system of tele-consults between the ER doctor and an off-site ophthalmologist from NYEE.

The program is coordinated through a Mount Sinai command center, which alerts the ophthalmologist to an emergency consult, provides information from the treating physician on the nature of the case, and then connects the ophthalmologist via video or telephone directly to the physician. The center also allows the consulting ophthalmologist to be at a remote location, or even at home, when they are available at the time of the ER visit. The device allows the tele-ophthalmologist to perform real-time evaluations of the patient's eye and surrounding tissues in real-time from their laptop or cell phone.

“Tele-consults will make it possible for the ER doctor to get an expert opinion on a patient’s condition much faster than waiting for a specialist to come to the emergency room,” emphasizes David Harris, MD, Medical Director for Ophthalmology at Mount Sinai Morningside and Mount Sinai West, who is part of the team implementing the project. “They also help to eliminate trips to the hospital by orthopedic or neurologists in the presence of brain injuries.”

The successful implementation of this program has highlighted NYEE’s ability to innovate and serves as an example of how to effectively expand access and coverage for other departments in the Health System. “As an ophthalmologist and the Director of Tele-consults for the Mount Sinai Health System, I am proud to say that the Ophthalmology Department was among the first specialties to implement tele-consults at Mount Sinai,” shares Sophia Saleem, MD. “To our knowledge, this is the first synchronous tele-consult model in the United States that provides ophthalmic services for emergency room patients. As we gain more experience in this area, we look forward to optimizing the delivery of ocular care throughout the Health System and expanding our reach to patients regionally and nationally.”

Propelled by future improvements in technology, Dr. Harris can envision this innovative program eventually taking hold in hospitals across the region—particularly those in remote areas that don’t have access to a nearby ophthalmologist—for emergency evaluations such as a ruptured globe or angle-closure glaucoma with elevated intraocular pressure, or for less serious cases like corneal abrasions.
Caring for Hard-to-Reach Patients

Six years before COVID-19, NYEE began to realize the enormous potential of telemedicine through its developing tele-ophthalmology (AI)—that could revolutionize the operation and effectiveness of the existing telemedicine. Dr. Pasquale observed in April 2020 issue of the American Journal of Ophthalmology, the NYEE also presents evidence that vascular dysregulation is contributing to these hemorrhages, "then we should be focusing glaucoma treatment on correcting that hemodynamic flaw."

The current retrospective study assessed densitometric profiles of disc hemorrhages from fundus photographs and evaluated the impact of oxygen saturation on disc perfusion. OHTS was a highly important randomized clinical trial, designed to establish whether ocular hypertensive therapy, or delayed glaucoma in patients with elevated intraocular pressure (IOP). Post-mortem analysis of study results found that disc hemorrhages were associated with a 3.7-fold increased risk of developing POAG, even after adjusting for the IOP level among study participants. According to Dr. Pasquale, OHTS offered a unique opportunity to gain insights on the origin of disc hemorrhages, because all participants started with elevated IOP and had either mild or no optic nerve damage.

For the past five years, researchers have been busy investigating vascular risk factors as a potential driver of disease progression. "I would say that disc hemorrhages are the neglected stepchild of glaucoma," says Louis Pasquale, OHTS lead author of the study. "Many people in the field write them off as a secondary cause of—glaucoma in many patients. Our over-arching hypothesis is that disc hemorrhages in the disease glaucoma and retinal degeneration that serves patient professional improvement.

Separating Physician Visits From Diagnostic Visits

The pandemic has underscored the need for better flow and prioritization of patients in busy clinic and offices. "Instead of having to wait a week, patients are informed immediately about a potential disorder, and never see an eye doctor on their own."

Capturing Hard-to-Reach Patients

"We believe the reason this is occurring is vascular dysregulation," offers Dr. Pasquale. "The blood flow cannot autoregulate when the patient is doing something simple, like waking up in the morning and changing from sitting down to a standing-up position. Blood flow should remain constant during those routine movements, but in glaucoma patients it doesn’t." Indeed, previous work by Dr. Pasquale showed how blood flow can increase in patients with frequent disc hemorrhages to the point where it can cause or contribute to these hemorrhages. To that end, NYEE researchers plan to soon launch a follow-up investigation using retinal oximetry in conjunction with Haemo-PCIOX recently closed the Department of Ophthalmology of Mount Sinai, and lead author of the study. "Many people in the field write them off as a secondary cause of—glaucoma in many patients. Our over-arching hypothesis is that disc hemorrhages in the disease glaucoma and retinal degeneration that serves patient professional improvement.

Vascular Dysregulation Emerges as Central Issue in Primary Open-Angle Glaucoma

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Years Spent in the Sun May Cause More Than Skin Damage

It is well established that basal cell carcinomas and squamous cell carcinomas are triggered in part by prolonged exposure of the skin to ultraviolet (UV) radiation. New evidence has now emerged that long hours spent outdoors by people in their younger years under intense solar rays may carry other serious consequences later in life. They may have set the stage for exfoliation glaucoma (XFG), a disease characterized by more rapid progression of glaucoma than the more common primary open-angle glaucoma (POAG).

Researchers from the Mount Sinai Icahn School of Medicine and Weill Cornell Medicine led a team from various European centers in a study that assessed the relationship between time spent outdoors during the teenage years and risk of XFG. In the Journal of Glaucoma, they report that greater personal exposure to UV radiation from the sun may increase the risk of exfoliation glaucoma. The study is the first, to their knowledge, to explore the association between time spent outdoors in the teenage years and risk of XFG, the leading cause of secondary open-angle glaucoma.

The findings are based on data from the General Practice Research Database, which is one of the largest administrative databases in the UK with more than 4,000,000 participants. A prospective study of more than 17,000 individuals, ages 16 to 85 years, who did not have a diagnosis of glaucoma at baseline, was conducted. Each participant had a baseline assessment at the age of 16 years, and their exposure to UV radiation was measured using the number of hours spent outdoors by people in their younger years under intense solar rays. The study also included an assessment of the participants’ geographical location at baseline.

The study found that increased time spent outdoors in the teenage years was associated with an increased risk of XFG. Specifically, for every 1000 additional hours spent outdoors during the teenage years, there was a 1.4-fold increase in the risk of XFG, which is the leading cause of secondary open-angle glaucoma. The study also found that this association was strongest for those living in northern latitudes, farther away from the equator, and for those living in northern latitudes, farther away from the equator.

In identifying individuals at greatest risk of XFG, Dr. Pasquale believes his team has taken an important step toward better understanding a disease that is associated with considerable morbidity. He states, "That a diet low in carbohydrates but high in fat and protein from vegetable sources may lower POAG risk. That work, in fact, is well underway at NYEE. Researchers are now using an artificial intelligence algorithm to calculate the amount of paracentral visual field loss among participants with POAG who are on a low-carbohydrate diet. We've shown how a low-carbohydrate diet may lower POAG risk. Our findings don't necessarily mean that carbohydrate restriction won't work in terms of reducing POAG risk. Dr. Pasquale emphasizes, "It could simply mean that we're going to limit carbohydrates. We need to be done much more stringent intake levels than what we reported in our study."
A New Eye Drop Regimen for Macular Holes May Spare Patients Intrusive Surgery

The origin of macular holes, which require surgery for so many people over 60, has long puzzled researchers. Theories have abounded, including tangential traction, inner retinal degeneration, glial migration, and hydrodynamics. In 2011, after studying serial optical coherence tomography (OCT) images and clinical data for more than 15 years, Ronald Gentile, MD, Clinical Professor of Ophthalmology at Icahn School of Medicine at Mount Sinai, arrived at his own theory. Based on the countervailing forces of hydration and dehydration, his idea has since spawned a novel way to treat macular holes through eye drop medications, sparing patients the risks and rigors of invasive surgery.

**A Theory Is Born**

When Robert Wayne, MD, Director of Glaucoma Research and Surgical Director Emeritus at New York Eye and Ear Infirmary of Mount Sinai (NYEIS), introduced a prototype imaging device known as OCT to NYEIS in 1995, Dr. Gentile, an ophthalmologist resident at the time, soon found an intriguing use for the device that in following years would revolutionize the diagnosis and treatment of ocular diseases around the world. With the encouragement of Joseph Walsh, MD, FACS, FRCOphth, KStJ, the legendary Chairman of NYEIS Ophthalmology Department for 25 years, Dr. Gentile began imaging macular hole patients over time, analyzing how eye disease progressed through time lapse video created on the OCT images.

"I saw swelling the disease in a new way, and discovered that not every macular hole was the same," Dr. Gentile recalls. "Some holes had traction on them, others didn't. Some had hydration, others didn't." Digging deeper to learn why, he came up with the "combined tractional hydration theory of macular hole." It’s at odds: traction of the vitreous gel on the center of the macula creates just enough force to open a macular hole. Dehydration provides an opposing force to close it. And when the forces of dehydration are able to overcome those of the macular hole, the macular hole will repair itself without the need for surgical intervention.

"The non-surgical way was in surgery for macular hole," Dr. Gentile points out. "We overcome the forces of hydration and traction by inserting a gas bubble in the eye, which causes the edges of the hole to bow toward one another so that they eventually close."

**Creating a Spin-Off Treatment**

Dr. Gentile’s unique offshoot of the tractional hydration theory was a concept called cystoid dehydration, which proposes closing a macular hole by using eye drops. The simple procedure is designed to dehydrate the retina and alleviate swelling around the hole. As the fluid depletes and swelling decreases, the edges of the macular hole creep together, sometimes closing the opening.

Putting this new idea to the test in 2011, Dr. Gentile gave a patient—who was leery of surgery for his macular hole—three drops: a steroid, a non-steroidal and a carbonic anhydrase inhibitor. A follow-up visit two weeks later showed the macular hole had closed. Similar results were observed with other patients of Dr. Gentile. And so in 2012, the retina surgeon presented his cystoid dehydration of macular holes concept—thoroughly critiqued along the way by Dr. Wayne—before the most prestigious retinal organizations, the Macula Society (36th Annual Meeting) and the American Society of Retinal Specialists (31st Annual Meeting).

"People were awestruck," remembers Dr. Gentile, which paved the way for presentations before other professional groups, and for growing support from nationally known retina surgeons like Raymond Iezzi, Jr., MD, at Mayo Clinic and Dean Eliott, MD, at Harvard Medical School. After hearing Dr. Gentile speak at one of those conferences that year says Ernest Ocular Imaging Center at the University of Chicago, also became a firm believer, using the eye drop approach as an option for some of her macular hole patients with rewarding results.

"She had been invited by a group of specialists around the country including the retinal team at NYEIS.

**Weighing the Results**

As part of her own research, Dr. Skondra teamed up with Dr. Gentile to prepare for publication this year a retrospective case series of 40 patients whose cystoid dehydration had successfully closed through this three-drug regimen of prednisolone, ketorolac, and brinzolamide. And in 2013, the retinal surgeon presented his cystoid dehydration of macular holes concept—thoroughly critiqued along the way by Dr. Wayne—before the most prestigious retinal organizations, the Macula Society (36th Annual Meeting) and the American Society of Retinal Specialists (31st Annual Meeting).

Dr. Gentile cautions that treatment with eye drops is not meant for every patient with a macular hole. In fact, it is considered to be less than 100 microns in diameter since larger holes may cause more severe vision loss or getting the retina into the hole, diminishing the effectiveness of drops. Nonetheless, cystoid dehydration continues to gain traction in the ophthalmic world. "I think there are a lot of doctors who find it to evolve and become accepted," Dr. Gentile concedes, "but when you weigh invasive surgery against administering eye drops in cases where the patient's macular hole is small, the choice seems pretty obvious. As a physiologist, my goal is to look at each patient and their disease in a new way sometimes that means reaching for an eye dropper instead of the scalpel."
Alterations in Disease Metabolic Imaging Reveals Functional Signals Preceding Structural Alterations in Disease

Retinal Metabolic Imaging Reveals Functional Signals Preceding Structural Alterations in Disease

Advanced imaging technologies like optical coherence tomography (OCT) angiography and quantitative retinal fluorescence are the first for enabling researchers at New York Eye and Ear Infirmary of Mount Sinai (NYEE) to visualize metabolic signals in the retina that precede structural changes, offering paths to objective validation of both patient symptoms and early responses to retinal vascular therapies. Among these findings are vascular constriction coincident with the light shows many people report at the onset of migraine headaches, and improvements in acuity improvements. Confirming coincident subjective visual changes, objectively measuring coincident subjective visual acuity improvements.

"Changes in intracellular mitochondrial function occur long before they detectable as alterations in retinal vessel conformation, even by OCT imaging," explains Dr. Rosen, who is also Vice Chair and Director of Ophthalmology Research at NYEE and senior author of the study. “We’ve been able to confirm that flavoprotein imaging may be a promising clinical biomarker for gauging retinal metabolic integrity. Flavoproteins are critical components of the electron transport chain which drives the energetics of all of our cells. When they are damaged by oxidative stress from a variety of diseases, they emit visible light that drives the metabolic machinery of life. The ability to detect subtle changes in metabolic function and cellular energy levels has long been a goal of clinicians for monitoring disease prior to the onset of structural damage or evidence of repair. In a study recently reported in Ophthalmology, dr. Rosen and team point to new directions for research in the relationship of migraine to normal tension glaucoma,” he explains.

“FPF signal imaging may prove to be an important new bioenergetic marker which can detect early response to new treatments based upon improvement in cellular vitality as indicated by mitochondrial integrity. Additional studies have shown its value in detecting pre-treatment signals of flavoprotein fluorescence in patients with diabetes,” Dr. Rosen notes. People with diabetes have increased levels of oxidative stress, which reduces mitochondrial membrane potentials, leading to elevation in their flavoprotein fluorescence (FPF). Studies have shown that mitochondrial membrane potentials, leading to elevation in their flavoprotein fluorescence (FPF), are critical components of the electron transport chain which drives the energetics of all of our cells. When they are damaged by oxidative stress from a variety of diseases, they emit visible light that drives the metabolic machinery of life. The ability to detect subtle changes in metabolic function and cellular energy levels has long been a goal of clinicians for monitoring disease prior to the onset of structural damage or evidence of repair. In a study recently reported in Ophthalmology.

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3D Simulator Takes Ophthalmoscopy Instruction From the Dark Age to the Digital Age

Seymour Fradin, MD, has impressive skills as a medical artist that are matched only by his reputation as one of New York City’s top retinal surgeons prior to his retirement in 1994. Since then, the one-time Associate Director of Retina Service at New York Eye and Ear Infirmary (NYEE) has been anything but idle. In addition to volunteering his time as an indefatigable instructor at NYEE for the past 25 years, he has developed, with Richard Rosen, MD, Chief of Retina Service at Mount Sinai Health System and Vice Chair and Director of Ophthalmology Research at NYEE, the first digital ophthalmoscopy simulator which teaches proficiency in one of the most difficult procedures for residents to master.

That project is expected to launch in the next few months as a highly animated, fully interactive learning tool that can be accessed by trainees from a web browser or through a downloadable app to their tablets and smaller mobile devices. “The program uses amazing graphics and animation to simulate what residents would see if they had an indirect ophthalmoscope on their head and were looking into the interior of the patient’s eye,” explains Dr. Fradin, who began his own three-year residency at NYEE in 1959. “It’s designed to allow them to comfortably transition from computer screen to actual patient in the exam room.”

To be sure, indirect ophthalmoscopy with scleral depression has always been a challenge for students to learn, instructors to teach, and patients to endure. “That’s precisely why we designed this program,” says Dr. Fradin. “Patients can often take a beating at the hands of someone unfamiliar with the technique. Realizing this, the learning process was obviated and first we needed to do something much better.”

The brainstorm came naturally to a physician who has loved teaching ever since he trained at Johns Hopkins’ Department of Art as Applied to Medicine, following World War II, and joined the University of California in San Francisco as a medical illustrator. Those experiences, along with the encouragement of his childhood friend Morton Rosenthal, MD, founder of the NYEE Retina Service, made him want to become a doctor. He realized that dream with a medical degree from Columbia University of New York in 1958, a residency and fellowship at NYEE, and eventually a leadership role with the hospital’s newly launched Retina Service in 1963.

Seeds for the ophthalmoscopy simulator were planted by Dr. Rosen in the mid-90s when Dr. Fradin retired from active clinical practice and thought about writing a book to share his extensive expertise. With the support of the department chair, Joseph Walsh, MD, who helped re-establish NYEE’s reputation as one of the nation’s leading teaching hospitals, Dr. Fradin was encouraged to create a more dynamic teaching tool using newly available computer simulation techniques. Fortuitously, he found a young graphic artist, Carl Lydon, who was working with...
Is Reinventing Its Approach to Education

The intensified use of online learning dovetailed with another major innovation: the launch of its Joint Internship Program. Nine trainees became part of the inaugural class to start their residency enrolled in a one-year internship at Mount Sinai’s affiliated hospitals which also include New York Eye and Ear Infirmary of Mount Sinai (NYEE) and The Mount Sinai Hospital. This move was made possible by the declaration of a pandemic training emergency under the rules of the Accreditation Council for Graduate Medical Education. This online collaboration enabled residents from NYEE to continue into the future, "says Douglas Fredrick, MD, Deputy Chair for Education at NYEE for Oculoplastics, Orbital and Reconstructive Surgery at NYEE and Mount Sinai. "Residents will get the chance to see firsthand other professional pathways in public health administration and global health they might wish to pursue after completing their residency training learning through a structured curriculum that leverages the state-of-the-art resources of NYEE and The Mount Sinai Hospital was just the first step. Now we want to be known as a big program,” notes Dr. Reddy. “Combining the extensive resources of NYEE and Mount Sinai with the latest tools,”

Localizing the long journey that got the ophthalmoscopy simulator to the point, Dr. Fradin muses, “We’ve gone from a crude process that used actual patient slides to a digital patient as teacher to a digital patient that not only avoids the discomfort of a real patient, but puts the trainee in a much better position to master the difficult technique.” Characteristically, Dr. Fradin is still enthusiastically about the next step he has charted for his advanced learning tool: virtual reality.

$\text{Large Retinal Lesion}$

Despite the wishes of the retina community to avoid the COVID-19 pandemic, the New York Eye and Ear Infirmary of Mount Sinai (NYEE) and The Mount Sinai Hospital ophthalmology residency program firmly stepped up. Indeed, the largest accessed ophthalmic residency training program in the country received $\text{additional funds}$ for resident education and research in response to the COVID-19 pandemic. NYEE is known for its cutting-edge programs in glaucoma, vitreoretinal surgery, and neuro-ophthalmology, and NYEE’s resident trainees are leaders in these fields.

"We really try to make the didactic portion of an education," emphasizes Harold S. Reddy, MD, Ophthalmology Residency Program Director at NYEE and Site Director for Oculoplastics, Orbital and Reconstructive Surgery of NYEE and Mount Sinai. “We believe that there needs to be a balance between how much of the learning process will involve a class and instructor. The residents need to be taught how to learn by being able to learn in a self-directed way. This is crucial because technology will continue to change and evolve, so residents need to be able to adapt quickly. In the future, the residents will need to be comfortable with technology and able to use it in their daily work. This is a crucial skill for any ophthalmologist, as technology continues to evolve and play an increasing role in patient care. It is essential to prepare residents for the rapidly changing landscape of ophthalmology training.” The intensive use of online learning has already proven its value for residents, who have praised the online learning experience for its flexibility and the ability to learn at their own pace. NYEE’s residency training remains a leader in virtual reality, and the residents are eager to continue to explore the potential of this technology in ophthalmology education.

NYEE’s residency training remains a leader in virtual reality, and the residents are eager to continue to explore the potential of this technology in ophthalmology education. The residents have already begun to use virtual reality technology to simulate various scenarios, and the virtual reality platform has been well-received by the residents. The residents have also used the platform to prepare for clinical rounds and to practice various skills, such as performing a vitreoretinal surgery. The virtual reality technology has been praised for its ability to provide a realistic simulation of clinical scenarios, allowing the residents to practice important skills in a safe and controlled environment. NYEE’s residency training remains a leader in virtual reality, and the residents are eager to continue to explore the potential of this technology in ophthalmology education.

The recent revamp of NYEE’s education platform is creating a fertile ground for innovation in ophthalmic education, and the residents are eager to continue to explore the potential of this technology in ophthalmology education. NYEE’s residency training remains a leader in virtual reality, and the residents are eager to continue to explore the potential of this technology in ophthalmology education. The residents have already begun to use virtual reality technology to simulate various scenarios, and the virtual reality platform has been well-received by the residents. The residents have also used the platform to prepare for clinical rounds and to practice various skills, such as performing a vitreoretinal surgery. The virtual reality technology has been praised for its ability to provide a realistic simulation of clinical scenarios, allowing the residents to practice important skills in a safe and controlled environment. NYEE’s residency training remains a leader in virtual reality, and the residents are eager to continue to explore the potential of this technology in ophthalmology education.
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Attacking Hydroxychloroquine-Related Retinal Degeneration at Its Source

Norovirus (the cause of Norovirus) and hydroxychloroquine (HCQ) which have been imported drugs for treating malaria since the early twentieth century, gained new popularity in the 1950s as effective agents in the battle against autoimmune disease. While they are extremely well tolerated in the short term, prolonged usage of these drugs, which most individuals are able to take, poses an ominous risk of blindness, one that is often referred to as hydroxychloroquine retinopathy. Epidemiological studies have shown that retinal degeneration occurs in up to 10 percent of people who use HCQ for more than five years, decreasing to nearly 20 percent following 10 years of drug therapy. New York Eye and Ear Infirmary of Mount Sinai (NYEE) has now taken a promising first step toward developing antivirals to tackle the toxic effects of HCQ on the retina. A research team has identified a mechanism and molecular metabolic pathway responsible for the development of HCQ-related retinal degeneration and has found that certain medications, which can stimulate adrenaline receptors to reverse HCQ toxicity, in turn can stop retinal pigmented epithelial (RPE) cells, potentially preventing the devastating loss of central vision that follows. These findings were reported in The International Journal of Ophthalmology (April 2020).

“Our RPE cell culture studies have identified several medications which can potentially modify the disease and importantly be useful for the prevention and treatment of HCQ-related retinal degeneration,” says Dan Fong Ku, MD, Research Professor of Ophthalmology at Icahn School of Medicine at Mount Sinai, and co-author of the study. “The urgency of our efforts is prompted largely by the absence of any current medical therapy for HCQ toxicity—other than stopping the drug—and the widespread popularity of HCQ as a long-term solution for many conditions. The importance of the protein kinase A (PKA) signaling pathway and the ability of medications for other serious eye disorders.”

According to Dr. Hu, the mechanism can be traced to the fact that retinal toxicity effects of HCQ are initiated mainly by a reduction in acidity of the lysosomes. This results in inhibition of lysosomal enzyme activity, blockage of the autophagy process, increased vacuolation, and death of RPE cells which, in turn, leads to death of photoreceptors and loss of vision. Adrenergic agonists—developed over the past 20 years and used safely for long-term management of various chronic diseases—inhibit the PKA pathway, increasing the acidity of lysosomes, and potentially protect the RPE cells against HCQ toxicity.

While adrenergic agonists will not be a most effective against HCQ-related retinal degeneration, “We are testing a diverse range of medicinal properties to any different biological mechanisms and have randomized it down to 10 that effectively protected RPE cells in vitro,” Dr. Ku says. “We are currently developing an animal model to test whether we can select from several promising candidates that seem the safest and most effective for clinical trial.”

Dr. Ku remains the possibility that off-label regimens of one of the drugs or two adrenergic agonists already on the market could emerge as a valuable, safe, and effective agent for the prevention and treatment of HCQ-related retinal degeneration. Moreover, the research team is now using in vivo models to test whether or not HCQ toxicity can be reduced by strategies targeting other serious eye disorders.

Fig. 1: Beta-Adrenergic Agonist Rescues RPE from HCQ Toxicity

Fig. 2: Macular Toxicity from Chronic HCQ Use

Fig. 3: Animal Model of Photoreceptor Loss from Hydroxychloroquine Toxicity

Fig. 4: Animal Model of Photoreceptor Loss from Hydroxychloroquine Toxicity
First-Time Parents Brave COVID-19 Fears To Get Their Infant Emergency Treatment

When Mia Alvarez was born on March 17 with congenital cataracts in both eyes, parents and physicians alike were hit in a perfect storm. There was the issue of timing: to prevent permanent vision impairment, the cataracts had to be removed from the newborn’s eyes within a two-month window. It was a difficult task in normal times, perhaps, but this was the height of COVID-19 in New York City, when surgical practice everywhere was being upended and personal fears and health for especially those of a month-old, were rampant. But each day was critical to Mia’s development, and her surgery was scheduled for April.

For Mia’s mother, Kristal Alvarez, this meant presurgical planning with its own shutdown orders and working remotely, for the Infirmary of Mount Sinai’s uptown satellite and The Mount Sinai Hospital, whereophthalmic surgery was performed. The situation was further complicated by the endless frustrations of attempting to get approval from Medicaid, which was grappling with its own shutdown orders and working remotely, for the absolutely necessary procedure.

The stakes for Mia became even higher when Ms. Alvarez learned that she would need ocular surgery, the parents acted on the recommendation of their pediatrician at Mount Sinai and chose Dr. Fredrick, internationally known for his treatment of pediatric cataracts and complex extractions. “We believed Dr. Fredrick could give us a better chance of having good sight as we got older,” says Ms. Alvarez. Nothing was more important to the 28-year-old mother, whose sight was zero in 20/20 (corrected eye vision 20/200) for the result of Marfan syndrome and microphthalmia, a developmental disorder that produces abnormally small eyes. She was born with cataracts, but they weren’t removed until she was six.

Even the prearranged standards of infant surgery Mia was a challenge for Dr. Fredrick. “We were dealing with a smaller workspace and smaller tolerances in an eye where the diameter of the cornea was just 7 millimeters, compared to 11 millimeters normally,” he explains. “The reduced exposure required us to use smaller gauge surgical instruments, among the smallest made, to cut away some of the vitreous gel from the eyeball.” On the positive side, because infant cataracts are usually soft and gelatinous, the surgical team was able to remove them through tiny incisions, versus the ultrasonic energy required for adult cataracts.

Once the initial surgery was complete, the Alvarezes were faced with another challenge. Both legally blind, they had to follow a strict post-op regime of administering four eye drops three times a day to both eyes of an infant who made her displeasure with the process abundantly clear. Just as demanding was the work around maintaining the tiny contact lenses that needed periodic readjusting. Since these will all soon lose, with a strength of +32 diopters, enabled oxygen to pass through to the surface of the cornea, they could be worn a week at a time without the risk of infection. Still, they had to be removed, cleaned, and reinserted into the infant’s eye weekly.

At first, Dr. Fredrick lent a helping hand during the couple’s office visits. After that, the couple learned to master the delicate task themselves, drawing on the wellspring of strength and resilience that had already sustained them through each day of their young and challenged lives.

“This is the way she wants is just amazing to us.”

Their optimism has only grown since then as Mia continues to heal and Dr. Fredrick has given a prognosis of good functional vision in the longer term—perhaps as good as 20/40 corrected—if she had never done that before.”

The success of this difficult surgery can be measured not by what happened afterward, when Mia was back home, mom and dad hovering over her crib, “there was a joy to the side of her, she just kept going and grabbed the strips. “She’s incredibly excited because earlier she never had that chance.”

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Innovative AI Prediction Models Provide Early Alert System for Eye Disorders

Ophthalmologists have long fretted over the number of people who are unaware they have disorders like macular degeneration or diabetic retinopathy until sudden vision loss or a retinal hemorrhage forces them to seek emergent care. Researchers at New York Eye and Ear Infirmary of Mount Sinai (NYEE) have now set the stage for dramatic change, as revealed in two recently published clinical studies. The first study, in the April issue of Translational Vision Science & Technology, describes a family of artificial intelligence (AI)-driven models developed by the NYEE team that, for the first time, can identify not only patients at risk for age-related macular degeneration (AMD), but also those who are likely to progress to late-stage AMD within one to two years and should be seeking ophthalmic care. The second study, in Diabetes Care, reports on the development and validation of an automated diabetic retinopathy screening tool which could help pave the way for detection of potentially blinding ocular disease in diabetic patients during routine visits to their primary care doctor.

Predicting AMD

The unique models for detecting adult macular degeneration use an ensemble of deep learning screening methods and AMD-specific algorithms to classify patients into early, intermediate, or late-stage AMD categories, and then in a machine learning technique to predict progression to late-stage AMD. The accuracy of this innovative system for predicting disease progression within one to two years was 86 percent, higher than any other tool currently available. When measured on its ability to further predict who would progress to dry or wet forms of the disease—a considerably more demanding parameter—the accuracy of the NYEE models was around 67 percent.

“This technology could be particularly useful in identifying someone who has slipped across the boundary to intermediate- or higher-risk AMD and is thus more statistically likely to progress,” says R. Theodore Smith, MD, PhD, Director of Biomolecular Retinal Imaging at NYEE and corresponding author of the study. “By alerting patients and their physicians to the potential dangers ahead, we believe this approach could play a very important public health role.”

Early detection of AMD—the leading cause of vision loss in people over 50—has never been more important. The Age-Related Eye Disease Study (AREDS), the largest study of its type to date, showed that specific antioxidants and vitamin supplements could reduce the risk of progression from intermediate- to late-stage AMD allowing for additional preventive strategies. Those treatments might include photobiomodulation and sub-threshold nanosecond laser.

To train and validate their AI-based models for AMD screening and prediction, Dr. Smith and his team started with nearly 117,000 color fundus photographs from 4,139 participants in AREDS. A deep-learning image classifier was used to distinguish no-AMD or early-stage AMD from intermediate-stage AMD with near-perfect accuracy. The deep-learning classifier relied on six algorithms that provided probabilities of where an image would reside on one of 12 more detailed AREDS scales. These outputs were then combined with socio-demographic clinical data and AMD-specific imaging data through a logistic model tree—a sophisticated machine learning technique—to identify individuals at risk of progressing from intermediate- to late-stage AMD within one to two years. For those found to be in danger, the technology further predicted the type (dry or wet) of progression.
“We were able to train those convolutional neural networks on hundreds of thousands of photographs to be able to recognize features that determined if they fell into the broad categories of the so-called ‘early AMD’,” explains Dr. Smith, who’s also Professor of Ophthalmology, and Neuroscience, at the Icahn School of Medicine at Mount Sinai. ‘And that’s the beauty of AI: it can delineate patterns and make inferences from gigabytes of data that humans could never wrap their minds around.”

Screening for Diabetic Retinopathy (DR)

A deep learning system is the heart of the automated system for diabetic retinopathy developed as part of the National Eye Institute’s (NEI) initiative to reduce health care disparities impacting nonwhite, low-income, immigrant, and other underserved communities. In the wake of this success, plans are afoot to further test the five-point DR deep learning system via the results of a large-scale vision study to be funded by the Food and Drug Administration (FDA). Dr. Smith, senior author of the Diagnostic and Analytical Framework of Deep Learning-Based Diabetic Retinopathy: Ensemble Screening for Diabetic Retinopathy (DR) paper (October 2020), researchers described the five-point scale they created for grading the severity of the disease (no DR, mild, moderate, severe, and proliferative). Each model then produces total probabilities are then input to ensembles of five pre-trained DL models, respectively, differing in type of architecture (CNN, RNN, LSTM) and is the final classifier.

To that end, NYEE hopes to team up with the new Institute for Health Equity of Mount Sinai (NYEE) is playing a leadership role in reducing health care disparities and is working with the National Eye Institute (NEI) to improve national vision and eye health outcomes. “The result is an understanding of the disease that improves our ability to effectively diagnose and treat patients.”

Hyperspectral autofluorescence (AF) imaging

According to Dr. Smith, qAF provides a new understanding of RPE health and increasing severity of non-neovascular AMD. “It’s one of those translational technologies, developed and introduced by Dr. Smith and several colleagues in 2011 while he was a Professor of Ophthalmology at Columbia University, and now performed at the Icahn School of Medicine at Mount Sinai. The result is an understanding of the disease that improves our ability to effectively diagnose and treat patients.”

The qAF image in gray code depicts areas damaged by non-neovascular AMD. Areas damaged by AMD and particularly low qAF coded blue and dark blue intensities. qAF imaging courtesy of Wei MD).
The ophthalmic endoscope with its high resolution of 20/200.

**Surgical Management of Hemorrhage Offers New Hope to Patients**

ubercular hemorrhage presents ophthalmologists with one of their greatest challenges for restoring visual function. The high risk of dramatic visual loss in patients following an arterial retinal hemorrhage forms one of their greatest challenges for restoring visual function.

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Seeding the Future of Ophthalmology

The distinction of being the first specialty hospital in America has given NYEE a coveted place in the history and development of Ophthalmology. From the seeds we have planted over the past 200 years have sprouted many of the clinical standards of care and surgical innovations that define our specialty today. The spirit of our founders and their ironclad commitment to patient care, education, and research have inspired future generations of NYEE faculty and alumni to establish new hospitals, clinics, and organizations with global import.

And our numerous innovations and clinical and research breakthroughs have led to new medical and surgical treatments and diagnostic modalities that revolutionized the field and helped millions of patients worldwide. We are proud of our lasting legacy and the pioneering spirit of our founders, faculty, trainees, and scientists.

NYEE Contributions to Organizational Ophthalmology in America

1820
New York Eye Infirmary, the first eye hospital in America
Founders: Dr. Edward Delafield and Dr. John Kearny Rodgers

1824
First formal lectures in ophthalmology for medical students attending the College of Physicians and Surgeons in America
Established by Dr. Edward Delafield

1824
The American Ophthalmological Society (AOS) Foundation
Members: Dr. Henry D. Noyes and Dr. Edward Delafield

1824
Clinic for the Diseases of the Eye and Ear at Columbia University’s College of Physicians and Surgeons
Founded by Dr. Cornelius Agnew

1828
Clinic for the Diseases of the Eye and Ear at Washington University
Founder: Dr. Harvey J. Howard

1828
Association for Research in Vision and Ophthalmology (ARVO)
Founder: Dr. Conrad Berens

1834
Edward S. Harkness Eye Institute at Columbia University
First Director: Dr. John Martin Wheeler

1835
Pan American Congress of Ophthalmology
Founding member: Dr. Conrad Berens

1847
First School of Orthoptics in the U.S.
Founders: Dr. Conrad Berens and optometrists Elizabeth K. Stark and Ethel Mussor

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Clinic for the Diseases of the Eye and Ear at Columbia University’s College of Physicians and Surgeons
Founders: Dr. Cornelius Agnew

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Brooklyn Eye and Ear Hospital
Founding member: Dr. Cornelius Agnew

1869
Monahunt Eye and Ear Hospital
Founding member: Dr. Cornelius Agnew

1890
Department of Ophthalmology at Grady Hospital and Emory University
Developed by Dr. F. Phinzy Calhoun

1904
Algonquin-Reese Pathology Laboratory, at Columbia University’s College of Physicians and Surgeons
Founder: Dr. Algonquin B. Reese

1910
Manhattan Eye, Ear, and Throat Hospital
Founding member: Dr. Cornelius Agnew

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1885 - Dr. Louis Girard, Chief of Ophthalmic Plastic and Reconstructive Surgery, develops the “Hughes Procedure” for the removal of large tumors.

1939 - NYEE's Chief of Ophthalmic Plastic and Reconstructive Surgery, Dr. Wendell Hughes, develops the “Hughes Procedure” for the removal of large tumors.

1949 - NYEE's Retina Diagnostic Center, under the leadership of Thomas D. Billson, MD, class of 1966.

1958 - Aran Safir, MD and Arthur Leonard Schawlow. This would eventually become the mainstay treatment for diabetic retinopathy.

1961 - NYEE-trained Dr. Louis J. Girard conducts the first clinical evaluation of corneal contact lenses following the removal of large tumors.

1971 - NYEE physicians Dr. Louis J. Girard, Dr. William Dennett, a NYEE attending, invent corneal topography and built the first small, unique identification system for intraocular lens measurements.

1983 - Robert Ritch, MD, and NYEE, expanding upon a research and teaching the Ocular Imaging Center for the study of optic nerve structure and disease. The Center becomes a world-class glaucoma imaging resource with the advent of high resolution ultrasound biomicroscopy (1994) for investigating the anterior segment anatomy such as anterior lamellar keratoplasty, and employs 1990's of the first OCT systems outside MIT, where it was developed.

1991 - Ronald Wolfson, a NYEE attending, invents corneal topography and builds the first commercial retinal aberrometer, leading the way to precision corneal vision correction.

1997 - NYEE's Retina Diagnostic Center, under the leadership of Thomas O. Muldoon, MD, class of 1966.

2003 - First photo of cultured, purified human IPE epithelial sheet following isolated and cultured human IPE.

2007 - NYEE attending Dr. Aran Safir, during his NYEE residency, invents an early electronic retinoscope and lid speculum for a patient.

2007 - Aran Safir, MD and Leonard From, MD invented iris recognition biometrics for unique identification.

2010 - First photo of cultured, purified human IPE epithelial sheet following isolated and cultured human IPE.

2011 - Leonard From, MD invented iris recognition biometrics for unique identification.

2012 - Dr. Aran Safir, during his NYEE residency, invents an early electronic retinoscope and lid speculum for a patient.

2014 - The New York Eye Trauma Center, the first of its kind in New York City, opens at NYEE under the leadership of Robert Rutstein, MD.
NYEE Timeline

Established 1820

1992
Richard B. Rosen, MD, Thomas O. Muldoon, MD, and Dennis Branton, MD, in partnership with the Mount Sinai, developed the first commercial trans-scleral laser retinopexy probe for treatment of retinal tears and detachments.

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1992
Iron sights MD, Robert Ries MD, and Steven M. Cornia MD, PhD developed the methodology for surgical excision of choroidal metastatic UMs. The first photo of an UM was taken 12 days after the seeding of an UM isolated from the choroid of a rabbit. This methodology is identified as the first clinical technique for surgical excision of choroidal melanomas diagnosed with ocular ultrasound.

1996
Ronald Gentile, MD, claims of ICD, developed the first clinical trial of only vascular deposits of mucoideal tissue, of which is xanthelasma in the treatment of late-stage AMD.

2002
Richard B. Rosen, MD, and Vinh Tong Chua, PhD, introduced the first en face OCT of trans-scleral laser retinopexy probe for treatment of retinal tears and detachments.

2007
Richard B. Rosen, MD, Patricia Garcia, MD, and Mark Hathaway, PhD, introduced a full spectrum of quantitative tools for precision assessment and follow-up of clinical microvascular disease, based upon their adaptive optics work.

2012

2010
Richard B. Rosen, MD, and Yuen Ping Toco Chui, PhD, introduced a full spectrum of quantitative tools for precision assessment and follow-up of clinical microvascular disease, based upon their adaptive optics work.

2014
Ronald Gentile, MD, claims of ICD, developed the first clinical trial of only vascular deposits of mucoideal tissue, of which is xanthelasma in the treatment of late-stage AMD.

2016
With the introduction of OCT angiography, the clinical utility of an in vivo OCT became widely available. This was followed by a non-invasive and minimally invasive OCT angiography device.

2018
Bo Chen, PhD demonstrated how the gene transfer of ß-catenin and three transcription factors, in a living mouse, can successfully reprogram retinal glial cells into rod photoreceptors. Congenitally blind mice were now able to see light for the first time in their lives following treatment.

2019
NYEE and The Mount Sinai Hospital merge their ophthalmology, residency programs to form the largest ophthalmology residency program in the nation.

2019
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2021
The study of microvascular disease in healthy eyes has led to a deep understanding of the role of adaptive optics in the treatment of retinal and macular degeneration.

2018
Richard B. Rosen, MD, and Yuen Ping Toco Chui, PhD, introduced quantitative analysis of capillary density using en face OCT angiography. This project was done in collaboration with the University of Illinois, which created the first in vivo OCT.

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2015
Taking OCT to the next dimension, Richard B. Rosen, MD, Patricia Garcia, MD, Gennady Landa, MD, and Robert Weitz, BEng, introduced SLO microperimetry and OCT/SLO 3-D transconjunctival imaging, integrated with OCT/SLO OCT angiography device.

2005
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## Department of Ophthalmology at a Glance:

<table>
<thead>
<tr>
<th>Service</th>
<th>Year 2019</th>
<th>Year 2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refractive Surgery</td>
<td>635+</td>
<td></td>
</tr>
<tr>
<td>Phakic/Optics</td>
<td>1710+</td>
<td>1710+</td>
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<tr>
<td>Cornea and External Diseases</td>
<td>4950+</td>
<td>4950+</td>
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<tr>
<td>Oculoplastic Residency</td>
<td>33</td>
<td>33</td>
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<tr>
<td>Ophthalmology General</td>
<td>50 51</td>
<td>50 51</td>
</tr>
<tr>
<td>Other</td>
<td>620+</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>20,027+</td>
<td>20,027+</td>
</tr>
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## Statistics

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<thead>
<tr>
<th>Service</th>
<th>Year 2019</th>
<th>Year 2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emergency Room Visits</td>
<td>152,272</td>
<td></td>
</tr>
<tr>
<td>Outpatient Visits</td>
<td>152,272</td>
<td></td>
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<tr>
<td>Residents</td>
<td>33</td>
<td>33</td>
</tr>
<tr>
<td>Fellowships</td>
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<td>7</td>
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<tr>
<td>Clinical Trials</td>
<td>33</td>
<td>33</td>
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</table>

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<tr>
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<th>Year 2019</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Ophthalmology 5050+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oculoplastics 33</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## New Recruits

- **Mary Abigail Crowden, MD**
  - Fellowship trained both in ophthalmology and in urologic surgery.
  - Dr. Crowden joins the faculty as Director of Uro-Ophthalmology Consultative Service for Mount Sinai West and Assistant Professor of Ophthalmology at Icahn School of Medicine at Mount Sinai.
  - She completed her urology residency at the University of Pennsylvania and her ophthalmology fellowship at New York Presbyterian Hospital.

- **Shreya Jayasimha, OD**
  - Dr. Jayasimha joins the faculty as Assistant Clinical Professor of Ophthalmology at Mount Sinai West, with a concurrent fellowship in corneal transplantation, and corneal and anterior segment surgery.
  - She graduated from New York University College of Optometry and completed her fellowship in corneal transplantation, ocular surface surgery, and anterior segment surgery at The Ohio State University Wexner Medical Center.

- **Yogyah Khashay, MD**
  - Dr. Khashay joins the faculty as Assistant Clinical Professor of Ophthalmology at Mount Sinai West, with a concurrent fellowship in corneal transplantation, and corneal and anterior segment surgery.
  - She completed her residency at the University of Virginia, followed by a fellowship in corneal transplantation, and corneal and anterior segment surgery at the Bascom Palmer Eye Institute.

- **Varun K. Pawar, MD**
  - A uveitis specialist, Dr. Pawar joins the faculty as Assistant Clinical Professor of Ophthalmology at Mount Sinai West.
  - He received his medical degree from University of Kentucky College of Medicine and then completed a residency in ophthalmology at Saint Louis University, followed by fellowship training in uveitis at New England Retina Associates before joining the faculty at the Francis I. Proctor Foundation at UCSF.

## Faculty News

- The Harold W. McGraw, Jr. Family Foundation Professorship in Neuroregeneration
  - New York Eye and Ear Infirmary of Mount Sinai (NYEE) and Mount Sinai Hospital (MSH) / Icahn School of Medicine at Mount Sinai have received a generous donation from The Harold W. McGraw, Jr. Family Foundation to endow and establish a professorship in the Department of Ophthalmology to support neuroregeneration research. Considered one of the most promising fields in ophthalmology, the McGraw gift represents a significant investment in current and future scientific discoveries in the revolutionary field of neuroregeneration at NYEE, ensuring that innovative research in this area will be boldly propelled by internationally renowned investigators. NYEE's priority is to recruit the best minds to drive the field forward to achieve its overarching mission, and to ensure that groundbreaking research, education, and clinical care at NYEE continues to advance in this critical area of vision science.

- **Acclades**
  - **Alon Harris, MS, PhD, FARVO**
    - Awarded the award for long-lasting research programs investigating ocular blood flow and metabolism in glaucoma.

- **Dr. Deepta Nangia**
  - The $2 million gift represents a significant investment in current and future scientific discoveries in neuroregeneration.

- **Dr. Harry Stern**
  - He has been appointed to the position of Professor of Ophthalmology and Neuro-Ophthalmology.

- **Dr. Stephen M. Gore**
  - He has been appointed to the position of Professor of Ophthalmology and Neuro-Ophthalmology.

- **Dr. Peter C. Craven**
  - He has been appointed to the position of Professor of Ophthalmology and Neuro-Ophthalmology.

- **Dr. Varun K. Pawar**
  - He has been appointed to the position of Assistant Clinical Professor of Ophthalmology at Mount Sinai West.

- **Dr. Shreya Jayasimha**
  - She has been appointed to the position of Assistant Clinical Professor of Ophthalmology at Mount Sinai West.

- **Dr. Yogyah Khashay**
  - He has been appointed to the position of Assistant Clinical Professor of Ophthalmology at Mount Sinai West.

- **Dr. Varun K. Pawar**
  - He has been appointed to the position of Assistant Clinical Professor of Ophthalmology at Mount Sinai West.
Current Residents and Fellows

NYEE Residents

FG-4
Michael Chu, MD
Kamileri, MD
Kelly Leonard, MD
David MacPherson, MD
Duke Short, MD
Douglas Short, MD

FG-3
Julie Fullam, MD
Sarah McCord, MD
Shannon Saa, MD
Young Seol, MD
Shravan Savant, MD

FG-2
Jeffrey Brown, MD
Jonathan Levenson, MD
Susel Orpeesa, MD
Rupak Bhuyan, MD

PGY-3
Daniel Wang, MD
Duaa Sharfi, MD
Kelly Lee, MD
Mary Labowsky, MD
Karen Hu, MD
Michael Chua, MD

PGY-4
NYEE Residents

Joel Pakett, MD (Cornea)
Vincent Sun, MD (Retina)
Thomas Quehl, MD (Pediatric)

Carl Wilkins, MD (Retina)
Matthew Wieder, MD (Retina)

Jonathan Levenson, MD
Jeffrey Brown, MD
Susel Orpeesa, MD
Rupak Bhuyan, MD

Ekta Patel, MD
Cesar Alfaro, MD

Kirolos Ibrahim, MD

Mount Sinai Departmental Faculty and Administration

Christopher T. Spina, MS
Vice President for Administration, NYEE

Harsha S. Reddy, MD
Programs Director, MSH
Associate Residency Program and Mentoring, MSHS

Salvatore Loiacono, Jr., MPA
Chief, Retina Service, MSHS

Douglas Fredrick, MD
Vice Chair and Director of Ophthalmology Research, MSHS

Alon Harris, MS, PhD, FARVO
Director, Cornea and External Diseases, NYEE

Robin N. Ginsburg, MD
Medical Director, East 102nd Street

Avnish Deobhakta, MD
Director, Ophthalmic Vascular Fellowship Program, NYEE

Joel Mindel, MD
Medical Director, East 85th Street

Paul A. Sidoti, MD
Medical Director, Midwood

Edward Raab, MD
Medical Director, Tribeca

Tamiesha Frempong, MD, MPH
Vice Chair, Translational Ophthalmology Research, MSHS

Paul Lee, MD
President, NYEE

Tamiesha Frempong, MD, MPH
Chief, Pediatric Ophthalmology and Strabismus, MSHS

Douglas F. Buxton, MD
Co-Director, Cataract Service, NYEE (Anterior Segment), NYEE

John Aljian, MD
Chief, Neuro-Ophthalmology, MSHS

Jose Mario Wolosin, PhD
Instructor, Harvard Medical School, Ophthalmology, Elmhurst

Sophia Saleem, MD
Research Faculty, Basic Science/Translational Research Faculty

Jeanne L. Rosenthal, MD
Co-Director, Trauma Service, NYEE

Richard B. Rosen, MD
Chief, Refractive Surgery

R. Theodore Smith, MD, PhD
Associate Director of Ophthalmology Faculty Practices

Tamara D. Frey, MD
Associate Director of Operations - Mount Sinai Queens

Jodi Sassoon, MD
Ophthalmic Pathology

Mary-Abigail Craven, MD
Reconstructive Surgery, MSHS

Robert Della Rocca, MD
Chair, Pathology, NYEE

Richard B. Rosen, MD
Chair, Ophthalmology, NYEE

Paul Finger, MD
Ocular Oncology

Richard B. Rosen, MD
Co-Director, Pediatric Ophthalmology and Strabismus, NYEE

Jeffrey Brown, MD
Senior Vice President and Chief Operating Officer, NYEE

Robert Fisher MD
Director of Ophthalmology, Elmhurst Hospital

Robin Fredrick MD
Director of Ophthalmology, Elmhurst Hospital

ISMMS - Instruth School of Medicine at Mount Sinai

NYEE - New York Eye and Ear Infirmary of Mount Sinai

MSH - Mount Sinai Health System

MSQ - Mount Sinai Queens
NYEE Celebrates Its 200th Anniversary
Due to the worldwide pandemic, our bicentennial events have been postponed to 2021.

Join faculty, alumni, and friends of NYEE in a celebration of our 200-year legacy of leadership, innovation, and excellence in patient care.

**Bicentennial Gala**
The Plaza Hotel
768 5th Avenue
New York, NY
**October 14, 2021**

**Transformational Ophthalmology 2021:**
**Envisioning Our Third Century**
New York Academy of Medicine
1216 5th Avenue
New York, NY
**October 15, 2021**

For more information and tickets go to: www.nyee.edu/200years