Department of Ophthalmology
First Eye Hospital in America Turns 200

FALL 2020
A Defining Legacy of a Beacon of Hope and Help

New York Eye and Ear Infirmary’s (NYEE) 200-year journey has not been an easy one. Wars, pandemics, and financial meltdowns: we have seen and endured them all. So perhaps it is fitting that an institution that has weathered the vicissitudes of history and the constant flux of the health care industry celebrated its bicentennial year in the trenches—fighting the worldwide outbreak of COVID-19 in the epicenter of the pandemic, New York City.

We were all looking forward to celebrating with friends and colleagues during numerous events, including the Bicentennial Gala in October, the restrictions on large gatherings due to the pandemic have caused us to postpone many of our plans until 2021. Despite the setback, NYEE faculty and staff marked our historic milestone with the publication of a history book and a dedication caused us to postpone many of our plans until 2021. Despite the setback, NYEE faculty and staff marked our historic milestone with the publication of a history book and a dedication to the NYEE’s evolution into a leader in defining specialty surgical care for people, places, and historic events that shaped our country and our community.

The 200-Year History of the New York Eye and Ear Infirmary 1820–2020

A keen-witted project of the late Dr. Peter R. McDowell, MD, Chief of Ophthalmology Service at Mount Sinai Health System, and the late Joseph B. Walsh, MD, Professor and Chair of Ophthalmology for both NYEE and New York Medical College, this lavishly illustrated book weaves together a rich tapestry detailing the founding of the first specialty hospital in America and its growth in prominence—bringing to life places, people, and historic events that touched our country and our institution and left a lasting impact in the fields of ophthalmology and otolaryngology.

From the very beginning our future was built on a dream of two young physicians, Dr. Edward Delafield and Dr. John Kearny Rodgers, who returned from their medical studies in Europe as the Royal London Ophthalmic Hospital (Moorfields Eye Hospital). Armed with the latest knowledge of eye diseases and the importance of cataract surgery, they believed in sight-saving treatments and the ability not only to remain true to its founding mission but to inspire others and transmit its values and knowledge beyond its doors as one of NYEE’s most enduring legacies.

“Todays, we and countless men, women, and children are the beneficiaries of this noble mission,” said Dr. Thomas MD, President of NYEE and Delafield-Rodgers Professor and Chair of Ophthalmology at Icahn School of Medicine at Mount Sinai and Mount Sinai Health System. “To today, we and countless men, women, and children are the beneficiaries of this noble mission.”

“We can really expand exponentially the effect that we’ve had in the past, touch even more lives, train even more physicians and make the experience we have here at NYEE available to many others, both here and internationally,” said Dr. Rosen.

Reflecting on NYEE’s history and its place in modern medicine, Dr. Rosen sees an ability not only to remain true to its founding mission but to inspire others and transmit its values and knowledge beyond its doors. “Within a few years of our founding, many NYEE’s physicians began to export our brand of expertise and help others in one new institution and departments of ophthalmology locally, nationally, and internationally. Despite the lack of interest from New York City authorities and the medical community around the hospital has changed, NYEE remains an anchor, consistent delivering exemplary patient care—and hope—to those who need it most. NYEE is an example of what we can do in the future with all the new technology available to us and backed by a major academic medical center.”

Today, we stand witness to more, we must remember our founders’ unwavering dreams for the Infirmary. Their work continues to evolve, they would be proud of the work we do here today. The ongoing evolution of NYEE continues to enhance our ability to deliver superior patient care, develop new treatments, and to train the next generation of medical leaders. The NYEE Medical Alumni Association and the NYEE’s current board of trustees are committed to the future.

Life is a journey, not a destination. It is what it is, enriched by the experiences and relationships we create and share.”

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Celebrating the Life of an Iconoclast: America’s First Black Ophthalmology and ENT Specialist

In August 13, 2020, NYEE held a painting dedication ceremony to recognize and celebrate Dr. David Kearny McDonogh, America’s first Black ophthalmologist and otolaryngology specialist and protégé of our founder Dr. John Kearny Rodgers. “For the past 200 years, NYEE has been an incubator of the newest ideas, and it’s clear from the very beginning that NYEE’s leadership and its leaders were aware of their time when it came to social and racial justice. This ceremony is a fitting tribute to both the man and the institution, a warning together, pushing against the forces of prejudice and fighting for justice and equity for all regardless of their race, color, religion, or financial status,” said Dr. Too.

Born into slavery in W.D., Dr. McDonogh fought the racial prejudices of the time to determine his course in life. He was the first Black graduate from Lafayette College, finishing third in his class. Denied entry into New York medical schools, the aspiring physician attended classes at Columbia College of Physicians and Surgeons unannounced, freebies to the support and mentorship of the world-renowned Richard Koplin, MD. Unfortunately, upon his graduation in 1851, the college refused to award him a medical degree (an injustice that was rectified in 2018 by Columbia University as a result of a move to work together to dismantle systemic racism, sexism, violence, plantation capitalism, and health care disparities), explained Dr. Lancee, Assistant Clinical Professor of Ophthalmology at the Icahn School of Medicine at Mount Sinai.

Dr. McDonogh’s life and legacy continue to illuminate the way for Black ophthalmologists in America today. Dr. Koplin, Co-Director of the Cataract Service at NYEE, also sees bigger meaning in the portrait of Dr. McDonogh. “Perhaps it is fitting that we have no image of Dr. McDonogh. The portrait of the black man represented Monday as Dr. McDonogh, but more importantly to him was considered an avatars, the embodiment of the young men and women of color who aspire to join our profession.”

The moving tribute was concluded by the unveiling of the portrait, which will remain on permanent display in NYEE’s new waiting room area. As NYEE looks toward the next century of specialty establishment, which never fail to remind us that fighting for justice and equity for all regardless of their race, color, religion, or financial status, must continue to be relevant today. While we have made progress by dismantling slavery and lawful segregation, we must all continue to work together to dismantle systemic racism, sexism, violence, plantation capitalism, and health care disparities,” explained Dr. Lancee, Assistant Clinical Professor of Ophthalmology at the Icahn School of Medicine at Mount Sinai, and consultant and glaucoma surgeon at NYEE. “As NYEE looks toward the next century of specialty achievement and excellence and helped to integrate colleges, and medical schools, and provide health care to all. His legacy is an important part of American history.”

Certainly NYEE’s founders, Drs. Delafield and Rodgers, believed that change for the better was possible—and so does the current leadership 200 years later.

Painting dedication ceremony at NYEE. Featured James Tse, MD, Daniel Laroche, MD, and Tamiesha Frempong MD unveiling the portrait of Dr. McDonogh during the COVID-19 pandemic.
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Left: In 1934, NYEE acquired New York City’s first eikonometer. The safety of our community is our highest priority; some images herein were taken prior to February 2020.
Building on our role as an innovator in American ophthalmology, for the past two centuries NYEE has been in the forefront of exploring the vast potential of our field. In that tradition, our department has undertaken a new strategy of embracing telemedicine, which will pave the way for faster decision-making without the need for a physical consultation.

The pandemic that struck in March and forced NYEE to shut down most non-emergency patient services catapulted to the forefront several novel modalities already under development. The most important of these is telemedicine. To reduce potential exposure of our staff and patients to the coronavirus, we began using video and telephone conferences between patient and physician. The vigorous embrace of this format by all parties is now setting the stage for a paradigm shift in how we bring our services to patients. That transition will be increasingly driven by emerging technologies that allow for accurate and portable imaging of the back and front of the eye from remote locations, and by artificial intelligence driven by emerging technologies that allow for accurate and portable imaging of the back and front of the eye from remote locations, and by artificial intelligence.

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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 grand cause for celebration by its new hosts.

“The significance of the moment was not lost on us,” acknowledges Tsiotso (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 the two principal investigators, Dr. Ianchulev and Joseph Panarelli, MD, that brought the project to fruition in advance of excellence in care at NYEE, not far from the site of the early Dutch colony that would eventually become New York. “Because microsurgery 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 one 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 clinical use of the device. Potentially it will have applications in the fields of retina, cornea, cataract, and glaucoma surgery. The first trial, expected to begin next year, will use the robotic assistant on retinal surgery, whose micron-level demands on hand movement push even the best surgeons to their physical limits. “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
The Secret World of Ocular Melanocytes Revealed

Ophthalmologists usually associate melanocytes with the production of melanosomes, which give color to the iris, ciliary body and choroid. Little was known about the distribution or functionality of melanocytes in the eye, particularly because those cells were not visible in the early descriptions of the ophthalmic system.

But there are melanocytes in the eye, too. “Melanocytes have been known for their role in various physiological and pathological processes in the eye, including secretion of various growth factors, cytokines, chemokines, and proteases involved in tissue remodeling, angiogenesis, immune response, and uveitis,” says Dr. Hu, who began investigating ocular melanocytes 30 years ago.

One of the study’s most intriguing findings is that scleral melanocytes could be involved in the development of myopia. “Scleral melanocytes perform various functions related to inflammatory disease in the sclera and may be involved in the development of myopia,” says Dr. Hu, who led the study, which began investigating ocular melanocytes 30 years ago in the Tissue Culture Center to develop New York Eye and Ear Infirmary of Mount Sinai (NYEE). “Because of their diverse functions, they could be a new target for the prevention and treatment of disease of the sclera.”

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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—an extremely scary situation get severe through the unbearable pain. “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,” explains Dr. Gentile. “If the injury is acute and uncomplicated, the retina will reseal itself, but we have no control over how the eye will do on its own.”

On June 13, Dr. Gentile began the intricate repair of the internal tissue of the eye. The immediate task was addressing the blood that filled the eye, a not-uncommon condition that makes the blood vessels rupture and the retina不能 be visualized. “Typically, I use a vitreous cutter and very fine forceps to uncover the retina and repair it. I combined laser surgery to allow the retina to reseal in place,” explained Dr. Gentile. 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 realign the internal tissue removed not just the debris and blood but also tissue that developed as the retina tried to heal itself, and also involved suturing a stent to the outside of the globe to prevent it from collapsing.

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, the revelation came one hour into the procedure. The next morning, when Dr. Gentile removed the patient’s bandages, he was “excited” to see that Mr. Dzierzanowski could see. “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. Mr. Dzierzanowski was back to work as a train conductor at Metro-North Railroad following his surgery.
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 in disease, altering their shape, density, and distribution in response to external and internal threats like injury and infection. Now, a study published in the June 2020 issue of Investigative Ophthalmology & Visual Science (IOVS), researchers at New York Eye and Ear Infirmary of Mount Sinai (NYEE) have now opened a revealing new window on how these cells may be used as biomarkers of early activation or inflammation within the retina. Researchers are able to visualize their spatial relationships to surrounding structures.

"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," says Dr. Rosen. "And that could potentially allow doctors in their offices to one day make more informed decisions on the best ways to monitor and treat our patients."

Macrophage-like cells, for example, are likely to be activated in the retina in diseases such as proliferative diabetic retinopathy, which is the result of new blood vessels growing out of the retina to try and re-vascularize the retina. Indeed, NYEE researchers have imaged redistribution and altered morphology of the macrophage-like cells of patients with various retinopathies. Those relationships—in the form of abnormal macrophage-like cell imaging, movement, and distribution—could provide valuable clues into the activity of retinal pathologies such as diabetic retinopathy, optic neuropathy, retinal detachments, and age-related macular degeneration. In this study, OCT imaging could afford scientists new insights into photographic quid pro quo, pre-retinal membrane formations, and vascular endothelial growth factor secretion.

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As COVID-19 was shutting down most non-emergent ophthalmic care this spring, telemedicine emerged overnight as a new, powerful option to keep care on track. 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 as Louis Pasquale, MD, Chair of Ophthalmology, Mount Sinai Health System, observed, “Telemedicine, the dynamics of visits that start on time, don’t require any travel or parking, and give them the undivided attention of their 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.

Emergency Room Consults

Few emergency rooms come equipped with an on-site ophthalmologist — a disconnect that leads to considerable wait times for our specialists 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 consultant to log onto a special high-magnification camera embedded in the ER.

“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 specialist ophthalmologists if their presence is not really essential.”

The successful implementation of the 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 these 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.”

Reimagining Telemedicine for a New Era of Patient Care

Sophia Saleem, MD conducting a tele-consult with a patient in the Emergency Department via InTouch Lite 4 system.

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— Sophia Saleem, MD
Caring for Hard-to-Reach Patients

Six years before COVID-19, NYEE began to realize the enormous potential of telemedicine through a program designed to capture patients at high risk of diabetic retinopathy who might otherwise never come for routine exams that primary care physicians typically do within the Mount Sinai Health System, screening up to 500 patients annually. Onsite fundus cameras are operated by trained medical personnel to acquire non-mydriatic images of the back of the eye, which are then transmitted through a secure platform to a specialist at NYEE for later interpretation. The patients are informed in an HIPAA-compliant new pathway is described, and Urgents seek follow-up care when it is.

According to Dr. Saleem, who also the Senior Director of Teleophthalmology at NYEE, two of the current participating primary care offices added new technology—so-called Intelligent Imaging— that could revolutionize the operation and effectiveness of the existing telemedicine-based program. As a result, NYEE launched a pilot project in April 2020. A study published in the April 2020 issue of the American Journal of Ophthalmology, the NYEE study also provides evidence that virtual visits can be used to triage patients to in-office imaging and to help address the problem can be addressed in a very important new modality for treating POAG.

“Patients in the seven participating primary care offices were divided into two groups. Those in the first were managed conventionally, that is, with in-office visits. In the second, up to six patients were enrolled. Eight were assigned to each arms in the study. In the second group, a virtual visit was scheduled, consisting of a video consultation with the patient. Patients were given a reminder message by phone and text, and their health data were shared with the provider via a secure web portal.

The pilot project demonstrated that tele-ophthalmology could be used to deliver high-quality care to patients who were not candidates for in-person visits. The study found that tele-ophthalmology was able to provide care to patients who were unable to come to the office for routine appointments, and that the care provided was comparable to that provided in-office.

Separating Physician Visits From Diagnostic Visits

The pandemic underscored the need for better follow-through and prevention of patients to have busy clinic and office settings. NYEE has demonstrated that this goal can be effectively met at its Eye Clinic, and expanding the new process to the busy Retina Center in Manhattan, by converting many physician appointments to diagnostic-only visits. After on-site imaging is performed by a resident or clinic staff, fundus photographs are read on the spot by an AI algorithm which provides immediate clinical feedback.

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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 by prior prolonged exposure of the skin to ultraviolet (UV) radiation. New evidence has now emerged that long, hours-on-end exposures by people in their younger years under intense sun rays may carry other serious consequences later in life. They may have worsened the age of non-melanoma skin cancers. (NMSC), a disease characterized by more serious consequences, may actually play an important role in their later development. People in their younger years with a higher risk of developing NMSC, as reported in the June 2020 issue of the Journal of Glaucoma, were even greater for individuals less than 65 years of age and those living in northern latitudes, farther away from the equator. Researchers from the Mount Sinai/NYEE Eye and Vision Research Institute have found that a history of non-melanoma skin cancer is associated with a 40 percent higher risk of developing NMSC. Hence, the June 2020 issue of the Journal of Glaucoma, the Mount Sinai/NYEE Eye and Vision Research Institute, New York, NY, USA.

For that reason, Pasquale sees an important public health implication from the new findings. "Teenagers and young adults often don't feel the acute sunburn pain, which is especially true for individuals who do not remember their meagerly exposed, "But our evidence confirms that these critical years are important for protecting your eyes from UV rays of the sun. The American Academy of Ophthalmology recently recommended that people use protective glasses whenever they're outdoors for long periods."

"To our surprise, we found that the hazardous effects of the sun are beginning to show up in the form of a thinning of the anterior portion of the vitreous cavity when it reflects off the surface of the ground and directly into the eyes. This scenario plays out more prominently in geographic locations that are located farther away from the equator."

Physicians need to be aware of this confluence of factors in treating patients with non-melanoma skin cancers, Dr. Pasquale maintains. "Rabbits subjected to stratospheric stress in an artificial environment, which is similar to the natural pathway of secondary open-glaucoma formation, have demonstrated higher UV exposure to the retina, which increases the risk of retinal degeneration, which is the leading cause of this disease formation. Studies have shown that a history of non-melanoma skin cancer is associated with a 40-fold increase in the risk of UV-induced retina damage."

That work, in fact, is well underway at NYEE. Researchers are now using an artificial intelligence algorithm to calculate the amount of paracentral visual loss due to the posterior segment of the eye. That review, "Our findings don't necessarily mean that carbohydrate restriction won't work in terms of reducing POAG risk, but they do shed light on the mechanisms of paracentral visual field loss," says Dr. Pasquale. "It could be used to develop new treatments for patients with more central visual field loss occurring first, before affecting their peripheral vision.

In Search of a Biological Link Between a Low-Carbohydrate Diet and Glaucoma

"We want to re-analyze the data to see if its stronger association emerges between a vegetable-rich, low-carbohydrate diet and POAG with a lower prevalence of visual field loss," says Dr. Pasquale, who is a Director of the Mount Sinai/NYEE Eye and Vision Research Institute. The new evidence is "Our findings don't necessarily mean that carbohydrate restriction won't work in terms of reducing POAG risk, but they do shed light on the mechanisms of paracentral visual field loss," says Dr. Pasquale. "It could be used to develop new treatments for patients with more central visual field loss occurring first, before affecting their peripheral vision.

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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 new way to treat macular holes through eye drop medications, sparing patients the risks and rigors of invasive surgery.

A Theory Is Born

When Robert Welch, MD, Director of Glaucoma Research and Surgical Director Emeritus at New York Eye and Ear Infirmary of Mount Sinai (NYEES), introduced a prototype imaging device known as OCT to NYEES in 1995, Dr. Gentile, an ophthalmologist resident at the time, soon became intrigued with 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 Chair of NYEES’ Ophthalmology Department for 25 years, Dr. Gentile began imaging macular holes in patients over time, analyzing how eye drop progression through time video created on the OCT circular images.

“In time we saw 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.” To put it another way, the disease centered on the macula creates just enough force to open it in the macula. Dehydration provides an opposing force to close it. And when the forces of dehydration overcome the forces of hydration, the macular hole will repair itself without the need for surgical intervention.

“By the same token, we see 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 move 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 departs 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 in 2013, the retinal surgeon presented his cystoid dehydration of macular holes concept—thoroughly critiqued along the way by Dr. Gentile’s peers at some of the most prestigious retinal organizations, the Macula Society (36th Annual Meeting) and the American Society of Retinal Specialists (31st Annual Meeting).

“People were in awe,” remembers Dr. Gentile, which paved the way for presentations before other professional groups, and for growing support from nationally known retinal surgeons like Raymond Lee, MD, at Mayo Clinic; Dean Elliott, MD, at Harvard Medical School. After hearing Dr. Gentile speak at one of those conferences four years ago, Ernest Ocular Imaging Center at the University of Chicago, also known as a “playground,” began using the eye drop approach as an option for some of their macular hole patients with rewarding 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 macular holes successfully closed through a three-drug regimen of prednisolone, ketorolac, and brinzolamide. Dr. Gentile cautions that treatment with eye drops is not meant for every patient with a macular hole. In fact, it works best in holes less than 300 microns in diameter since larger holes have more scar tissue or gel tugging on the edges of the hole, diminishing the effectiveness of drops. Nonetheless, cystoid dehydration continues to gain traction in the ophthalmic world. “It takes time for an idea to evolve and become accepted,” Dr. Gentile concedes, “but when you weight invasive surgery against administering eye drops in cases where the patient’s macular hole is small, the choice seems pretty obvious. As a physician, 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.”

Weighing the Results

Dr. Gentile’s eye drop approach affords patients the opportunity to avoid the risks and rigors of invasive surgery, which seems pretty obvious. As a physician, 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.”

Ronald Gentile, MD, at the Tom Otterness playground sculpture.
Functional Signals Preceding Structural Alterations in Disease

Retinal Metabolic Imaging Reveals Functional Signals Preceding Structural Alterations in Disease

A dynamic new marker for mitochondrial energetics

A Dynamic New Marker for Mitochondrial Energetics

Mitochondria are the powerhouse of cells and are responsible for maintaining the metabolic machinery of life. The ability to detect subtle changes in mitochondrial 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 reported in Ocular Disease and Cellular Longevity (August 2018), NYEE researchers reported that flavoprotein fluorescence (FPF) imaging, a newly introduced clinical tool, provides for dynamic measurement of mitochondrial oxidative stress, can reveal evidence of response to therapy earlier than structural changes, objectively confirming subjective visual acuity improvements.

“Changes in intracellular mitochondrial function occur before they are detectable as alterations in intraretinal tissue fluorescence, 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 fluorescence may be a promising clinical biomarker for gauging retinal mitochondrial 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 will signal the cells that something is awry, offering a potential window into the origins of disease and thus a means to assess oxidative damage.”

FPF signal imaging may prove to be an important new bioenergetic marker that can monitor early response to new treatments based upon improvement in cellular vitality as indicated by mitochondrial integrity. Additional studies have shown FPF signal imaging to be a promising new diagnostic tool for early detection of intraretinal modifications in glucocorticoids, flavin monooxygenase, ischemia-reperfusion injury and other slow degenerative conditions,” Dr. Rosen observes.

“FPF signal imaging may also prove to be an important new bioenergetic marker by which we can detect early alterations in intraretinal tissue fluorescence, 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 fluorescence may be a promising clinical biomarker for gauging retinal mitochondrial 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 will signal the cells that something is awry, offering a potential window into the origins of disease and thus a means to assess oxidative damage.”

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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.”

“Patients can often take a beating at the hands of someone unfamiliar with the technique. I realized this learning process was obsolete and that we needed to do something much better.”

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. I realized this learning process was obsolete and that we needed to do something much better.”

That 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 success with a medical degree from Columbia University of New York in 1958, a residency and fellowship at NYEE, and eventual leadership role with the hospital’s newly launched Retinal 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. Fortunately, he found a young graphic artist, Carl Lydon, who was working with

“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.”

—Seymour Fradin, MD
Large Residency Training Program in U.S. Is Reinventing Its Approach to Education

Despite the lower clinical volume during the height of the COVID-19 pandemic, the New York Eye and Ear Infirmary of Mount Sinai’s ophthalmology residency program hardly skipped a beat. Instead, the largest accredited ophthalmology residency training program in the country moved up its traditional on-site 360-degree training experience to virtual sessions, providing a 360-degree training experience that is tailored to our residents using the latest tools.

Is Reinventing Its Approach to Education

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Attacking Hydroxychloroquine-Related Retinal Degeneration at Its Source

C

Nriagu’s study (HCQ) and hydroxychloroquine (HCQ), which have been
imported drugs for treating malaria since the early twentieth century, gained new popularity in the 1960s as safe options for treating
a variety of diseases—activate the PKA pathway, increasing the acidity of lysosomes, and
demonstrating reduced perifoveal sensitivity (right) and OCT (bottom)
demonstrating a collapse of retinal architecture corresponding to bull’s-eye
pattern, otherwise referred to as the “bull’s-eye sign”.

Fig. 1: Cell culture images of retinal RPE cells (left) cells demonstrating hydroxychloroquine toxicity following exposure to 100 μM of drug (middle), and cells spared by addition of beta-adrenergic agonist (right).

Fig. 2: Animal model of retinal degeneration in hydroxychloroquine toxicity.

Fig. 3: Animal model of photoreceptor loss in an animal model of photoreceptor loss from HCQ toxicity.

Fig. 4: 30 days model x 400

Fig. 5: Control x 400

Fig. 6: Beta-Adrenergic Agonist Rescues RPE from HCQ Toxicity

Fig. 7: Macular Toxicity from Chronic HCQ Use

Legend

Seen at given level
Not seen at given level

Betaine Adsorption Therapy

Reducing Cell Dysfunction (Vacuolization) and Death

Beta-Adrenergic Agonist Therapy

Animal Model of Photoceptor Loss from Hydroxychloroquine Toxicity

Animal Model of Retinal Degeneration from Hydroxychloroquine Toxicity

Beta-Adrenergic Agonists to Help Maintain RPE Function as a Novel Strategy to Address HCQ-Related Retinal Degeneration.

According to Dr. Hu, the mechanism can be traced to the fact that HCQ-related 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 vacuolization, 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—activate the PKA pathway, increasing the acidity of lysosomes, and potentially protect the cells against HCQ toxicity.

Which adrenergic agonists will turn out to be most effective against HCQ-related retinal degeneration? “We’ve tested dozens of medications belonging to many different medical classes and have narrowed it down to 10 that effectively protect RPE cells in vitro,” Dr. Hu says. “We are currently developing a animal model to help select from several promising candidates that seem the safest and most effective for clinical trials.”

Dr. Rosen sees the possibility that this lab’s research could be the first step toward developing antidotes to the toxic effects of HCQ on the retina, potentially preventing the devastating loss of central vision that follows.

New York Eye and Ear Infirmary of Mount Sinai (NYEE) has now taken a promising first step toward developing effective therapies to fight the toxic effects of HCQ on the retina. A research team has identified the mechanism and molecular metabolic pathway responsible for the development of HCQ-related retinal degeneration and has found that certain medications which stimulate adrenaline receptors appear to reverse HCQ toxicity, to save and protect the retinal pigment epithelial (RPE) cells, potentially preventing the devastating loss of visual function that follows these findings. These findings were reported The International Journal of Ophthalmology (April 2020).

“Our RPE cell culture studies have identified several medications which can potentially modify the disease and improve its course,” said Dr. Hu. “These include medications which activate the PKA pathway, increasing the acidity of lysosomes, and potentially protect the RPE cells against HCQ toxicity.”

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Fig. 1: Fundus image of bull’s-eye maculopathy (left), microperimetry demonstrating a collapse of retinal architecture corresponding to bull’s-eye pattern, otherwise referred to as the “bull’s-eye sign”.

Fig. 2: Beta-Adrenergic Agonist Therapy

Beta-Adrenergic Agonist Therapy
When Ms. Alvarez was born on March 17 with congenital cataracts in both eyes, parents and physicians alike were thrust into 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 at normal times, but this was the height of COVID-19 in New York City, when surgical practice everywhere was being upended, and personal fears for health and safety, especially those of a month-old infant, 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 COVID-testing for her daughter, her husband, and herself, and wearing protective covering to enter New York City’s Mount Sinai Hospital, where ophthalmic 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 follow-up surgery just two months after the first one to remove and 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 eyes 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 of placing and removing her tiny contact lenses. “It was a struggle,” admits Mr. Alvarez. “Sometimes they wouldn’t stay in place. We tried using our fingers, a Q-tip, and even a tiny plunger to squeeze the contact lenses into her tiny eyes. Sometimes they would stick on perfectly, other times they wouldn’t. Mia would get very frustrated and angry.”

Their determination also helped carry them through the second surgery on June 2 to remove the membrane that had formed behind the pupil of each eye, flush against the iris. “We failed at the first attempt, so we had to try again,” says Dr. Fredrick of the intraocular surgery. “That increased the visualization we needed to do the surgery, while allowing the pupil to retain its function and shape after the procedure.”

The success of this difficult surgery can perhaps be measured best by what happened afterwards, when Mia was back home, more and less demanding than her parents. “There was a day to the side of her crib, she just reached out and grabbed it,” remembers Ms. Alvarez. “We were incredibly excited. We were incredibly excited because she had done more that day.”

Their optimism has only grown since then as Mia continues to heal well, and Dr. Fredrick has given a prognosis of good functional vision in the longer term—perhaps as good as 20/40 corrected—if the eyes develop properly. “From the time she was conceived I dreamed of her having the best vision she could,” says Ms. Alvarez. “Now that she has it, I am incredibly grateful.”

First-Time Parents Brave COVID-19 Fears To Get Their Infant Emergency Treatment
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 an 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 kind 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 two years. For those found to be in danger, the technology further predicted the type (dry or wet) of progression.

R. Theodore Smith, MD, PhD in the Retinal Imaging Lab of NYEE.
"We were able to train these convolutional neural networks on hundreds of photographs to be able to recognize features that determined the severity of the disease, especially in the case of age-related macular degeneration (AMD)," explains Dr. Smith, who also holds a Professor of Ophthalmology and Neuroscience, at the Icahn School of Medicine at Mount Sinai. "And that's beauty of AI. It can define patterns and make inferences from gigabytes of data that humans could never review their entire records.

Screening for Diabetic Retinopathy (DR)

A deep learning software is also the linchpin of the automated tool for diabetic retinopathy developed in the NYEE Diabetes Care paper (October 2020), researchers described the five-point scale they created for grading the severity of the disease in DR, mild, moderate, severe, and proliferative based on the presence of and extent of microaneurysms, hemorrhages, hard exudates, softer drusen, and microinfarcts. The authors comprehensively analyzed thousands of photographs they examined in their study.

To measure and report severity in most diabetic retinopathy, against the gold standard — for example screening — the deep learning system is trained to recognize and score four severity levels for DR: no DR, early, intermediate, and severe DR. Intermediate and severe DR can progress to advanced disease.

In the wake of this success, plans are afoot to further test the five-point diabetic retinopathy gradings with a wide-ranging sample on the road to FDA approval. Dr. Smith, senior author of the Diabetes Care study, envisions the automated system eventually residing in primary care settings in the community to screen and classify patients on the spot for diabetic retinopathy. Physicians would be able to triage patients who are at risk for AMD before they ever see the office, and be part of the plan to get those patients to special care," he points out. "It could represent a major step for public health by alerting patients to problems that too often today lead to advanced care, especially in the case of age-related macular degeneration.

At NYEE, we use every available form of imaging," says R. Theodore Smith, MD, PhD, Director of Biorepository Retinal Imaging at NYEE, and lead author of the paper whose research is now being enhanced by his lab at NYEE as a predictor of AMD and retinal disease.

Quantitative autofluorescence imaging (qAF) is one of the established technologies, developed and introduced by Dr. Smith and several colleagues in 2011 while he was the Professor of Ophthalmology at Columbia University, and now commonly performed by the late NYEE's professor of AMD progression. qAF builds on fundus autofluorescence (FAF) imaging, which presents the ability to detect the retinal health through the retinal pigment epithelium (RPE). Because this is the basal membrane that with fluorescence properties, the appearance of dark patches on a fundus photograph in an image could reduce RPE deteriation, with the potential to progress over time to advanced AMD.

Quantitative autofluorescence imaging takes FAF to a whole new level by measuring spectral data related from the retinal pigment epithelium. A decision in qAF may suggest a threshold in RPE health and increasing severity of non-neovascular AMD. According to Dr. Smith, qAF provides a new understanding of the retinal disease process and can help to define a new clinical standard. A new imaging tool also has the ability to highlight various AMD subtypes like the dry pathway, which is identifiable through fundus images.

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The ophthalmic endoscope could open the door to a radically different approach to vitreoretinal surgery. By offering unprecedented access to the subretinal space, the ophthalmic endoscope—developed in Japan—could perform a major advance for intraocular observation during surgery. For example, in a patient with a large subretinal hemorrhage caused by a bleeding blood vessel from the underlying macular degeneration, the endoscope could afford an extremely direct way to access the subretinal space and remove the hemorrhage from underneath the retina. This compares to the current approach which observes the subretinal space and instead fills the eye with an expanding gas that acts like a bubble to push the hemorrhage away from the macula.

The ophthalmic endoscope could open the door to a radically different approach to vitreoretinal surgery by offering unprecedented access to the subretinal space.

Hyperspectral AF Imaging in AMD Tissue With Drusen

Left: After mathematical “unmixing” of the hyperspectral image from the AMD tissue, 3 distinct spectra are identified in the RPE (labeled S1, S2 and S3), presented graphically in blue, magenta and red, and a distinct new spectrum (SDr) (azure) is found for subfoveal drusen around 550 nm.

Right: The original unmixed full color AF of the sample with drusen is presented. A strong green YFP signal (arrow) from the RPE, and green AF from the drusen. After unmixing, the color-coded tissue localizations of the individual fluorophore sources of the spectra S1, S2 and S3D are shown.

Surgical Management of Hemorrhage

Surgical Management of Hemorrhage

umbilical herniorrhaphy presents ophthalmologists with one of their greatest challenges for restoring visual function. The high risk of dramatic visual loss in patients following an event has been used for years at NYEE as well as other major centers around the world as one of their greatest challenges for restoring visual function. The high risk of dramatic visual loss in patients following an event has been used for years at NYEE as well as other major centers around the world as one of their greatest challenges for restoring visual function.

The regimen of pars plana vitrectomy and tPA with pneumatic displacement of the subretinal blood in their retrospective study of 10 patients (20 subretinal hemorrhages) after 1 week using 0.45% tPA, gained three or more lines at the three-month follow-up. Moreover, these results were observed regardless of the underlying pathology, be it exudative macular degeneration (19%) or idiopathic choroidal neovascularization (19%), polypoidal choroidal vasculopathy (14%), serous retinal detachment (14%) or proliferative diabetic retinopathy (14%).

For the first time ever we were able to show the effectiveness of this treatment in a highly diverse patient population,” states Carl Wilkins, MD, lead author of the study and former chief resident at The Mount Sinai Hospital and current New York Eye and Ear Infirmary fellow. “Our analysis of subretinal visual recovery in each subgroup regardless of the underlying pathology.”

“Several factors that are important for patients to consider prior to undergoing submacular hemorrhage surgery and before observing the improvement in visual function,” states Carl Wilkins, MD, lead author of the study and former chief resident at The Mount Sinai Hospital and current New York Eye and Ear Infirmary fellow. “Several factors that are important for patients to consider prior to undergoing submacular hemorrhage surgery and before observing the improvement in visual function.”

Dr. Wilkins went on to add that the results of this study could have major implications for future treatment strategies.

The high risk of dramatic visual loss in patients following an event has been used for years at NYEE as well as other major centers around the world as one of their greatest challenges for restoring visual function.

A state-of-the-art robotic assistance system, expected to begin clinical trials in the United States for the treatment of macular degeneration, could help raise the standard of care for submacular hemorrhage and submacular vitreous hemorrhage. A state-of-the-art robotic assistance system, expected to begin clinical trials in the United States for the treatment of macular degeneration, could help raise the standard of care for submacular hemorrhage and submacular vitreous hemorrhage.

Potential complications which may affect visual restoration from the hour-long procedure include the presence of deeper blood clots beneath the retinal pigment epithelium (RPE), which may only become apparent during the surgery, and the risk of recurrence of bleeding following surgery. Potential complications which may affect visual restoration from the hour-long procedure include the presence of deeper blood clots beneath the retinal pigment epithelium (RPE), which may only become apparent during the surgery, and the risk of recurrence of bleeding following surgery.

Findings from the NYEE study, according to Dr. Rosen, who also VICE Chair and Director of Ophthalmic Research at NYEE, could help raise the confidence level for retinal specialists who have little or no experience with this approach. “I encourage any ophthalmologist who has a patient presenting with a submacular hemorrhage and a submacular vitreous hemorrhage to give the approach strong consideration, regardless of the underlying pathology,” he noted. “It is most important for physicians to understand the final results when treatment is initiated in the first two weeks of the event.”

Robotic vitrectomy could potentially offer an additional option of proven and standardized for surgeons employing the vitrectomy RPH technique. A state-of-the-art robotic assistance system, expected to begin clinical trials in the United States in 2021, could offer a substantially improved level of instrument stabilization for the vitreoretinal surgeon. “Three-arm vitrectomy is an emerging and rapidly advancing technology for vitrectomy, and robotic vitrectomy could ensure the most accurate delivery of medication and aspiration without any limitation of the underlying pathology,” says Dr. Wilkins, who will work alongside Dr. Rosen in the development of the robotic system. The robotic vitrectomy system will be manufactured by a robotic engineering company that manufactures the devices to secure approval from the Food and Drug Administration for the Werner enhancement (Fig. 4), the final component of a submacular system of the United States for complex surgical care.

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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.

Seeding the Future of Ophthalmology

In 1824, NYEE creates its original seal depicting the Great Physician restoring the sight of Bartimaeus. The American Ophthalmological Society adopts the Infirmary’s seal as its own upon its founding forty years later within the institution.

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 Keamy Rodgers

1828
Department of Ophthalmology at Washington University
Founder: Dr. Harvey J. Howard

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

1828
Edward S. Harkness Eye Institute at Columbia University
First Director: Dr. F. Phinzy Calhoun

1833
Pan American Congress of Ophthalmology
Founding member: Dr. Conrad Berens

1835
Manhattan Eye, Ear and Throat Hospital
Founding member: Dr. Cornelius Agnew

1839
Algemon Reese Pathology Laboratory, at Columbia University’s Vagelos College of Physicians and Surgeons
Founder: Dr. Algemon B. Reese

1844
The American Ophthalmological Society (AOS)
Founding members: Dr. Henry D. Noyes and Dr. Edward Delafield

1846
Clinic for the Diseases of the Eye and Ear at Columbia University’s College of Physicians and Surgeons
Founder: Dr. Cornelius Agnew

1846
Monongahela Eye, Ear and Tissue Hospital
Founding member: Dr. Cornelius Agnew

1864
New York Ophthalmological Society
Founding members: Dr. Henry D. Noyes and Dr. Cornelius Agnew

1864
Brooklyn Eye and Ear Hospital
Founding member: Dr. Cornelius Agnew

1866
Clinic for the Diseases of the Eye and Ear at Columbia University’s College of Physicians and Surgeons
Founder: Dr. Cornelius Agnew

1868
Department of Ophthalmology at Grady Hospital and Emory University
Developed and led: Dr. F. Phinzy Calhoun

1869
The American Orthoptical Society
Founding members: Dr. Conrad Berens and orthoptists Elizabeth K. Stark and Ethel Mussor

1870
Clinic for the Diseases of the Eye and Ear at Columbia University’s College of Physicians and Surgeons
Founder: Dr. Cornelius Agnew

1875
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1881
Clinic for the Diseases of the Eye and Ear at Columbia University’s College of Physicians and Surgeons
Founder: Dr. Cornelius Agnew

1884
Clinic for the Diseases of the Eye and Ear at Columbia University’s College of Physicians and Surgeons
Founder: Dr. Cornelius Agnew

1890
Clinic for the Diseases of the Eye and Ear at Columbia University’s College of Physicians and Surgeons
Founder: Dr. Cornelius Agnew

1910
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1928
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1935
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1939
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1947
Clinic for the Diseases of the Eye and Ear at Columbia University’s College of Physicians and Surgeons
Founder: Dr. Cornelius Agnew

1953
Clinic for the Diseases of the Eye and Ear at Columbia University’s College of Physicians and Surgeons
Founder: Dr. Cornelius Agnew
1862 | Henry O. Haynes, Executive Director of NYEE, takes the first photographic image of the retina, using a rabbit.
1951 | Became a leading contributor to the development of electroretinography at NYEE. Dr. Jacobson
1886 | Dr. Louis Girard is the first to describe the removal of large tumors.
1939 | NYEE’s Chief of Ophthalmic Plastic and Reconstructive Surgery, Dr. Wendell Hughes, develops the “Hughes Procedure” for reconstructing lower eyelid defects following tumor excision.
1935 | Dr. John Martin Wheeler pioneers the specialty of ophthalmic plastic and reconstructive surgery.
1982 | The first corneal mapper, leading the way to unique identification.
1961 | The New York Eye Infirmary opens its doors, one of the first three eye centers to be established in New York City.
2005 | Dr. Aran Safir, MD and Leonard F. Flom, MD invented corneal topography and built the first OCT systems outside MIT, where it was developed.
1959 | First photo of cultured, purified human iris pigment epithelial (IPE) cells was taken at NYEE’s Ocular Cell Cultural Lab, thanks to Dan Ning Hu, MD, Robert Ritch, MD, and Steven A. McCormick, PhD, who were the first to develop the methodology for isolation and culture of human IPE.
1990 | First photos of cultured, purified human iris pigment epithelial (IPE) cells were taken at NYEE's Ocular Cell Cultural Lab, thanks to Dan Ning Hu, Robert Ritch, MD, and Steven A. McCormick, PhD, who were the first to determine the methodology for isolation and culture of human IPE.
1958 | Dr. Louis Girard designs the first small, closed-field binocular indirect ophthalmoscope and four filters for a patient.
1957 | New York Eye Infirmary opens its doors, one of the first three eye centers to be established in New York City, opens.
1974 | NYEE’s Retina Diagnostic Center, for retinal photography and fluorescein angiography, is established under the leadership of Thomas D.1965
1961 | Dr. John Martin Wheeler pioneers the specialty of ophthalmic plastic and reconstructive surgery.
1935 | NYEE’s Chief of Ophthalmic Plastic and Reconstructive Surgery, Dr. Wendell Hughes, develops the “Hughes Procedure” for reconstructing lower eyelid defects following tumor excision.
1982 | The first corneal mapper, leading the way to unique identification.
1961 | The first digital color imaging system for corneal topography was invented by NYEE’s Biomechanics and Computer Science Division, established at NYEE’s Bioengineering and Computer Science Division, established by Richard Koeppl, MD and Martin Gruber, PhD.
1939 | NYEE’s Chief of Ophthalmic Plastic and Reconstructive Surgery, Dr. Wendell Hughes, develops the “Hughes Procedure” for reconstructing lower eyelid defects following the removal of large tumors.
1944 | Abbe’s first dye for colored surgery and introduced by NYEE physician Dr. W. M. H. Haderick, Haderick, Roman and Peterson, Dr. W. M. H. Haderick, Roman and Peterson.
1949 | NYEE trained Dr. Louis J. Loring conducted the first clinical investigation of corneal contact lenses.
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NYEE Timeline

Established 1820

1992 Richard B. Rosen, MD, Thomas O. Muldoon, MD, and David Buzawa, MEng (in partnership with Iris Medical) developed the first commercial trans-scleral laser retinopexy probe for treatment of retinal tears and detachments.

1996 A 4-dimensional scanning laser ophthalmoscope (SLO) imaging device with internal fluid dynamics of retinal capillary microaneurysms.

1998 Donald Gensler, MD, of Yale, developed the first OCT technology, which created the first en face OCT.

2002 The study of retinal microvascular disease took a leap forward with the introduction of OCT angiography.

2005 NYEE holds the "Eye on the Future" conference, the first of its kind, bringing together specialists focusing on the future of organ, tissue and eye transplantation and donation.


2005 The New York Eye and Ear Infirmary of Mount Sinai/New York Eye and Ear (NYEE) Eye and Ear program, a voluntary teaching staff of community ophthalmologists.

2009 Paul N. Finger, MD, Ray Iezzi, MD, Richard B. Rosen, MD, Daniel P. Slora, MD, and Iris Medical (in partnership with Iris Medical) developed the first commercial trans-scleral laser retinopexy probe for treatment of retinal tears and detachments.

2010 Ronald Gentsler, MD, class of 1987, and his team, created the first en face OCT.

2012 With the introduction of OCT angiography, the clinical utility of OCT became widely recognized. OCT angiography provided previously unattainable capillary imaging of OCT angiography to enable high-resolution imaging of microvessels.

2015 The New York Eye and Ear Infirmary of Mount Sinai/New York Eye and Ear (NYEE) Eye and Ear program, a voluntary teaching staff of community ophthalmologists.

2018 Developing an assistive work in adaptive optics, Richard B. Rosen, MD, Yue-Ping Tsou Chiu, PhD, and their collaborators in the Medical College of Wisconsin added the first on-axis imaging to OCT. This technology is now widely used in retinal imaging.

2019 Richard B. Rosen, MD and Yuen Ping Tsou Chiu, PhD, introduced a full spectrum of quantitative tools for precision assessment and follow-up of clinical microvascular disease.

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New York Eye and Ear Infirmary of Mount Sinai (NYEE) and The Mount Sinai Hospital (MSH) / Icahn School of Medicine at Mount Sinai

Department of Ophthalmology at a Glance:

- Combined 2019 numbers for NYEE
- One of the largest Surgical Case Volume by Specialties in the country
- Graduate medical education programs in the country
- NYEE-Midwood
- NYEE-East 85th Street
- NYEE-East 102nd Street
- NYEE-East 102nd Street
- NYEE-Union Square
- Faculty News
- Accolades

Accolades

- Mary-Abigail Craven, MD: Appointment as Assistant Clinical Professor of Ophthalmology at Icahn School of Medicine at Mount Sinai.
- Varun K. Pawar, MD: Appointment as Assistant Clinical Professor of Ophthalmology at Icahn School of Medicine at Mount Sinai.

Faculty News

New Recruits

- Dr. Mary-Abigail Craven
- Dr. Varun K. Pawar

The Harold W. McGraw, Jr. Family Foundation Professorship in Neuroregeneration

New York Eye and Ear Infirmary of Mount Sinai (NYEE) has received a generous donation from The Harold W. McGraw, Jr. Family Foundation to establish an endowed professorship in the Department of Ophthalmology to support neuroregeneration research. Considered one of the most sophisticated forces in the brain, the development of new cells in the retina may change the way we view the treatment of age-related diseases such as macular degeneration that currently relies on preventing the disease from progressing. The $2 million gift represents a significant investment in current and future scientific discoveries. These groundbreaking contributions are enabled by the unique research environment at NYEE, ensuring that innovative research in this area will be further propelled by internationally renowned investigators. NYEE proudly acknowledges the impact of these donors in enabling the institution to achieve its overarching mission, and is immensely grateful for the support of its partners in advancing sight saving therapies to improve quality of life.

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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