Precision + Innovation

Defining the Future of Ophthalmology | Spring 2023

New York Eye and Ear Infirmary of **Mount Sinai**

Message From James C. Tsai, MD

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As the first specialty hospital in the country and an ongoing innovator in ophthalmic care and research, New York Eye and Ear Infirmary of Mount Sinai (NYEE) takes pride in several programs that we believe are models for the entire field. As described in the two articles that follow, they are our eye stroke service, a program that has achieved outstanding results by pairing retinal specialists with emergency room physicians for the treatment of central retinal artery occlusion (CRAO), and our eye trauma center, the only one of its type in the New York metropolitan area.

While other hospitals may have eye stroke programs, we stand alone in equipping ours with sophisticated optical coherence tomography (OCT) located right in the emergency departments of several Mount Sinai hospitals. That capability is enabling ED-based stroke teams trained on the device to transmit tele-images of suspected CRAO patients directly to NYEE retinal specialists who are on call. Since being launched two years ago, the CRAO program has reduced the time it takes for growing numbers of patients to receive intra-arterial tPA treatment to within six to seven hours, the critical window for optimal results. While eye stroke is not a common occurrence, for patients whose sight has been saved thanks to this uniquely collaborative program, it makes all the difference in the world.

Our eye trauma center represents another way we are leveraging our expertise and resources to meet our long-standing commitment to the community. Indeed, we are the only hospital in the city and surrounding area with a walk-in clinic to treat eye trauma seven days a week, even holidays. What's more, we have staffed it with an on-site team of specialists in retina, cornea, glaucoma, oculoplastics, and severe eye injuries. The eye trauma center also serves as an excellent training site for our residents, interns, and fellows.

It's no secret that NYEE is undergoing significant change along with the rest of the health care industry. One thing that will not change, however, is our commitment to maintaining specialized services that break new ground for the field of ophthalmology and, just as importantly, for our patients.

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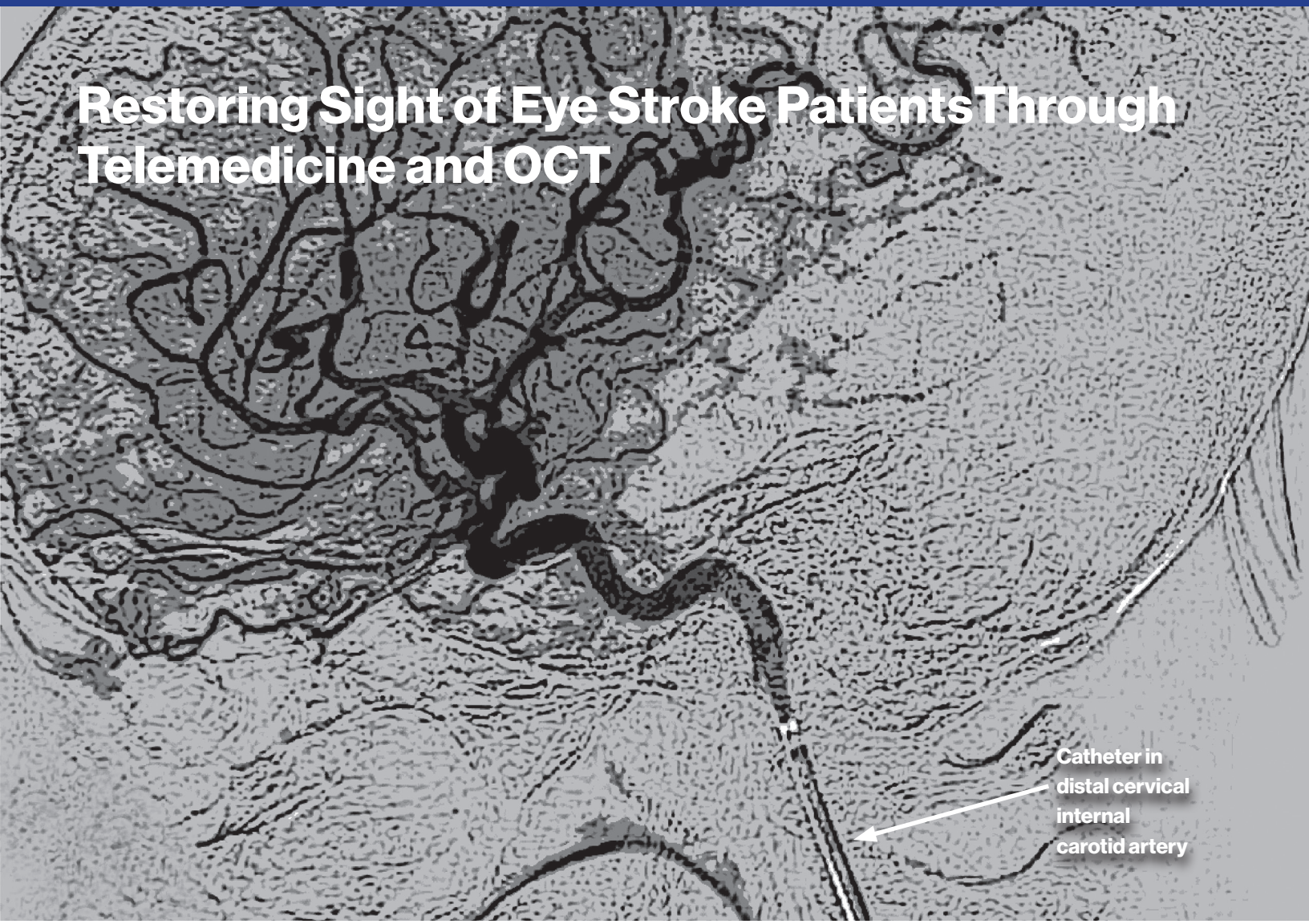
No. 12 in the Nation
(highest ranked in NYC)
in Ophthalmology
by *U.S. News & World Report's*
2022–23 "Best Hospitals"
rankings

Restoring Sight of Eye Stroke Patients Through Telemedicine and OCT



Angiogram of a catheter being guided by an interventional radiologist into the distal cervical internal carotid artery to administer tPA into the ophthalmic artery.

New York Eye and Ear Infirmary of Mount Sinai (NYEE) retina specialists are helping reverse vision loss from central retinal artery occlusion (CRAO) throughout New York City, one automated optical coherence tomography (OCT) image at a time. A novel "eye stroke" diagnostic protocol has reduced the time to treatment so that Mount Sinai's neurointerventional teams can more effectively treat this blinding condition.

While the system is being developed as a fully remote diagnostic protocol, the combined efforts of our consult services, retina division, stroke teams, and emergency physicians have already had real-world impact on patients from across the tristate area, including Manhattan, Brooklyn, Queens, the Bronx, Long Island, and New Jersey.

OCT machines linked by a tele-consult network form the linchpin of the eye stroke initiative created by NYEE. By placing imaging devices in busy hospital stroke centers, this innovative program has cut the time to diagnose and treat the ocular equivalent of a cerebral stroke.

Patients who arrive within 12 hours of the last time they remember seeing well can be treated with the clot-busting drug tissue plasminogen activator (tPA). Those who arrive outside the treatment window receive a coordinated work-up of their cerebral stroke risk, which rises up to 9% in the month following an acute embolic retinal artery occlusion.

During the first 18 months of the program, 59 patients were evaluated, 25 retinal artery occlusions were identified, and 11 were treated for CRAO. The mean improvement in

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visual acuity was from finger-counting to 20/100, with 4 improving to 20/40 or better, often within minutes of treatment.

Intra-arterial tPA (IAT) was administered by the interventional neuroradiology team directly to the ophthalmic artery via transfemoral arterial catheterization. The average time from presentation to injection of tPA was 146 minutes, which is good but leaves room for improvement.

Gareth Lema, MD, PhD

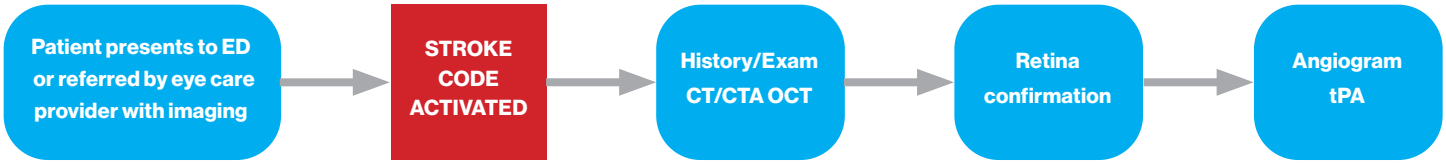
"There are increasing numbers of hospitals nationwide that have the ability to treat retinal artery occlusion. What makes our program different and so effective is the addition of immediate OCT confirmatory imaging in stroke centers, coupled with a round-the-clock tele-ophthalmology network of retina specialists at NYEE available for image review and consultation," says Gareth Lema, MD, PhD, Vice Chair for Quality, Safety, and Experience, Department of Ophthalmology, NYEE, who helped develop the CRAO program. "We're showing that tele-consultation can be extremely effective even with very high acuity ophthalmic problems."

The program is currently in place at three Mount Sinai hospitals in Manhattan, each with stroke teams and the capability for endovascular tPA injection. Under the protocols, members of the stroke team are trained to acquire an OCT to assess patients with suspected CRAO. Once these images are collected, our panel of retina specialists based at NYEE can confirm the diagnosis remotely.

"High-resolution imaging with OCT is coming down in cost, allowing it to be affordable for hospital emergency rooms and be operated by individuals without specialized imaging skills," notes Richard Rosen, MD, Chief of Retina at the Mount Sinai Health System, and Vice Chair and Director of Ophthalmology Research at NYEE. "As our experience as a service has matured, we've seen increasing buy-in from ED attendings, as evidenced by the fact that more suspected CRAO referrals are turning out to be false positives. This indicates that ED physicians are more proactive in referring patients with sudden vision loss, occasionally sending cases with vitreous hemorrhage or retinal detachment for evaluation. That's a very encouraging development since it suggests that we're missing fewer patients with time-sensitive stroke eye emergencies."

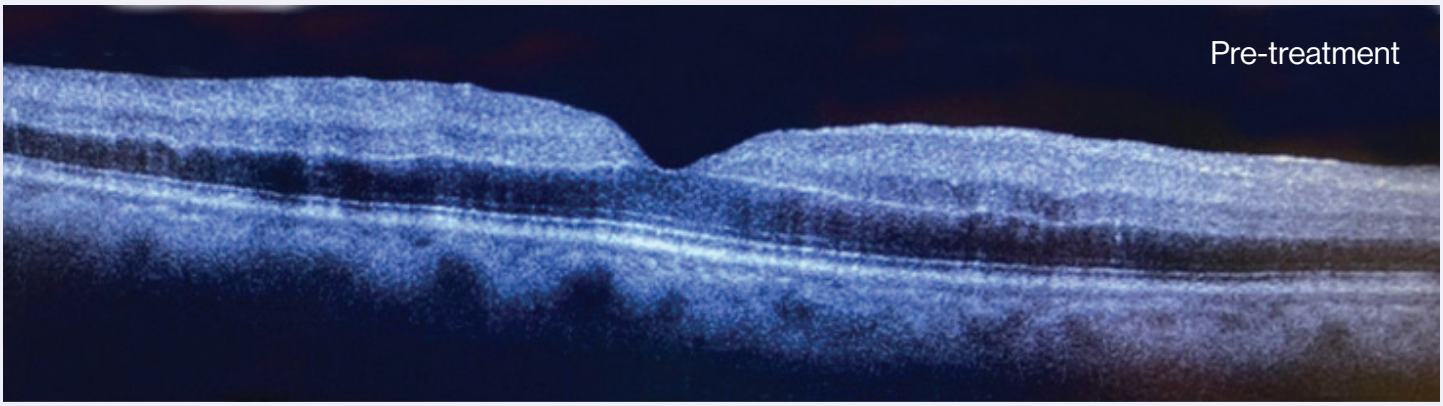
Dr. Rosen believes the eye stroke initiative will continue to grow in importance and usage as public awareness of the possibility of "successful treatment with immediate action" becomes common knowledge. "Patients often wait hours or days to go to seek care, hoping the problem will resolve on its own," he explains. "Even many ophthalmologists are unaware an effective service like ours exists and is available to all. Addressing this information gap will require education of the public at large as well as the physician community."

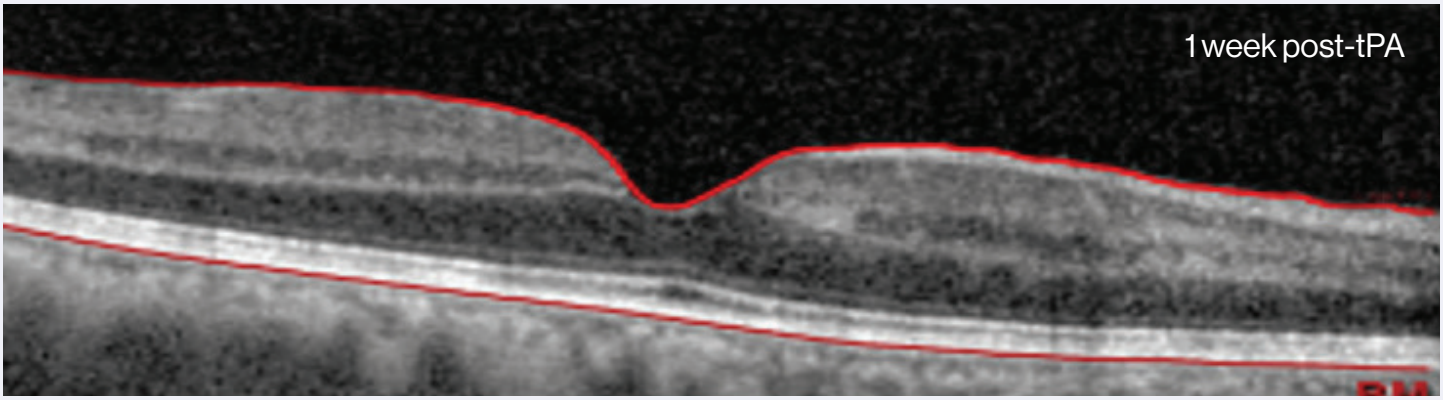
Eye Stroke Diagnostic Protocol

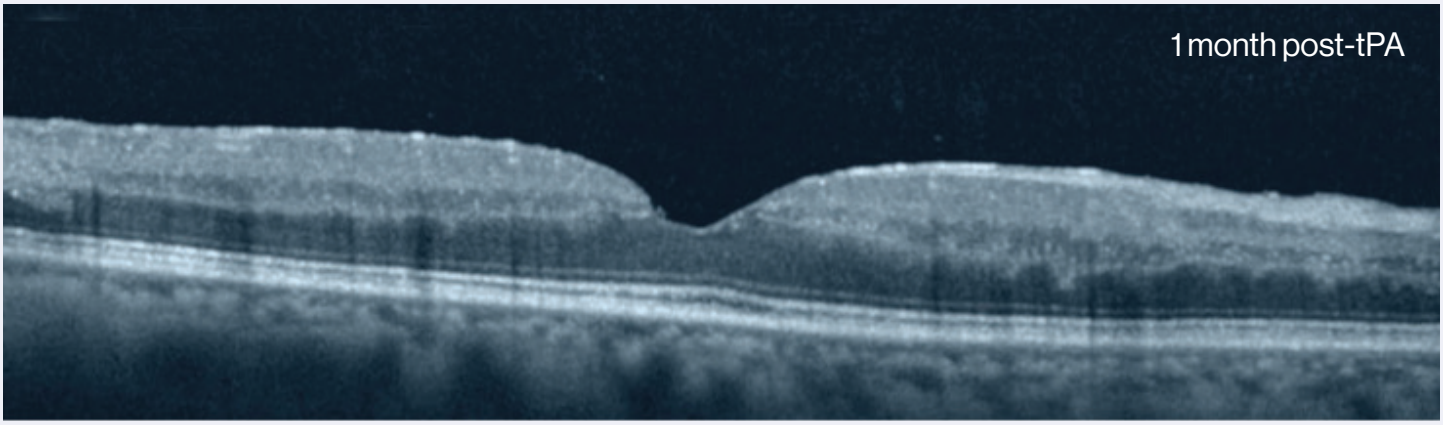


Criteria for ANGIO-tPA: Duration <12 hours | Vision 20/200 or worse | No suspicion of GCA | No pain, flashes/floaters

When Every Minute Counts: **CRAO Case Study**







A 68-year-old man presented to the emergency department at Mount Sinai Brooklyn with acute, painless, monocular vision loss in his right eye. The stroke team recognized a possible eye stroke and the patient was immediately transferred to The Mount Sinai Hospital (MSH) for evaluation. The OCT (pre-treatment) showed findings typical of an early central retinal artery occlusion: hyperreflectivity, loss of differentiation of the inner retinal layers, impaired signal penetration to the outer retina and choroid, and normal reflectance through the fovea—"the foveal glow."

Once the patient arrived at MSH, he was diagnosed and treated within 118 minutes. The day following treatment, his vision had returned to 20/100.

At one-week follow-up, his vision had returned to 20/25 and he maintained these visual gains through one month. OCT scans at one-week and one-month post-treatment show resolution of retinal hyperreflectivity that is associated with retinal ischemia.

Right to left: Dr. Fallon and Dr. Rosen

A Patient at Risk of Losing His Sight Is **Routine Work for NYEE Surgeons**

Walking down a street can be life-altering, as 45-year-old Adam Cruz found out in October of 2022 when he tripped over a Bird scooter just outside his front door in the Bronx. The subsequent fall crash-landed his face on the cement pavement, rupturing his better-functioning left eye. Suddenly his world went dark. With finger-count vision in his right eye, Mr. Cruz clung to the hope that his doctor, Richard Rosen, MD, Chief of Retina Services at the Mount Sinai Health System, who, 23 years earlier, had repaired a retinal detachment in his good eye, could help him once again—to return to his normal life that he had enjoyed since the original surgery.

"I barely had any sight when my wife drove me to New York Eye and Ear Infirmary of Mount Sinai, and I was terrified it wouldn't return," a father of two recalls. The on-duty retina fellow who met him, Julia Fallon, MD, could judge from just a quick visual inspection the severity of the injury—a ruptured globe that had already deflated and deformed the contours of the eye. Before starting preparations for surgery, she reached out for consultation to Dr. Rosen, who rushed in on a Saturday night to help her with the emergent surgery on his longtime patient.

While somewhat routine for New York Eye and Ear Infirmary of Mount Sinai (NYEE), the case had a number of complexities few hospitals in our community are equipped to handle. For starters, the patient has Marfan syndrome, an inherited disorder that had weakened the attachment of the lens in both eyes, requiring lens extractions in childhood. This greatly increased the patient's risk for retinal detachment, which had already occurred, and been repaired at NYEE. The old wound from the cataract surgery had, however, left a point of structural vulnerability, which ruptured during the patient's accidental fall. The previously healed surgical wound gave way at the corneal limbus, expelling intraocular tissue that included the iris and vitreous.

"His eye had opened and collapsed like a squashed grape," observes Dr. Rosen, Vice Chair and Director of

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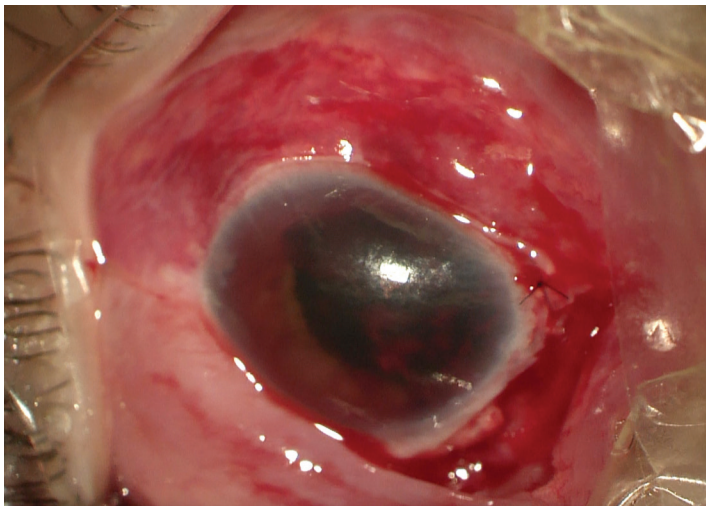
Ophthalmology Research at NYEE. "We knew we had to reform and seal the globe, which was exceptionally challenging in light of its structural compromise from prior surgeries. These procedures have a high risk of poor visual outcomes—not a good situation for a patient with only one good eye to begin with."

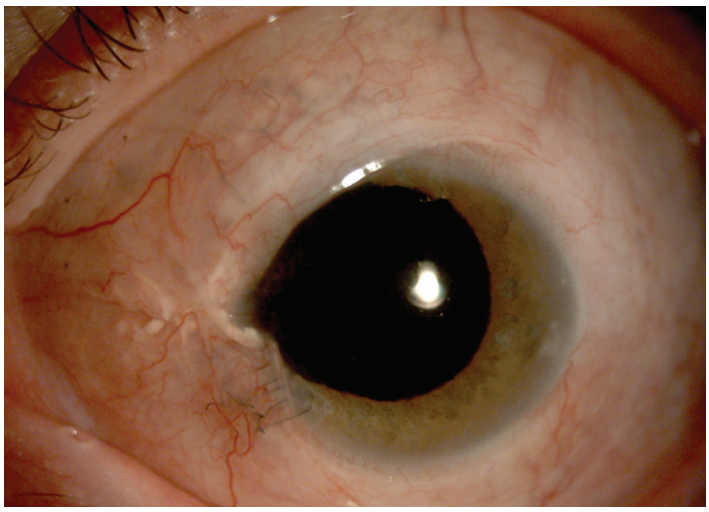
The three-hour operation, with the patient under general anesthesia, hinged on securing and reconstructing the open globe wound with a large number of nylon and Vicryl sutures, and re-approximating the vitreous-filled space with as little tissue loss and wound distortion as possible. "It was extremely complex and time-consuming work designed to essentially put everything back in place," explains Dr. Fallon, a first-year vitreoretinal fellow, who also did her residency training at NYEE. "You only get one chance in cases like these, and if the wound repair is too tight or too loose, the patient could end up with severe astigmatism or a persistently leaky eye with low pressure and limited function."

Once the suturing was complete, the surgeons faced another challenge. In addition to the ruptured globe, the injury had triggered a vitreous hemorrhage with significant bleeding into the back of the eye. To clean out the blood in hopes of recovering the vision, Drs. Rosen and Fallon performed a vitrectomy. And as often occurs in post-trauma cases, the patient needed to return to the OR a few weeks later for additional revision of the extensive wound.

Although the early prognosis for Mr. Cruz was guarded at best, the results that emerged within a few months after surgery were a cause for celebration. The patient went from light perception in his left eye following the injury to 20/30 with glasses—better than his vision prior to the accident—and 20/25 with contacts. "I realize I could have easily gone blind without the expert care I got," Mr. Cruz allows. "Instead, my life has returned to normal, and I now follow the advice of my doctors to wear protective glasses whenever I leave the house."



Preoperative: Following a partial conjunctival peritomy, the previous surgical wound was noted to be dehisced for 5 clock hours.



Postoperative: Month 6 external photograph showing formed globe and residual corectopia from traumatic iris loss.

Sharing the patient's jubilation at the outcome are his NYEE surgeons. "We have extensive experience in managing these complex cases over the years," remarks Dr. Rosen, who brings his own 30-year surgical background to the operating suite. "They're the kind of challenge most other hospitals don't see enough of to manage successfully—and that makes us a critical resource for the greater New York community as a center of excellence in eye trauma as well as our residents and fellows who gain invaluable surgical experience from these complex cases."

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