NYU Langone Health

Neurosurgery

2018 Year in Review

MESSAGE FROM THE CHAIR

It gives me great pleasure to share exciting updates from the Department of Neurosurgery at NYU Langone Health that have fundamentally transformed the ways in which we care for our patients.

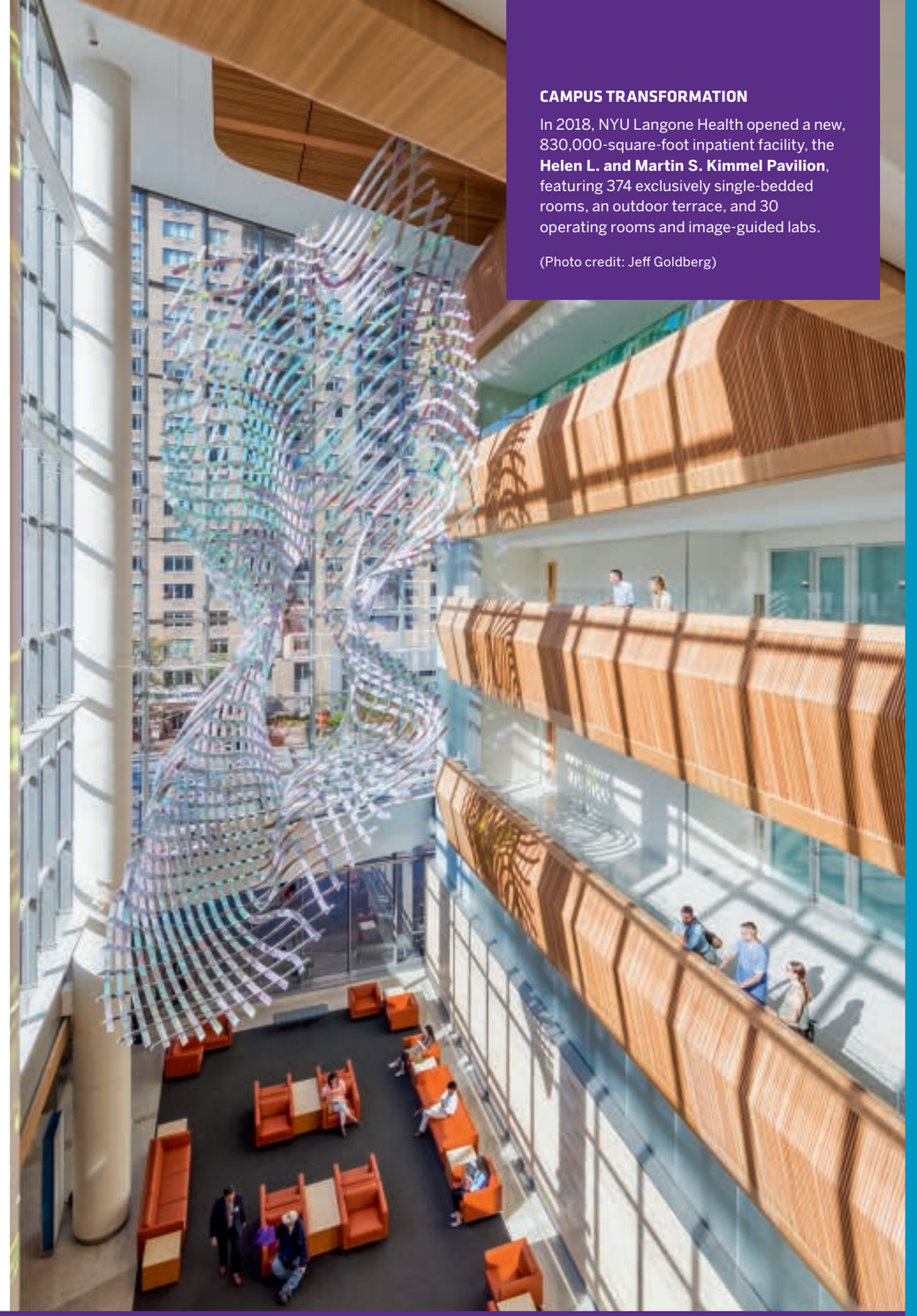
This year has been a time of extraordinary growth and expansion. Kimmel Pavilion, our new, state-of-the-art inpatient facility, houses a neurosurgery hospital within a hospital. It integrates a suite of six neurosurgical ORs and a hybrid vascular suite on two floors completely dedicated to neurosurgical care.

Unique approaches and continued collaboration in our Center for Stroke and Neurovascular Diseases and our Spine Center provide new possibilities for extraordinarily complex cases, while clinicians in the Center for Neuromodulation and the Brain Tumor Center embrace novel technologies and restore quality of life for our patients.

Our new cutting-edge facilities combined with the expertise of our faculty, researchers, and residents enable us to work at the very forefront of neurosurgery, resulting in the best possible patient outcomes.

JOHN G. GOLFINOS, MD

Chair, Department of Neurosurgery
Associate Professor of Neurosurgery and Otolaryngology



CAMPUS TRANSFORMATION

In 2018, NYU Langone Health opened a new, 830,000-square-foot inpatient facility, the **Helen L. and Martin S. Kimmel Pavilion**, featuring 374 exclusively single-bedded rooms, an outdoor terrace, and 30 operating rooms and image-guided labs.

(Photo credit: Jeff Goldberg)

DEPARTMENT OF NEUROSURGERY

5,300+

NEUROSURGICAL CASES

16,000+

PATIENT VISITS

1,300+

NEUROINTERVENTIONAL CASES

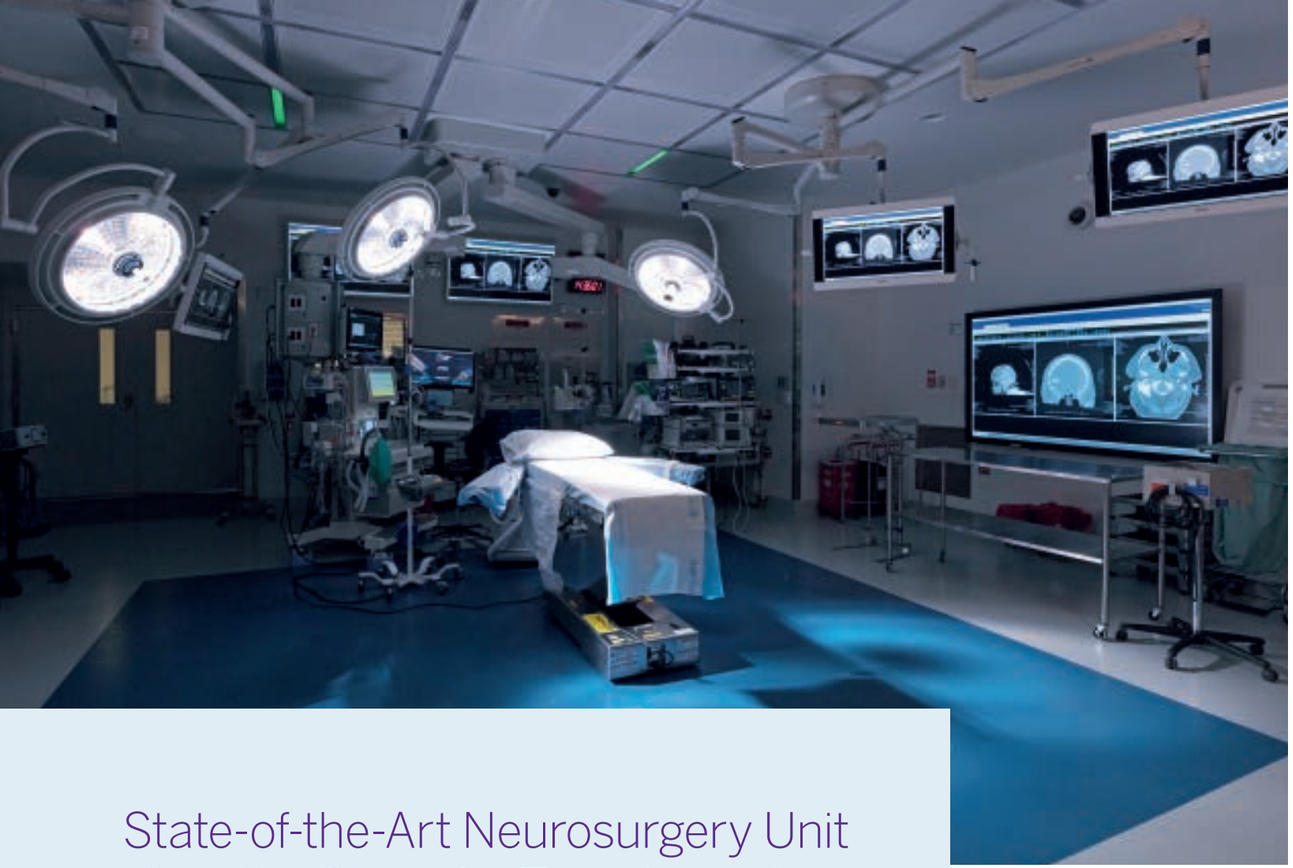
1,200+

SPINAL NEUROSURGERY CASES

1,700+

CRANIAL CASES

Numbers represent FY18 (Sept 2017–Aug 2018)



State-of-the-Art Neurosurgery Unit Sets the Stage for Transformative Patient Outcomes

With a new, dedicated specialty unit that integrates a comprehensive suite of state-of-the-art technology, NYU Langone Health neurosurgeons are poised to set a new standard of care—combining innovation with expertise to foster more precise approaches, unrivaled safety, and expanded treatment options for the most challenging cases.

One of two operating rooms connected to the new intraoperative MRI, providing neurosurgeons with real-time high-resolution imaging guidance.

A DEDICATED NEUROSURGICAL CENTER

Encompassing two floors and seven custom-developed OR suites in the 830,000-square-foot Kimmel Pavilion, the new space greatly expands the health system's neurosurgical footprint and solidifies its ongoing investment in technological advancement. "Two of the rooms are connected to our new intraoperative MRI, two others are shielded for intraoperative CT, and we have a dedicated neurovascular surgery room with robotic three-dimensional angiogram imaging capabilities," says John G. Golfinos, MD, associate professor of neurosurgery and otolaryngology and chair of the Department of Neurosurgery. "The combined potential of these tools lays the groundwork for new milestones to be set in patient care and outcomes."

The neurosurgical team functions as a single closed-loop system of specialized expertise, able to quickly discern complications and mobilize with needed interventions. "And on top of this collective insight, our patients are surrounded by next-generation technology that continues to evolve and transform how we approach neurosurgical care," adds Dr. Golfinos.

INTRAOPERATIVE MRI DELIVERS UNPRECEDENTED SURGICAL PRECISION

The new intraoperative MRI provides neurosurgeons with real-time, high-resolution imagery that guides their approaches and circumvents neurosurgical challenges, enabling a level of precision that decreases complications and confirms total tumor resection.

NYU Langone is one of the few health systems in the nation that utilizes a fixed-magnet setup and 3-Tesla high-resolution technology, a combination that results in unsurpassed functional views of both anatomy and pathology. The integral presurgical and intraoperative collaboration between neuroradiologists provides both advanced guidance and real-time refinement. "Based on the patient's prior MRI, the neuroradiologists predetermine what sequences will be done when the patient comes into the intraoperative MRI suite," notes Girish M. Fatterpekar, MD, associate professor of radiology and chief of Neuroradiology. "Time is of the essence during surgery—so this advanced planning allows us to perform as few sequences as possible, harnessing the key information needed to determine the best approach."

The hybrid operating room is equipped with a state-of-the-art suite of imaging and surgical technology.

State-of-the-Art Neurosurgery Unit Sets the Stage for Transformative Patient Outcomes

Deeper intraoperative insight is transforming the neurosurgical team's treatment of complex tumors, allowing surgeons to achieve full resection by better distinguishing margins from normal brain tissue, identifying complications such as hemorrhage with a new level of accuracy, and circumventing problems such as shifting brain tissue that typically obscures tumor margins and is missed by less precise intraoperative MRI. "The availability of intraoperative MRI makes surgery more efficient and safer for our patients and allows us to proceed confidently with resections, armed with insight we never had before," says Dr. Golfinos.

TOGETHER, TECHNOLOGY AND COLLABORATION ENHANCE OUTCOMES

Close collaboration among key stakeholders during the planning process enables neurosurgeons to play a critical role in evaluating evidence-based technologies and determining the optimal combination of innovations to invest in, with an eye toward better outcomes. The result is an infrastructure of future-ready technologies that are taking neurosurgery to the next level.

The intraoperative MRI is accessible from two dedicated neurosurgical operating rooms.

7 **DEDICATED NEUROSURGICAL OPERATING ROOMS** equipped with state-of-the-art technology

Augmented Reality Delivers Holographic Surgical Vision

Integrated augmented reality (AR), being used experimentally in a number of NYU Langone surgical departments, has the potential to revolutionize how surgery itself is visualized.

The AR headset projects an algorithm-based holographic rendering of a patient's scan onto a surgical site, allowing the surgeon to visualize the body's internal structure alongside a tumor or other malformation. This technology, recently submitted for FDA approval, was developed by Osamah Choudhry, MD, chief neurosurgery resident, and grew out of a research collaboration with members of the Department of Radiology.

"We began by reconstructing a multilayer MRI or CT scan to create an exact three-dimensional replica of the patient's anatomy, then converted it into an image that could be projected into holographic space," says Dr. Choudhry. As resolution quality is improved, AR has the potential to significantly enhance procedures requiring precision pinpointing of a specific target, such as biopsies or catheter placements. "The three-dimensional, live guidance enabled by augmented reality could lead to newer, safer approaches in these cases," Dr. Choudhry notes.

Real-time spinal navigation provides Anthony K. Frempong-Boadu, MD, with an image-enhanced approach to surgery.

> "We are at the forefront of precise, minimally invasive, imaging-driven advances, whose possibilities we are just beginning to unearth."
>
> **—John G. Golfinos, MD**

One such technology, advanced PET MRI, utilizes an on-campus cyclotron to produce radioactive tracers that enhance the visualization of specific tumor types. "With conventional imaging, we can identify the lesion but we have difficulty identifying the tumor type," notes Dr. Fatterpekar. "The radiopharmaceutical tracer complements the conventional MRI by pinpointing the tumor type and mapping its extent, and it can detect other, 'silent' tumors of the same type elsewhere in the body. It also plays an important role in distinguishing tumor recurrence from treatment-induced changes, which isn't possible with conventional imaging."

A dedicated spinal navigation room in the new neurosurgical suite brings advanced, real-time spinal navigation to the operating table. The new setup enables imaging-enhanced approaches once limited to preoperative and postoperative imaging alone. "With the integration of advanced spinal navigation, we're working toward navigated functional spine surgery, which is a first," says Anthony K. Frempong-Boadu, MD, associate professor of neurosurgery and orthopedic surgery and director of the Division of Spinal Surgery.

A single-plane digital fluoroscopy machine that uses state-of-the-art perfusion software enables simultaneous open surgery and interventional procedures, and four-dimensional angiography visualizes blood flow through vascular malformations in the brain for enhanced navigation during lesion treatment. Consolidating the technologies is Brainlab Buzz, a customized multimedia platform that puts all available information at the care team's fingertips—an innovation in clinical informatics that amplifies the benefits of the individual procedural technologies.

"We've amassed a collection of all the leading neuro-surgical technologies in one place," notes Dr. Golfinos. "Walking into these operating rooms, you know you're looking at the future of neurosurgery. We are at the forefront of precise, minimally invasive, imaging-driven advances, whose possibilities we are just beginning to unearth."

Complex Case

Navigating Risk to Resect a Cavernous Malformation and Relieve Functional Decline

When a patient with recurrent neurological symptoms underwent imaging that revealed a cavernous malformation in the brain, the 49-year-old was referred to experts at NYU Langone Health's Center for Stroke and Neurovascular Diseases for surgical intervention. There, a carefully planned multidisciplinary approach guided by advanced technology enabled a successful resection and restored the patient's quality of life.

Howard A. Riina, MD (Photo credit: Keiji Drysdale)

Howard A. Riina, MD (Photo credit: Keiji Drysdale)

A HEMORRHAGE AT THE BRAIN'S EPICENTER

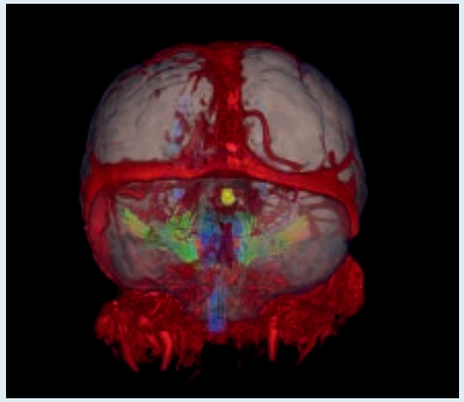
At another institution, a presentation of headaches, visual problems, and hemisensory loss precipitated the diagnosis of obstructive hydrocephalus and intracranial hemorrhage. Imaging subsequently revealed a cavernous malformation at the tectum, and active surveillance was recommended. Two years later, imaging prompted by recurring symptoms revealed a repeat hemorrhage at the posterior tectum, and studies four months later showed expansion of the cavernous malformation without resorption of the hemorrhage.

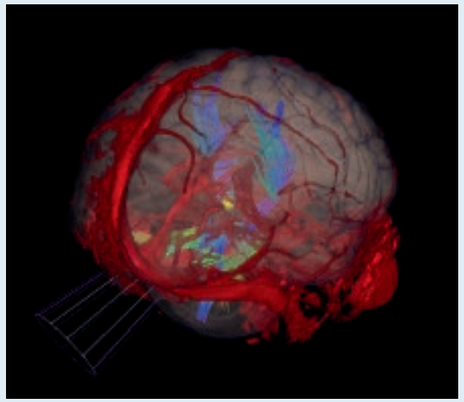
FUNCTIONAL DECLINE, HEMORRHAGE RISK COMPEL TREATMENT

The patient's increasing sensory abnormalities and headaches led Howard A. Riina, MD, professor of neurosurgery, neurology, and radiology, vice chair of the Department of Neurosurgery, and director of the Center for Stroke and Neurovascular Diseases, to consider surgical intervention, a challenging option that had been ruled out by other experienced surgeons. The patient's history also supported surgery: Although the hemorrhage rate is initially 0.25 percent to 2.3 percent, the rate climbs to 30 percent to 40 percent for patients with symptomatic recurrent hemorrhage, making resection urgent.

In light of the technical challenges and significant risks, Dr. Riina's extensive surgical experience would be critical to the successful management of this case. "A case as complex as this one requires both a precise approach and advanced imaging," says Dr. Riina. "Superimposing a fused image of the brain and vascular anatomy on the patient both guides our approach and allows us to avoid all critical vascular structures and motor pathways so we can confidently achieve full resection."

Complex Case: Navigating Risk to Resect a Cavernous Malformation and Relieve Functional Decline





Three-dimensional preoperative imaging was used to assess the location of the malformation and guide a surgical approach that provided the pathway to complete resection.

ADVANCED IMAGING PLOTS A PATH FOR RESECTION

Multi-planar, multi-sequential MRI showed a malformation with a hemosiderin rim measuring 1.2 centimeters by 1.1 centimeters in the right paramedian tectum, with evidence of chronic hemorrhage. A developmental venous anomaly inferior to the lesion drained into the right ambient cistern, and a ventriculoperitoneal shunt catheter with a right frontal approach and termination in the region of the third ventricle was identified.

Guided by the imaging results, Dr. Riina determined that a subtentorial supracerebellar approach would enable access for complete resection while avoiding damage to critical structures. Image overlays produced by diffusion tractography of the corticospinal tract provided an enhanced analysis of two-dimensional images to elucidate the approach. "We chose to operate with the patient in the sitting position to drop the cerebellum from the field by gravity, providing greater exposure while avoiding traction on the cerebellum," says Dr. Riina.

With a comprehensive plan in place, Dr. Riina began the operation by identifying the transverse sinus and then carried a midline incision to the bone, extending into the suboccipital region, avoiding exposure of the C1 arch. The inferior half of the transverse sinus was exposed by suboccipital craniotomy, and the dura was opened to expose the supracerebellar region. The trajectory to the right superior colliculus was confirmed before two bridging veins were coagulated and incised, further relaxing the cerebellum to facilitate the approach to the pineal recess. Under direct visualization, the arachnoid was opened and the hematoma gradually came to the surface, accompanied by a portion of the cavernous malformation. Entrance into the cavity resulted in evacuation of the hematoma, and the cavernous malformation was removed using micro biopsy forceps, with visual inspection confirming no residual malformation.

OPTIMIZING OUTCOMES IN THE CONTEXT OF COMPLEXITY

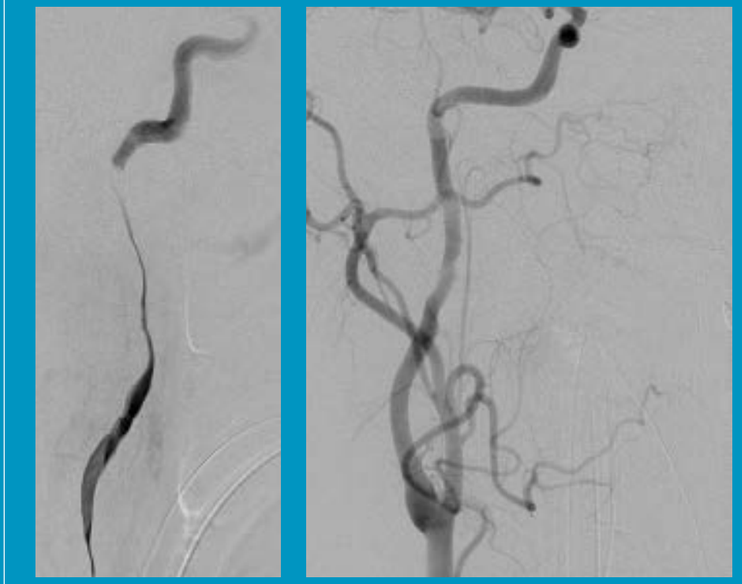
Armed with advanced imaging and extensive expertise, Dr. Riina was able to provide complex surgical treatment that few other surgeons would have been equipped to perform. "This case required a unique combination of advanced imaging and a highly refined approach, which together enabled us to plan and execute a successful resection," notes Dr. Riina. "With these capabilities, we reduced a typically eight-hour operation down to three hours and safely sent this patient home two days later with a complete resolution of symptoms."

Complex Case: Swift Neurovascular Intervention Prevents an Impending Stroke

A woman in her late 40s presented to physicians at the Ronald O. Perelman Center for Emergency Services with tingling and numbness in her right hand, accompanied by imaging obtained at an out-of-state institution where she had presented with similar symptoms while traveling a few days earlier. With her symptoms recurring, she was referred to vascular neurologist Jose L. Torres, MD, assistant professor of neurology, who ordered repeat vascular imaging based on earlier findings of left carotid artery dissection. The new scan revealed that her left carotid artery dissection had worsened, with new dissection in the right carotid artery and irregularities in the left vertebral artery.

Although a subsequent MRI showed no brain injury or stroke, Dr. Torres and the attending neuro-interventional radiologist, Maksim Shapiro, MD, clinical associate professor of radiology and neurology, performed a conventional angiogram, which demonstrated that all major arteries to the brain—now including the right vertebral artery—were deteriorating. "Based on the appearance of the vessels as well as the risk associated with intervention, we decided to stent the two carotid arteries on the spot, leaving the two vertebral arteries to be managed medically," explains Dr. Torres.

The successful procedure was completed in less than five hours, and the NYU Langone team's swift, multidisciplinary intervention prevented what could have been a major stroke. "She could have easily been disabled for life," he says. "But our emergency department physicians, nurses, stroke doctors, and interventional radiologists mobilized as a team, responding to a troubling set of symptoms and imaging results with the most advanced intervention available."



Severely restricted blood flow in the patient's right internal carotid artery (left), with normal blood flow restored after intervention (right).

Extending the Edge of Brain Tumor Treatment with Alternative Methods and Molecular Diagnostics

Clinicians at NYU Langone Health's Brain Tumor Center are expanding brain tumor treatment options with a new laser-based ablation approach, and a collaborative effort to develop genetically based cancer screens is advancing the complementary fields of cancer diagnosis and cancer research.

Dimitris G. Placantonakis, MD, PhD

LASER ABLATION PROVIDES MINIMALLY INVASIVE OPTION FOR INTRACTABLE TUMORS

Laser interstitial thermal therapy (LITT), a tumor ablation technique in use at NYU Langone over the past year, offers a new treatment approach to inoperable brain tumors. Stereotactic navigation guides the placement of an infrared laser probe that heats and destroys the adjacent cancerous tissue, with real-time MRI informing the precise positioning required for this treatment. "This approach gives us tremendous control over the ablation process," notes Dimitris G. Placantonakis, MD, PhD, assistant professor of neurosurgery. "It expands our reserve of treatments in cases that lack surgical options because of tumor location, or when a patient's age or overall health makes a craniotomy unfeasible."

The therapy's application in an 80-year-old patient with a newly diagnosed, otherwise inoperable glioblastoma deep within the brain, offered encouraging results. "We decided to use the laser over just chemotherapy and radiation, which likely would have been ineffective," notes Dr. Placantonakis. "Nine months later, the patient was doing very well. I have no doubt this treatment extended his life."

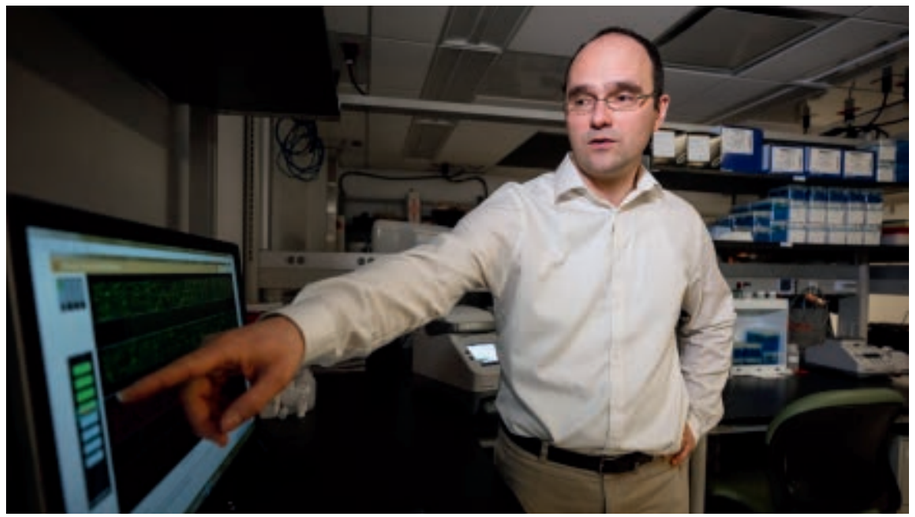
LITT may also be indicated to counter brain swelling effects from radiation treatment, as a minimally invasive therapy for tumors untreatable with resection or radiosurgery, and for tumors that do not respond to current treatment options. "In addition to laser ablation's use for brain tumors, we're looking at it as a potential treatment for epilepsy and movement disorders, with clinical trials anticipated here in the near future," adds Dr. Placantonakis.

REVOLUTIONIZING CANCER DIAGNOSTICS WITH NOVEL GENETIC TECHNIQUES

A 580-gene diagnostic panel, resulting from a two-year collaboration between the Department of Pathology and NYU Langone's Perlmutter Cancer Center, provides a comprehensive framework for comparing the results of sequencing normal and tumor tissue DNA. Approved in mid-2018 by the New York State Department of Health, the panel reveals genetic differences that may drive tumor growth, with the goal of informing targeted treatment strategies.

"Our team custom built the gene panel, selecting genes known to be diagnostic or to be actionable with FDA-approved drugs, as well as gene mutations expected to be treatable by drugs on the horizon," says Matija Snuderl, MD, assistant professor of pathology and director of Molecular Pathology. "Our goal was to capture as much genetic information as we could from cancers of various origins, because we know that the same mutations—which could potentially be targeted with the same drug—arise with different frequency in cancers throughout the body."

Matija Snuderl, MD



Extending the Edge of Brain Tumor Treatment with Alternative Methods and Molecular Diagnostics

> To have our own large sequencing panel that serves as a flagship genomic screen for national institutions represents a new era for NYU Langone."
>
> **—Matija Snuderl, MD**

The gene panel will be used as a foundation for detailed cancer investigations, with findings then translated into basic science studies that could lead to therapeutic targets. Eventually the panel could be used to screen all cancer patients and offered as a service to regional medical centers that lack such diagnostic resources. "To have our own large sequencing panel that serves as a flagship genomic screen for national institutions represents a new era for NYU Langone," says Dr. Snuderl.

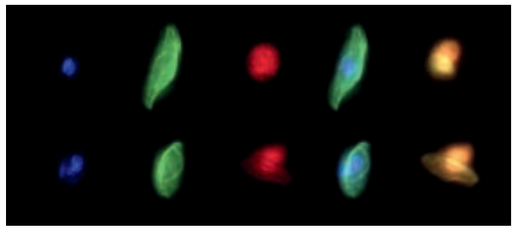
Two additional novel screens developed by Brain Tumor Center researchers are being reviewed for approval by New York State. One, a sequencing panel that looks for nearly 100 specific gene fusions that drive tumor growth, can help to identify treatments for individual cancers; the other examines the DNA methylation profile of brain tumors to identify specific subtypes. "We will be the first certified lab in the United States to use epigenetic profiling and machine learning to diagnose brain cancers," says Dr. Snuderl. "These screening tools represent important milestones in our efforts to better align brain tumors with their most effective treatments."

New Expertise Refines Center's Clinical, Research Emphasis

The Brain Tumor Center has reaffirmed its commitment to forward-thinking patient care with the addition of Erik P. Sulman, MD, PhD, co-director of the Brain Tumor Center and vice chair of Research in the Department of Radiation Oncology. Dr. Sulman brings deep experience combining radiation planning with advanced imaging and immuno-oncology to achieve maximum treatment benefit for patients, thus expanding the center's armamentarium of cutting-edge radiation treatment modalities.

Dr. Sulman will adapt the center's translational research programs to target critical problems associated with brain tumor treatment, such as expanding the center's investigations into neuro-psychological approaches to counter the effects of radiation and chemotherapy. "It is thought that there may be genetic predictors associated with these neuro-cognitive effects," he explains. "Exploring these factors will align our laboratory research with our clinical focus."

Traditionally, therapeutic outcomes have been emphasized, notes Dr. Sulman, but the goal at NYU Langone is to round out the patient experience with the addition of multidisciplinary services including psychiatric care, rehabilitative medicine, integrative medicine, and palliative care. "The idea is to address the overall brain health of the patient with a combined approach focused on both tumor control and patient well-being," he says.



Molecular pathologists use DEPArray™ to identify and capture tumor cells on a single-cell level, enabling in-depth molecular analyses.

Complex Case

Surgical Collaboration Yields Transformative Outcome for Long-Term Spinal Deformity

When a patient with a history of adolescent idiopathic scoliosis developed proximal junctional kyphosis as a result of previous surgery, she turned to experts at NYU Langone Health's Spine Center for surgical consultation. The multidisciplinary team, drawing on its extensive neurosurgical and orthopedic expertise in complex spinal reconstructions, developed a radical, innovative surgical solution to correct her long-standing deformity.

Michael L. Smith, MD (Photo credit: Juliana Thomas Photography)

Complex Case: Surgical Collaboration Yields Transformative Outcome for Long-Term Spinal Deformity

REDESIGNING THE SPINE TO CORRECT A LONG-STANDING DEFORMITY

A 57-year-old woman with a long, complex history of spinal deformity and surgery presented with worsening head drop, neck and upper back pain, numbness, and loss of horizontal gaze. She had undergone Harrington rod placement for scoliosis as an adolescent, later developing proximal junctional kyphosis at T5. Although some improvement was initially achieved with a pedicle subtraction osteotomy (PSO) at T4 with posterior spinal fusion from T1 to T10, subsequent progression of recurrent C7-T1 kyphosis had resulted in severe pain and functional disability.

The patient's major structural problems demanded far more than a traditional PSO, typically done at C7. "The geometry of this bone limits any potential correction," explains Themistocles S. Protopsaltis, MD, associate professor of orthopedic surgery and neurosurgery. "This patient needed part of the bone removed, the vertebral column resected, and her head repositioned, since her chin had fallen to her chest—and we were able to draw on our extensive body of research to meticulously plan the perfect alignment."

A T2 vertebrectomy with dorsal placement of an expandable cage was identified as the safest approach to correcting the deformity. This nontraditional strategy would help to circumvent the risks of paralysis from spinal cord injury and hand weakness from C8 nerve injury. "With this approach, we could reduce the potential for a disabling neurological injury while increasing the space available for us to fully correct the spinal alignment," says Michael L. Smith, MD, assistant professor of neurosurgery.

Michael L. Smith, MD; Themistocles S. Protopsaltis, MD; Anand Segar, MD (Photo credit: Juliana Thomas Photography)

CAREFUL PLANNING AND CLOSE COLLABORATION GUIDE DELICATE SPINAL REALIGNMENT

The surgical plan was essentially to reconstruct the patient's failing spine architecture by disconnecting and then reconnecting her cervicothoracic spine.

To begin, the patient was placed in the prone position on the operating table, and the vertebral column was exposed, including the previously placed spine instrumentation. After removal of the rods, previously placed pedicle screws were replaced from T1 to T10 to achieve good purchase and new screws were placed from C2 to C7.

A wide laminectomy was performed, with careful dissection of scar tissue from the dura to expose the thecal sac. Circumferential decompression of the spinal cord allowed visualization of any spinal nerve impingement prior to performing the correction. "Our goal was to ensure that at the critical moment when we did the alignment correction, there would not be any compression that could put the spinal cord at risk," notes Dr. Smith.

Temporary stabilizing rods were placed, and the transverse processes were removed before resection of the posterior lateral bony elements and bilateral T2 pedicles. Careful dissection around the T2 vertebral body to the ventral midline was achieved without injury to the soft tissue structures and the great vessels. The vertebrectomy was performed from inferior T1 to the superior T3 endplates, the epidural plane was opened, and the posterior longitudinal ligaments were tamped into the defect. A titanium expandable cage was placed and packed with bone graft harvested from the iliac crest.

To close the osteotomy, the Mayfield head holder was released and repositioned while spinal instrumentation was used simultaneously to apply correction forces. These maneuvers placed the patient's cervicothoracic spine into ideal alignment. A five-rod construct was placed across the vertebrectomy, with fixation spanning T10 to C2, including C2 pedicle and laminar screws and thoracic pedicle screws. Intraoperative imaging confirmed adequate reconstruction before arthrodesis was performed from C2 to T3. There were no changes in intraoperative neuromonitoring, with motor function confirmed before the patient was extubated and transferred to recovery.

Preoperative imaging shows the structural problems causing the patient's functional decline.

Postoperative imaging shows that the deformity has been corrected and the patient now has normal alignment.

"By taking the correction down to a lower level, we were able to achieve the radical correction needed to address this patient's profound deformity," Dr. Protopsaltis explains. "With our detailed preoperative planning we attained the necessary deformity correction and the anterior column lengthening using a high-grade osteotomy and the expandable device."

SHARED EXPERIENCE REDUCES OPERATIVE RISK TO CORRECT COMPLEX DEFORMITY

Vertebral column resection is a long and challenging surgical procedure, and the extraordinary complexity of this particular case required a critical combination of expertise, planning, and collaboration in executing the plan. With the deformity corrected, the patient now walks with normal alignment and is able to look left and right with a more typical horizontal gaze, without any loss of neurological function.

"In the case of a major spinal deformity and alignment loss like this one, there are no intermediate options—a technically challenging reconstruction drawing upon our shared experience was needed to get her standing upright again," says Dr. Smith. "Fortunately, our experience and expertise enabled us to provide her with a definitive solution."

New Technologies Target the Brain to Control Movement Disorders

New technologies pioneered at NYU Langone Health are helping clinicians home in on brain areas at the root of symptoms that accompany neurological disorders. With advances in deep brain stimulation (DBS), treatments are becoming more targeted, personalized, and effective.

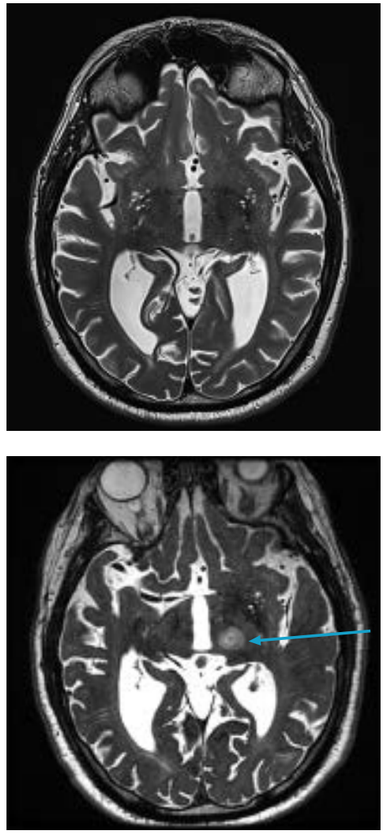
Alon Y. Mogilner, MD, PhD, and Michael H. Pourfar, MD

PIONEERING CUTTING-EDGE TECHNIQUES TO COUNTER ABNORMAL BRAIN SIGNALS

In the past year, the NYU Langone Center for Neuromodulation added high intensity focused ultrasound (HIFU) to its suite of noninvasive approaches that counter abnormal brain signals associated with essential tremor, becoming one of only two facilities in New York State that offer the procedure. The promising technology sends a focused ultrasound beam from an external transmitter into the brain to destroy the neural tissue causing unwanted motor symptoms.

"We've already had great results using HIFU to treat a small number of essential tremor patients, and we now have a waiting list of patients seeking treatment," says center co-director Alon Y. Mogilner, MD, PhD, associate professor of neurosurgery and anesthesiology. "Following the procedure, symptoms improve immediately—and the data have shown that HIFU treatment is both safe and highly effective in the long term."

Because it can be used on only one hemisphere of the brain, HIFU is used to treat essential tremor occurring on the more affected side of the body. "These patients often suffer from tremors in their dominant hand that challenge their ability to shave, apply makeup, drink, or sign a check—but HIFU treatment helps them regain those functions," says the center's other co-director, Michael H. Pourfar MD, assistant professor of neurosurgery and neurology. "We're seeing a reduction in symptoms in the range of 70 percent, making this an effective option for patients who aren't candidates for deep brain stimulation implantation because of age or medical risk or because they simply don't want DBS surgery."



Above: Pre-procedure MRI

Below: An MRI after the HIFU procedure shows the lesion in the thalamus.

150+
DBS IMPLANTATIONS
performed in 2018 for patients with Parkinson's disease, essential tremor, and other movement disorders

270+
NEUROMODULATION PROCEDURES
performed in 2018

New Technologies Target the Brain to Control Movement Disorders

To confirm that symptoms can be reduced without unwanted side effects, physicians precisely map the brain area, and then apply test doses of HIFU to produce a temporary lesion. Once the target is confirmed, the patient receives multiple 30-second treatment doses inside an MRI machine in an outpatient procedure that takes just a few hours to complete. "It's pretty remarkable to have somebody come in with a tremor they've had for 20 years, then return home the same day with the tremor taken care of," notes Dr. Mogilner.

Use of HIFU for essential tremor has been approved by Medicare, and private insurance companies are expected to follow suit within the next year. The procedure's applications could expand considerably as clinical trials explore its use for symptoms associated with other neurological disorders, such as motor function in individuals with Parkinson's disease.

> "It's pretty remarkable to have somebody come in with a tremor they've had for 20 years, then return home the same day with the tremor taken care of."
>
> **—Alon Y. Mogilner, MD, PhD**

Alon Y. Mogilner, MD, PhD, and Michael H. Pourfar, MD

Alon Y. Mogilner, MD, PhD

NEXT-GENERATION DBS DEVICES ENHANCE TARGETING AND EXPAND TREATMENTS

NYU Langone has played a leading role in testing and evaluating two novel DBS devices, contributing to their recent approval by the FDA and advancing them toward more mainstream use. The devices' electrodes enable more finely tuned targeting of electrical current to the desired brain regions, providing more precise treatment for patients' conditions and symptoms.

Center clinicians play a leading role in the evaluation of new devices as they evolve, informing their development by refining the understanding of which device works best for each indication. For example, the directional targeting capabilities of newer DBS devices can be useful for patients prone to DBS side effects, while the proven reliability and MRI compatibility of the traditional device is preferred for the center's pioneering use of DBS for patients with Tourette syndrome. "There is no 'best' DBS approach," says Dr. Mogilner. "But there are more options now, which is why we will continue to keep pace as the technology evolves and lead the conversation that helps make these devices even better."

Collaborating with Neuroscientists to Elucidate Brain Structures

A novel OR-based collaboration with NYU Langone neuroscientists is harnessing open access to the brain's firing patterns, enabled by DBS implantation, to shed new light on the mechanisms behind hearing and speech. "Our patients are awake during the brain mapping process," says Dr. Pourfar. "So, while we evaluate the firing patterns of specific neurons related to motor disorders, neuroscientists are able to take advantage of this unprecedented open brain access in awake patients by asking them to perform tasks that reveal how the brain engages in functions such as sound interpretation and decision making."

Select Publications

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29	40+	$6.1M
FULL-TIME FACULTY	ONGOING CLINICAL TRIALS	GRANT FUNDING AWARDED IN 2018

Awards & Recognition

Anthony K. Frempong-Boadu, MD
has been appointed co-director of NYU Langone Health's Advanced Spinal Imaging & 3-D Surgical Navigation Program, an imaging-based research and development initiative.

John G. Golfinos, MD
gave the honorary graduation address and was a visiting professor at Barrow Neurological Institute in Phoenix, Arizona, and was a visiting professor at Weill Cornell Medicine in New York City.

David H. Harter, MD
is president elect of the New York State Neurosurgical Society.

Douglas S. Kondziolka, MD
was appointed associate editor of the *Journal of Neurosurgery* and is treasurer of the American Academy of Neurological Surgery and both head of Oral Examination for and director of the American Board of Neurological Surgery (ABNS).

Dimitris G. Placantonakis, MD, PhD
has been appointed associate editor of *Oncogene*, was appointed to the American Association of Neurological Surgeons/ Congress of Neurological Surgeons Section on Tumors Executive Committee, and has three active research grants, including one R01.

NYU Langone Health

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#15

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#3

IN THE NATION

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Bernard A Birnbaum, MD
Quality Leadership Award
2018 Winner
vizient.

5

CONSECUTIVE YEARS

of top ranking for overall patient safety and quality of care

ANNOUNCING

Tuition-Free Initiative Addresses High Student Debt

NYU School of Medicine announced in August 2018 that it will begin offering full-tuition scholarships to all current and future students in its MD degree program regardless of need or merit—a bold effort to simultaneously address the rising costs of medical education and still attract the best and brightest students to careers in medicine. "This decision recognizes a moral imperative that must be addressed, as institutions place an increasing debt burden on young people who aspire to become physicians," says Robert I. Grossman, MD, the Saul J. Farber Dean of NYU School of Medicine and CEO of NYU Langone Health.

(Photo credit: Juliana Thomas Photography)

Visit **med.nyu.edu/school** for more information.

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270+

NEUROMODULATION PROCEDURES
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7

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