

INNOVATIONS IN NEUROSCIENCES



UH Neurological Institute Has a Brain-Specific Mission

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Improved
treatment for
ischemic strokes

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Specialized care
for traumatic
brain injuries

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First auditory
brainstem
implant
in region

A NEW LOOK AT BRAIN HEALTH

The news media have helped to heighten awareness of sports-related brain injuries in athletes of all ages and have raised concerns in the general population. But awareness is only the starting point for maintaining brain health. The care model used at University Hospitals Neurological Institute includes three key components: Integrate, Individualize and Innovate. Tying these components together makes it possible to optimize the care of patients at risk for or suffering from brain injuries.

This issue of Innovations in Neurosciences describes the latest enhancements to our treatment model.

- The cover story focuses on the mission of the UH Neurological Institute to promote, protect and restore brain health. This includes an overview of our Comprehensive Stroke Center certification and integration of stroke care across all hospitals in the system.
- The feature story on page 6 describes the new Traumatic Brain Injury Center. The new TBI Center provides a single point of entry into the UH system for patients with any degree of traumatic brain injury.
- In the case study feature, specifics about the first patient in Northeast Ohio to receive an auditory brainstem implant are described. The surgery enables individuals who have suffered damage to the cochlear nerve to enter the hearing world.

- The latest innovations in stroke care are described in the research story on page 3. Neuroimaging is helping to better identify patients who might have vulnerable, but still salvageable brain tissue as far out as 24 hours from the onset of their stroke.

Please visit **UHHospitals.org** to learn more about our specialists, our services and our community facilities, which are available throughout Northeast Ohio to serve you and your patients.



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IMPROVED TREATMENT FOR ISCHEMIC STROKES

Upcoming DAWN trial may improve access to stroke therapy for patients with severe strokes

"Ischemic stroke is the most common type of stroke, and patients with blockages of large arteries are at highest risk of death and disability," says **Cathy Sila, MD**, Director of the Comprehensive Stroke Center at University Hospitals Neurological Institute. "Our current standard treatment is intravenous tPA, the 'clotbuster' drug, but this needs to be given within the first few hours of stroke symptoms," she says. "Unfortunately, fewer than 25 percent of stroke victims are seen soon enough to be eligible for tPA. Also, tPA may not be strong enough to dissolve a large clot and reopen the artery to prevent brain damage."

Standard computed tomography (CT) scans cannot detect stroke damage for several days. "Currently, physicians must rely on their clinical judgment to make a diagnosis of an acute stroke. If we wait until the CT scan shows a stroke, we are too late, as the brain tissue is already damaged," says Dr. Sila. "Although we use strict time criteria to determine eligibility for tPA therapy, some people have more tissue resistance or collateral blood flow and are actually candidates for treatment for potentially longer periods of time."

INNOVATIONS IN TESTING FOR TISSUE DAMAGE

Jeffrey Sunshine, MD, PhD, Vice Chairman of Radiology at UH Case Medical Center, and Professor of Radiology and Assistant Professor of

Neurology at Case Western Reserve University School of Medicine, has been researching better and faster ways to diagnose and treat stroke for years. "In 1999, he and **Robert Tarr, MD**, Head of Neuroradiology at UH Case Medical Center and Professor of Radiology and Neurosurgery at Case Western Reserve University School of Medicine, reported on the use of ultrafast MRI brain scans to guide physicians in emergency decision-making for stroke victims," says Dr. Sila. The protocol focused on diffusion-weighted imaging (DWI) and magnetic resonance angiography (MRA) to detect a blockage in a major brain artery. "This is essentially the protocol that has been selected for the new DAWN trial," she says.

INVESTIGATING BEYOND THE TIME WINDOW

The DAWN (DWI or CTP Assessment with Clinical Mismatch in the Triage of Wake Up and Late Presenting Strokes Undergoing Neurointervention) trial will investigate the safety and benefit of opening a blocked brain artery in select patients with acute stroke up to 24 hours after symptom onset. The trial will enroll up to 500 subjects from 50 Comprehensive Stroke Centers worldwide. "The trial could have significant implications if the treatment is successful, as many more stroke victims could be candidates for life-saving treatment," says Dr. Sila.

All DAWN trial patients will undergo special imaging studies with either an MR DWI or, if not a candidate for MRI, a CT scan sequence with perfusion (CTP) to determine whether brain tissue is still viable. If there is no evidence of significant tissue damage, the patient will be randomized to either an endovascular procedure with thrombectomy to open the clogged artery with maximal medical management, or maximal medical management alone. "With a major stroke where the artery remains blocked, about one-fifth of patients regain the ability to walk, but successful thrombectomy and restoration of blood flow to viable brain tissue increases this to about two-thirds," says Dr. Sila.

The Trevo retriever device has been selected for use in this study. "It is already approved for restoring blood flow by removing a clot within eight hours of stroke symptom onset, including among patients who are not eligible for tPA or fail to respond to tPA therapy. We want to push the envelope for stroke victims as far out as 24 hours from the last time they were seen well. Fewer than half of patients are even seen within 12 hours of their stroke."

FOR MORE INFORMATION

To access the Stroke Team at University Hospitals Case Medical Center 24/7 for patient transfers or urgent advice, call **216-844-1111**.



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A Brain-Specific Mission

UH Neurological Institute delivers innovative and integrated care for a wide range of disorders

“To promote, protect and restore brain health.” That’s the mission of University Hospitals Neurological Institute, says Director **Warren R. Selman, MD**.

“There has been a shift in thinking about brain health,” adds Co-Director **Anthony J. Furlan, MD**. “Not only are we treating brain injury and disease, but we are now emphasizing prevention and restoration,” he says. For example, promoting both physical and mental exercise in patients with memory loss is the new trend.

“Neurological care of patients is standardized across all hospitals in the system, which means that the same protocols, including post-discharge care, are followed independent of the admitting hospital,” says Dr. Furlan. Collaborations between Case Western Reserve University and UH are designed to maximize the disciplines on campus to develop innovative therapies. Outside the UH system, the neurology team collaborates with Cleveland-area schools to create awareness of brain health beginning at an early

age. This collaboration has led to pre-season baseline testing of student athletes who are at increased risk of traumatic brain injury, such as concussion.

SPOTLIGHT ON STROKE

“Hospitals in Cleveland have a long history of providing comprehensive stroke care. In the late 1990s, the hospital and emergency management system protocols were organized at the city level,” says Dr. Furlan. The UH stroke program is the most experienced in the city. Two years ago, UH was awarded Joint Commission Comprehensive Stroke Center certification, which is awarded to only about 100 centers across the country. UH was the first center in Northeast Ohio to meet the core requirements needed to receive the certification.

Comprehensive certification requires that the stroke center provide a wider continuum of services than those available at a Primary Stroke Center. “For example, a Primary Stroke Center can administer tissue plasminogen activator but cannot perform aneurysm coiling,” says Dr. Selman. UH makes sure that as new hospitals merge into the system, each has a Director of Stroke Care and receives Primary Stroke Center certification.

FUNCTIONAL AND RESTORATIVE NEUROSURGERY

The UH neurosurgery team is working on the leading edge of patient care and developing innovative ways to restore brain function. An emerging area of care is called “circuit descriptions.” Neural circuit malfunctions are associated with several diseases, such as Parkinson’s disease, epilepsy, severe depression and other psychiatric conditions, traumatic brain injury and memory loss.

“By more completely describing the neural circuits in

The UH Neurological Institute offers 15 centers of excellence focused on investigating and developing advanced treatments for neurological disorders. To request an appointment with a specialist at UH, call **216-844-2724**.

the human brain, we hope to learn more about their function and develop new treatment options,” says Dr. Furlan. The UH Neurological Institute has several NIH grants supporting investigations into brain circuitry.

Neurosurgery also partners with other disciplines. The multidisciplinary team includes experts in neurology, biomedical engineering and neuropsychology. Biomedical engineers help surgeons determine where to place deep brain stimulator electrodes. Neuroimaging, including intraoperative MRI, is essential to provide the best care. Brain fiber tracks or “circuits” are mapped to provide a sophisticated pre-operative evaluation that will provide the safest surgical route. Novel techniques such as MR fingerprinting are being applied in patients with neurological conditions.

BRAIN TUMOR AND EPILEPSY

“Most brain tumors are treated by surgical excision,” says Dr. Furlan. Unfortunately, it is often difficult to visually differentiate tumor tissue from normal tissue during surgery. To aid the surgeon, an imaging technique called “painting the tumor” is used to create a fluorescent glow in the tumor tissue. Another process for treating brain tumors is known as laser interstitial thermal therapy. Transducers, placed directly within the tumor or a specific target region, use heat to destroy tumor cells. “This technology can reach tumor cells that are deep in the brain tissue,” says Dr. Selman.

New techniques in the delivery of chemotherapy are also under investigation. Although direct instillation of chemotherapy into a tumor has not been particularly successful, viral vectors that carry chemotherapy to the target tissue appear to have promise.

BRAIN HEALTH AND MEMORY

There are at least 15 clinical trials under way at UH to investigate new therapies for patients experiencing memory loss, such as with Alzheimer’s disease. These trials use amyloid labeling, and some are testing agents that can rid the brain of amyloid plaques. More recently, research has suggested an association between prions and both Parkinson’s and Alzheimer’s diseases.

“Prion disease is responsible for bovine spongiform

FURTHER INNOVATIONS

The expertise of the UH Neurological Institute extends beyond stroke, brain tumors and epilepsy. UH has the largest mood disorders treatment program in the country. Investigations into obsessive compulsive disorder and severe depression are also under way. UH has also been successful in treating Tourette’s syndrome with deep brain stimulation.

encephalopathy, also known as ‘mad cow disease,’” says Dr. Furlan. Prion diseases cause proteins in brain tissue to misfold, preventing them from performing their normal function. Since 1997, the National Prion Disease Pathology Surveillance Center at Case Western Reserve University has gathered data to aid in early identification and treatment of these conditions.

Another frequent cause of memory loss is traumatic brain injury. Concussions are a risk in all sports, from the professional level to childhood games. The goal of therapy is to restore brain health, reintegrate patients back into society and return them to their usual daily activities.

“Concussions are not mild little things to be shaken off,” says Dr. Furlan. Concussion treatment requires time for the brain to recover. That means rest and recuperation. Patients need a safe environment, no contact sports and rest. If the patient starts concentrating again too soon after a concussion, symptoms may recur. Multiple or recurrent concussions may lead to the development of chronic traumatic brain injury. In these cases, the UH Neurological Institute offers individualized programs for cognitive rehabilitation.



S. ALAN HOFFER, MD

Director of the Traumatic Brain Injury Center, Co-Director of the Reinberger Neuroscience Intensive Care Unit, University Hospitals Case Medical Center; and Assistant Professor of Neurosurgery, Case Western Reserve University School of Medicine

SPECIALIZED CARE FOR TBIs

New center provides a multidisciplinary approach to traumatic brain injuries

Diagnosing and treating patients with traumatic brain injury (TBI) requires a multidisciplinary team – including neurosurgeons, neurologists, neuropsychologists, neuroimaging experts and occupational and physical therapists. That's why University Hospitals launched its Traumatic Brain Injury Center in late 2014.

"About 1 to 1.5 million cases of traumatic brain injury (TBI) are reported each year in the United States," says **S. Alan Hoffer, MD**, Director of the Traumatic Brain Injury Center and Co-Director of the Reinberger Neuroscience Intensive Care Unit at University Hospitals Case Medical Center. "The diagnosis requires investigation into subtle changes," says Dr. Hoffer, "using the right tests."

A COMPLICATED DIAGNOSIS

Diagnosing TBI is far more complex than simple patient observation, says Dr. Hoffer. For one thing, many patients don't seek immediate medical attention and only present to their primary care physician as latent symptoms emerge. When that's the case, the link between injury and symptoms may not be easily correlated.

Of those who do present to an emergency department (ED), about 25 percent have injuries severe enough to require hospitalization in the intensive care unit (ICU). The other 75 percent have less severe injuries, but may still require hospitalization.

Rather than just a physical space, the Traumatic Brain Injury Center at UH is an integrated effort to provide coordinated care for any form of TBI.

To ensure the proper diagnosis is made, the TBI Center has two neuropsychologists available to perform advanced testing. The Center's multidisciplinary team steers the patient to the right testing and treatment needed to help prevent further problems and maximize functional performance.

"Following TBI, most people think that a patient is okay if they are walking and talking," says Dr. Hoffer. But that isn't necessarily true. Patients may develop cognitive or memory issues over time, suffer from headaches or experience other more subtle changes that affect their daily lives. At a minimum, Dr. Hoffer says, all patients with TBI need to take a break from their usual routine to give the brain a rest. Just avoiding the sport or activity associated with the injury is not enough to allow the brain time to recover.

COORDINATED CARE

Rather than just a physical space, the Traumatic Brain Injury Center at UH is a multidisciplinary, integrated effort to provide coordinated care for any form of TBI. In the past, there have been several areas of expertise within UH for treating TBI, including neurosurgery, neuro-intensive care, sports medicine and neuropsychology.

Rehabilitation services for TBI, similar to those needed for other types of brain injury, such as stroke, are already in place. Although these services have been offered in the past, they were never integrated into a single coordinated effort until now. Another key aspect of the TBI Center is the creation of a single path of entry. Patients are able to bypass the emergency department in order to get evaluated and treated more quickly.

The Center has both inpatient and outpatient capacity. With 14 ICU beds and dozens of other inpatient beds now available, the hope is to add five more ICU beds within the next year. Plans for community outreach are in place, including contact with primary care physicians and sports medicine facilities to help identify patients who may need TBI care.

In addition to the standard physical and occupational therapies, the TBI Center also includes a special branch for cognitive evaluation and training. As with any injury, "patients ultimately want to know if the symptoms will go away and, if not, how they can learn to live with them," says Dr. Hoffer.

To refer your patient or schedule a consultation, call **216-844-2724** or **866-UH4-CARE** (866-844-2273).

**NICHOLAS BAMBAKIDIS, MD**

Director, Cerebrovascular and Skull Base Surgery, UH Neurological Institute, UH Case Medical Center; and Professor and Vice Chair for Clinical Affairs in the Department of Neurological Surgery, Case Western Reserve University School of Medicine

FIRST AUDITORY BRAINSTEM IMPLANT IN REGION PERFORMED AT UH

INDIVIDUALIZING A LIFE-CHANGING SURGERY

Cochlear implants have been used for more than 20 years to improve hearing. However, “people without a cochlear nerve do not benefit from this type of implant,” says **Nicholas Bambakidis, MD**, Director of Cerebrovascular and Skull Base Surgery, University Hospitals Neurological Institute, UH Case Medical Center.

For patients who lack a cochlear nerve, an auditory brainstem implant (ABI) can instead be surgically placed. The ABI is implanted in the brainstem nucleus, ensuring that the exact placement will directly stimulate the cochlear nuclei. This type of complex neurosurgery is indicated for people with rare genetic auditory tumors, as well as for those who have congenital deafness, which is not uncommon.

ABI surgery has been around for several years, but only a few centers in the United States have the resources to make the procedure available to patients. Most centers offering ABI are located in major cities, such as Los Angeles and New York, making it necessary for patients to travel a great distance to receive care.

Earlier this year, a patient underwent successful ABI surgery at UH. “To our knowledge, this was the first ABI procedure in Northeast Ohio,” says Dr. Bambakidis.

Dr. Bambakidis implanted the device in the patient’s brainstem, assisted by **Cliff Megerian, MD**, and **Maroun Semaan, MD**. Dr. Megerian holds the

Richard and Patricia Pogue Chair in Auditory Surgery and Hearing Sciences and is Chairman of Otolaryngology-Head and Neck Surgery at UH Case Medical Center. He is Professor of Otolaryngology at Case Western Reserve University School of Medicine. Dr. Semaan is Associate Director of Otology, Neurotology and Balance Disorders at UH Case Medical Center; and Assistant Professor of Otolaryngology at Case Western Reserve University School of Medicine.

“The surgical procedure is very intricate, and involves close collaboration with the audiologist,” says Dr. Bambakidis. The procedure included implanting both the brainstem implant and an external receiver/stimulator placed behind the ear, similar to a cochlear implant, to manage the device after surgery. During surgery, the implant was tested to ensure proper placement in the brainstem and functionality of the implant and receiver/stimulator. “Intraoperative testing is 90 percent predictive that the device will function appropriately when turned on,” says Dr. Bambakidis.

For the patient who received the first ABI at UH, the surgery went well. Although testing was performed during surgery, the implant was not turned on in the immediate postoperative period, allowing the surgical site time to heal before further stimulating the area. The implant will eventually be encapsulated by fibrous tissue, adhering it against the brainstem.

The patient’s implant was activated six weeks after surgery, and her doctors report that she is hearing well. “Moving from deafness to hearing is a life-changing experience for the patient and her family,” says Dr. Bambakidis. The hope is that the patient will continue to adapt well to the hearing world.

A TEAM APPROACH

The UH Audiology Department is responsible for patient selection, training and long-term follow-up. Auditory surgeons are vital for planning and assisting in ABI surgery.

REFER YOUR PATIENT. To refer a patient for ABI surgery or consult with a physician, call 216-844-1111 or 800-421-9199.

UH NEUROLOGICAL INSTITUTE

Ranked by U.S. News & World Report as one of the nation's top programs, University Hospitals Neurological Institute delivers innovative, integrated and individualized care to patients with diseases affecting the nervous system.

Our multidisciplinary team of neurosurgeons and neurological specialists provides treatments for a wide variety of diagnoses, including stroke, brain tumors, epilepsy, Parkinson's, Alzheimer's, spine and pain disorders, and more.

Experts in neurology, neurosurgery, neuroradiology and other specialties promote, protect and restore brain health through 15 Centers of Excellence:

- Brain Health & Memory Center
- Brain Tumor & Neuro-Oncology Center
- Community Neurology Center
- Comprehensive Stroke Center
- Epilepsy Center
- Functional & Restorative Neurosurgery Center
- Movement Disorders Center
- Music & Medicine Center
- Neurocritical Care Center
- Neurological & Behavioral Outcomes Center
- Neuromuscular Center
- Neuropsychiatry Center
- Neuroscience Nursing Practice Center
- Spinal Neurosurgery Center
- Traumatic Brain Injury Center

To learn more about the UH Neurological Institute, visit UHhospitals.org/neuro.

PHYSICIAN RESOURCES

Adult Neurosurgery Referrals

Call **216-844-2724**.

Pediatric Neurosurgery Referrals

Call **216-844-PEDS (216-844-7337)**.

24/7 Transfers and Urgent Consultations

Call **216-844-1111** or **1-800-421-9199**.

Physician Advice Line

Call **216-844-1001** for advice on adult patients.

Call **216-844-2362** for advice on pediatric patients.

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University Hospitals Case Medical Center and Case Western Reserve University School of Medicine are consistently recognized as two of the premier institutions in the nation, according to U.S. News & World Report's annual rankings.

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