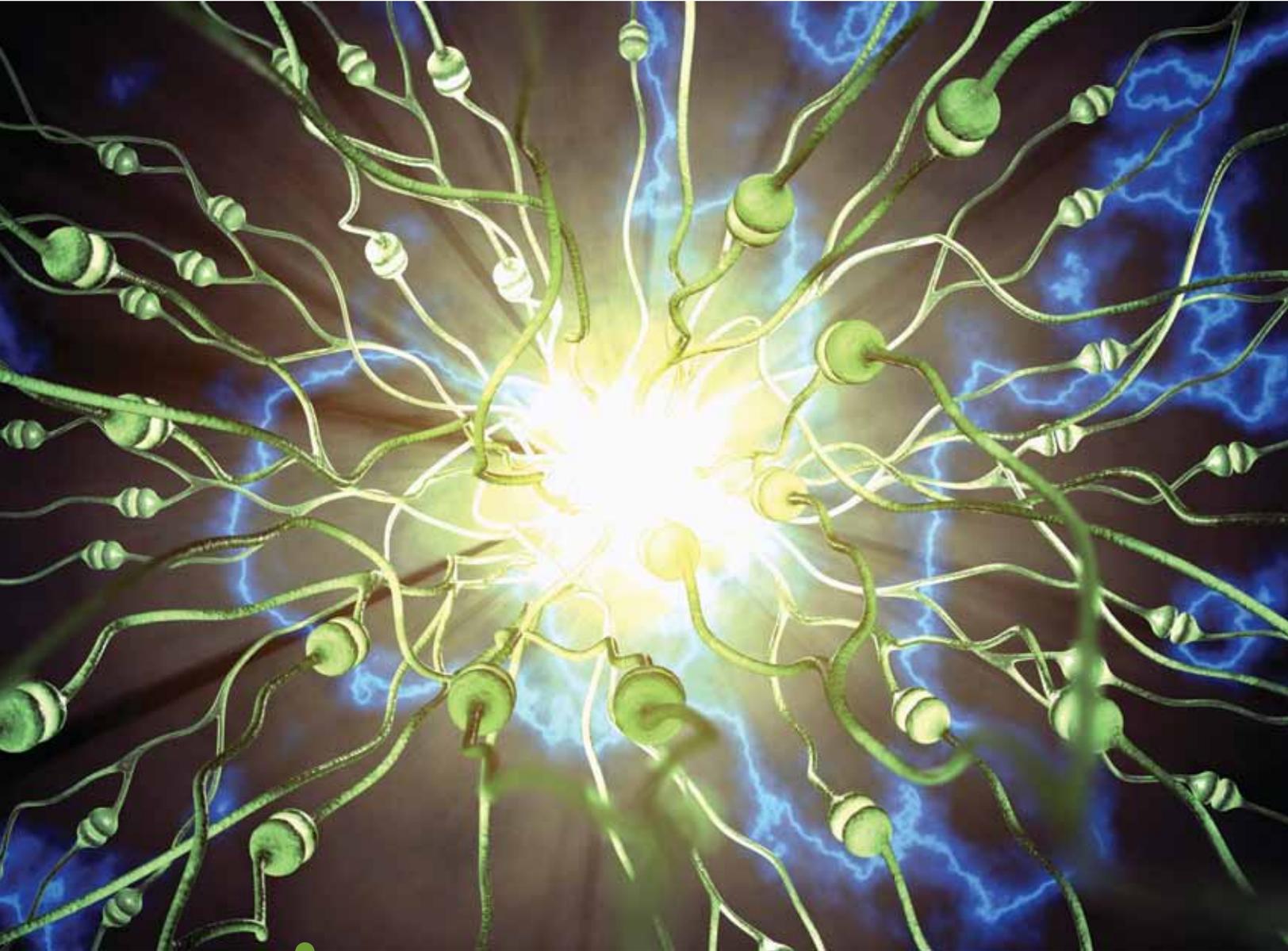


ROUNDS

HARTFORD HOSPITAL'S WELLNESS MAGAZINE



Brain Storm

How epilepsy specialists fix faulty circuits in the brain

Hartford Hospital already has a renowned Stroke Center with advanced technologies, so a state-of-the-art epilepsy center was the next logical step.

Epilepsy Facts

- *Epilepsy is a neurological condition that affects the nerve cells (neurons). When all the neurons erupt at once, disjointed bursts of energy overwhelm the brain.*
- *An estimated 18,000 people in central and northern Connecticut—plus another 11,000 around the state—have been diagnosed with epilepsy.*
- *Nearly 9,700 north-central Connecticut residents have “medically refractory epilepsy” and aren’t seizure-free despite treatment with antiepileptic drugs.*
- *Surgery could help 2,000–3,000 people in the Hartford region with medically refractory (treatment resistant) temporal lobe epilepsy.*
- *“Tonic-clonic” seizures (formerly called grand mal seizures) are a type of generalized seizure that affects the entire brain.*
- *“Absence” seizures (formerly called petit mal seizures) look like someone is staring off into space.*
- *One-third of people with epilepsy suffer accidental injury each year.*
- *Recurrent seizures lead to “kindling” (an increased probability of having more seizures).*
- *More than three million Americans have been diagnosed with epilepsy.*

The brain contains an estimated 100 billion nerve cells that flash ideas through the cerebral cortex at lightning speed. Nerve cells, or *neurons*, release electrical pulses that zip around the brain delivering messages to the spinal cord, muscles and nerves.

The neuron’s powerhouse is the *axon*, whose radiating branches unleash tiny jolts that shoot electrical signals from one nerve cell to the next. Neurotransmitters smooth the biochemical pathway as axons fire and impulses jump the gaps between nerve cells. The brain’s electrical system effortlessly directs every thought and action.

Sudden surges

Seizures strike the brain like an electrical storm. When all the neurons start erupting at once, disjointed bursts of energy jam the signals and overwhelm the brain. Neurons fire wildly and the seizure can disrupt “eloquent” regions of the brain involving important functions such as speech, movement and even consciousness. Epilepsy most often strikes the temporal lobe of the brain.

A chronic neurological disorder characterized by recurrent seizures, epilepsy afflicts about one percent of the population, or three million Americans. Up to 30 percent of all kids diagnosed with an autism spectrum disorder develop epilepsy. An estimated 60 million people worldwide suffer from the condition, with approximately 70,000 new cases of epilepsy diagnosed each year in the United States.

“Epilepsy is a common neurological disorder,” says Hartford Hospital neurologist Erica A. Schuyler, M.D., whose clinical training and expertise in interpreting brain wave activity help her to see subtle clues that can find the origin of a patient’s seizures even when the patient is not having a seizure. “In addition to tonic-clonic (grand mal) seizures or convulsions, seizures can present with a wide variety of clinical symptoms such as sensation of déjà vu, twitching on one side of the body, acting confused, or having difficulty speaking.” Rather than dramatic episodes, many people who develop epilepsy in childhood experience “absence” seizures, short attention blackouts that look to an observer like nothing more than daydreaming.

“People with poorly controlled epilepsy are embarrassed when they have a seizure in front of their coworkers,” adds Brendan D. Killory, M.D., director of Epilepsy and Functional Neurosurgery at Hartford Hospital. “About a third of epilepsy sufferers are accidentally injured each year. Epilepsy is associated with reduced quality of life, psychiatric problems, decreased likelihood of marrying and having children, lower education status, lower employment rates and inability to drive.”

Why a disease that is so common continues to be stigmatized is a puzzling dilemma. For decades, epilepsy was a secret, almost shameful affliction. In the popular imagination, the disease has often been linked with the mystical visions of tyrants and saints. Epilepsy famously afflicted Julius Caesar and the novelist Fyodor Dostoyevsky.

Erica Schuyler, M.D.

Erica A. Schuyler, M.D., a Hartford Hospital neurologist, is board-certified in Neurology and Clinical Neurophysiology. Her clinical experience and specialized training in electroencephalography (EEG) provide special expertise in the treatment of epilepsy.

She earned her undergraduate degree at Wesleyan University and her medical degree from Johns Hopkins University in 2003. She completed her residency in Neurology at the University of Michigan Health System in 2007, followed by fellowship training at the University of Michigan Health System in Clinical Neurophysiology (epilepsy) in 2008 and an additional year of advanced training in epilepsy/EEG in 2009.

A native of Massachusetts, she was excited to settle in New England with her husband, originally from New Jersey, when she joined Hartford Hospital in 2009. They are the parents of two boys, age four and nine months.



Center of excellence

Hartford Hospital is creating a multidisciplinary Neuroscience Center to treat the estimated 18,000 central and northern Connecticut residents—plus another 11,000 from the southern and northwest regions of the state—who have been diagnosed with epilepsy. Nearly 9,700 of them have “medically refractory epilepsy,” which means they don’t have complete seizure control despite treatment with antiepileptic drugs.

Hartford Hospital physicians pinpoint regions of abnormal brain activity with functional MRI (fMRI) and highly sophisticated PET imaging, brain scans, angiograms to map the blood vessels, speech and language evaluation and neuropsychological testing. The Institute of Living’s Olin Neuropsychiatric Research Center provides a state-of-the-art fMRI scanner and electrophysiology equipment to create colorful images that reveal where the brain “lights up” during a seizure.

“Our neurosurgical team is dedicated to collaborating with other specialists to provide high-quality medical and surgical care for complex or severe epilepsy,” says Inam Kureshi, M.D., chief of the Department of Neurosurgery. “Hartford Hospital has committed resources to developing a multidisciplinary program to treat even the most difficult cases right here in Hartford.”

Sharp and spiking waves

“When anti-seizure medications don’t work, we do a detailed work-up with specific tests to confirm the diagnosis,” says Dr. Schuyler. “About 30 percent of people with epilepsy still continue to have seizures with even the best available medications. These are patients for whom we will now be able to offer alternative treatments which could

dramatically reduce or even cure their seizures altogether.”

The percentage of people with refractory epilepsy has not decreased despite the introduction of nine new FDA-approved anti-epileptic medications since 1993. Recurrent seizures are believed to cause progressive brain injury, resulting in loss of cognitive ability and “kindling” new seizures in the affected region of the brain.

EEG (brain wave) tests show whether abnormal electrical activity is generalized across the brain—common in people whose seizures begin in childhood—or localized to a single spot in the brain. Brain waves are typically recorded for a half hour, although some patients must be monitored over the course of several days to determine exactly where their seizures arise.

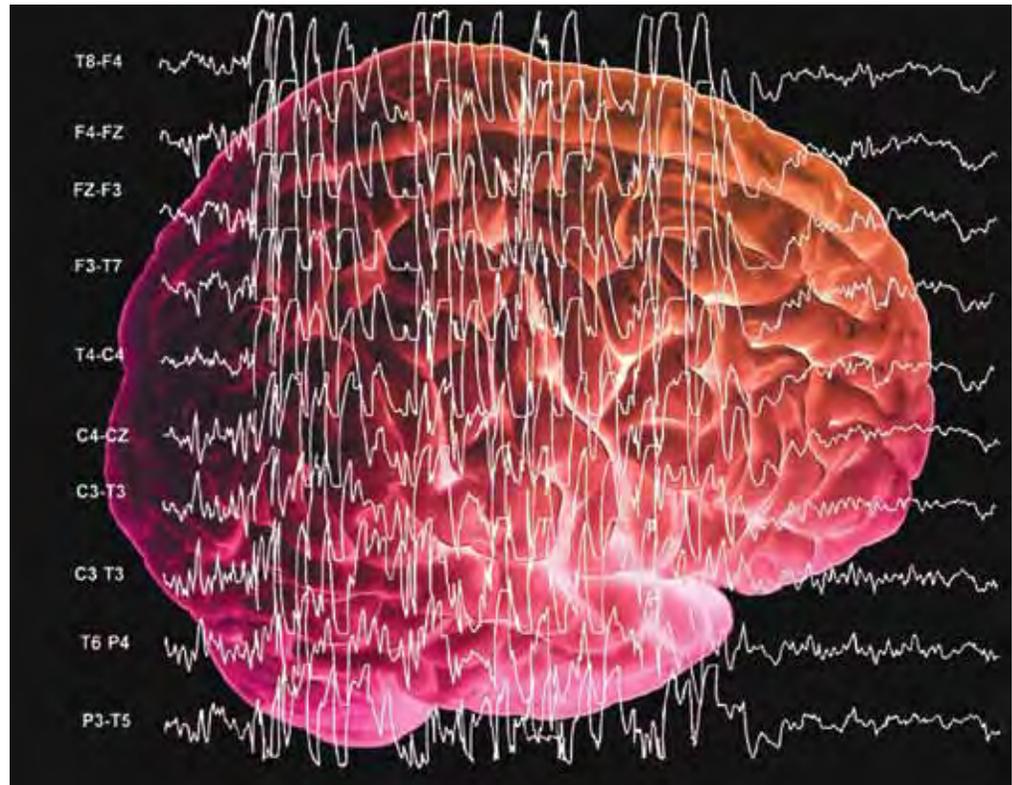
“Sometimes people have a single spot in the brain—caused by a stroke, traumatic injury, brain tumor or developmental malformation—that makes them prone to having seizures,” says Dr. Schuyler. “We already have a renowned Stroke Center with advanced technologies, so a state-of-the-art epilepsy center was the next logical step.”

Nerve stimulation

Some patients with refractory epilepsy who aren’t candidates for surgery can benefit from a surgically implanted device called a *vagus nerve stimulator*. “The device is placed just below the collarbone like a pacemaker,” says Dr. Schuyler. “Stimulating the vagus nerve with low-level current is not a cure for epilepsy, although it has been shown to reduce seizure frequency.”

New treatments are on the horizon. “Researchers are studying a ‘neuropacemaker’ implanted permanently in the brain that can sense seizure activity before it

Pictured right is an electroencephalogram (EEG) showing brain waves in a 17-year-old patient with epilepsy, superimposed on a three-dimensional MRI image of the brain (side view).



Although innovative brain surgery can ‘cure’ the disorder when a lesion or brain tumor can be pinpointed, most people rely on medications to control symptoms. The availability of new treatments means that all patients with medically refractory seizures should be referred to a specialized epilepsy center for evaluation.

begins,” says Dr. Killory. “Neurons are electrical nodes in the brain that respond to either excitatory or inhibitory signals.”

Although innovative brain surgery can “cure” the disorder when a lesion or brain tumor can be pinpointed, most people rely on medications to control symptoms. The availability of new treatments means that all patients with medically refractory seizures should be referred to a specialized epilepsy center for evaluation.

Life-altering surgery

People with epilepsy have two to three times greater mortality risk and an even greater chance of dying if the disease is poorly controlled. What’s known as “sudden unexplained death in epilepsy” accounts for half of the increased mortality rate. Scientists don’t fully understand why seizures can be deadly, but believe that epilepsy somehow disrupts brain function, breathing and heart rhythms.

Surgery is most effective for epilepsy patients with partial (focal) seizures that occur in a limited area

of the brain. “We have the best outcomes and an 80 percent seizure-free rate when the seizures can be localized to a focal area of the brain,” says Dr. Killory. “Epilepsy surgery can be curative when the part of the brain where the abnormal activity originates can be surgically removed to achieve total control of the disease.”

Deep within the temporal lobe of the brain lies the hippocampus, a structure central to the formation of new memories. Just above are regions exquisitely specialized for language, visual-spatial tasks and verbal memory, nestled within intricate webs of delicate blood vessels. Dr. Killory thoroughly maps the brain before navigating within these “eloquent” areas to avoid disrupting vital motor, sensory or cognitive functions.

“Surgery can decrease or even eliminate seizures in people with a common type of epilepsy that affects the temporal lobe,” says Dr. Killory, “but fewer than one percent of patients with medically refractory epilepsy are referred to an epilepsy center.”