



HOPE HAPPENS HERE:

THE CENTRE FOR STROKE RECOVERY

RESEARCHERS AT SUNNYBROOK ARE
LEADING STUDIES IN HOW BEST
TO PREVENT STROKE AND OPTIMIZE
HEALING AFTER IT

BY ELENI KANAVAS

In January 2010 while watching TV in his Toronto home, Vincenzo Cirillo noticed the images on the screen started to blur. He adjusted his eyeglasses, to no avail. The problem persisted, leaving him unable to see clearly from his right eye.

That's when his wife, Stella Cirillo, scheduled an appointment with their optometrist. "I knew something was wrong because he took an awfully long time at the eye doctor's office," says Mrs. Cirillo. "When he came home, I didn't believe what he told me."

At age 67, Mr. Cirillo had suffered a "mini-stroke" caused by a blood clot in the back of his right eye. An estimated 10% to 20% of patients who have such a "warning stroke" or transient ischemic attack (TIA) will experience a major stroke within 90 days; one-half of these will experience a major stroke within 48 hours.

The next morning, Mr. Cirillo met with his family physician, who had reviewed the optometrist's report. The physician did an ultrasound scan of his neck. Results showed Mr. Cirillo had carotid artery disease, which is caused when plaque builds up in the carotid arteries, the arteries that are the main blood supply to the brain. When plaque forms here, it can block blood flow to the brain and eye, and lead to a massive stroke.

Within two days of his diagnosis, Mr. Cirillo had a referral to see Dr. David Gladstone and a team of experts at the Regional Stroke Prevention Clinic and Dr. Thomas and Harriet Black Acute TIA Unit at Sunnybrook Health Sciences Centre. One week later, a surgical team at Sunnybrook performed a carotid endarterectomy—also referred to as "stroke prevention surgery"—and removed the built-up plaque, restoring blood flow and dramatically reducing Mr. Cirillo's risk of a major stroke.

"Stroke is a massive public health problem in Canada and worldwide, and we are constantly striving to provide the best care, and discover newer and better treatments and prevention strategies," says Gladstone, director of Sunnybrook's Regional Stroke Prevention Clinic and a scientist in the Brain Sciences Research Program at Sunnybrook Research Institute (SRI).

In Canada, a stroke occurs every 10 minutes. It is the second-leading cause of death worldwide in people aged over 60 years, the most common cause of adult neurological disability in the country, and a main cause of physical and cognitive disability.

Sunnybrook is leading Canada's effort to address the national and global problem of stroke. In addition to the stroke prevention clinic and TIA unit, Sunnybrook houses

a Regional Stroke Centre and—critically for the future of research-driven stroke care—the Heart and Stroke Foundation Centre for Stroke Recovery. In this world-class centre, researchers and clinicians are working together to invent new standards of care and best practices in the treatment and prevention of stroke.

The Heart and Stroke Foundation of Ontario funded the establishment of the Centre for Stroke Recovery in 2002 as a virtual organization that combines the expertise, space and technology of three health care centres and their research institutes: Sunnybrook and SRI, the University of Ottawa and the Ottawa Hospital Research Institute, and Baycrest's Rotman Research Institute with the Kunin-Lunenfeld Applied Research Unit.

Dr. Sandra Black is the centre's site director at Sunnybrook, director of the Brain Sciences Research Program at SRI and a professor in neurology at the University of Toronto. She is leading a team of scientists and clinical researchers in neurology, imaging, neurophysiology,

neuropsychology and rehabilitation. They are investigating interventional methods using advanced imaging technologies, developing physical and cognitive assessments to assist in stroke recovery, and designing and testing new drug therapies.

The need for advances in stroke research—and their translation into care—is urgent. “We are seeing an increase in stroke patients because of an aging population, and there is a lot more we still need to understand about how we can help the brain make the maximum recovery and rehabilitate people after a stroke,” says Black.

RISKY BUSINESS: PREVENTING STROKE

In 2009, Gladstone published a study in *Stroke* that evaluated wait times for carotid artery surgery in Ontario as a key measure of quality of care in stroke prevention.

Wait times for this surgery are important because patients like Mr. Cirillo who have a warning stroke caused by carotid artery disease have a high risk of having another stroke. The benefit of this surgery for preventing strokes is best if the procedure is performed within two weeks after a warning stroke.

“Carotid artery disease is a major treatable risk factor for stroke,” says Gladstone, who is also an assistant professor of medicine at U of T. “At Sunnybrook, we are working hard to lead the way in providing rapid and accurate diagnosis and treatment planning for those in need, including expediting surgical treatment for the highest-risk patients.”

Using data from the Registry of the Canadian Stroke Network based at the Institute for Clinical Evaluative Sciences, Gladstone's study revealed that only one-third of Ontario patients who underwent carotid artery surgery did so within the recommended two weeks. One-half waited more than a month, and in 25% of cases surgery was delayed more than three months. “That's far too long to wait,” says Gladstone.

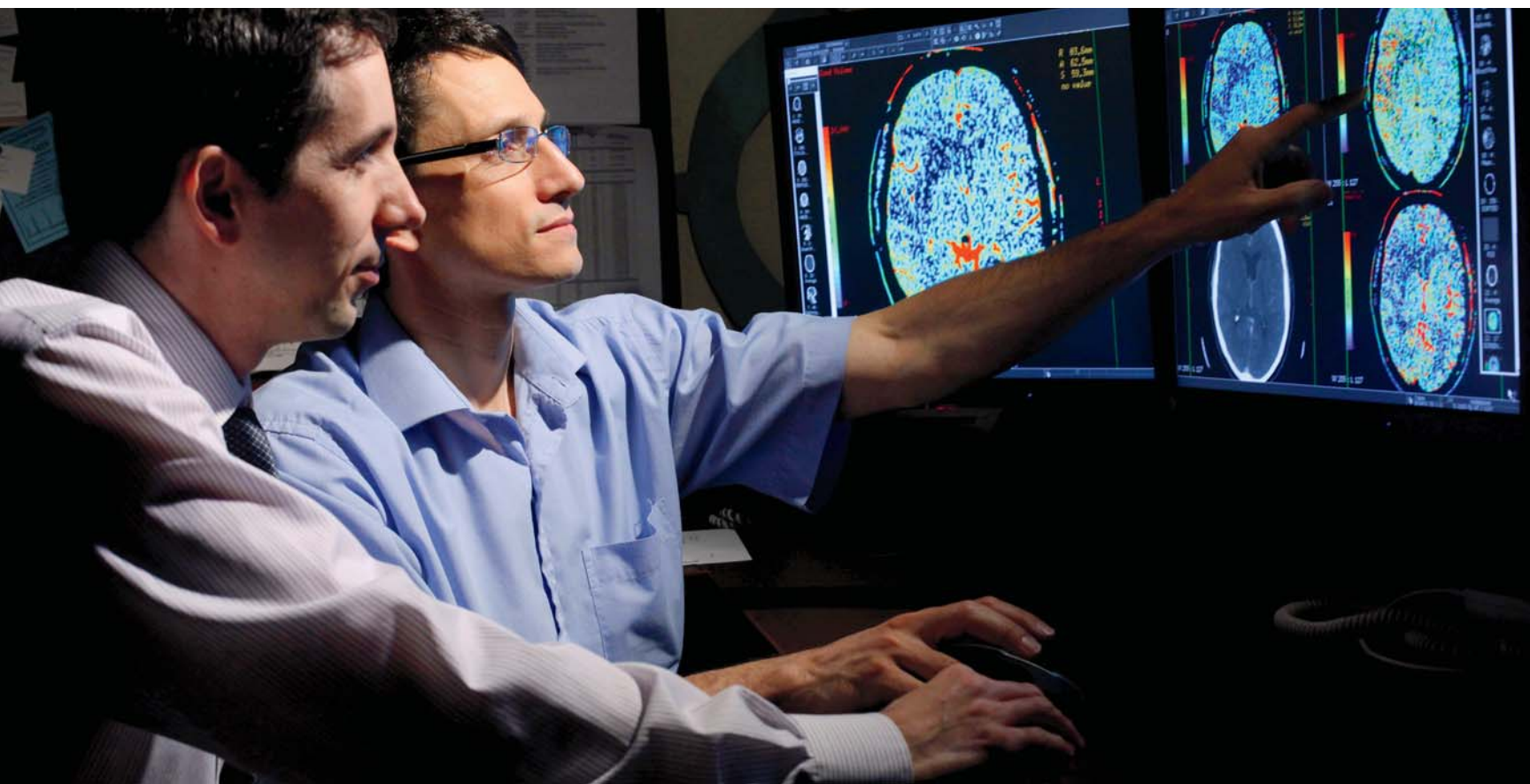
The study is now drawing attention to the importance of minimizing delays to diagnosis and stroke prevention surgery for patients with high-risk TIAs. Gladstone says he hopes the study will lead to better hospital protocols aimed at expediting care for these patients.

MAKING HEADWAY WITH INNOVATIVE IMAGING TECHNIQUES

A main focus of the centre's research is imaging, something for which scientists at SRI are renowned. For example, functional magnetic resonance imaging (fMRI), which shows the brain “in action,” and computed tomography perfusion imaging (another type of functional imaging that measures blood flow) are helping researchers understand what happens during stroke and quantify the amount of brain tissue loss caused by stroke.

DRS. DAVID GLADSTONE AND RICHARD AVIV

PHOTO THIS PAGE & PREVIOUS: TIM FRASER



THE CENTRE FOR STROKE RECOVERY IS A WORLD-CLASS CENTRE OF EXCELLENCE WHERE RESEARCHERS AND CLINICIANS ARE WORKING TOGETHER TO INVENT NEW STANDARDS OF CARE AND BEST PRACTICES IN THE TREATMENT AND PREVENTION OF STROKE.

Much of Black's research uses imaging to study brain-behaviour relationships and disorders that arise when these relationships go wrong. One example is the loss of language called aphasia, a disorder caused by damage to the left hemisphere of the brain. She is studying the use of structural and functional imaging in the diagnosis and monitoring of mild cognitive impairment, and in Alzheimer's disease and other dementias, in which language loss is prominent in some patients.

Studies show about 25% of stroke patients have dementia and 65% have some cognitive impairment; both greatly affect recovery. There is a relationship between stroke and Alzheimer's disease, emphasized by research that shows this disease can be unmasked by a stroke.

"Alzheimer's disease can cause a hemorrhagic stroke because amyloid deposits in the brain cause the vessels to become weak and bleed," Black says. "We've spent years developing imaging pipelines that allow us to look at the way atrophy and stroke disease are related."

Dr. Richard Swartz also uses imaging technology. Swartz is an imaging scientist at SRI, director of the stroke research unit at Sunnybrook and director of the stroke program at U of T. Through a "scanner-to-bedside" approach to stroke and cognition, he is exploring ways to improve the care of patients with problems affecting blood vessels in the brain, including atherosclerosis (plaque build-up in blood vessels), vasculitis (blood vessel inflammation) and — surprisingly — pre-eclampsia.

"Most people think of pre-eclampsia as an obstetrical disease, but it's what I call

a neurovascular disease. It's driven by pregnancy, but the most dangerous symptoms are from blood vessels in the brain," Swartz says. Pre-eclampsia may even be a "stress test" for vascular problems in later life — an idea Swartz is investigating with collaborators in obstetrical medicine. Imaging can help distinguish between pre-eclampsia and stroke, conditions that share symptoms of confusion and seizures, thereby improving physicians' treatment decisions.

The centre's imaging-focused researchers and Dr. Alan Moody, radiologist-in-chief of medical imaging at Sunnybrook and associate scientist at SRI, are pioneering the use of MRI for early diagnosis and intervention strategies to prevent strokes and heart attacks by identifying high-risk patients with carotid artery plaque.

The journal *Neuroradiology* published a study in 2009 by Moody and Gladstone that studied the association between carotid artery stenosis, narrowing of the carotid arteries, in men without any symptoms, and the risk of future strokes through an MRI examination of plaque characteristics. Results showed a positive link between intraplaque hemorrhage as

detected by MRI and future stroke events; this suggests using MRI to screen for intraplaque hemorrhage may be a useful means by which to classify the risk of future strokes in patients who don't have any symptoms, but who have some narrowing of the carotid arteries.

Researchers and clinicians at Sunnybrook will continue to find new ways to treat stroke and enhance patient recovery, Swartz says. "The connections between our research with Dr. Gladstone, Dr. Black and our partners in the Centre for Stroke Recovery has the potential years from now to change the way we diagnose and treat stroke patients."

Days after Mr. Cirillo's carotid artery surgery, life returned to normal for his family. "I stayed in the hospital overnight, and when I got home the next day I was up and walking," he says. "I didn't feel much pain, and I was not going to sit around and do nothing."

Since then, Mr. Cirillo has continued to craft his homemade Italian wine and enjoy time with his family. He recently celebrated his 40-year wedding anniversary.

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