

CIMIT *at* Work

... *Striking out Stroke* ...

Mirta Torres considers herself a medical miracle. She can walk. She can talk. She can smile a full, radiant smile. But on August 2, 1998, Ms. Torres couldn't have smiled even if she had wanted to. She lay on a stretcher at Massachusetts General Hospital, unable to move her left arm or leg, or to explain what was wrong. She had suffered a stroke, at the age of 38.

The third-leading cause of death in the U.S., stroke usually is caused by a blood clot that blocks circulation in the brain and deprives cells of oxygen. Ms. Torres' stroke occurred early in the morning, as she sat reading. An hour later, she felt an intense pain near her right temple. "The headache kept get-

ting worse," she recalls. "I finally decided that it must be caffeine deprivation, so I got up from the couch to make coffee." Ms. Torres reached the kitchen but never got her coffee. As she tried to turn on her new gas stove, her left side went weak. The gas pilot clicked but did not ignite, alerting her husband that something was wrong. He found his wife slumped on the floor and immediately dialed 911.

harnessing the latest medical technologies to improve the diagnosis and treatment for stroke. The combination of some of these technologies, they believed, could save Ms. Torres' life.

"Tissue passes through several stages on its way to cell death, and for each stage, there is a specific therapy that's most appropriate," Dr. Koroshetz says. For instance, as brain tissue dies, the blood

"...her condition was growing more serious with each minute: soon, she was completely paralyzed on her left side."

Ms. Torres was rushed to Massachusetts General Hospital, a member of the Center for Innovative Minimally Invasive Therapy, or CIMIT. CIMIT is a consortium of world-leading academic and research institutions that also include Brigham and Women's Hospital, Draper Laboratory, and Massachusetts Institute of Technology. Together, these institutions are working with industry to develop less-invasive therapies and procedures that hold the promise of redefining treatment approaches and improving patient care.

Within a half hour of arriving at the hospital, Ms. Torres was being treated by Dr. Walter Koroshetz, a Mass General neurologist, and Dr. Gil Gonzalez, Chief of Neuroradiology. Together, they lead a team of CIMIT researchers who are

vessels feeding it become damaged and leaky. Restoring blood flow to large areas of dead or dying tissue can result in a potentially fatal hemorrhage, causing more harm than good, so clinicians need to know how much tissue is damaged. Brain scans can provide this information, as well as the location and nature of the stroke, thus leading to more precise treatment.

Within minutes of being evaluated, it was decided that Ms. Torres should undergo a CT angiogram, which scanned the blood vessels and revealed a clot clogging the major artery to the right side of her brain. Blood was still getting through secondary vessels, but with the main supply route blocked, cells were dying. An MR scan then showed the extent of the damage,





Ms. Torres was wheeled into the interventional neuroradiology suite less than 120 minutes after falling on the floor, where Dr. Ron Budzik opened the occluded vessel within minutes. "When I awoke from anesthesia, I was surrounded by people," she says. "They asked how I felt. I said 'fine.' Then I realized, I could feel my smile again - completely. I could move my hand. I brought my arm out and laughed like a fool."

Most stroke victims, however, aren't as lucky as Ms. Torres. For every patient like her, another six are left with some degree of disability. The scope of this problem requires a wide variety of treatments, and CIMIT is uniquely positioned to bring these treatments together with new technologies that can dramatically help those who suffer a stroke.

One of these technologies, for example, utilizes catheters and MR-guidance to deliver low-level laser energy, which creates tiny openings in the clot and allows greater access for clot-dissolving drugs. As a result, CIMIT researchers hope vessels will be unblocked with lower drug doses - and the risk of brain hemorrhage will be reduced.

CIMIT researchers also are exploring the use of hypothermia to reduce the swelling that accompanies stroke. Like any other tissue, the brain swells when injured - and this swelling can cause

additional damage as it squeezes healthy tissue against the skull. But swelling can be reduced through localized cooling of even two or three degrees Celsius.

In addition, CIMIT is testing a new non-invasive imaging modality, known as diffuse optical tomography (DOT), that can identify, map, and monitor cerebral bleeds and ischemia. It is expected this technique will provide opportunities for rapid diagnosis of cerebral trauma where CT and MRI are unavailable, as

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which, fortunately, was still limited. This meant that Ms. Torres was a candidate for an innovative, minimally invasive therapy called intraarterial thrombolysis.

In this procedure, Dr. Gonzalez' team would snake a series of nested catheters from Ms. Torres' groin to the clot in her brain. The tiniest catheter would puncture the clot, fracturing it while injecting a blood-thinning drug called heparin. Most of the fragments would dissolve. Some might lodge in smaller blood vessels and cause minor strokes, but their damage would be minimal.

Dr. Gonzalez and Koroshetz presented this option to Ms. Torres and her husband, along with an alternative - intravenous administration of the clot-dissolving drug t-PA, an FDA-approved treatment that nevertheless carries a risk of brain hemorrhage. "They told me that there are risks with every treatment," says Ms. Torres. "I opted for the catheter because it was faster, and I knew that with stroke, time is of the essence."

well as afford continuous monitoring of patients with evolving stroke.

"Stroke treatment of the future will combine many of these new technologies and agents tailored to the course of damage at a given time in an individual patient," says Dr. Koroshetz. "Thus enabling us to save more people from the tragedy of a brain attack." And while much work remains ahead for the investigators of CIMIT, Ms. Torres is living proof that much has already been accomplished.



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