# Technology targets tumors

*By Connie Piloto*

**A former amateur rodeo star**, Donald Croxton has had his share of medical issues.

In 1989, he was paralyzed when he fell from a bull during his hometown's annual rodeo. Nine months later, Mr. Croxton walked out of a rehabilitation center with the aid of a cane. A cascade of problems stemming from the injuries followed him for years.

Then, in 2005 he was diagnosed with something unrelated to his previous injuries – brain cancer.

During a lengthy and difficult operation, surgeons gingerly removed a cancerous tumor lodged under Mr. Croxton's brain. He underwent radiation, and the cancer was gone.

Two years later, the nose bleeds Mr. Croxton had suffered shortly before he was first diagnosed with cancer returned. Doctors confirmed his suspicions: The cancer was back.

This time, a malignant tumor had developed in the sinus cavity between Mr. Croxton's eyes, and it was pushing out along the bridge of his nose toward his right eye. Operating would require surgeons to remove Mr. Croxton's eye and eye socket.

"I wanted to save my eye," said Mr. Croxton, 45, who lives in Bowie. "I didn't care if I lost my eyesight, but I didn't want my eye removed."

His doctors at UT Southwestern Medical Center decided to forego surgery and instead tried stereotactic radiosurgery. The noninvasive technique concentrates high doses of radiation directly on tumors that would be especially hard to reach using traditional surgery. In Mr. Croxton's case, the tool of choice was the CyberKnife.

"Due to the scarring produced by Mr. Croxton's previous surgical procedure, it would be difficult to find the margins of the recurrent tumor surgically," said Dr. Bruce Mickey, professor of neurological surgery and otolaryngology-head and neck surgery, director of the Annette G. Strauss Center in Neuro-Oncology and holder of the William Kemp Clark Chair in Neurological Surgery at UT Southwestern. "On the other hand, the CyberKnife could precisely target the tumor and its margins with the aid of the digital information provided on his CT [computed tomography] and MRI [magnetic resonance imaging] scans."

In the Annette Simmons Stereotactic Treatment Center at UT Southwestern University Hospital - Zale Lipshy, radiation oncologists use high-tech, image-guided radiation tools such as the CyberKnife and a related system called the Gamma Knife to target tumors and offer breakthrough radiation treatments.

"We have paired our state-of-the-art technology and our research capabilities with a team of world-renowned radiosurgery experts to provide our patients with the latest advancements in cancer treatment," said Dr. Hak Choy, chairman of radiation oncology and holder of the Nancy B. and Jake L. Hamon Distinguished Chair in Therapeutic Oncology Research.

Stereotactic therapy delivers high-dose radiation beams to a tumor in a concentrated, extremely precise manner. Many beams of radiation – often more than 100 – are directed at the tumor. Each of these beams is relatively weak and causes very little damage when traveling through the patient's body.

When all the beams converge at the target, however, their cumulative effect adds up to an extremely potent dose aimed at destroying the target cells with great precision.

At UT Southwestern, the CyberKnife is most commonly used to treat primary or metastatic brain tumors, which are those that have spread to the brain from other parts of the body. It is also the therapy of choice for treating other tumors of the head and neck, base of the skull, cervical spine and the lungs and liver.

The CyberKnife system features sophisticated tracking software and a linear accelerator that is mounted on a robotic arm. The robotic arm is coupled with two orthogonal X-ray imaging cameras, which are used to locate the position of the tumor. The flexibility of this robotic arm makes it possible to treat certain areas of the body, such as the spine and spinal cord, that cannot be reached by conventional radiotherapy techniques.

Before UT Southwestern radiation oncologists treated Mr. Croxton with the CyberKnife, doctors first took MRI and CT scans of Mr. Croxton's tumor. The scans provided three-dimensional images of the tumor and allowed physicians to configure the radiation beams to target precisely its unique shape.

"We decided to use the CyberKnife to give a highly focused radiation boost to the tumor and to try to control it without surgery," said Dr. Robert Timmerman, professor of radiation oncology and holder of the Effie Marie Cain Distinguished Chair in Cancer Therapy Research. "We gave Mr. Croxton's tumor five separate high-dose treatments on the CyberKnife and paid special attention to minimize the dose to the optic pathways in hopes that he would be able to retain his vision."

Mr. Croxton's eyesight has remained intact, and while the tumor has shrunk considerably, Dr. Timmerman and Mr. Croxton's surgeons are monitoring it closely. They might yet have to perform surgery, but they would be removing a much smaller tumor than the one initially discovered before undergoing treatment with the CyberKnife.

Another high-tech radiation tool called the Gamma Knife also uses highly focused and targeted radiation to treat vascular malformations, cancer and benign tumors in the brain when conventional surgery can't be done.

In addition to treating brain disorders and tumors, the Gamma Knife's accuracy and pinpoint precision have helped many people recover from the constant and debilitating pain of more uncommon functional disorders like trigeminal neuralgia.

Ken Hardin's pain started out of the blue one spring day in 2005. Every time he touched the left side of his face – to rub an eye or touch his upper lip – a bolt of intense pain would shoot through his face.

"Sometimes the pain would last 2 seconds, sometimes up to 30 seconds," Mr. Hardin said.

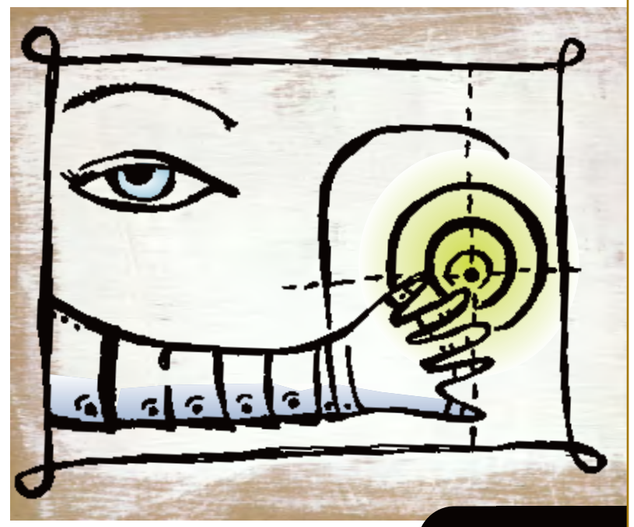
Mr. Hardin, 75, of Arlington, did his own research and consulted with several neurologists who determined he was suffering from trigeminal neuralgia, a chronic pain condition that causes extreme, sporadic, sudden burning or shock-like face pain.

The condition is often treated with medication that can make patients feel tired and sleepy. There were other treatment options, but most included surgery, he found. Then, he read about radiosurgery using the Gamma Knife system.

Mr. Hardin's neurologist referred him to Dr. Timmerman at UT Southwestern.

"I was a little anxious about the treatments, but when I read about the Gamma Knife, I knew that if it was an option for me, that was the way to go," Mr. Hardin said. "It was not invasive at all."

At UT Southwestern, Mr. Hardin was fitted with a special helmet that kept his skull from moving during the treatment. Then, 201 separate beams of cobalt-60 radiation were targeted on Mr. Hardin's brain stem during a treatment that lasted less than an hour.



"The helmet allows us to have the mechanical accuracy of one-tenth of a millimeter. You could hardly hold your fingers that far apart. Then, we treat the nerve as it comes out of the brain stem," Dr. Timmerman explained. "It's a 4 millimeter section of the nerve right as it exits the brain stem, and it's in a very critical area."

Surgery would have required physicians to drill through the hardest bone in the body – the temporal bone, which controls hearing and facial functions.

"We can relieve the pain substantially in about 80 percent of patients," Dr. Timmerman said. "About half of them will get complete relief within a week or two of the treatments."

That's what happened to Mr. Hardin. A week later he started feeling less pain. Two weeks later, the pain was gone.

"Day to day living without pain, discomfort or medication is wonderful," Mr. Hardin said. "I am much more productive, and I am less of a burden physically and emotionally to those close to me."

*For more information on CyberKnife or Gamma Knife treatments, please call 214-645-6455, or to learn more about radiation oncology, visit www.utsouthwestern.edu/patientcare/medicalservices/radonc.html.*

> **"We have paired our state-of-the-art technology and our research capabilities with a team of world-renowned radiosurgery experts to provide our patients with the latest advancements in cancer treatment."**
>
> *–Dr. Hak Choy*

# Stent strikes down strokes

*By Aline McKenzie*

**Bob Ritchie** hadn't had a massive stroke – yet – but the signs were there that one might be in his near future. In late 2007, he began suffering a series of short-lived but frightening symptoms.

"I'd lose my vision or have blurred vision, or there would be a tingling around my mouth or down to my right hand," said Mr. Ritchie, 75, a retired truck driver who lives in Wichita Falls. "It was very scary."

> "I think it's a beautiful surgical procedure. You have all the time in the world."
>
> *–Dr. Babu Welch*

Eventually, Mr. Ritchie was referred to Dr. Lee Pride, associate professor of radiology at UT Southwestern Medical Center, who performed a procedure designed to prevent, rather than treat, strokes.

Mr. Ritchie is one of the first patients to have been treated with a specially designed brain stent – a thin tubular mesh that holds open a blood vessel that's been narrowed by atherosclerosis. UT Southwestern is one of a few centers in the United States participating in a registry to operate on patients and track the success of the procedure.

The commercially developed system, called Wingspan, uses a balloon to expand the vessel and then leaves the stent behind to keep it open. It was approved by the Food and Drug Administration in 2005 under a program called a Humanitarian Device Exemption, which encourages development of treatments that affect fewer than 4,000 people in the U.S. each year.

Before the cranial stent was available, UT Southwestern neurointerventional surgeons used stents designed for vessels around the heart, but these devices were made for tougher vessels and were less suitable for the more delicate vessels of the brain.

"Overall, the new stents have been much safer than anything we've had before for treating narrowed arteries in the brain," said Dr. Pride, who described the stents as gentler on patients.

Since his surgery, Mr. Ritchie said he feels only minor dizziness from time to time.

"I feel much safer," he said. "I think it's prolonged my life."

Another treatment for defective blood vessels in the brain is also in the works at UT Southwestern. Excimer Laser-Assisted Nonocclusive Anastomosis, or ELANA, uses a laser to create a connection between arteries without the need to stop blood flow to the brain.

With the success of this technique, surgeons will be able to replace or bypass diseased portions of a critical brain artery while significantly reducing the risk of stroke, said Dr. Babu Welch, associate professor of neurological surgery and radiology.

Bypass surgery in the brain is trickier than in other parts of the body. Clamping off an artery for even a few minutes could cause some people to suffer a massive stroke, Dr. Welch said.

With the ELANA technique, one end of the replacement vessel is attached to an artery "downstream" of the portion that is to be removed. A tiny laser is then fed through a slit in the graft, and the free end of the graft is sewn to the vessel beyond the point of the defective area. The laser then burns a tiny hole through the vessel wall, and blood begins flowing directly from the carotid artery through the graft.

With a blood supply guaranteed to the brain, the defective portion of the vessel can then be clamped off at both ends and removed with no haste required.

ELANA, developed in the Netherlands, is used only in rare cases when an enormous tangle of malformed vessels called an aneurysm that can't be treated with normal methods must be removed, or when removal of a tumor would tear a blood vessel.

UT Southwestern's reputation as a world-class center for neurovascular surgery opened the door for Dr. Welch and Dr. Duke Samson, chairman of neurological surgery, to travel to Europe, where they learned the surgery from its inventor.

UT Southwestern is now fully equipped to perform the operation, which was approved by the FDA in summer 2007.

"I think it's a beautiful surgical procedure," Dr. Welch said. "You have all the time in the world."

*For more information about neurological surgery, please call 214-645-2300, or visit www.utsouthwestern.edu/patientcare/medicalservices/neuro.html.*



# Seeing MS clearly

*By Aline McKenzie*

**Multiple sclerosis** has traditionally been difficult to diagnose because its symptoms can be variable and attacks might be separated by years. As technology has developed, however, accurate early diagnosis has become easier and doctors can begin treatment in the vital early stages.

Now, one of the fastest and simplest methods to track damage in the central nervous system is available at UT Southwestern Medical Center. Called Optical Coherence Tomography, or OCT, it measures the thickness of the layer of nerves in the retina of the eye.

The device sits on a small tabletop and is a bit larger than a microwave oven. A patient puts his or her chin on a rest, and two quick flashes of light probe the retina. On the computer screen, a speckled strip of colors shows the depth of the retina.

Patient Julie Marwitz has undergone both magnetic resonance imaging and spinal taps for monitoring her MS.

"This is a lot simpler," said Ms. Marwitz, an office accounting manager. "All I have to do is take my contact lenses out. The only bad part is trying to hold your eyes open without blinking."

OCT is a relatively new way of monitoring MS, said Dr. Elliot Frohman, professor of neurology and ophthalmology and director of the Multiple Sclerosis Program and Clinical Center at UT Southwestern.

"To look at something as delicate as the retina in a few seconds with a resolution of 8 microns [micrometers] – I was blown away," said Dr. Frohman, recalling his first view of the images.

"The beauty of OCT is it's really a stand-alone method to be able to measure the structural architecture of nerve cells and their axons within the retina," he said.

An axon is the long arm of a nerve cell, along which the electrical signal travels before triggering the next nerve cell.

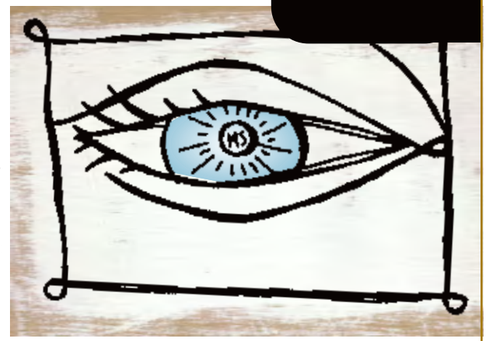
In the retina, axons converge behind the eye to form the optic nerve, which then travels into the brain.

Collaborative studies between Dr. Frohman and his colleagues Dr. Laura Balcer from the University of Pennsylvania and Dr. Peter Calabresi from Johns Hopkins University show a striking relationship between the integrity of the retina and changes in both vision and the brain over time. The researcher-clinicians hope this technology can be used to help identify and prove the ability of new drugs to protect both the eye and the brain from the ravages of MS. A number of clinical trials of novel drug therapies to both protect and restore nerve function are in the planning stages and will be spearheaded by Dr. Frohman.

"OCT's ability to monitor axonal nerve damage in MS may introduce a new tool to understand and find treatments," said Dr. Frohman, who holds the Irene Wadel and Robert I. Atha Distinguished Chair in Neurology and the Kenney Marie Dixon-Pickens Distinguished Professorship in Multiple Sclerosis Research.

> "We may now have the ability to really look at neurons, their preservation, and perhaps even their restoration within the eye."
>
> *–Dr. Elliot Frohman*

MS is caused by an autoimmune reaction in which the body attacks its own myelin, the fatty-insulating layer that surrounds nerve cells. Without myelin, nerve cells can't conduct electrical signals as quickly, and their axons, the long, thin branches that stretch to their target cells, become scarred and damaged.




Brain damage can be tracked with MRI, and researchers have developed some mathematical models to quantify the loss of brain tissue and link it with patients' symptoms, but with mixed success, according to Dr. Frohman.

Thus, if OCT turned out to be a reliable measure of brain atrophy and the disease's progression, doctors would have an inexpensive, easy technique that can be performed in the office.

"We may now have the ability to really look at neurons, their preservation, and perhaps even their restoration within the eye," Dr. Frohman said.

*For more information about multiple sclerosis, please call 214-645-8800, or visit www.utsouthwestern.edu/patientcare/medicalservices/neuro.html.*

# Keep a healthy heart

*By Katherine Morales*

**It wasn't until** his second year in medical school that Dr. Casey Pollard pieced together his family's history of heart disease – a history so rife with cardiovascular disease, he thought he could be at risk, too.

"The more I started learning and thinking about my health, the more I realized I needed to be proactive about it," he said.

After Dr. Pollard moved to Dallas for a radiology residency at UT Southwestern Medical Center, he continued to wonder whether he would soon suffer the same battles with heart disease as other men in his family.

"Everyone in the family on my dad's side has had diabetes and heart problems from an early age," Dr. Pollard said. "I started digging deeper and asking questions of my family. My dad had an angioplasty and had several stents put in. He was also diagnosed with diabetes when he was 28."

Dr. Pollard, 28, decided to try a new approach to protect his health.

"One of my friends told me that his wife worked as a physician assistant at the preventive heart clinic at UT Southwestern. He said he knew the perfect person to help me," Dr. Pollard said.

The perfect person turned out to be Dr. Amit Khera, head of the preventive cardiology program and assistant professor of internal medicine at UT Southwestern.

> "Success is when a patient never develops a chronic disease rather than treating it after it develops."
>
> *—Dr. Amit Khera*

A relatively new addition to the division of cardiology, Dr. Khera and his team help prevent chronic disease from developing in patients who have complex risk factors for heart disease.

"I see many patients who don't actually have diagnosed heart disease, but who are at increased risk due to very strong family histories of heart disease," Dr. Khera said. "Some patients, like Dr. Pollard, also have uncontrolled risk factors, and it's very important for them to address these problems as soon as possible."

In addition to genetic risk factors, Dr. Khera looks at traditional risk factors and lifestyle habits. Those with a genetic predisposition to heart disease may be compounding their problems by not exercising or not eating the right foods. Patients who come to the clinic also meet with a dietitian, who advises them on ways to improve or augment their diet.

"Early intervention is critical, as are lifestyle changes. We also try to assess whether advanced testing is needed and whether drug therapies would be useful," Dr. Khera said.

In some cases, patients may not need any intervention, he added.

"We are very judicious in treatment and understand that some people don't necessarily need to take a pill every day for the rest of their lives. A lot of people we see are very young, so if they don't need drug therapies, we avoid that. In some cases, modest lifestyle modification is the best solution," Dr. Khera said.

Although preventive cardiology is not new, it is a rare specialty in private practice. It is more common in academic medical institutions like UT Southwestern, where the collaborative scope of patient care provides broader expertise.

"As a physician, I've always felt that it makes more sense to avoid a potential chronic health problem before it develops and affects a patient's quality of life," Dr. Khera said. "Success is when a patient never develops a chronic disease rather than treating it after it develops."

Dr. Pollard strives to be one of those success stories.

"The damage accumulates over the years, and I told my wife that my family is an example of what happens if you don't step in early," Dr. Pollard said. "I want to measure the success of preventive medicine for myself."

*For more information on preventive cardiology, please call 214-645-7500, or visit www.utsouthwestern.edu/patientcare/medicalservices/hlv.html.*

# Stopping the migraine trigger

*By Donna Steph Hansard*

**Three years ago**, Sharon Schafer Bennett suffered from migraines so severe that the headaches were disrupting her life.

The 46-year-old mother of two said she felt like she was constantly "canceling everything" because the headaches – often two or three per week – would put her flat on her back.

Now, thanks to an innovative surgical technique performed by a UT Southwestern Medical Center plastic surgeon who helped pioneer the procedure, the frequency and intensity of the Houston-area native's migraines have diminished dramatically.

"I can't even begin to tell you what a change this has made in my life," said Mrs. Bennett, who had the procedure in May 2005. "For the first time in years, I can live like a normal human being and do all the normal 'mom' and 'wife' things that the migraines physically prevented me from doing."

The technique – performed by only a handful of plastic surgeons in the U.S. – uses the anti-wrinkle drug Botox to pinpoint which of several specific muscles in the forehead, back of the head or temple areas may be serving as "trigger points" to compress, irritate or entrap nerves causing the migraine. Because Botox temporarily paralyzes muscles, usually for about three months, it can be used as a litmus test to see if headaches go away or become less intense while the Botox's effects last, said Dr. Jeffrey Janis, assistant professor of plastic surgery.

If the Botox is successful in preventing migraines or lessening their severity, then surgery to remove the targeted muscle is likely to accomplish the same result, but on a longer-term and possibly permanent basis, he said.

"Many neurologists are using Botox to treat migraines, but they are making the injections in a 'headband-like' circle around the forehead, temple and skull," Dr. Janis said. "They are not looking at finding the specific location of the headache's trigger point. While patients may get temporary relief, after the Botox wears off they will have to go back and get more injections or continue medications for migraines.

"I inject the Botox into one trigger point at a time and leave the others alone."

Approximately 28 million Americans, 75 percent of those women, suffer from migraines, according to the National Institutes of Health.

"A migraine is something you can't explain to someone who hasn't had one," said Mrs. Bennett, who began suffering monthly migraines as a teenager. As she grew older, the headaches become more frequent and unpredictable.

"This surgery has made a huge difference in my life," she said.

Dr. Janis began collaborating more than five years ago with Dr. Bahman Guyuron, a plastic surgeon at Case Western Reserve University and the first to explore using surgery to relieve migraines, following the revelation by several of his patients that their migraines had disappeared after they had cosmetic brow lifts. Dr. Janis has assisted his colleague by performing anatomical studies on cadavers to explore the nerves and pathways that might cause migraines. Together they have identified four specific trigger points and developed a treatment algorithm that includes using Botox prior to deciding whether to perform surgery.


Dr. Janis sees only patients who have been diagnosed with recurring migraines by a neurologist and have tried other treatments that have failed.

"Plastic surgeons are not in the business of diagnosing and treating headaches," he said. "This is a novel method of treatment that is proving to be effective and potentially more long-lasting than other things used before. But it is still in its infancy."

*For more information about migraine treatments, please call 214-645-2353, or visit www.utsouthwestern.edu/patientcare/medicalservices/plastics.html.*

> "This is a novel method of treatment that is proving to be effective and potentially more long-lasting than other things used before."
>
> *—Dr. Jeffrey Janis*

# This is spinal tech

*By Russell Rian*

**Stanton Laraway** wasn't willing to give up racquetball and other activities as he turned 60, but his chronic back pain was growing worse.

"It just deteriorated through the years," the Allen resident said. "For years and years it bothered me. I was really uncomfortable. I was in constant pain."

He tried the traditional routines – aspirin, exercise therapy, muscle relaxers – but nothing helped.

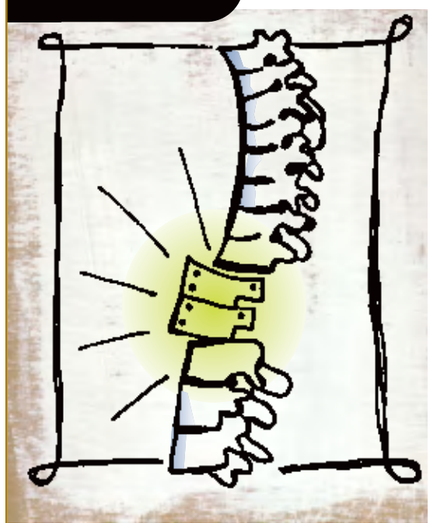
So after being steered to UT Southwestern Medical Center's Dr. Kevin Gill, one of the top spine surgeons in the nation, Mr. Laraway consented to take part in a new trend – mobility surgery – and had an artificial disc inserted in his spine.

"Three weeks later I was swimming and went back to work," said Mr. Laraway, a technical manager for AT&T. "Now, I have no pain at all. I walk, jump, run, climb trees, lots of things I shouldn't be doing. I play racquetball once a week for a couple of hours. I take a great deal of pleasure in feeling like a younger man."

Mr. Laraway reflects a growing population of back-pain sufferers who are finding fresh lives through new innovations for back surgery.

Dr. Gill, professor of orthopaedic surgery, Dr. Kevin Morrill, assistant professor of nuerological surgery, and Dr. Samuel Bierner, associate professor of physical medicine and rehabilitation, serve as co-directors of UT Southwestern's new Spine Center. The center brings together experts in orthopaedic surgery, neurological surgery, neuroradiology, rheumatology and physical therapy to forge a comprehensive treatment plan individualized for each patient.

> "I guess you could say we are in the mobility business."
>
> *–Dr. Kevin Gill*



From testing new artificial discs and flexible rods in the spine to employing new bone materials that lessen recovery time, UT Southwestern is establishing itself as a frontline leader in efforts to correct long-standing back pain.

The technology boom for damaged discs encompasses a wide range of devices designed to maintain flexibility, including replacing the damaged discs with prosthetic devices, as in Mr. Laraway's case.

For unpinching nerves, technologies are emerging that use more flexible rod systems and spacers to keep vertebrae separated. Cutting-edge bone cement materials help repair fractured vertebrae.

Gene therapies to preserve the disc, to prevent degenerative disc diseases, to avoid cartilage deterioration and to allow nerve healing also are under study.

Even traditional surgeries that fuse vertebrae together have improved. Surgeons can now use a protein that stimulates bone formation to generate new tissue. The protein compound, called bone morphogenetic protein, or BMP, has been approved by the Food and Drug Administration for several procedures to heal and strengthen bones.

"To achieve a fusion you have to get the bones to grow together," explained Dr. Morrill, who specializes in multilevel fusion operations for deformities and tumor-spinal-cord compression. "So now we have these things that can help us achieve that fusion without having to take the bone from some other part of the body. That reduces pain. It improves recovery time. It improves the rates of achieving a fusion."

As the population ages, the prevalence of back pain continues to climb. And the surgical field reflects that, with spinal surgeries shifting from single-digit to double-digit growth rates over the past decade, Dr. Gill said.

"I think you're going to find that more and more people want their spine problem taken care of; they want to be more active," he said. "I guess you could say we are in the mobility business. We don't save lives, we save lifestyles."

*For more information about the Spine Center, please call 214-645-6455, or visit www.utsouthwestern.edu/patientcare/medicalservices/spine.html.*