

UT SOUTHWESTERN
 MEDICAL CENTER

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- + Artificial Disc Replacement
- + Spine Care Specialists

**Innovative Surgical
and Medical Options**

UT Southwestern applies a multi-disciplinary approach to evaluate and treat all types of lumbar and cervical conditions and injuries. This includes complex conditions, tumors and fractures, spinal deformities, and degenerative disease. Our specialists are dedicated to clinical excellence, as well as research and education, to provide the highest standards of comprehensive care.

**Groundbreaking
Spine Surgery
Study Now Open
to Participants.**

More information inside.

**Environment or Heredity—
Which Affects Spinal
Disc Degeneration More?**
Kevin Gill, MD

Vice Chair and Professor, Orthopaedic Surgery, UT Southwestern Medical Center
Lead Investigator, Twin Spine Study

Aging, injuries, and general mechanical insult are considered the most common causes of lumbar disc degeneration. The Twin Spine Study, which was conducted over a span of 19 years, is now contradicting this conventional view. Its results have revealed heredity has a major impact.

“The Twin Spine Study focused on the etiology and pathogenesis of disc degeneration. Exposure-discordant identical twins were used to provide perhaps the most well-controlled studies on the effects of specific exposures on human disc degeneration to date,” explains Kevin Gill, MD, Vice Chair of Orthopaedic Surgery at UT Southwestern Medical Center, and lead investigator in the Twin Spine Study.

A multidisciplinary, multinational team of collaborators from the United States, Canada, and Finland conducted the study. This included UT Southwestern Medical Center. The research began in 1991 to provide a long-term view of the role of heredity in disc degeneration.

“An injury model is most commonly applied to prevention strategies, treatment, and research of lumbar disc degeneration. As a result of the Twin Spine Study, we know a patient’s genetic background can have a significant impact on our treatment plans. We are now using this information to develop innovative approaches to evaluating spine issues and managing patient care,” says Dr. Gill.

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Kappa Delta Award The Twin Spine Study received the Elizabeth Winston Lanier Award from Kappa Delta, which is presented by the American Academy of Orthopaedic Surgeons. It was bestowed for outstanding research in Orthopaedic Surgery in 2008.

About the Twin Spine Study

Subjects of the Twin Spine Study were recruited from the population-based Finnish Twin Cohort, which included 13,888 male pairs of known zygosity. Information about the twins was based on surveys conducted in 1975 and 1981, which had elicited response rates of 89% and 84%, respectively.

The cohort was found to be representative of the general Finnish population. The Twin Spine Study subjects drawn from the Finnish Twin Cohort included:

- 147 monozygotic (MZ)
- 153 dizygotic (DZ) male twin pairs (as determined through original zygosity questionnaire data)

Heredity: A Major Determinant of Disc Degeneration

The observations of co-twin similarities led to two studies of independent samples of MZ twins to systematically evaluate familial aggregation of disc degeneration. In MZ twins, this represents the upper limit of genetic influences, as similarities can reflect both shared genes and shared early environments.

Because there are very few traits that exhibit shared environmental (i.e., nongenetic familial) effects in adulthood, familial aggregation is generally viewed as a proxy of total genetic effects. The resulting two articles were published in 1995 and supported a major shift in the way

Determinants of Disc Degeneration

The variability in quantitative disc degeneration summary scores explained by physical loading, age, and familial aggregation (proxy of heredity) demonstrated that significantly more variability remained unexplained in the L4-S1 disc levels.

disc degeneration and its determinants are viewed.

Although occupational physical loading and other environmental exposures had received much attention as possible risk factors, there were few detailed studies focused on hereditary aspects of disc degeneration. Before this study, there were only case series reports of similarities between twin siblings and relatives in the extent and location of degenerative changes in the spine and other joints.

The pilot of the study enrolled 20 twin pairs of MZ twins discordant for smoking. There was a striking degree of similarities (matching by type of finding and spinal level) within identical twin pairs, well beyond that expected by chance or because of similarities in age.

This was followed by a larger, more comprehensive investigation of the role of familial aggregation and environmental influences in disc degeneration. This has been among the most important contributions to date from the research program.

The Impact of Genetic and Early Shared Environmental Influences

Spine MRIs from 115 pairs of MZ twins were used to estimate the effects of commonly suspected risk factors on disc degeneration relative to the effects of age and familial aggregation, representing

both genetic and early shared environmental influences.

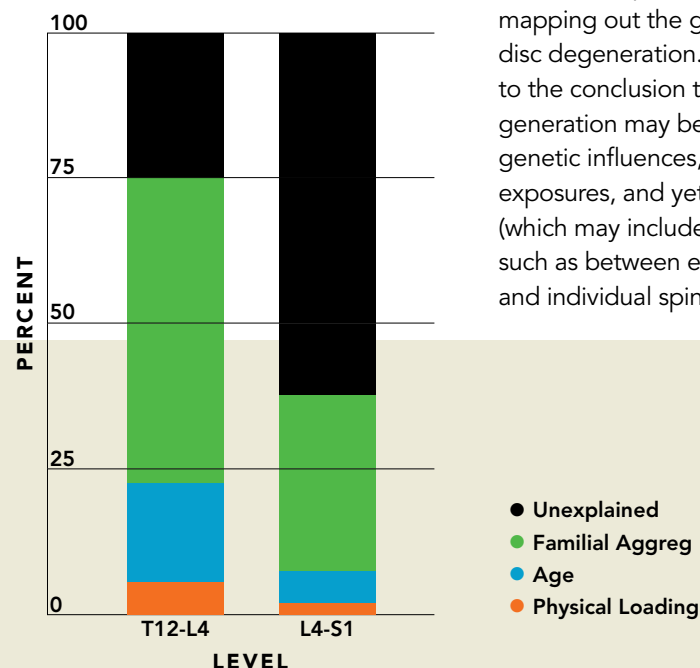
The data from the study showed:

- In the multivariable analysis of the T12–L4 region 61% of the variance in disc degeneration was explained by familial aggregation, beyond that of age and occupational physical loading that together explained 16%.
- In the L4–S1 discs, 11% of disc degeneration was explained by physical loading and age, which rose to 43% once familial aggregation was added to the model.
- In contrast to the upper lumbar levels, 57% remained unexplained in the lower lumbar region.

The high heritability estimates for different degenerative findings in spine MRI provide motivation for identifying associated genes. Yet, disc degeneration and associated pathology likely represent

Study findings have led to the conclusion that lumbar disc degeneration may be explained primarily by genetic influences, early environmental exposures, and yet unidentified factors.

complex conditions with multifactorial inheritance, presenting challenges to mapping out the genetic architecture of disc degeneration. The study findings led to the conclusion that lumbar disc degeneration may be explained primarily by genetic influences, early environmental exposures, and yet unidentified factors, (which may include complex interactions, such as between environmental factors and individual spinal anthropometrics).



Groundbreaking Spine Surgery Study Now Open to Participants: First Posterior Minimal Access Motion-Preserving Device

UT Southwestern will be one of five sites in the United States (and the only academic medical center) participating in the Triumph Study, research on the surgical management of L1-L5 single level degenerative disc disease.

“This will be an important landmark in spine surgery, allowing surgeons the first opportunity to implant a motion-preserving device from the posterior minimal access approach,” says Kevin Gill, MD, the study’s lead investigator at UT Southwestern.



Triumph implant in lumbar flexion and extension.

Disc replacement technology is currently performed through an anterior approach to the spine. This new method requires a one-hour surgery. It follows a routine approach to the spine (TLIF) and can be performed by most spine surgeons.

In addition, a new metal-on-metal implant with two cobalt-chrome alloy components is being used. This implant has a titanium, plasma-spray porous coating to promote bony ingrowth at the vertebral endplate. It is designed to allow motion in flexion/extension, lateral bending, and axial rotation.

The study, which is being sponsored by Globus Medical, has been approved by the Institutional Review Board at UT Southwestern and is authorized by the U.S. Food and Drug Administration.

The follow-up pivotal study will be offered to 480 patients at 20 sites; patients in the pivotal study will be randomized 1:1 with a TLIF fusion of the lumbar spine. Twenty patients from UT Southwestern will be included.

To participate in the Triumph Study, patients need to:

- Have been diagnosed with L1-L5 single level degenerative disc disease, a condition with decreased disc space and disc bulging; loss of disc height; annular tearing; and disc dissection
- Have lumbar back and leg pain
- Be between the ages of 18 and 64 years old

For more information or to refer a patient to this study, please call 214-645-8300.

Fingers to Toes 2011: A Musculoskeletal Clinical Correlation Conference May 6-7

The Department of Orthopaedic Surgery is holding its annual continuing medical education (CME) course, Fingers to Toes on May 6 and 7. It will cover the evaluation and treatment of orthopaedic conditions and injuries—common and complex cases, for both adult and pediatric patients. UT Southwestern’s Orthopaedic Surgery faculty will lead this course.

CME credit is being offered for Fingers to Toes.

Guest Faculty, Matthew Matava, MD
Associate Professor of Orthopaedic Surgery and Co-Chief of Sports Medicine Service Washington University School of Medicine (Saint Louis, Missouri)

Educational Objectives

As a result of attending this activity, participants will be better able to:

- Understand the pertinent anatomy of the elbow, wrist, hand, lumbar spine, hip, and knee in relation to common injuries
- Evaluate, diagnose, and treat patients with common sprains, strains, and fractures of the elbow, wrist, hand, lumbar spine, hip, and knee
- Order and interpret plain radiographs of common injuries of the elbow, wrist, hand, lumbar spine, hip, and knee
- Know when to refer patients for surgery for elbow, wrist, hand, lumbar spine, hip, and knee conditions
- Evaluate and treat patients with osteoporosis and rheumatologic disorders
- Evaluate children with spine, elbow, wrist, hand, hip, and knee conditions and refer when indicated

Who should attend?

Orthopaedic Surgeons, General Practitioners, Family Practice Physicians, Internal Medicine Physicians, Pediatricians, ED Physicians, Physical Therapists, Physician Assistants and Nurse Practitioners, and Athletic Trainers

Registration

For information or to register, call 214-648-3138 or e-mail cmeregistration@utsouthwestern.edu.

Comprehensive Care Helps Patient Resume Life

UT Southwestern's goal for spine care is to find answers for patients suffering from back and neck pain. This includes nonoperative and operative treatment options. For one patient from West Texas, a multidisciplinary approach was applied to her care to resolve severe back pain and depression.

L5/S1 Disc Degeneration and Midline Annular Tear

The patient, who we will name Debra, developed classic post-laminectomy syndrome at L5/S1. This resulted from a laminectomy performed prior to seeing specialists at UT Southwestern. Debra's MRI images demonstrated the L5/S1 disc degeneration and midline annular tear on the axial image at the disc margin.

Prior to seeking care at UT Southwestern, Debra's treatment program included extensive nonsurgical care. Physicians also recommended surgery, a fusion at L5/S1.

When the patient was evaluated at UT Southwestern, findings concluded disc space narrowing and annular degeneration and the annular tearing, with disc space loss and foraminal stenosis. Dr. Kevin Gill determined Debra was a candidate for minimal-access surgery, which he performed.

Innovative Zlif Minimal-Access Fusion Spine Surgery Performed

At UT Southwestern, a special, minimal-access fusion called Zlif (developed with Globus Medical) is performed. It is similar to the Alif, according to Dr. Gill. However,

a primary difference is the posterior approach. "For this surgery, we use a special product called Signature™. It is a hinged PEEK implant that offers full disc endplate coverage from a posterior approach. This allows for excellent bony coverage, while backing up the construct with pedicle screws—so minimal-access surgery can be performed," said Dr. Gill.

The incision for this procedure is small, just four centimeters. The surgery requires a one-night stay in the hospital.

Care Beyond Surgery

Debra's L5/S1 disc degeneration and midline annular tear were resolved with surgery. However, during her recovery, she was diagnosed with depression.

UT Southwestern Orthopaedic Surgery offers a multidisciplinary approach to care. As a result, Dr. Gill worked with Dr. Carl Noe to evaluate Debra and determine her treatment plan. (Dr. Noe is the Director of the Eugene McDermott Center for Pain Management at UT Southwestern.) Debra was placed on Cymbalta®. This had the double impact of treating her leg pain and serving as a mood elevator.

"As a result of the team approach to care UT Southwestern takes, we determined the most effective course of treatment for this patient. We were successful in treating issues with her spine, as well as other medical conditions," said Dr. Gill.

To learn more about spine care at UT Southwestern, visit our website at utsouthwestern.org/spine.

Noteworthy Mention

Technologic innovations allow our spinal surgeons to replace damaged discs with mechanical artificial disc implants. For some patients, we can preserve individual vertebrae and replace the cushioning disc between them with safe, effective structure typically composed of biopolymer components. This can dramatically reduce pain levels, and achieve high levels of mobility and flexibility for patients.

Referring Patients for Lumbar and Cervical Spine Issues

UT Southwestern Orthopaedic Surgery evaluates and treats all types of lumbar and cervical spine conditions and injuries. This includes complex conditions, tumors, fractures, spinal deformities, and degenerative diseases. When making a referral, consider these points:

- Our physicians are available to provide information about the diagnosis and treatment of your patients.
- Physicians can access their patients' electronic medical records.
- After treatment, your patients will be returned to your practice.

For information or to refer a patient to UT Southwestern please call 214-645-8300, Monday through Friday, 8:00 a.m. to 5:00 p.m. Online appointments and referral requests are available at utsouthwestern.org.

Featured Specialists in Spine Care and Pain Management



Kevin Gill, MD *Vice Chair and Professor, Orthopaedic Surgery*

Dr. Kevin Gill practices orthopaedic surgery with a specialty in disorders of the spine. His extensive clinical experience involves the diagnosis and treatment of degenerative cervical and lumbar spine conditions, including spinal fusions, disc arthroplasty, and minimally invasive spine surgery. Dr. Gill participates in multiple clinical trials that investigate motion preservation implants and surgical techniques. His latest clinical trial is Triumph–Globus Medical posterior disc replacement system. • His research has focused on degenerative conditions of the cervical and lumbar spine. Minimally invasive techniques and motion preservation studies are also under way. Academic research involves a 19-year follow-up of MRI degenerative changes (the Twin Spine Study). Additionally, he has been a leader in a five-year study of lumbar spinal stenosis in adult patients. • Dr. Gill is a member of the American College of Physician Executives, Diplomate of the American College of Healthcare Executives, and American Board of Orthopaedic Surgery. He serves as an advisory editor of the *Journal Spine*, as well as *The Spine Journal*. • • •

Board Certification

American Board Orthopaedic Surgery
American Board of Spinal Surgery

Recognition

Kappa Delta Award, American Academy of Orthopaedic Surgery
Volvo Award–ISSLS

Fellowship

London England Clinic/Hospital, Disorders of the Spine
University of Vermont, Disorders of the Spine

Residency and Internship

UT Southwestern, Surgery Internship
UT Southwestern, Orthopaedic Surgery

Education

Bachelor's Degree: University of Texas (Austin)
Medical Degree: Baylor College of Medicine (Houston)
Master's Degree in Medical Management: Tulane University



Michael Bolesta, MD *Associate Professor, Orthopaedic Surgery*

Dr. Michael Bolesta has focused on degenerative and traumatic conditions of the spine. This includes investigating minimally and less invasive techniques to treat spinal disorders. • He serves as Chief of Orthopaedic Spine Service at Parkland Memorial Hospital, as well as Medical Director of its Multidisciplinary Spine Clinic. He also serves as adjunct faculty in biomedical engineering at the University of Texas, Arlington. • Dr. Bolesta has garnered professional honors, such as the North American Traveling Fellowship of the American and Canadian Orthopaedic Association. He has also held leadership positions in several professional societies and universities and serves on the Ethics and Professionalism Committee of the Cervical Spine Research Society. • • •

Board Certification

American Board of Orthopaedic Surgery

Recognition

North American Traveling Fellow

Fellowship

Case Western Reserve University, Spine Surgery

Residency

Duke University Medical Center, Orthopaedic Surgery

Education

Bachelor's Degree: University of Missouri - Columbia
Medical Degree: University of Missouri - Columbia



Carl Edward Noe, MD *Professor, Department of Anesthesiology and Pain Management Director, Eugene McDermott Center for Pain Management*

As part of a multidisciplinary approach to treating patients with spine injuries and conditions, UT Southwestern Orthopaedic Surgery and Pain Management offer accurate diagnostic services and successful treatments that make an important difference in patients' lives. The Eugene McDermott Center for Pain Management is led by Dr. Noe. It is recognized as one of the nation's leading clinical and research centers for advanced therapies to treat chronic pain. • • •

Board Certification

American Board of Anesthesiology (ABA)

Fellowship

Stanford University, Critical Care Medicine
Texas Tech University Health Sciences Center,
Pain Management Fellowship

Residency

Texas Tech University Health Science Center, Rotating Internship
Texas Tech University Health Science Center, Anesthesiology Resident
Stanford University, Cardiothoracic Anesthesia and Critical Care

Education

Medical Degree: UT Health Science Center, San Antonio



Lori Tappen Named Physician Assistant of the Year

UT Southwestern Medical Center named Lori Tappen as Physician Assistant of the Year for consistently exceeding the standard of patient care. She was selected based on her work history and contributions to the medical center, patients, and the community.

Ms. Tappen has served as Physician Assistant to Dr. Kevin Gill since March 1999. She joined UT Southwestern Orthopaedic Surgery in 2005. She holds a bachelor's degree from UT Southwestern School of Allied Health and a master's degree in physician assistant studies from the University of Nebraska Medical Center.



The Twin Spine Study has led to identification of the first gene forms associated with disc degeneration.

(continued from page 1)

Environment or Heredity – Which Affects Spinal Disc Degeneration More?

First gene forms linked to disc degeneration

The most significant investigations related to determinants of disc degeneration included occupational exposures, driving and whole-body vibration exposure, smoking exposure, anthropomorphic factors, heritability, and the

identification of genotypes associated with disc degeneration. The Twin Spine Study found a substantial influence of heredity and the identification of the first gene forms associated with disc degeneration.

When extraordinary discordance between twin siblings in occupational and leisure-time physical loading conditions throughout adulthood was considered, the data showed there was little impact. As an example, one of the environmental factors considered was smoking. When

one of the pair of twins was exposed to more smoking, there was some difference in disc degeneration. However, the effect was small.

With data from the Twin Spine Study, lumbar disc degeneration can be explained primarily by genetic influences, early environmental exposures, and yet unidentified factors (which may include complex interactions, such as between environmental factors and individual spinal anthropometrics).

For more information about the Twin Spine Study, contact Dr. Gill at 214-645-8300.



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