

S P I N A L  
CURVES

LEARN THE CURRENT  
TREATMENT OPTIONS FOR  
**SCOLIOSIS**

STRAIGHT TALK ON  
CURVATURE OF THE SPINE

CURVES AHEAD?  
WHEN SPINAL CURVES  
IMPACT YOUR LIFESPAN

TREATMENT OPTIONS FOR  
FLATBACK SYNDROME  
& KYPHOSIS

NONSURGICAL OPTIONS:  
HOW & WHEN THEY WORK

# WHAT TO DO WHEN LIFE THROWS YOU A CURVE

When a person first learns they have an abnormal curvature of the spine, it's certainly unsettling. You learn new terms like scoliosis, kyphosis, flatback syndrome, etc.

Thanks to school programs that screen for scoliosis, most scoliotic curves are detected by a school nurse in elementary school, who then may direct the parent and child to regional scoliosis surgeons in their area.

These specialists can assess the curve, try non-surgical treatment options like bracing, and advise the parent on the best course of action, including watchful waiting. Adults with spinal curves that are progressing in many cases will have to consider scoliosis surgery to correct the problem.

But why did Mother Nature throw such a curve? What causes scoliosis in the first place?

### **What causes spinal curves?**

Scoliosis is in most cases a painless condition that can progress unnoticed for years. Ultimately, as the curve worsens, it causes an abnormal curvature in the spine. This will often result in a rotation of the spine and rib cage, which affects the symmetry of the shoulders, trunk and waist.

Although most cases of scoliosis are mild, severe scoliosis can be disabling, inflicting excruciating back pain as a symptom. Certain conditions like cerebral palsy, may actually cause scoliosis, but in most cases the cause of scoliosis is unknown. Sometimes

there can be a hereditary tendency to pass along the problem from generation to generation.

The three main types of scoliosis are Functional, Neuromuscular, and



*In scoliosis, the spine is not only curved, but also twisted, like a corkscrew. Severe curves can impact internal organs. As the person ages, the spinal curve can worsen and begin to pressure, encroach upon and impair the function of the internal organs which can shorten lifespan. When spinal curves become dangerously severe, a scoliosis surgeon will use special instrumentation that untwists and straightens the curve as much as possible.*

Degenerative. Functional scoliosis is where the spine is normal, but over time an abnormal curve develops due to another ailment in the patient's body, such as having one leg longer than the other.

Neuromuscular scoliosis can usually be much more severe since the condition is present at birth. This type of scoliosis is due to the failure of the spine bones to properly form, or fail to correctly separate from each other. People born with birth defects or cerebral palsy can often have neuromuscular scoliosis.

Degenerative scoliosis is found in adults where the weakening of normal ligaments and other soft tissues of the spine can lead to an abnormal curve in the spine. Many times this can

be linked to the patient having complained about arthritis.

Idiopathic scoliosis is not linked to a known cause, but it is the most common type of scoliosis in adolescents. Doctors are unsure what causes this type of scoliosis, but it is suggested that it is hereditary because the disorder tends to run in families.

### **How scoliosis progresses**

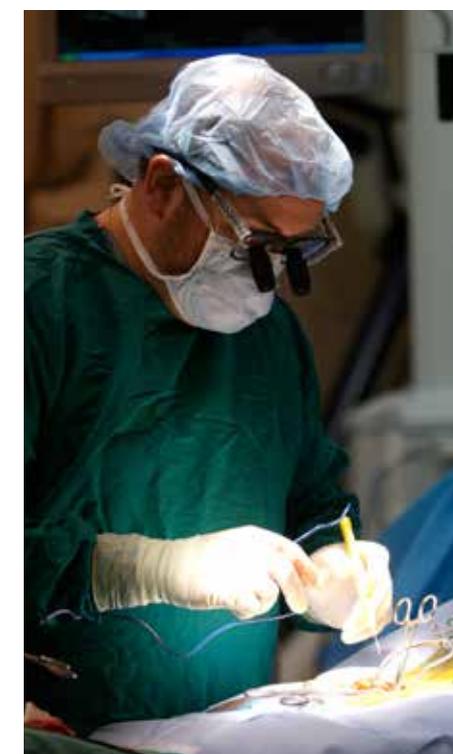
Most of the time the patient is unaware of the curvature in their spine until it is noticed by someone else. The most common symptom of scoliosis is a curve in the spine. Some of the warning signs to look for are shoulders at different heights, appearance of a uneven waist, rib cages at different heights, leaning of entire body,

fatigue, backache, low-back pain and head not aligned with the pelvis. These signs and symptoms typically begin in adolescence when boys and girls hit their growth spurt.

Boys and girls develop mild scoliosis around the same rate, but interestingly, girls have an increased risk of the scoliosis worsening. Severe scoliosis (a curve greater than 100 degrees) can create dangerous problems. The spinal curve can encroach upon the lungs and heart, as well as other organs, making it more difficult to breathe and for the heart to pump blood flow properly.

If there is uncertainty that you or your child might have scoliosis, you should see a scoliosis specialist to get evaluated.

*When should a person consider scoliosis surgery to straighten a curve? It's a complex decision, because waiting too long carries increasing risks. That's because the spine is most flexible—and more receptive to correction—when the person is under 21 years of age. As a person gets older, the spine is less flexible and the scoliosis surgeon must be careful to not over-correct which could cause damage to the spinal cord and paralysis. When curves appear as a child, a scoliosis specialist may try bracing to arrest the curve. Other minor curves can be watched over time to see if they worsen. If surgery is necessary, it's crucial for a person to seek out a fellowship-trained scoliosis surgeon who is experienced with the most current scoliosis instrumentation. For example, Flatback Syndrome is the result of a physician using Harrington Rods, which is an antiquated system that merely straightens without derotating the spine. This can require revision surgery later on to repair the problems that were created with the first surgery.*



## Spinal Curves

### SCREENING

## DO YOU HAVE SCOLIOSIS? HERE'S HOW TO SCREEN FOR IT

Viewed from the side the healthy spine has natural curves. But viewed from behind, the alignment should be straight. The easiest way to screen a child or adult for scoliosis, is to have the person bend over at the waist and observe their shoulder blades to see if they are uneven. If the spine is curved, one shoulder will appear higher than the other.



School examinations include Adam's Forward Bend Test for scoliosis. This test has the child bend over and touch their toes, which exposes the spine to the examiner so he or she can easily detect any abnormal spinal curvatures. Most of these screenings take place in the 5th or 6th grade.

Additional testing can be done by taking an X-ray from the front and the side to get a clearer view of the spine's alignment. Height and weight is measured because the more remaining growth the patient has, the greater potential of the scoliosis to worsen.

A scoliosis specialist will monitor the patient over several follow up visits to compare the results of the previous visits to get a better idea of the pace of the progression of the spinal curve.

Ideally, the treatment of scoliosis is customized to each patient and based on the severity of the curve and the potential of the spine to curve even worse. Most scoliosis treatment includes observation, bracing, and surgery. Observation is usually the most common route. If the doctor recommends wearing a brace, this treatment is designed to further prevent worsening of the spinal curve, rather than to reverse the scoliosis back to a completely straight spine.

So bracing is typically a hedge against the curve becoming worse. Scoliosis experts caution the patient and the parent that at best, a brace may slow a curve, which may make corrective surgery less complex.

### **When scoliosis surgery is needed**

Surgery consists of using metal rods, screws or wires to de-rotate the curve, to regain a straight posture while the spine heals. Neuromuscular scoliosis typically requires spine surgery.

Experimental testing is being researched to see if a patient's blood can give doctors insight about if the scoliosis is likely to worsen in the future. School screening is especially crucial for scoliosis, as it helps parents to become aware of their child's situation before the spinal curve worsens. Early detection may prevent a surgery, or make the surgery less complex.

The good news about scoliosis is that the vast majority of people diagnosed with some degree of scoliosis will often live normal, active and healthy lives.

### **Scoliosis at birth**

Congenital scoliosis is a condition where there is deformity in the spine present at birth, but typically it is



## Spinal Curves

### TREATMENT

## X-RAYS AND ASSESSING YOUR OPTIONS

Dr. Douglas Geiger is a fellowship-trained, board-certified orthopedic surgeon at Ann Arbor Spine Center. He is a fellow of the Scoliosis Research Society and a fellow of the American College of Surgeons. He specializes in spine surgery, reconstructive surgery and scoliosis surgery for children and adults.

Dr. Geiger is a frequent lecturer on such topics as scoliosis, current technologies in spine surgery, as well as spine care in the elderly population.

Dr. Geiger completed a Surgical Internship and orthopedic Surgery Residency at Henry Ford Hospital in Detroit. He went on to complete an NIH research fellowship in Orthopedic Spine Surgery at the University of Minnesota and a Spine clinical fellowship at the Twin Cities Scoliosis Spine Center.

He currently serves as the Director of the Spine Fellowship Program at University of Toledo College of Medicine, and has held numerous teaching positions at several medical schools.



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revealed only as the baby continues to grow. The cause of congenital scoliosis is abnormally shaped or fused bones in the spine that do not grow or fuse correctly.

Neuromuscular scoliosis consists of poor neurologic or muscular control of the spine and might be evident in those children born with cerebral palsy and muscular dystrophy.

Children diagnosed with more advanced scoliosis can often feel like they sometimes have trouble breathing. They are also prone to more back and leg pain symptoms.

Because kids are fairly flexible, spinal curves can progress unnoticed for years without any symptoms. This explains why school screenings are so critical to detect scoliosis early on. During the screening, a school nurse or pediatrician may notice a hump, uneven shoulder blades or hips, or an “S” shaped curve in their spine.

“The one thing all my patients have in common is a lack of desire to actually be in a spine surgeon’s office. Most of them consider spine surgery to be a last resort, or at least not the first choice in spine treatment. I try to be certain all non-operative options have been exhausted before entertaining the prospect of surgery, and then the decision to proceed ahead with an operation is made only after careful deliberation by the patient and the surgeon. It is a very mutual well-educated decision that involves all necessary parties and information. Thus, a game plan is developed, and with appropriate expectations by the patient, will give the best chance for success with surgical treatment.”

-Douglas Geiger



The potential for the curvature in the spine to worsen is linked to the amount of growth remaining in the bones and spine. This growth may relate to the treatment decision and recommendation from the scoliosis surgeon.

One way to determine how much growth has yet to take place is to perform an X-ray of the pelvic hip region. Another way is to note the changes of puberty in girls and boys which can give insight if the person has more growth left. In girls, evidence suggests that after their first period, there may be one to two more years of spine growth remaining.

### Where spinal braces fit in

Every adolescent dreads the thought of wearing a back brace to school. They are afraid it can be

a source of ridicule and it draws undesirable attention to their scoliosis, something most kids would like to forget.

Most scoliosis surgeons are aware of these concerns, and there are some braces that need only be worn at night in the hope that such bracing may yield a decent result in arresting the spinal curve. The purpose of bracing is to apply pressure to the trunk and pelvis to arrest the curve. Some doctors might recommend bracing if the scoliosis starts to pass 20 degrees measured laterally in the curve. Most doctors will recommend bracing for patients with a curvature angle around 20-50 degrees.

A back brace, however, is not designed to reverse the curvature, but rather to prevent the spine from worsening. There are many different

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types of bracing options available with specially placed padding and straps that place resistance on the certain area in the spine. Most braces are constructed of plastic and contoured to the patient’s unique body.

The Boston Brace is probably the most common used to treat scoliosis. These braces are made out of plastic components that are custom modeled to the patients body which creates a low-profile for the brace.

On the front side, this brace extends from the lower breast to the start of the pelvic area. On the back side it extends from the upper back to the tail bone. This brace forces the low back to flex which helps flatten the curve.

When scoliosis progresses to above 40 degrees — and bracing

“I always try to provide the least invasive surgery that will give the greatest amount of pain relief. Our current technology now allows us to perform many procedures as an outpatient and to return people to work and play sooner than in the past. Exhaustive non-operative treatment, complete patient education, and state-of-the-art surgical techniques allow us to provide our patients with the best possible experience, especially important since they didn’t want to come to see us to begin with.”

-Douglas Geiger



has shown no signs of arresting the curve — spine surgery is typically recommended.

Children who don’t need bracing or surgery will still need to be under observation through regular follow up visits just to monitor progression of a curve in the future.

X-rays might be done semi-annually until the child completes their growth spurt to document the degree of curve in the patient’s file.

The good news is that the majority of children diagnosed with scoliosis will not need any type of treatment. Only about one in seven adolescents diagnosed with scoliosis will ever need to begin some type of treatment whether that be bracing or surgery.

### Does exercise help or hurt?

Unfortunately, while exercise and movement are key to recovery from other cases of back and neck pain, there doesn’t appear to be any specific exercises that have proven to stop scoliosis. That’s because the muscles are simply no match for a spinal deformity where bone is inclined to curve out of the correct position.

With that said, exercise doesn’t hurt or worsen scoliosis and most scoliosis specialists are quick to recommend that kids stay active in their sports as well as stay active with friends. In cases where a curve is worsening, a scoliosis surgeon may advise against contact sports like football which pose special risks to the spine.

### When adults have scoliosis

Adult scoliosis relates to those 18 or older. Adult scoliosis differs from pediatric scoliosis in that adults have spines that are mature and have fewer treatment options. For example, a brace is of no use typically for an established curve in an adult.

Scoliosis in adults is also often

## PEDIATRIC SCOLIOSIS

### BRACING & WAITING

While bracing is ineffective for adult scoliosis, it can be an effective non-surgical way to arrest spinal curves in the adolescent who is still growing.



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accompanied with back pain, mainly because in addition to complications from the curve, poor spinal alignment can cause muscle and ligament strain.

Scoliosis can also cause discs to herniate from the pressure placed on them from the curve. Another complication can be osteoporosis, where the vertebrae in the spine become porous and brittle, causing vertebral fractures. When the scoliosis patient has osteoporosis, it can limit the spine surgeon's surgical treatment options.

## Issues with middle-aged patients

When surgery is necessary, the concern with adults is that the older the patient, the less the flexible the spine is for correction, and the more risk for spinal cord damage during correction. In this case, waiting years to deal with progressing scoliotic curves can be to

your disadvantage.

There are many non-surgical treatment options for adult scoliosis that can consist of exercises to reduce the back pain symptoms. Steroid injections may also be used to help relieve pain without surgery. Again, bracing is rarely used in adults as it doesn't reverse the existing curve, and doesn't relieve pain symptoms.

Surgery is often the recommended treatment option for curves that have gradually worsened or when pain cannot be relieved nonsurgically.

Some patients, because of severe curves, can have several levels of degenerative discs, which can require fusions over multiple levels.

Recovery after scoliosis surgery is dependent on the length of the incision and scope of surgery, as well as the age of the patient. Some pa-

tients will be back to full activity in three months, while others may need as much as six months to recover and return to activities.

During scoliosis surgery, an incision is made in the back so the surgeon can access the vertebrae and install the necessary instrumentation, rods, hooks and screws. In some cases an anterior incision may be made to access the front of the spine.

Scoliosis surgery is based on a two-rod instrumentation system with hooks that attach to each vertebral level, to de-rotate and straighten the abnormal curve.

The instruments are left inside the body attached to the spine even after the spinal fusions heal to provide additional support.

After the surgery, the patient's spine will appear much straighter.

The ideal approach to spine surgery is where you have orthopedic surgeons working with neurosurgeons, so the patient has the best of both worlds. Ann Arbor Spine Center was one of the first centers in the United States to combine spine neurosurgeons with spine orthopedic surgeons.



The surgical procedure may require a five-day hospital stay. Even after leaving the hospital, the patient will limit movement to allow the spine and incisions to heal.

After three months most patients can begin to return to most normal activities with the exception of any contact sports, or sports like skiing that could result in a fall or trauma.

Because the spine and spinal cord is being repositioned during scoliosis surgery, paralysis is a real risk involved. Consequently, the patient should seek out a very experienced scoliosis surgeon.

## Harrington Rods & revision surgery

Harrington Rods date back to the 1960s. It was a stainless steel rod that was the precursor to current instruments. Harrington Rods were the most common system for scoliosis surgery for a couple decades.

However, while the new instruments de-rotate and straighten the spine, Harrington Rods take a cork-screw-like spine and merely bend it straight without derotation. This has

unfortunately become a problem for all those treated in that era with this now-obsolete system.

It is estimated that around one million people had Harrington Rods implanted over 30 years. And unfortunately, many people developed Flatback Syndrome as a result of this scoliosis system.

Consequently, scoliosis surgeons today are busy doing revision surgery on the thousands of middle-aged scoliosis patients who need these obsolete rods replaced with new instrumentation.

## Flatback syndrome: What is it?

A healthy spine has a natural spinal curve that requires minimum energy to stand or walk. When the spinal curve has been removed, the result is a condition called "Flatback Syndrome."

Some of the symptoms of Flatback Syndrome include having trouble maintaining one's posture, low back pain and upper leg pain. Since the person has trouble maintaining proper alignment, the symptoms can increase throughout the day causing extreme

pain and fatigue.

Patients might also have upper back and neck pain due to constantly trying to realign themselves. With some people, the pain symptoms can result in dependency on painkilling drugs.

Flatback Syndrome was originally used to describe Harrington Rods recipients (1960s- early 1990s) because the rods flattened the normal curve of the spine. This was due to the rods extending down into the lower part of the spine. The rods were unable to mimic the natural curve of the lower back, which in turn caused the spine to flatten out.

This unnatural spinal curve in turn would cause discs to herniate resulting in more pain symptoms.

Other conditions that may cause flatback syndrome include having a collapsed vertebrae. Arthritis can also contribute to flatback syndrome and cause inflammations in the spine, which may cause pain and stiffness.

Most patients with flatback syndrome will complain of pain while standing upright. If the doctor deter-

# Spinal Curves

mines you might have flatback syndrome, he or she will order a full-length X-ray of the spine. An MRI or CT scan might also be taken to help the doctor better understand the health of the spine and discs.

Patients diagnosed with Flatback Syndrome will initially be treated with an individualized physical therapy program and anti-inflammatory medication. If all non-surgical options have become exhausted, then surgery will be performed to remove the Harrington Rods, treat the herniated discs and to address other pain symptoms.

## **Lordosis: What is it?**

Lordosis is a condition consisting of an excessive inward curve of the spine causing the body to improperly distribute mechanical stress from movement such as walking. This condition can affect all ages and usually appears in the lower back but sometimes it is present in the neck.

Lordosis found in the lower back can give the person an exaggerated posture, which can affect movement and cause pain as well.

## **Kyphosis: What is it?**

Kyphosis is a progressive spinal condition effecting people ranging from kids to adults that has the potential to cause serious spinal deformity.

These abnormal curves usually found in the thoracic area can make the person look like they have a humpback. A physical examination consisting of tests such as observation, Adam's Forward Bending Test, Range of Motion and Palpation all help reveal the current health of the patient.

The two classifications of kyphosis are postural and structural. Postural kyphosis is from poor posture, but the person can correct it. Structural kyphosis is an abnormality in the upper body such as the spine and surrounding muscles. This type of kyphosis might have to be treated medically since the patient cannot fix the curving of the spine.

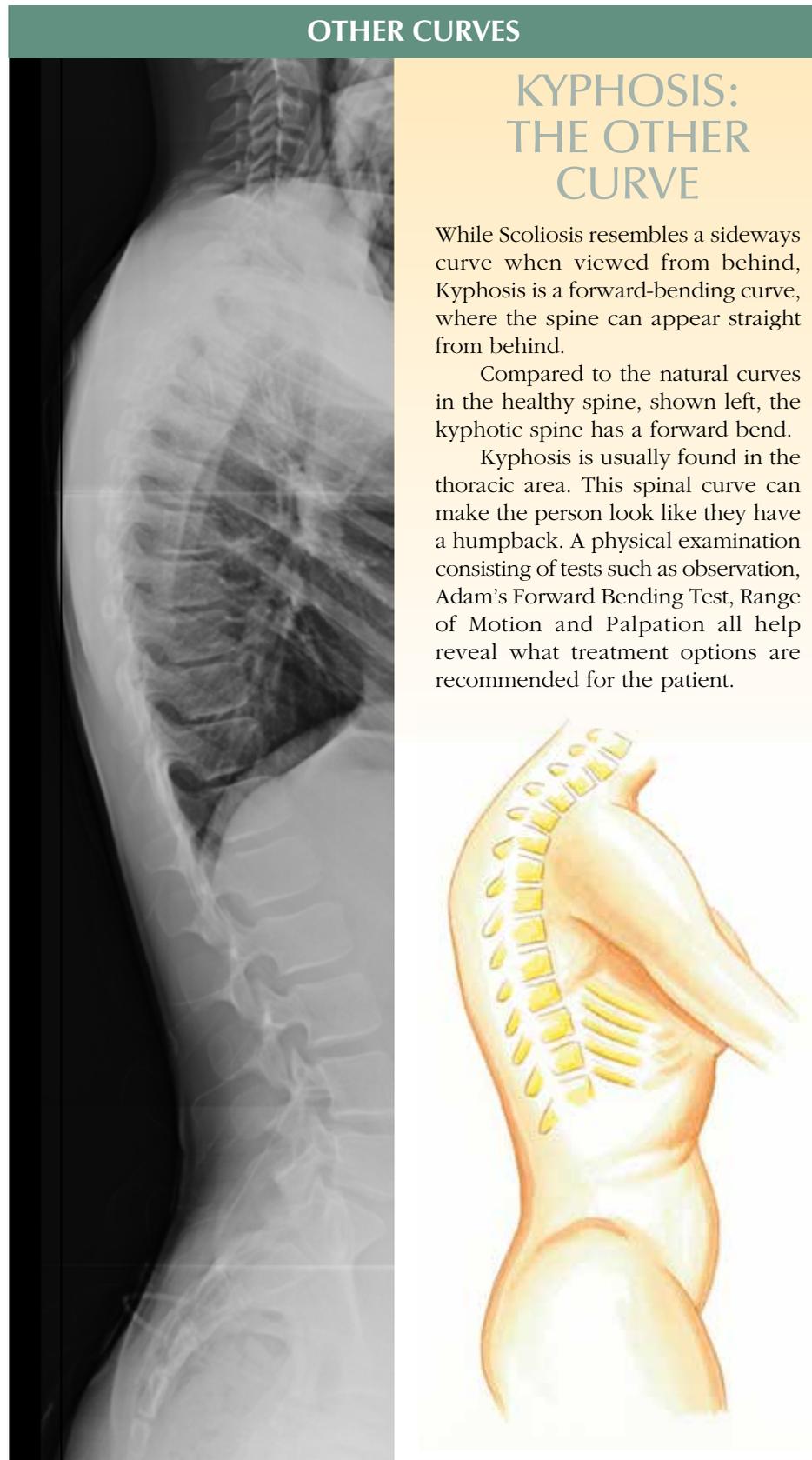
**OTHER CURVES**

## KYPHOSIS: THE OTHER CURVE

While Scoliosis resembles a sideways curve when viewed from behind, Kyphosis is a forward-bending curve, where the spine can appear straight from behind.

Compared to the natural curves in the healthy spine, shown left, the kyphotic spine has a forward bend.

Kyphosis is usually found in the thoracic area. This spinal curve can make the person look like they have a humpback. A physical examination consisting of tests such as observation, Adam's Forward Bending Test, Range of Motion and Palpation all help reveal what treatment options are recommended for the patient.



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When a spinal curve becomes extreme, it can pressure and damage internal organs, shortening one's life. The goal of scoliosis surgery is to enable the patient to return to an active life, and enjoy a normal lifespan.

## SCOLIOSIS SPECIALIST

**Douglas F. Geiger, M.D., F.A.C.S.**  
*Board-Certified Orthopedic Surgeon  
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Dr. Douglas Geiger is a board-certified orthopedic surgeon and a fellow of the American College of Surgeons. He specializes in reconstructive and minimally invasive spine surgery as well as adult and pediatric scoliosis surgery. He completed a research fellowship at University of Minnesota and a spine fellowship at Twin Cities Scoliosis Spine Center. Dr. Geiger is currently director of the spine fellowship at the University of Toledo medical school, and has several teaching roles at other medical schools in the region.



## OTHER PHYSICIANS AT ANN ARBOR SPINE CENTER

### Neurological Spine Surgeons

**Jason Brodkey, MD, FACS, FIPP**  
*Board-Certified Neurological Surgeon, Board-Certified Pain Medicine  
Fellowship-trained in spine*

Dr. Brodkey is Board-Certified with the American Board of Neurological Surgeons and with the American Board of Pain Medicine. He is also certified as a Fellow of Interventional Pain Practice. Dr. Brodkey specializes in complex spinal reconstruction, spinal cord and nerve stimulation, spinal infusion pump implantation and minimally invasive spine surgery.



**Geoffrey M. Thomas, MD**  
*Board-Certified Neurological Surgeon*

Dr. Thomas is a Board-Certified neurological surgeon and specializes in adult spinal degenerative conditions and cervical spine reconstruction. Dr. Thomas also focuses on general neurosurgery, brain tumors, neurooncology and radiosurgery.



### Non-surgical Spine Care

**Carrie Stewart, MD**  
*Board-Certified Physical Medicine and Rehabilitation*

Dr. Stewart is a Board-Certified physical medicine and rehabilitation physician who specializes in helping the back and neck pain sufferer return to activity without surgery. Dr. Stewart is proficient in the evaluation of spine patients, diagnostics, EMGs and providing non-surgical treatment options to those with back and neck problems.



**Andrew Egger, MD**  
*Board-Certified Physical Medicine and Rehabilitation  
Fellowship-Trained Interventional Pain Management*

Dr. Egger is a Board-Certified PM&R physician fellowship-trained in interventional spine care and pain management. He specializes in helping the neck, back, arm, and leg pain sufferer return to normal function without surgery. Dr. Egger is proficient in non-surgical spine care including minimally invasive interventions in the Cervical, Thoracic, Lumbar, and Sacral Spine and peripheral joints.



**Michael Louwers, MD**  
*Board-Certified Physical Medicine and Rehabilitation  
Fellowship-Trained Interventional Pain Management*

Dr. Louwers is a Board-Certified PM&R physician. He specializes in the assessment, diagnosis and non-surgical treatment of back and neck pain problems. Dr. Louwers is proficient in pain relieving spine injections and other non-surgical spine care.



## Orthopedic Spine Surgeons

**Anthony P. Cucchi, DO**  
*Board-Certified Orthopedic Surgeon  
Fellowship-trained in spine*

Dr. Anthony Cucchi completed his orthopedic spine surgery fellowship in Ann Arbor, at Michigan Brain and Spine Institute. He specializes in adult spine care, adult reconstructive spine surgery, degenerative spine surgery and minimally invasive spine surgery.



**Mark H. Falahee, MD, FACS**  
*Board-Certified Orthopedic Surgeon  
Fellowship-trained in spine*

Dr. Mark Falahee is a Board-Certified orthopedic surgeon and specializes in adult spine care encompassing traumatic, metabolic, pathologic, and degenerative problems. Dr. Falahee also specializes in reconstructive thoracic and lumbar spine surgery.



**Ann Arbor Spine Center...**  
*includes a multidisciplinary team of orthopedic and neurological spine surgeons working closely with spine physicians and spine therapists who specialize in non-surgical spine care. Ann Arbor Spine Center is the only spine center in Michigan to be included in Spine Center Network, SpineCenterNetwork.com, an exclusive national listing of credentialed spine centers of excellence.*

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