

# Adolescent Idiopathic Scoliosis



*Navigating  
Your Journey*

A GUIDE FOR YOU  
AND YOUR FAMILY

3rd Edition



Sponsored by




 Alfred I. duPont  
Hospital for Children

Spine and Scoliosis Center



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# *A Note from the Sponsors*



Rady Children's Hospital-San Diego is proud to join Harms Study Group and Setting Scoliosis Straight Foundation in support of scoliosis education, research and advocacy. We at Rady Children's believe education is critical to improving scoliosis care. We hope this outstanding booklet will be a valuable resource to your family.



Nicklaus Children's Hospital is honored and proud to be one of the sponsors of this scoliosis handbook. The initial version assisted many families in dealing with the various aspects of scoliosis treatment. Surely, many more families will benefit from this edition. Congratulations to the Harms Study Group and Setting Scoliosis Straight Foundation for production of such an outstanding manual.



## **Spine and Scoliosis Center**

Nemours/Alfred I. duPont Hospital for Children is pleased to partner with the Harms Study Group and Setting Scoliosis Straight to help guide families through this journey. As pioneers in scoliosis treatment and leaders in the healthcare of children, we understand families' need for education and support along the way. Thank you to the Harms Study Group and Setting Scoliosis Straight Foundation for creating this comprehensive roadmap for scoliosis.



Cincinnati Children's Crawford Spine Center is committed to helping the whole patient stand tall. Our multidisciplinary team treats the patient both physically and emotionally, and we are proud to sponsor this exceptional scoliosis resource from Harms Study Group and Setting Scoliosis Straight Foundation, which helps serve the critically important need of supporting and educating families throughout the diagnosis and treatment process.

# *A Note from the Producer*



*Supporting Discoveries  
in Spinal Deformities*

The Setting Scoliosis Straight Foundation and the surgeon members of the Harms Study Group are honored to present Adolescent Idiopathic Scoliosis, Navigating Your Journey: A Guide for You and Your Family.

This handbook is the culmination of over two years of work, which includes extensive feedback from our colleagues and our patients. We are optimistic that the widespread distribution of this handbook will improve the education and support for our patients, their families, and the medical community.

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# Introduction



This handbook about Adolescent Idiopathic Scoliosis was written for you—to guide you as you start this journey—and by you, from the experiences and ideas of people who have already traveled the road that lies ahead of you.

Having had the opportunity to care for many teens with Adolescent Idiopathic Scoliosis (AIS), we recognize that each family approaches this diagnosis in their own way.

We hope that the information provided will help you in your journey through scoliosis treatment.



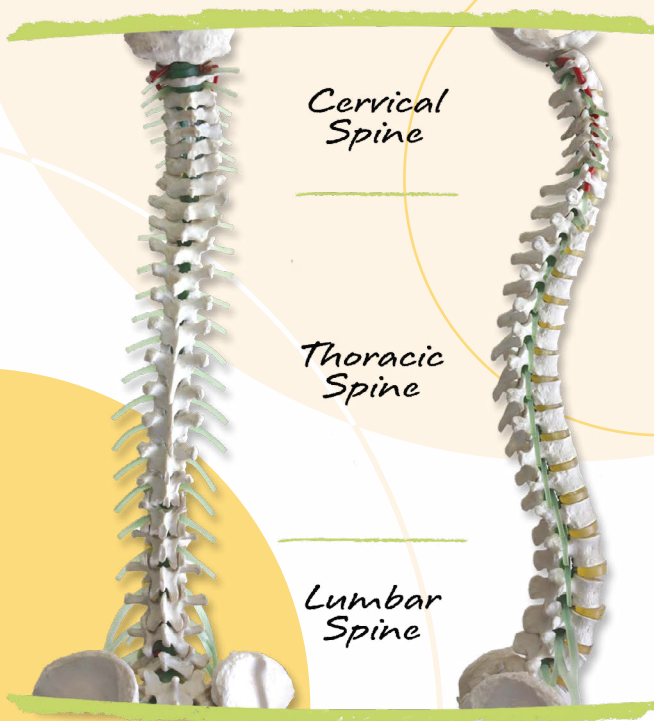
Kalli, after spine surgery

## What makes up the spine?

The spine is made up of twenty-four individual bones called vertebrae that are separated by discs. The discs allow the spine to be flexible.

There are three regions of the spine: seven cervical (neck) vertebrae, twelve thoracic (chest) vertebrae and five lumbar (low back) vertebrae. In addition, there are five fused vertebrae below the lumbar spine that make up the sacrum.

The spinal column houses and protects the spinal cord. Spinal nerves project out from the spinal cord through spaces between each of the vertebrae.

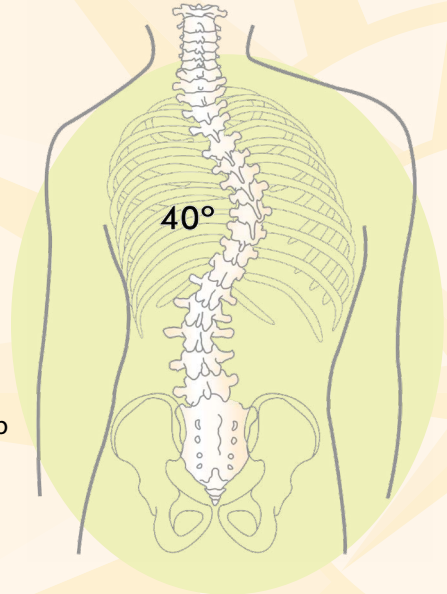


## What is scoliosis?

Viewed from the front or back, the spinal column should be straight. When scoliosis is present, you will see a sideways shift of the spine to the right or left. Approximately ten percent of the population has small curves (less than ten degrees), which are of no consequence to function or health. This condition is called Spinal Asymmetry.

When a diagnostic x-ray is done, the curve of the spine is measured in degrees, as an angle, and this is called a Cobb angle. Scoliosis is defined as a curve greater than ten degrees. It is most common in the thoracic and lumbar regions of the spine and can involve one or both of these regions. The most common curve pattern is a right thoracic curve.

There are naturally occurring curves in the spinal column when it is viewed from the side (laterally). Swayback (lordosis) is normally present in the cervical and lumbar regions while round back (kyphosis) generally exists in the thoracic spine.





## What causes scoliosis?

Scoliosis can arise from a number of underlying conditions, but the most common form is **idiopathic**, which means "cause unknown."

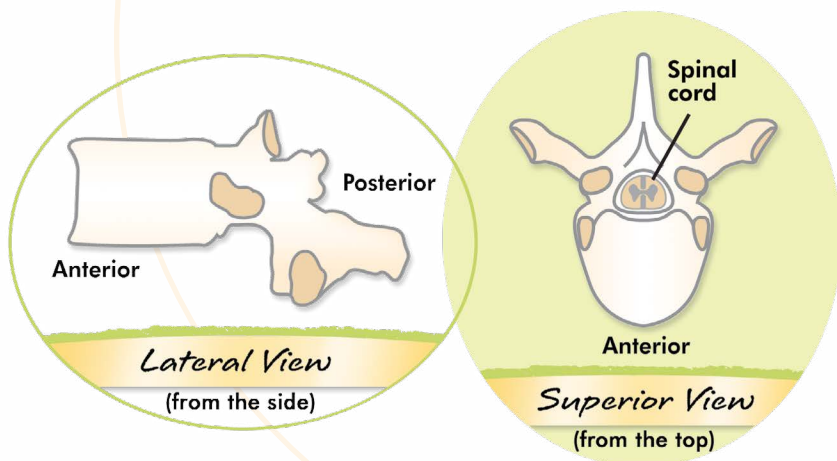
Scientists have identified that idiopathic scoliosis is a genetic condition and continue to work to isolate the combination of individual genes that cause scoliosis. A test has been developed that may help determine the risk of progression of scoliosis (whether or not the curve will get bigger). This may eventually allow for earlier diagnosis and more accurate selection of the "best" treatment for each patient.



## DNA

The material that holds all of our genetic code.

There is some evidence to suggest that uneven growth rates between the anterior (front) portion of the vertebrae and posterior (back) portion of the vertebrae may be one cause of scoliosis.



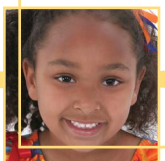
## Are there different types of idiopathic scoliosis?

Idiopathic scoliosis is defined by the age at which it begins to develop. Each age group has unique needs and challenges associated with treatment.



**Infantile-Onset  
Idiopathic  
Scoliosis:**

**Age 0 – 3**



**Juvenile-Onset  
Idiopathic  
Scoliosis:**

**Age 4 – 9**



**Adolescent-Onset  
Idiopathic  
Scoliosis:**

**Age 10 – 18**

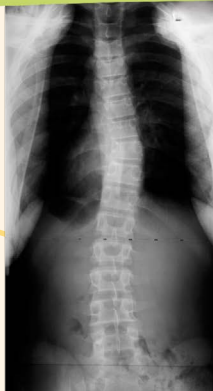
## How common is scoliosis?

Idiopathic scoliosis is thought to be present in two-to-three percent of adolescents. One in five hundred of these will require active treatment and only one in five thousand have curves that progress to the degree where surgery is recommended.

Girls and boys are equally affected by small degrees of scoliosis. Girls, however, are eight times more likely than boys to develop progressive curves.



*Less Than 10°*  
1:10



*11-20°*  
2:100



*20-45°*  
1:500



*>45°*  
1:5,000



# Diagnosis

## Who might detect the presence of scoliosis in a child?

- Pediatrician or family doctor during routine exam
- School screening nurse
- Athletic coach or P.E. teacher
- Parents
- The child her/himself
- Other family members or friends
- Incidentally, via an x-ray done for another reason



## What is school screening?

Some states in the U.S. mandate that children in the public school system be screened for scoliosis in early adolescence.

Typically, girls are evaluated in the fifth or sixth grade and boys in the sixth or seventh grade. This screening is usually performed by a school nurse.



*Shoulder Asymmetry*



*Trunk Shift*



*Rib Prominence  
visible on forward bend*



*Waist Asymmetry*

## What are they looking for?

There are a number of things that one might notice:

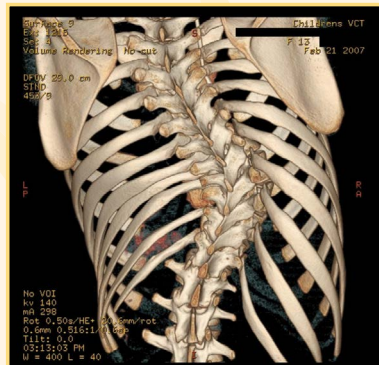
- One shoulder higher than the other
- One shoulder blade (scapula) more prominent
- One hip higher than the other
- One leg appears longer
- Asymmetry of the waist
- Trunk and ribcage shifted to one side
- Head not centered over middle of hips
- Clothing hangs unevenly & when child bends forward at the waist, one side appears higher

Some of these signs of scoliosis may be very hard to see, especially to the untrained observer.



## What causes these changes in appearance?

Scoliosis is a three-dimensional deformity. When a curve develops, the spine also twists, or rotates, to the left or right. The amount and type of change in body shape depend on the curve pattern, and there is variation among individuals because each person's body responds a bit differently to scoliosis.



As the spine curves the ribs also twist and bend.

## What we're seeing might be scoliosis.

### How did we miss this?

It is not uncommon for someone other than a parent or a child to notice scoliosis. Changes to the body occur rapidly during pre-adolescence and adolescence. Children typically become more private about their bodies, so parents often don't see their children in situations where it is easily noticed. The early changes in body shape that result from scoliosis may be subtle, and there may be little outward deformity despite a significant curve. In addition, scoliosis is not a typically painful condition so patients may not notice they have it.



Katie, back to skiing after spine surgery

We see signs of scoliosis.

What is the next step?

When there is concern for scoliosis, the first step is often an evaluation by one's pediatrician or family doctor. S/he will do a complete exam and may refer you to a specialist with expertise in scoliosis.

An x-ray will be required to confirm the diagnosis of scoliosis. Ideally, the x-rays should be obtained at a facility that routinely screens for scoliosis.

The x-rays should be done with the patient standing upright. To best assess the overall alignment of the spine, all regions of the spine should be included on a single film rather than obtaining individual films of each region.



What will happen at the visit to the specialist?

- The patient's health history and family history of scoliosis will be gathered.
- The patient's height will be measured.
- A physical examination will be done.
- An Adam's Forward Bend Test will be performed.
- X-rays of the spine will be obtained.
- The results of the exam and x-rays will be reviewed and explained to you.
- Initial questions will be answered.
- A treatment plan will be recommended.

## What is the Adam's Forward Bend Test?

As a spinal curve develops and the spine twists, asymmetry of the ribcage and/or waist is created. A scoliometer is used to measure the amount of rotation (in degrees as an angle).

Trunk rotation is determined with a forward bend at the waist and is a reflection of the severity of scoliosis. A rotation of greater than five to seven degrees suggests that scoliosis may be present.

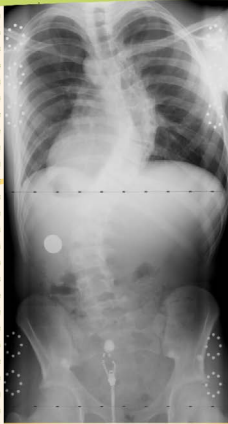


## What does scoliosis look like on an x-ray?

Scoliosis is defined by the region of the spine where the curve or curves develop (upper thoracic spine, thoracic spine, or lumbar spine). Scoliosis may be present in one or more sections producing single, double, or triple curves. The direction of the curve may be to the right or left.



*Right Thoracic*



*Right Thoracic  
& Left Lumbar*



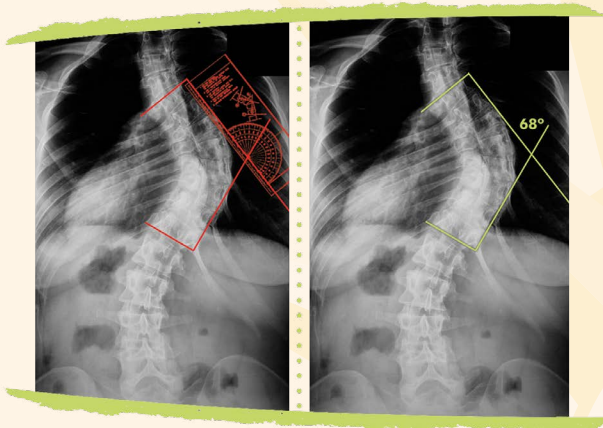
*Right  
Thoracolumbar*



*Left Lumbar*

## How is the size of the curve measured?

The size of the curve is measured on an x-ray in degrees and calculated as an angle. This is called the Cobb Angle or Cobb Measurement.



## When is an MRI or further diagnostic testing recommended?

In the presence of an unusual curve pattern (ex: left thoracic curve) or other symptoms, additional testing may be recommended. An MRI (magnetic resonance image) checks the spinal cord for problems.



*MRI Image*



## Will the curve get bigger?

There isn't always a way to know if scoliosis will continue to progress, though there are a number of factors that increase that risk.

If scoliosis is going to progress, the time of greatest risk is during the adolescent growth spurt when curves can increase one to two degrees per month.

There are two factors that are most important in predicting each child's curve progression. They are the current size of the curve and the amount of growth still to come.



Amanda, back to softball after spine surgery



## How is the potential for skeletal growth determined?

At each visit to the specialist, a height measurement will be taken. Two subsequent measurements (months apart) without a gain in height is the surest way to know that growth is complete.

In addition, a skeletal maturity marker on the pelvis called the Risser Sign is visible on x-rays, and this indicates how much bone maturation is left.

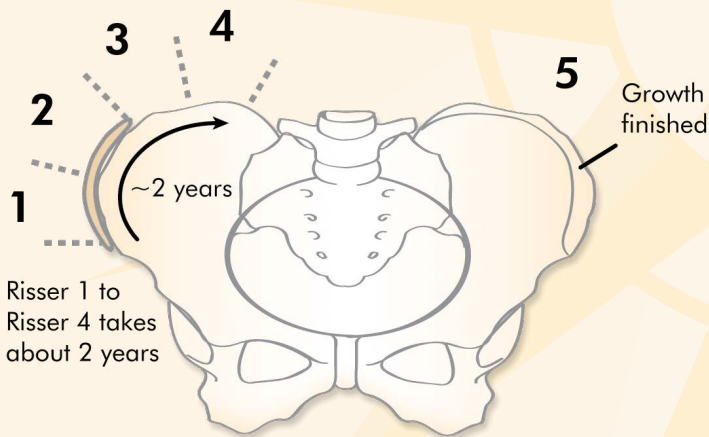
Also taken into account are signs of puberty. In girls, onset of menstrual periods and breast development are observed, and in boys facial hair and voice changes can be assessed.

Indicators of skeletal maturity do not always correlate, and an x-ray to evaluate the growth centers in the bones of the hand may be recommended.



## What is the Risser Sign?

The Risser Sign is used to evaluate skeletal maturity. When the skeleton is fully mature, a “cap” of growth cartilage covers the top of the pelvic bone (iliac wing) and solidifies. This growth cartilage turns to bone and becomes visible on x-ray. As the skeleton begins to mature, the cap of cartilage appears first at the outer edge of the iliac crest (Risser 1) and over a period of eighteen to twenty-four months grows to cover the iliac crest. The stages of skeletal maturity are classified as Risser 0--5, with zero being the time before the bone cap appears and four being complete coverage. Fusion of the growth cap to the iliac wing (Risser 5) signifies completion of spinal growth. This process occurs during puberty.



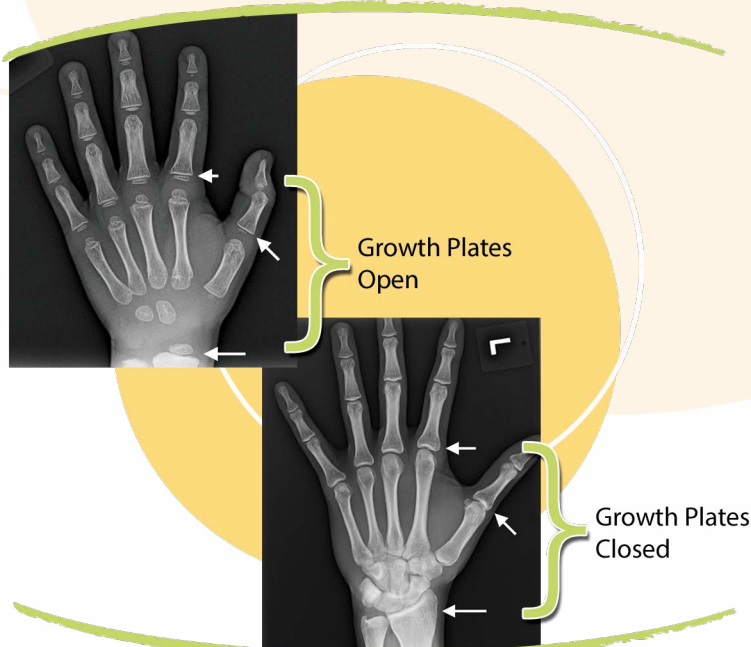
*The Risser Sign*



## What will an x-ray of the hand and wrist show?

An x-ray of the hand and wrist will show the growth plates of the individual bones in the hand. These growth plates remain open during growth and have a pattern of closure with skeletal maturity that is actually more reliable than the Risser Sign.

Hand x-rays also allow the doctor to compare chronological age (how old you are) with skeletal age (real bone age), which may or may not match up to one's chronological age. This can be helpful in determining how much skeletal growth remains.



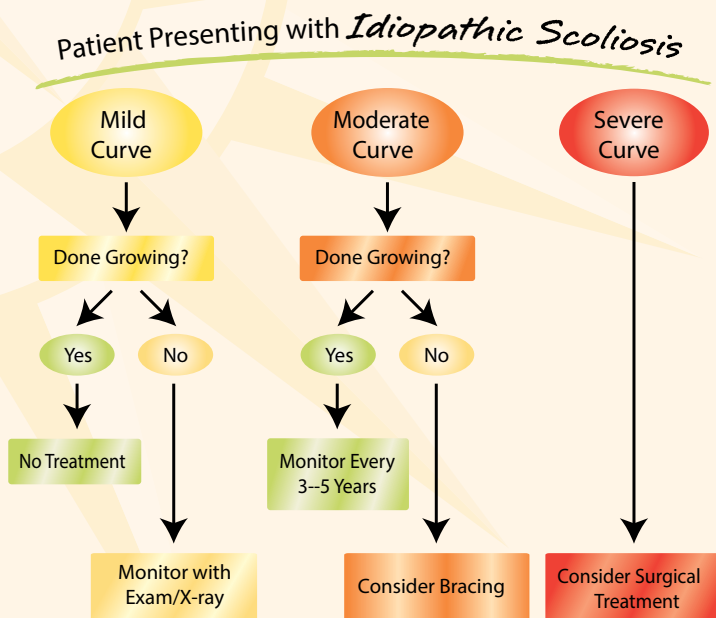
## Scoliosis is the diagnosis. What are my treatment options?

Scoliosis can be treated non-operatively or operatively, depending on how large the curve is. Non-operative treatment entails observation, which means a scoliosis specialist periodically checks the curve for signs of progression and the patient may or may not be asked to wear a brace.

Operative treatment (surgery) may be considered if the curve is significant and will likely continue to progress after growth is finished.



# Route I: Non-Operative Management



## What does observation entail?

Observation means that the patient will be regularly checked by the scoliosis specialist, who will perform an exam and take x-rays every four to twelve months. The frequency of visits is based on the patient's stage of growth. Due to slight variability (up to five degrees) in day-to-day x-ray measurements, comparative x-rays should not be done more frequently than every four to six months. Progressive curves generally increase at a rate of one to two degrees per month, so taking x-rays more frequently than every four months will not reliably determine true progression.

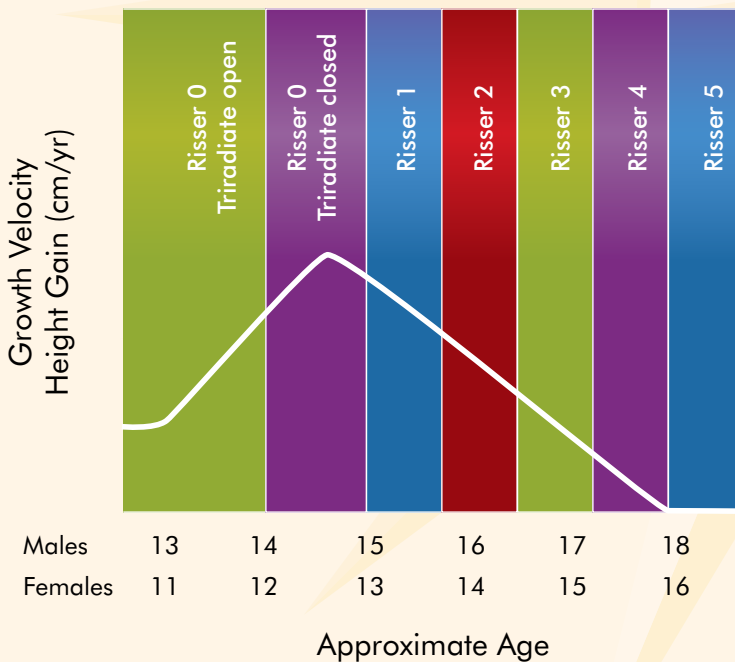
Observation is usually recommended for patients who are still growing with curves that measure less than twenty to twenty-five degrees and for patients who have finished growing with curves that measure forty to forty-five degrees.

## Will my curve progress?

In general, the younger the patient and the bigger the curve(s) at the time scoliosis is identified, the greater the potential for progression.

## Remember, most small curves stay small.

The graph below shows the rapid rate at which adolescents grow during the approximately eighteen months before the first Risser Sign appears. This is called the stage of peak height velocity, or a growth spurt. They will continue to grow taller but, as shown below, at a slower rate. Females go through this growth spurt earlier than males, usually before menarche (their first period).



## We've been observing the curve, and it has increased. What's next?

There are a few different scenarios for curves in the twenty to forty degree range:

1. If growth is finished and the curve has progressed but is less than forty degrees, there is little risk of the curve continuing to progress in adulthood. Curves over forty-five degrees are more likely to progress and should be monitored periodically.
2. If the patient is still growing and the curve has progressed but is still in the non-operative range (less than forty-five to fifty degrees), bracing with close observation may be considered.

## What is bracing?

Bracing is a treatment protocol in which the patient is referred by the doctor to an orthotist, a bracing specialist, who will evaluate, design, and fit an external support brace in an attempt to stabilize progressive curves. The primary goal of bracing patients with adolescent idiopathic scoliosis is to halt curve progression. Although it rarely leads to a significant or permanent decrease of the curve, a successful course of bracing might prevent the need for surgery.

## What is a scoliosis brace?

The typical scoliosis brace (also called an orthosis or TLSO: thoraco-lumbo-sacral orthosis) is made of contoured plastic that fits snugly around the torso and hips. It applies “directed” pressure to the curve(s). There are a variety of brace styles, some designed to be worn full-time (i.e., eighteen to twenty-one hours per day) and others to be worn only at night (i.e., eight to fourteen hours). The specific brace configuration will open either in the front or back and will be secured by Velcro straps. The biomechanical principles of bracing are founded on evidence that “directed” pressure reduces the curve(s) and moves the spine into better alignment while the brace is worn.



## How do I know which brace to use?

The patient's age, stage of skeletal maturity, curve size and pattern, and physician's preference all influence which type of brace is recommended. Patients and parents are encouraged to thoroughly investigate all bracing options because, despite common beliefs, not all braces or orthotists are equally effective.

As discussed earlier, three main regions of the spine can develop curves—upper thoracic, main thoracic, and lumbar—and a patient may develop curvature in one or all of these areas. Upper thoracic curves are more difficult to treat with underarm bracing because the upper section of the thoracic spine is blocked by the arms and shoulders. A TLSO worn full-time (the doctor will define “full-time”) is the most commonly recommended brace type and can be used for all curve patterns. For a single lumbar curve, some physicians may suggest a nighttime brace.

While x-rays and physical exams help guide the physician's recommendation, opinions regarding the use of a brace and specific brace designs vary widely among scoliosis experts. Communication between the patient, parent, and physician will help determine the most effective brace and bracing scenario for each patient. You can find more detailed information and guidelines for bracing on the websites for the Scoliosis Research Society ([www.SRS.org](http://www.SRS.org)) and the Society for Scoliosis Orthopedic and Rehabilitation Treatment (<http://www.sosort.mobi/>).

## Will bracing be effective?

Plainly put, bracing is frequently effective, but occasionally is not. There is often a tendency by professionals, parents, and patients to focus on the brace. However, many variables influence bracing success or failure, including the following:

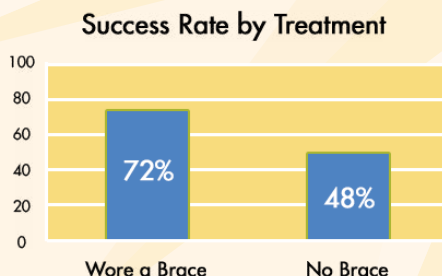
- Patient age
- Rate and stage of growth
- Curve size, curve pattern, curve flexibility
- Competency of the doctor and orthotist
- Specific brace design
- Adherence to wearing time
- Proper brace wear
- Attitude
- Consistent follow-up with the doctor and orthotist
- A positive support network

Research indicates that one of the most critical predictive factors of bracing success is the patient's adherence to the prescribed wearing time and protocol. Unfortunately, some curves progress and require surgery even when a brace is worn properly.

Data on the effectiveness of bracing can be found in studies such as 'Bracing in Adolescent Idiopathic Scoliosis Trial,' in which Stuart Weinstein, MD, and his colleagues collected information from 242

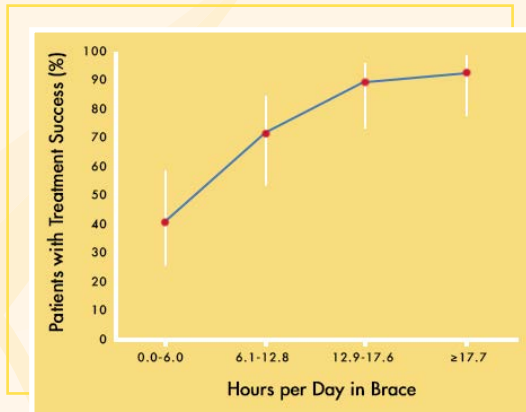
patients. As shown in the graph below, data from this study clearly shows that the group wearing a brace were less likely to experience curve progression to fifty degrees or greater

compared to the group that did not wear a brace. Ultimately, this means that people who wear a brace are less likely to develop a curve that may require surgery.





In addition, as shown in the graph below, the data from this study plainly illustrates that wearing a brace for more hours per day yields better results.



Also shown in the above graph, participants that wore braces an average of six hours or less per day had about the same outcome as those that did not wear a brace at all, with forty-one percent ending up with a curve of less than forty degrees. However, the success rate was much higher (ninety percent) for those who wore braces an average of thirteen or more hours per day.

Published in the New England Journal of Medicine, the paper including these findings can be accessed at :

<http://www.nejm.org/doi/full/10.1056/NEJMoa1307337>

Ultimately, it is the responsibility of the patient/parent and the physician to determine the best course of action and treatment method. This determination should be based on many factors, including the degree of curvature, stage of skeletal maturity, and the patient's willingness to adhere to the bracing program. If bracing is chosen, open communication between the patient/parent, physician, and orthotist is essential to achieving success.

Following are some patient responses  
to being told that a brace is recommended:

**NO WAY!**

What will my friends say?

You expect **ME** to wear  
**THAT?**

I'll wear it every day.

I'm **NOT** having  
an operation!

It fits under my clothes?

Oh, that means new clothes... and  
**shopping!**

I'll wear it,  
but **NOT** to school.

**Sports and other activities will not make scoliosis worse, so continuation of playtime and physical activity is highly encouraged.**



Josh, after spine surgery

**We've decided not to proceed with a brace.**

**What's next?**

Choosing observation rather than bracing is your choice. Your doctor will recommend how frequently you should follow up for x-rays and an exam, but those typically occur at four to twelve-month intervals.

**Are there other treatments that will stop scoliosis from getting worse?**

This is a topic of great interest and debate. Proponents claim a variety of treatments and techniques can stop scoliosis progression, including acupuncture and acupressure, electrical stimulation, biofeedback, traditional physical therapy, magnets, nutritional and vitamin supplements, chiropractic manipulation, shoe orthotics, and other less-traditional treatments. Currently, none of these methods have evidence to prove their claims. However, there is interest and early research in "Physiotherapy Scoliosis Specific Exercise" (PSSE), like the Schroth Method, that specifically addresses postural awareness, spinal balance, core strength, and pain management issues common to patients with scoliosis. Following is a link to the SRS position statement on PSSE.

(<http://www.srs.org/news/index.php?id=521>)

## We chose to proceed with bracing. What's next?

The doctor will write a prescription for the appropriate brace and refer you to an orthotist with whom they have a working relationship. The orthotist will evaluate the patient and capture their body shape using measurements, casting, and/or scanning. Within two to four weeks, the brace fitting and first adjustments should be complete, and the patient will return to the doctor, who will check the fit and take an in-brace x-ray to see how the brace is working (i.e., how much the brace reduces the curve(s)).

At this point, the doctor will tell you when to return for follow-up exams and x-rays. The patient should see the orthotist, who will adjust the brace based on the in-brace x-ray and feedback from the doctor. Also, the orthotist should ensure that the brace continues to fit appropriately and that the patient is wearing it properly. Please note that insurance coverage can sometimes affect bracing choices.

## How long does the brace need to be worn?

A brace is worn until a patient is done growing or the curve progresses to a degree where surgery is recommended. Most girls are done growing eighteen to twenty-four months after the start of their menstrual periods. Boys tend to grow into their late teens, so they often need to wear a brace longer than girls.

## Are there social and psychological impacts from bracing?

These are years of rapid change, a time of heightened sensitivity to differences between oneself and one's peers, and increased peer pressure. Having to wear a brace can affect how one adjusts to an already challenging time of life. Having a supportive network of family, friends, and peer support groups makes the challenge of wearing a brace easier.

Following are some helpful hints  
from brace wearers  
and their parents:

**From teens:**

- Talk to others who have scoliosis.
- Enjoy shopping for new clothes that fit over the brace.
- Keep doing everything you did before you got your brace.
- Don't be embarrassed by it or try to hide it. It's just like braces on your teeth: temporary!
- Don't expect it to get you out of P.E.!
- Decorate the brace.
- Name the brace.
- It's hard, but you can do it.
- Be proud of how strong you are!



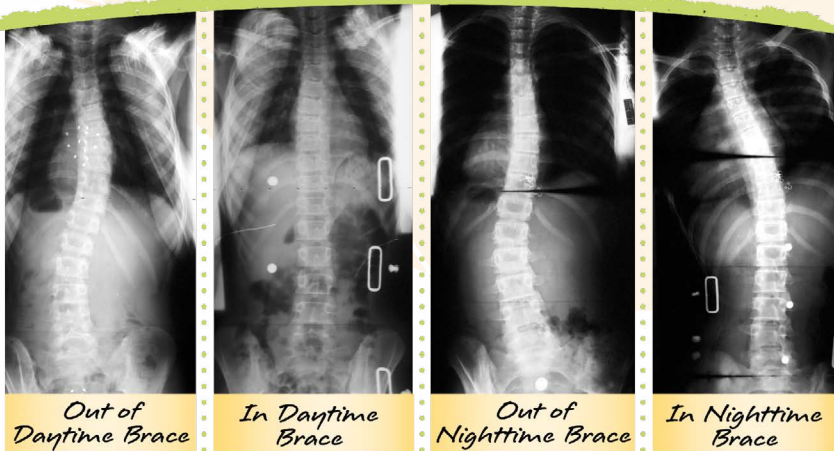
**"Yes, I'm wearing a brace.  
Can you tell?"**

**From parents:**

- Keep your children involved in sports and activities.
- Give them a break sometimes—for a sleepover, a vacation, or special event.
- Recognize that it is difficult, both for the parents and the patient.
- Hug your child every day when they are out of the brace.
- Talk to other parents whose teens are wearing braces.
- Support your child in their efforts.
- Communicate with your child. Most importantly, listen to their thoughts and concerns.

## Despite wearing my brace, my curve has progressed. What's next?

Unfortunately, even when you've done your best, some curves continue progressing. Scoliosis experts' opinions may differ regarding when surgery is recommended, but most agree that this condition is rarely life-threatening or one that demands immediate action. An informed decision can be made when the patient and parents talk with their doctor and understand their options.



## When might surgery be recommended?

This partially depends on the stage of growth, the location and severity of the curve(s), the curve pattern, and the surgeon's preference.

In general:

- When a curve reaches forty-five to fifty degrees, surgery may be recommended even though growth is not complete.
- At skeletal maturity (the end of growth), curves measuring less than forty degrees tend not to progress. However, lumbar curves less than forty degrees might progress.
- At skeletal maturity, some curves between forty to fifty degrees progress and some do not. Treatment recommendations vary.
- At skeletal maturity, curves measuring greater than fifty degrees are at greater risk for continued progression throughout adulthood, although at a slower rate (i.e., approximately one to two degrees per year). As a result, surgery will likely be recommended.



## *Route II:* — — — — — *Operative Management*

### **What are the goals of surgery?**

The goals of surgery are to prevent further progression of scoliosis and to correct the spine as much as can be done safely. Stopping progression will prevent the significant health issues later in life that are associated with severe scoliosis (curves greater than seventy to eighty degrees). Some of the problems associated with large curves include breathing trouble, heart and muscle weakness, and pain.

### **What is the surgery?**

During surgery, the curve is corrected as much as is safely possible. To do that, implants (generally rods, screws, wires, and/or hooks) are attached to the vertebrae at the section of the spine that is curved. After correction is achieved, bone graft is placed over the implants. With time, this bone graft fuses (or grows together) with the existing bone and forms a solid column of bone in that area. The implants act as an internal brace to hold the spine in the corrected position while the bones are fusing. This generally takes six to twelve months.

The fusion of the bones takes away the growth potential in that part of the spine, which is what has caused the scoliosis to worsen. Individual vertebrae grow approximately one millimeter per year, and potential height lost is generally balanced by the amount of height gained with correction of the curve(s). The fusion also permanently stops the motion of the spine in the segments that are fused. The loss of flexibility is modest and limits function of the trunk very little.



## Why now?

**Shouldn't we wait until my child is done growing?**

**Why not wait until it is causing symptoms?**

With moderate scoliosis, you wouldn't expect your child to have any health problems. Surgery is often recommended before pain and other symptoms develop for a variety of reasons. The ease of addressing the smaller, more flexible curves present in a child or teen versus the larger, rigid curves in adults involves less risk, a less complicated surgery, and the potential that fewer vertebrae may need to be fused.

In addition, the recovery is easier and life is less complicated (in terms of school, family, career) during adolescence.



## How do we decide if surgery is the right decision?



Educate yourself and ask questions. We suggest that some of the most important questions to ask are:

- What are the risks and benefits of having surgery at this time?
- What are the risks of not going ahead with surgery at this time?
- What are the risks and benefits of the suggested surgical procedure?

Everyone will interpret the answers and weigh the risks and benefits a little differently, but these questions are an excellent place to start analyzing information that will allow for the most informed decision.

The specialist may be able to connect patients and families with other patients and families who would be willing to share their experiences.

## What about getting a second opinion?

Good idea. Recommendations on who to see can come from the current specialist, pediatrician, family doctor, or from the internet. Some patients and families may know people who have been in this situation—asking them about their experiences with their surgeon can be helpful, but we do recommend getting a second opinion from a board-certified spine surgeon.

## We don't want surgery. What's next?

Choosing not to proceed with surgery is choosing observation, and the treating doctor will recommend how frequently the patient should follow up for x-ray exams. Bracing curves in the surgical range is of little or no benefit. It is important to continue to monitor the scoliosis by following up with your doctor for x-rays and exams as recommended since the curves may get larger.

We want to proceed with surgery.

### What comes next?

Choosing a surgeon, then formulating a surgical plan (deciding which procedure to choose) together, and selecting a date for surgery are the next steps.

### How do we choose a surgeon?

It is recommended that you choose a surgeon who:

- is board certified.
- specializes in the treatment of pediatric and teenage spinal deformities.
- is affiliated with a hospital facility with a staff experienced at caring for adolescents during and after spine surgery.
- has successful experience treating pediatric spinal deformities.

### What is a surgical plan?

There is more than one way to surgically treat scoliosis. One needs to decide which levels of the spine are going to be fused and by which approach/procedure. Surgeons can approach the spine through either an incision on the back or on the side of the chest or flank. The approach(es) recommended will depend primarily on the curve pattern, physical deformity, and skeletal maturity.

## What are the possible procedures?

There are two general surgical approaches to the spine: posterior and anterior.

The most common approach is through the back and is known as a **Posterior Spinal Fusion with Instrumentation**. With this procedure, an incision is made along the spine, screws and/or hooks are then attached to the vertebrae, and rods are then attached to the screws or hooks. These screws and hooks act as anchor points to secure the rods. Bone graft is then placed over the spine so that the spine can fuse in the corrected position.

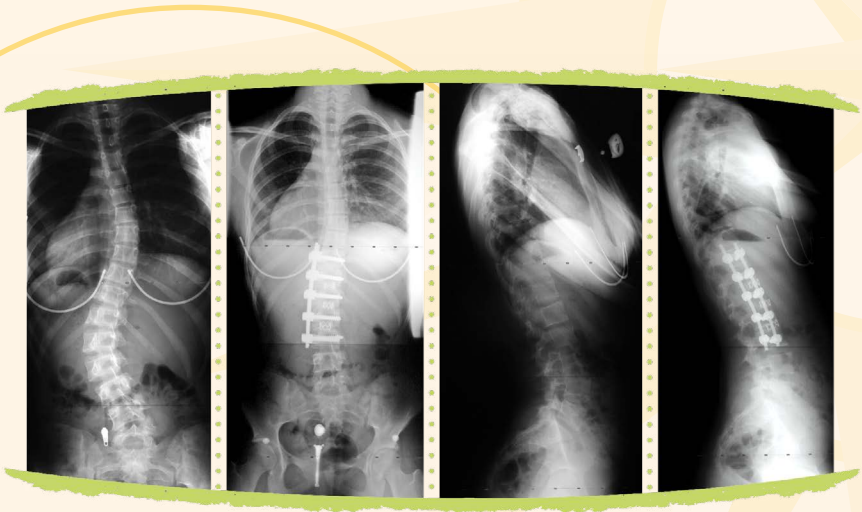
All curve patterns can be treated with this approach.



*Posterior Spinal Fusion  
with Instrumentation*

An **Anterior Spinal Fusion with Instrumentation** is done through an incision either on the flank or chest and is an option when there is a single curve to be treated. One or two screws are placed from the side through the front (anterior) part of each vertebra that is going to be fused. Rods are then attached to the screws lengthwise along the spine.

The discs between the vertebrae are removed and replaced with bone graft and, in some cases, metal mesh cages at some levels, which allows the spine to fuse in the corrected position. This approach is an option for single curves in the thoracic region of the spine and is also well suited for single lumbar curves.



*Anterior Spinal Fusion  
with Instrumentation*

In special circumstances, both anterior and posterior approaches may be accomplished with less invasive incisions. Some curve patterns may be best treated with a **Combined Anterior and Posterior Approach**. The combined approaches are reserved for very young patients and those with more rigid curves.

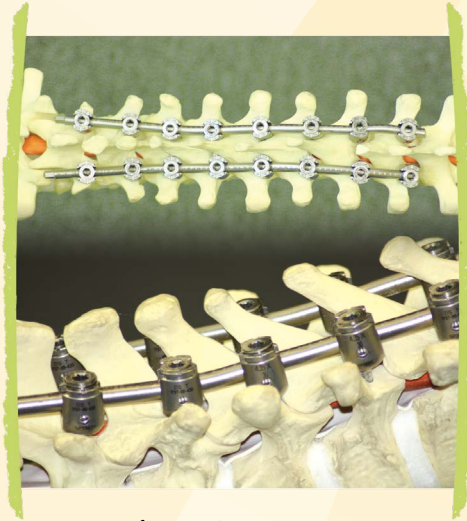
A **Thoracoscopic Anterior Spinal Fusion with Instrumentation** is done through four or five small incisions on the chest. This approach is best suited for single right thoracic curves.



*Anterior Disc Excision/Fusion  
Combined with Posterior Spinal Fusion  
with Instrumentation*

## What do implants look like, and what are they made of?

Implants are made of metal. They are either Stainless Steel, Titanium, or Cobalt Chromium. There are a wide variety of implants available. Most surgeons have individual preferences and will discuss this with their patients.



*Implants*

## How long will the implants stay in?

Except in uncommon circumstances, such as infection or discomfort, implants will stay in the body forever. The rods maintain the spine in its corrected position, acting as an internal brace while the vertebrae grow together and fuse, creating a column of solid bone. After the bones fuse together, the implants don't really have a job, as the fusion is what maintains the correction. However, the surgery to remove the implants (rods, hooks, screws) is major and not necessary in most cases.

## How do the bones fuse together?

Bone grafting is used to fuse the spine in its corrected position and can come from a variety of sources. These sources will depend on the surgical approach and will likely include a combination of bone removed from the spine during surgery and supplemental bone products.

## What are the effects of a fusion?

Besides maintaining the spine in its corrected position and preventing further progression of scoliosis, a fusion also stops growth in that section of the spine. This is not troublesome to most teenaged patients because some height is gained when the spine is straightened.

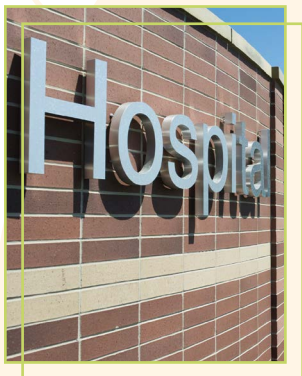
Additionally, the fused section of the spine is no longer flexible. This is of little consequence in the thoracic spine because this region of the spine has relatively little natural motion. However, the lumbar spine is more flexible, and a fusion in this area limits some motion. Concentrating motion on just a few lumbar discs may cause them to wear out sooner, so every effort is made to fuse as few of the lumbar vertebrae as possible.

## Which procedure will be best?

The best procedure will depend on the curve pattern, skeletal maturity, amount of physical deformity, and surgeon. There are risks and benefits associated with every surgery. Discussing these options with the surgeon will be part of the surgical planning.



## What should I look for in a hospital or surgery center?



- Board certified Pediatric Anesthesiologist on site
- Specialized pediatric staff
- Availability of a pediatric Intensive Care Unit (ICU)
- Intraoperative spinal cord monitoring
- Other features such as availability of pain management and other pediatric specialists

## What is spinal cord monitoring?

A little more anatomy first: the spinal cord and nerves control voluntary and involuntary activities of the body—movement, sensation, bladder and bowel function, to name a few. The brain processes all of the messages transmitted to it via sensory nerve pathways to the spinal cord then directs activity by sending messages back through the spinal cord to the muscles.

Throughout surgery, the message sending and receiving ability of the spinal cord and nerves are monitored, as well as the brain's response to these messages. This is to catch any changes in spinal cord and nerve signals that might indicate a problem.

This testing is done by a trained professional using a sophisticated computer system. This monitoring significantly lowers the risk of spinal cord dysfunction following surgery.



## How do we decide on a date for surgery?

There are a variety of factors—for example, the surgeon and patient schedules. Discuss the risks of waiting longer than six to twelve months with the surgeon. There are some cases where there may be enough progression during that time that additional levels of the spine may need to be fused. A surgeon can help you decide how long it is safe to wait.

## Okay, we've got a plan and a date.

### What's next?

In the time just before surgery, the patient and family will meet with the surgeon and his/her staff for additional discussion of the planned surgery. At this visit, additional x-rays may be needed. This visit is an excellent opportunity to ask questions, but do not hesitate to contact the surgeon's office at any time during this process with questions or concerns.

The surgeon's staff will assist with obtaining authorization from insurance providers, arrange for blood products to be available for the procedure, and arrange for additional diagnostic tests that may be recommended by the surgeon.

At this point, the patient and family may have the opportunity to tour the hospital and speak with other families that have had this experience.

## It is the day of surgery. What can we expect?

- More paperwork
- To meet with the anesthesiologist  
(the doctor that puts you to sleep)
- To meet with the surgeons and their assistants
- Repetition--a lot of different people asking  
the same questions
- An opportunity to ask questions prior to surgery
- A long day with minutes passing like hours for parents  
and the day passing like seconds for patients
- Support and patience from the hospital staff
- To feel great relief when you meet with the surgeon after  
surgery and even greater relief when the patient and family are  
reunited



Art by Brianna, age 15, spine surgery 2009

## Surgery is done. What's next?

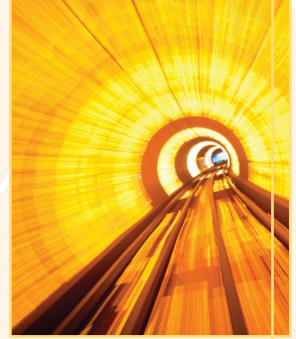
After surgery, most patients will go to the Recovery Room so that they may be closely monitored while waking from anesthesia. After time spent in the Recovery Room, they will be transferred to their hospital room.

The patient will likely be in the hospital for less than a week. During that time, the focus will be on pain management, sitting, walking, eating, bowel and bladder routine, and education--the multitude of things that will allow the patient to meet the necessary milestones before going home.

Individuals recover at different rates, and surgeons' post-surgery regimens vary. Patients are generally in the hospital three to seven days, depending upon the extent of the procedure.

Pain management, diet, and bowel/bladder routine will depend on how quickly the stomach and intestines return to normal function, or "wake up," and bowel sounds can be heard.

Once bowel sounds return, the patient can begin to eat and drink. This usually starts with liquids and then progresses to solid food. They will then be transitioned to oral pain medicine. Typically, a bladder catheter remains in place until this transition. Constipation is not uncommon as it is a side effect of anesthesia, narcotic pain medicine, and decreased activity levels. The medical staff will assist in managing this.



## When can we leave the hospital?

While there will be differences among individuals, in general, parents will see their adolescent making progress in their recovery each day, going from:

- Being in bed all of the time to taking walks in the halls.
- Transitioning from intravenous pain medication to oral (swallowed) pain medicine.
- Not eating or drinking to eating and drinking again.
- Urination managed with a bladder catheter to urinating normally.

Parents will also see themselves going from being nervous and wanting the nurses to do everything involved in their child's care to becoming confident that they can do it instead. They can!

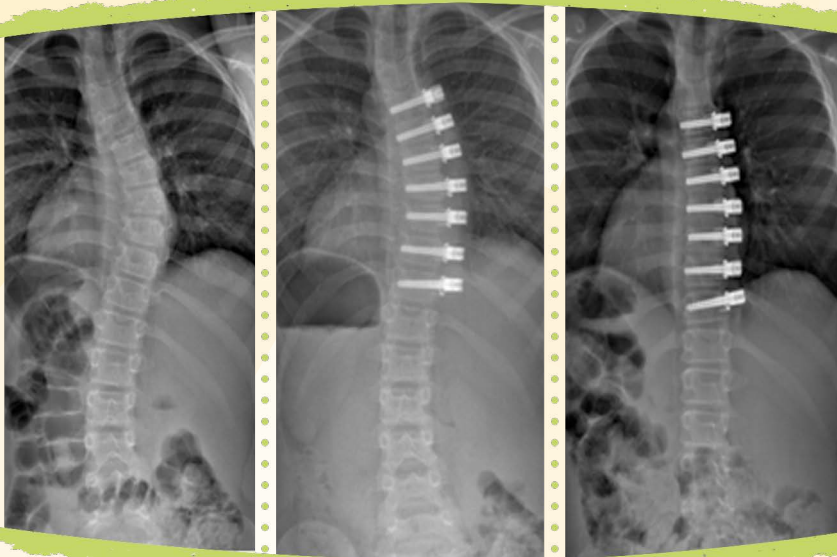
When these milestones are achieved, the patient is ready to go home.



Kalli, after spine surgery

## Fusionless Correction of Scoliosis

Recent attention has focused on fusionless treatment for correction of scoliosis. These surgical procedures can be used to treat progressive scoliosis and offer the potential advantages of preserving mobility and function and are an alternative to a traditional posterior spinal fusion. Vertebral body stapling is usually done for smaller curves (thirty-five degrees or less), which may not have responded to bracing.



Vertebral Body Tethering



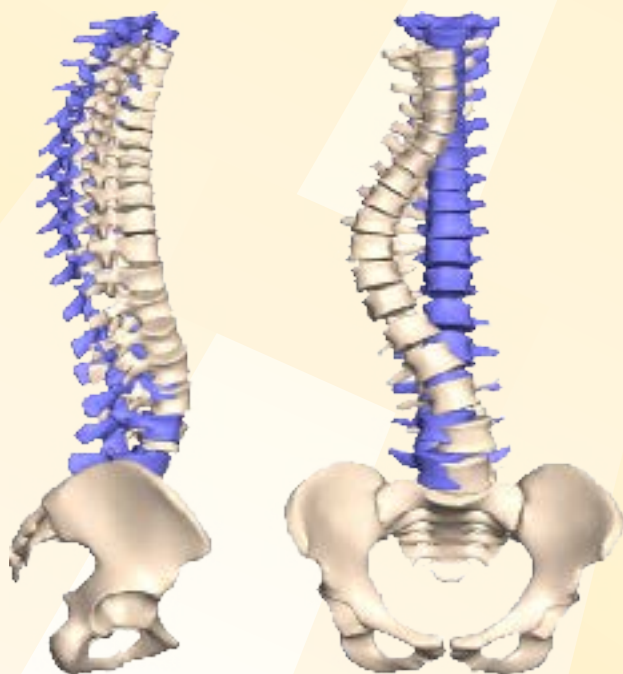
Rachel , after spine surgery

## Anterior Vertebral Body Tethering

Anterior vertebral body tethering (VBT) is a promising new technique with preclinical animal studies but very few clinical results. It is a growth modulation procedure, which uses a patient's own growth to attain progressive correction of scoliosis with a flexible tether that is tensioned to the patient's spinal curvature. Anterior VBT offers a treatment alternative to patients with near surgical curves who are considered to be at very high risk for continued progression. Research is being done to determine exactly upon whom, and when, to do the procedure and how to limit potential complications like overcorrection.

## Radiographic Imaging

Because patients with scoliosis may need frequent x-rays, and radiation can be potentially harmful, alternatives to traditional x-rays are now available at some centers. Ultra low dose imaging with special slot scanners can obtain very high quality images of patients' spines and lower extremities at a fraction of the dose of radiation. This is particularly important for our youngest patients or those who have had surgery, since they need frequent x-rays over their period of treatment. And perhaps even more exciting, with special software, these images can be used to reconstruct an image in three dimensions (3D) so that a surgeon can see particular nuances of a curve and decide how best to treat it.







### *3D Radiographic Imaging*

Since scoliosis is a 3D condition, it is exciting that, for the first time, we are able to appreciate what is happening in 3D when we view patients in the standing position. Also, after surgery, by using 3D imaging, we are able to more accurately assess the quality of the correction of the curvature. This area has spawned a new field of 3D classification of scoliosis and will change the way we treat scoliosis.

# Life Does Go On After Surgery

During the first few weeks at home after surgery, the focus is on:

- Pain management and weaning from narcotic pain medicines.
- Healthy eating as appetite returns to normal.
- Children getting back to independence with their own care. (Parents often comment that these weeks are like having a newborn again).
- Increasing activity and endurance.
- Returning to school three to six weeks after surgery.

At six weeks after surgery, most teens are:

- Feeling good, with their pre-surgery energy level back to normal.
- Back to their normal life except for activity/sport restrictions.
- No longer requiring narcotic pain medicine.

Ryan, back in the pilot's seat after spine surgery



## Six weeks to one year after surgery, activity restrictions may remain.

- Restricted activities are activities that put too much physical stress on the healing bones and may prevent them from fusing together.
- Many surgeons will gradually ease up on restrictions as the year progresses.
- Activities to avoid until cleared by the surgeon may include contact and high impact sports, physical education, heavy lifting and aggressive twisting, or stretching of the spine.

## One year after surgery:

- There are no restrictions on activities or sports, and life is back to normal!
- The surgeon will recommend how often to return for check-ups. It is very important to return for recommended check-ups!

## The rest of your life:

- There is little physical effect from surgery throughout life's stages.
- The risk of developing complications is low.
- Scoliosis runs in families, so watch the next generation.
- There are no limitations in choice of profession.
- Female patients can expect normal pregnancies and deliveries.
- A back-healthy lifestyle is recommended (maintain weight, remain active, no tobacco).

## A Personal Journey

My name is Jamie, and I am currently twenty years old. I was diagnosed with scoliosis at age fourteen in the middle of eighth grade. When I first found out the news while sitting in the doctor's office, I was devastated, heart-broken, and confused. I wasn't even sure what scoliosis was. All I knew was that I had a severe case and surgery was necessary to prevent life-threatening complications later in life.

The first thing that came to mind was "How am I going to play soccer?!"

Soccer has been my life since I was four years old, and knowing I had to give it up for a year to have surgery to straighten my spine was something I could not comprehend. But after much needed support from my family and doctors, I knew the surgery was something I had to do for myself to live a healthy life. Thinking about the surgery, I was scared with so many endless thoughts running through my head, but once I got to know my doctor and learned more about his skill, I was more calm and relaxed.

Looking back to those dreaded days before surgery, I could not be happier with my decision to follow through with the surgery. My results are phenomenal and I am more satisfied with my self-image and appearance now after the surgery than before. I am so thankful for the constant support I received from my family, friends, soccer team, and most importantly my doctors who performed such an extraordinary surgery. Support and self-determination are the two most significant aspects that pushed me through the surgery and the recovery process. I had such a strong will to spend continuous hours in physical therapy to get back to playing soccer the second I received permission. I played soccer after six months when the normal recovery period is one year. I ran again before the usual time period and experienced so much more because of the motivation that surrounded me. I had such a positive experience with all I encountered through the process. I am stronger now than ever before. I would not change one day from before or after the surgery because it has made me who I am today.



## Suggestions on how to navigate through treatment:

1. When you receive unexpected or unwelcome news at a doctor's visit it can be difficult to then focus on further information. Please come back to talk to your doctor when you've had time to think about the visit. It is important that you get all of your questions answered.
2. Write your questions down.
3. Educate yourself.  
Knowledge empowers you and will allow you to make informed decisions.
4. Talk with one another—  
parents, children/teens, and medical staff.
5. Listen to each other—parents, children /teens, and medical staff.
6. Work together to make decisions and to develop a trusting relationship.



Kayci, after spine surgery .

Lisa, training for a career as a  
Radiologic Technologist  
after spine surgery.



## Conclusion

As you travel on this course, please be reassured that Adolescent Idiopathic Scoliosis is a very treatable condition and generally will not affect the ability to fully participate in and enjoy life.

We hope that the information provided here will be helpful and ask that you keep in mind that this information is very general. It is intended to give you a framework as you are presented with choices, not to recommend specific treatments.

Scoliosis is a complex disorder, and there will be challenges along the way, but we're confident that you will rise to meet them!

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## Appendix

### Websites

There are a number of websites that provide reliable information. These include:

Setting Scoliosis Straight	<a href="http://www.settingscoliosisstraight.org">www.settingscoliosisstraight.org</a>
American Academy of Orthopedic Surgeons	<a href="http://www.aaos.org">www.aaos.org</a>
Scoliosis Research Society	<a href="http://www.srs.org">www.srs.org</a>
Pediatric Orthopedic Society of North America	<a href="http://www.posna.org">www.posna.org</a>
National Scoliosis Foundation	<a href="http://www.scoliosis.org">www.scoliosis.org</a>
The Scoliosis Association	<a href="http://www.scoliosis-assoc.org">www.scoliosis-assoc.org</a>
Kids Health	<a href="http://www.kidshealth.org/scoliosis">www.kidshealth.org/scoliosis</a>



## FAQs

1. **What is Scoliosis?** Scoliosis is a curve in the spine.
2. **How can you tell that I have scoliosis?** Sometimes it is not noticeable, but you might see that one shoulder or hip is higher than the other, one shoulder blade more prominent, or that your trunk and waist are not equally balanced.
3. **What causes scoliosis--carrying a heavy backpack, not drinking enough milk, poor posture?** No, scoliosis isn't caused by anything that you did or didn't do. It is a genetic condition.
4. **Does scoliosis hurt?** Adolescents with mild to moderate scoliosis do not have any higher incidence of back pain when compared with adolescents that have back pain but no scoliosis.
5. **How common is scoliosis?** It is present in two to three percent of the population.
6. **Does scoliosis run in families?** Scoliosis is a genetic condition most common in girls. At this time, scientists continue to work to identify the specific genetic markers of DNA that indicate scoliosis.
7. **Is there a way to tell if my scoliosis will get worse or not?** Not at this time, though part of the current genetic research is trying to find an answer to this question.
8. **Can I still exercise?** Yes, staying active is important to overall health. There are no exercises, sports or activities that will make scoliosis worse or better.
9. **What is the treatment for scoliosis?** Basically, there are three options: to monitor it with routine check-ups and x-rays, to wear a brace, or to have surgery.
10. **Are there any alternative treatments?** There is no scientific data that proves alternative methods such as chiropractic, physical therapy, vitamins, etc. will affect the natural history of scoliosis, but there is no evidence that they do harm either.
11. **What is the purpose of a brace?** The goal is to prevent the curve(s) from getting bigger while the patient is growing and therefore avoid surgery.
12. **Will a brace make my scoliosis better?** Not permanently. The curve(s) are somewhat corrected by the brace but once the brace is taken off, the curves can return to their original form.
13. **Do I have to wear the brace all of the time?** It depends on the type of brace, and the type of brace depends on the location of your curve. Some braces are worn full-time (twenty to twenty-three hours/day) and some only during sleep. If you are wearing a brace full-time, it is important to continue to participate in sports, P.E. and other activities. You can remove the brace during these times.

14. **How long do I have to wear the brace?** You should wear the brace until you are done growing.
15. **What is the goal of surgery?** The goal of surgery is to prevent scoliosis from continuing to get worse and correct the curves as much as can safely be done.
16. **What kind of surgery do I need?** Spinal fusion with instrumentation depends on the location of your curve(s). Surgery is done through an incision on your side (anterior) or through an incision on your back (posterior). Some curve patterns can be treated by either method.
17. **How long will I be in the hospital?** Three to seven days.
18. **How much school will I miss?** Three to four weeks.
19. **When can I play sports again?** Opinions vary among surgeons, but most release people back to sports and other activities by one year after surgery.
20. **What will the scar look like?** While everybody heals differently, incisions tend to fade and become less noticeable over time. The goal is for it to heal as a flat, thin line that is the same color as your skin. Please ask your surgeon this question.
21. **If I have metal in my back, will it set off alarms in the airport?** This is not likely.
22. **Will I need to have more surgery later on?** Subsequent surgeries are unlikely, but it is important to keep your follow-up visits with your surgeon for at least two to five years to make sure your spine heals properly.
23. **What if I decide not to have the surgery?** Good question. We recommend that you discuss this with the surgeon. Knowing risks and benefits of not having surgery, as well as the risks and benefits of having surgery, will be important as you make decisions.
24. **Are my children going to have scoliosis?** It is possible. There is a higher likelihood that your children will have scoliosis, although it may skip a generation or more.
25. **How do I choose a scoliosis surgeon?** You should speak to your family doctor and other people in your area who may be familiar with scoliosis surgeons. Your surgeon should have significant experience treating young people with scoliosis, should have performed many surgeries like yours and should be comfortable discussing the procedure with you and your family. S/he should also be a member of the Scoliosis Research Society and board certified with proper credentials.



## Glossary

You are going to be getting an education that you may never have thought you'd need. This includes a new vocabulary, so we have included some common words and phrases here. Some of the websites provided on page 54 have a more complete and user-friendly glossary. These definitions will be very helpful!

**Adams Forward Bend Test**—test used by many primary care physicians and school nurses to screen for scoliosis and to measure in degrees the amount of rotation associated with a scoliotic curve

**Allograft Bone**—bone that is taken from one individual, sterilized and available for use in a patient needing surgical fusion

**Anterior**—front

**Anterior Spinal Fusion**—surgical approach where the anterior section (vertebral body) of adjacent vertebrae are fused together. To access the anterior part of the vertebrae, an incision is made on the side of the body. The intervertebral discs are then removed and replaced with bone graft. Sometimes instrumentation is placed anteriorly to assist with the fusion.

**Apex of curve**—the vertebra in a scoliotic curve that is most horizontal and laterally displaced—usually the stiffest, middle part of the curve

**Autogenous (or Autologous) Bone**—bone removed from one location in an individual and placed in a different location in the same individual (For example, pelvis, rib graft, or portions of the spinal bones can be used in the spine to assist with fusion.)

**Bone Graft**—bone (allograft or autologous) that is placed over implants or between other bones to assist with fusion

**Cervical**—pertaining to the seven vertebrae of the neck

**Cobb Angle**—x-ray measurement, in degrees, of the magnitude (size) of a spinal curve

**Coccyx**—the bottom-most segment of the spine, located below the sacrum, also known as the tailbone

**Compensatory Curve**—a curve that develops above or below the primary curve as an attempt to maintain normal balance of the body (to keep your head above your pelvis)

**Corpectomy**—surgical removal of all or part of a vertebral body, also called a vertebral column resection or VCR

**Decompensation**—refers to loss of balance when one section of the spine is not centered above or below the adjacent section; a trunk shift is an example of decompensation

**Disc**—soft, fluid-filled structure between the anterior segments of each vertebrae that allows for absorption of loads and flexibility of the spinal column

**Excision**—removal of tissue, bone or tumor

**Facet Joint**—laterally located joints between individual vertebrae that allow for movement, sometimes excised and used as supplementary bone graft

**Idiopathic**—unknown, refers to cause of a disorder

**Internal Fixation or Instrumentation**—immobilization of the mobile segments of the spine with implants to promote correction and fusion of these segments (an internal brace)

**Lateral**—located away from the midline of the body

**Lumbar**—the section of the spinal column that is between the thoracic spine and sacrum, made up of five vertebrae

**Kyphosis**—a front to back curvature, sometimes called a sagittal plane deformity or “hunchback”

**Medial**—located close to the midline of the body

**Osteotomy**—cut in a bone

**Pedicle**—part of the vertebra, shaped like an arch that connects the anterior and posterior segments of each vertebrae

**Pedicle Screw**—screw placed posteriorly across the pedicle into the anterior part of the vertebral body, used as an anchor for the spinal rod

**Posterior**—back

**Posterior Spinal Fusion**—surgical approach where the posterior elements of the spine are melded together, accessed through an incision on the back

**Primary Curve**—the main curve(s) of a scoliotic deformity, usually the first curve(s) to develop and the largest one needing treatment

**Pseudarthrosis**—failure of the bones to fuse after corrective spine surgery (also called non-union)

**Rib Hump**—prominence caused by rotation of ribs as scoliosis develops

**Rotation**—twisting of spine when scoliosis is present, creates three-dimensional deformity

**Sacrum**—five fused vertebrae that comprise the bottom of the spinal column between the pelvis

**Scoliometer**—tool to measure, in degrees, rotation that is associated with a scoliotic curve

**Scoliosis**—a lateral curve of a section of the spine, usually accompanied with rotation

**Spinal Canal**—long canal between the anterior and posterior segments of the spinal column, houses the spinal cord

**Spinal Column**—refers to the column of bone and discs created by the individual vertebrae of the spine

**Spinal Implants**—metal devices (screws, rods, hooks, wires) used to instrument and stabilize the spine

**Spinal Instrumentation**—the attachment of implants to the spine to achieve correction of a scoliotic curve

**Spinal Fusion**—union or stabilization of two or more adjacent vertebrae with bone graft

**Spondylolisthesis**—forward slippage of one vertebra on another (usually L5 on S1)

**Structural Curve**—curve that is not flexible and is usually included in the fusion

**Thoracic**—refers to the twelve vertebrae between the cervical and lumbar regions of the spine that attach to the twelve ribs of the ribcage with cartilage

**Thoracolumbosacral Orthosis (TLSO)**—a rigid brace, custom molded to apply counter pressure to a scoliotic curve with the goal of preventing the curve from progressing to a degree where surgery may be needed

**Thoracoplasty**—resection/removal of rib segment, sometimes done to obtain additional correction of the rib prominence

**Vertebra**—one of the thirty-three bones (vertebrae) that make up spinal column

## Other Types of Scoliosis

While Idiopathic scoliosis is the most common cause of scoliosis, there are others.

**Neuromuscular**—an underlying neurologic condition such as Cerebral Palsy, Muscular Dystrophy, and Spina Bifida can cause scoliosis to develop.

**Congenital**—present at birth, failure of vertebrae to either separate (creating a fused block of vertebrae) or to form completely (hemi-vertebra) can cause uneven growth of the spine and scoliosis.

**Syndromic**—scoliosis is a component of many syndromes such as Marfans or Neurofibromatosis. Scoliosis in syndromes can have characteristics of either neuromuscular, congenital, or idiopathic scoliosis.

**Other**—examples include individuals who have had prior heart or chest surgery and may develop scoliosis from weakness of the chest wall, or those patients that have had prior surgery for tumors or radiation.



Kayla, a competing triathlete, after spine surgery

## Research

Many aspects of scoliosis have been, and continue to be, studied. These include the causes, varied treatment options, and long-term effects.

Some ongoing research aspects that are noteworthy include:

- Genetic research
- Effectiveness of bracing
- Fusionless treatment
- Study of the long-term effects on adolescents who have undergone surgical treatment

Information learned through research has already improved the available treatment options and ongoing study will further advance these.



## About the Harms Study Group and Setting Scoliosis Straight

This booklet was written by nurses and surgeons who take care of patients with scoliosis every day. The Harms Study Group is a group of caregivers who have dedicated their careers to learning how best to treat patients with scoliosis. These individuals participate in a research group that studies, in great detail, the surgical outcomes of thousands of their patients.

The group studies the outcomes of various treatment options, analyzes the results, and publishes their findings in peer-reviewed scientific journals, which educate medical professionals and the public. Committed to patients and focused on advancing the science of scoliosis treatment for the future, the Harms Study Group delivers these goals through multi-center research studies.

We thank the patients who have contributed to our numerous research publications that allow all scoliosis physicians to offer the optimal treatments for every individual patient.

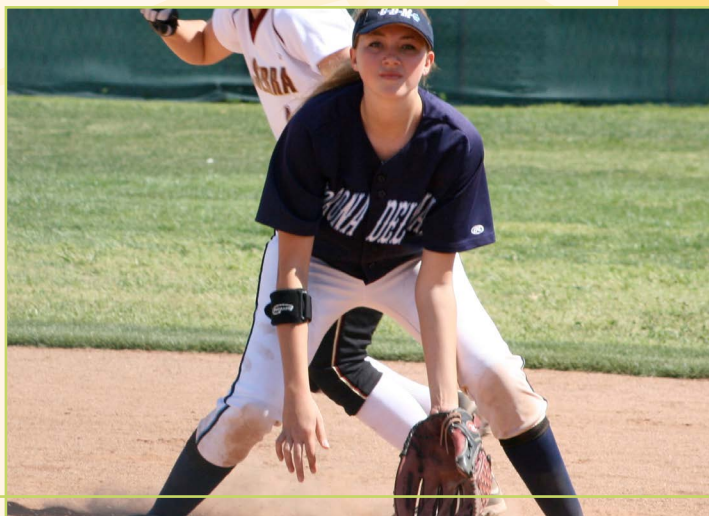
Setting Scoliosis Straight is a non-profit foundation established to support the Harms Study Group. If you would like to assist with the production of this handbook and the efforts of Setting Scoliosis Straight please visit [www.settingscoliosisstraight.org](http://www.settingscoliosisstraight.org) to make a donation. A one-time gift or a multi-year pledge can make a huge impact.

## *Be Part of Our Foundation Family*

You are invited to take part in Setting Scoliosis Straight!



Helena, a ballerina,  
after spine surgery



Amanda, a softball player,  
after spine surgery

Join the national effort focused on a future free of scoliosis. The Setting Scoliosis Straight Foundation supports ongoing research and educational efforts that improve the lives of children affected by scoliosis.

By joining the Foundation Family, you will have the opportunity to receive updates on the latest research and information about surgeon members and their innovations, and you will gain access to resources created just for families like yours.

Please take a moment to complete this form to opt-in to receive updates. Your personal information will be held in confidence and not be given to other organizations without your consent.

**Contact Info:**

info@ssshsg.org

619.810.1430

www.setting scoliosis straight.org



☐ **Yes, I want to join the Setting Scoliosis Straight Foundation Family!**

Please complete and leave with the doctor's office

Name: \_\_\_\_\_

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Email: \_\_\_\_\_

Phone: \_\_\_\_\_ ☐ home ☐ cell

Surgery Date: \_\_\_\_\_ ☐ n/a

Surgeon: \_\_\_\_\_

Signature: \_\_\_\_\_ Date \_\_\_\_\_



## *A Special Thank You to Our Road Crew*

The production of this booklet would not have been possible without the contributions and efforts of:

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## We appreciate your feedback!

This version of "Adolescent Idiopathic Scoliosis, Navigating Your Journey, A Guide for You and Your Family" was created using extensive feedback from our patients and colleagues. If you would like to give us feedback, please complete the form below and fax or mail in. THANK YOU!

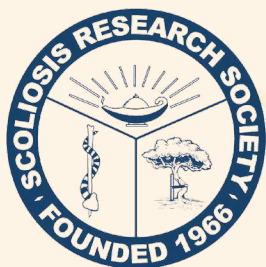
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**SCOLIOSIS**  
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in Spinal Deformities*



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