Patient and family guide to understanding

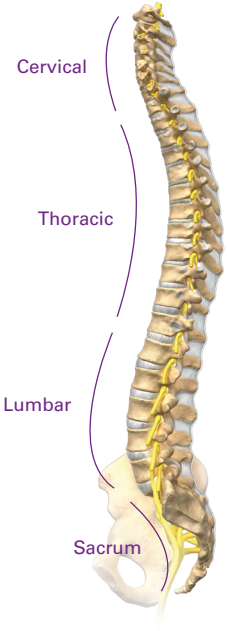
Pediatric scoliosis

This brochure is not meant to replace any personal conversations that the patient and family might wish to have with the physician or healthcare team. Not all information here will apply to the patient's individual treatment or its outcome.

About the spine

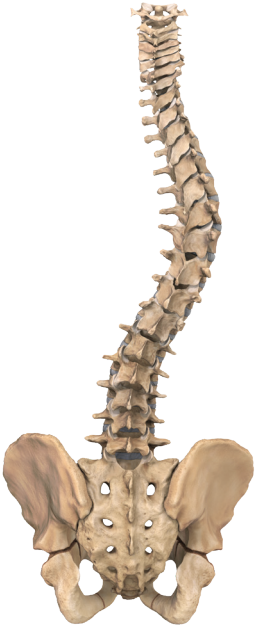
The human spine is made up of 24 bones or vertebrae in the cervical (neck) spine, the thoracic (chest) spine, and the lumbar (lower back) spine, plus the sacral bones.

Vertebrae are connected by several joints, which allow you to bend, twist, and carry loads. The main joint between two vertebrae is called an intervertebral disc. The disc is made of two parts, a tough and fibrous outer layer (annulus fibrosis) and a soft, gelatinous center (nucleus pulposus). These two parts work in conjunction to allow the spine to move, and also provide shock absorption.



About scoliosis

Scoliosis is a musculoskeletal disorder displayed in a sideways curvature of the spine. Viewed from the front or back, the spinal column should be straight. When scoliosis is present, the spine appears curved like a “C” or an “S.” The spinal curve is diagnosed using an X-ray image, and the curve of the spine is measured in degrees, referred to as a Cobb angle. When the Cobb angle is greater than 10° the patient is considered to have scoliosis. Curves can occur in the cervical, thoracic, and lumbar regions of the spine. In many cases, the spine also rotates, forming a multidimensional curve.



About early-onset scoliosis

Early-onset scoliosis (EOS) affects skeletally immature patients less than 10 years of age. Patients with EOS are still undergoing development, which can place them at risk for progression of the deformity. If EOS progresses to a severe state, the spine can crowd the space within the chest cavity, and can cause thoracic insufficiency syndrome (TIS), where the chest cavity (thorax) cannot support normal breathing or lung growth. Treatment for EOS should be sought in a timely manner to prevent progression of the deformity.

About adolescent scoliosis

Adolescent scoliosis occurs in patients diagnosed with the curvature between ages 10 and 18. The most common type of scoliosis developed in adolescents is where the cause is unknown—referred to as adolescent idiopathic scoliosis (AIS). The majority of these patients are otherwise healthy without a medical history.[1] Although no cause is known, around 30 percent of AIS patients have a family history of the condition.[2]

Girls are more likely to have AIS and have a greater risk of curve progression than boys.[3,4]

Signs, symptoms, and complications

Signs of scoliosis may include the following:

- Clothes hang unevenly
- Uneven shoulders
- Uneven waist
- One hip appears higher than the other
- One shoulder blade appears more prominently
- Child leans to one side

Those with moderate to severe scoliosis may experience one or more of the following symptoms and complications:

- Reduced range of motion
- Back pain
- More commonly in severe early-onset scoliosis cases, trouble breathing and cardiovascular issues from the rib cage pressing on the lungs and heart[2,5]

Common causes

There are four main common causes of pediatric scoliosis.

1. **Idiopathic scoliosis** refers to an unknown cause. This type often develops during adolescence.
2. **Syndromic scoliosis** occurs alongside a group of symptoms happening all at once that can often be defined as one syndrome.
3. **Congenital scoliosis** is caused by birth defects affecting the development of bones in the spine.
4. **Neuromuscular scoliosis** results from a condition which impairs voluntary muscle and nerve function.

Other types of scoliosis may arise from tumors, trauma, limb length discrepancy, and disc compensation.

Treatment goals

The treatment goals for pediatric scoliosis include:

- Controlling progression of the deformity
- Attempting to correct the curvature

EOS has the added treatment goal of allowing for continued growth until skeletal maturity is reached.

Conservative treatment options

The majority of pediatric scoliosis cases can be solved with conservative treatment. The doctor may recommend observing the patient every 4-6 months or during growth spurts. This can include the utilization of standing X-ray images. The doctor may also recommend correction through wearing an external brace or cast, or through physical therapy.

Adolescent scoliosis traditional surgical approach

Definitive fusion

The doctor will determine when surgical intervention is an option. This may depend on:

- The size of the curvature
- The patient's remaining growth
- The progression of the curve

The traditional procedure to treat adolescent scoliosis is definitive fusion. In this approach, metal rods and screws are implanted into both sides of the patient's spine to correct and stabilize the deformity. Bone graft may be used as it helps provide the necessary environment for the body to grow new bone. Over time, the operated segment of the spine heals into a solid block of bone or fused bone which cannot bend.

For AIS patients, a definitive fusion surgical procedure aims to permanently correct and fuse the spinal deformity.

EOS traditional surgical approaches

The doctor will determine when surgical intervention is an option. This may depend on:

- The size of the curvature
- The patient's remaining growth

Procedures to treat EOS include:

- Guided growth treatment
- Distraction-based treatment
- Definitive fusion

Guided growth treatment

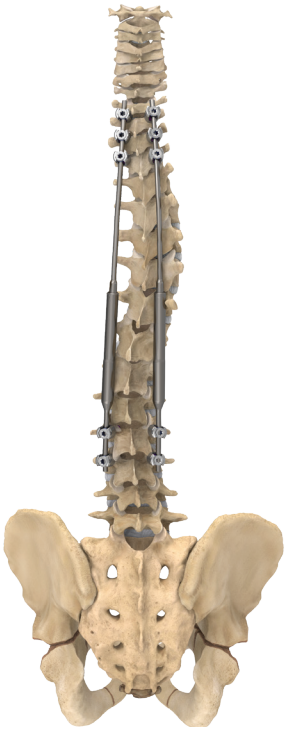
In guided growth techniques, during a surgical procedure anchors are placed in the top, middle, and bottom on both sides of the spine and connected by rods. The rods slide within the anchors while guiding the spine into a straighter position as the patient grows.

Traditional distraction-based treatment

When undergoing a traditional distraction-based implant procedure, an initial surgery is performed to implant a growing rod(s) on the spine to gain control over the deformity. Following the initial surgery, the doctor will perform distraction or rod lengthening procedures through a small incision while the patient is under general anesthesia to straighten and lengthen the spine as the child grows. On average, this planned surgery occurs twice a year.

Distraction-based treatment by NuVasive®

The MAGEC® system by NuVasive uses growing rods similarly implanted as with traditional approaches, but with subsequent noninvasive distractions. The implanted growing rods are magnetically controlled and adjusted outside the body using an external remote controller (ERC) following initial surgical insertion. No incision or anesthesia are used for distraction (rod lengthening) procedures and they are performed by a medical professional in an outpatient or office setting 4-12 times each year, on average. No acute pain is associated with lengthening; however, the patient may experience anxiety or mild discomfort.



Following guided growth or distraction-based treatment, the doctor will decide when the patient's bones have matured enough to discuss options for future treatment. Options may include a final surgery to correct remaining scoliosis.

Definitive fusion

For EOS patients, a definitive fusion surgical procedure occurs once growth is complete. In a definitive fusion procedure, fixation systems (metal rods and screws) are implanted into both sides of the patient's spine to stabilize the deformity. Bone graft may be used as it helps provide the necessary environment for the body to grow new bone. Over time, the operated segment of the spine heals into a solid block of bone or fused bone which cannot bend.

Complications from surgery

As with all surgical procedures, complications can and do occur. Surgery to treat pediatric scoliosis can be challenging due to the age and size of this unique patient population. Complications may include:

- Slow or poor healing of the wound and/or bone
- Anchors that move or break
- Rod breakage
- Implant prominence
- Injury to the spinal cord
- Infection
- Pulmonary issues

This is not a complete list of all possible complications. Discuss risks specific to the child's surgical approach with the surgeon prior to the child's procedure.

References

[1]Adolescent Idiopathic Scoliosis. Available at: https://www.srs.org/professionals/online-education-and-resources/conditions-and-treatments/adolescent-idiopathic-scoliosis. Accessed April 21, 2018.

[2]Idiopathic Scoliosis in Children and Adolescents. March 2015. Available at: https://orthoinfo.aaos.org/en/diseases--conditions/idiopathic-scoliosis-in-children-and-adolescents. Accessed April 21, 2018.

[3]Scoliosis in Children and Adolescents. December 30, 2015. Available at: https://www.niams.nih.gov/health-topics/scoliosis#tab-risk. Accessed April 21, 2018.

[4]Reamy BV, Slakey JB. Adolescent idiopathic scoliosis: review and current concepts. Am Fam Physician 2001;64(1):111-7.

[5]Early Onset Scoliosis FAQs. Available at: http://www.srs.org/UserFiles/image/EOSFAQ_Brochure.pdf. Accessed April, 21 2018.

Notes

Notes

Resources

For more information about pediatric scoliosis, please visit:
nuvasive.com

If you have any questions about adolescent or early-onset scoliosis, or spine surgery, please call or visit the child's physician, who is the only one qualified to diagnose and treat the child's spinal condition. This patient information brochure is not a replacement for professional medical advice.

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