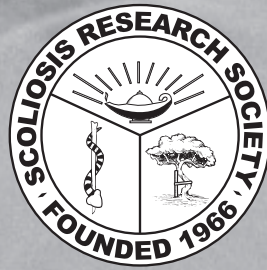
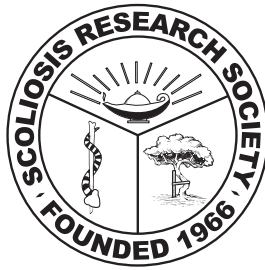


Spinal Deformity: Kyphosis

A Handbook for Patients





Scoliosis Research Society

Dedicated to Education, Research and Treatment of Spinal Deformity

555 East Wells Street, Suite 1100

Milwaukee, WI 53202

Phone: (414) 289-9107 | Fax: (414) 276-3349

Email: info@srs.org

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Preface



The Scoliosis Research Society’s Patient Education Committee has prepared this booklet to provide patients and their families with a better understanding of kyphosis. This information is intended as a supplement to the information your physician will provide. Just as no two individuals are exactly alike, no two patients with a spinal deformity are the same. Therefore, your spinal deformity surgeon should be the most important source of information about the management of your particular case.

It is not intended that the contents of this manual be interpreted as standards or guidelines proposed by the Scoliosis Research Society.

Table of Contents

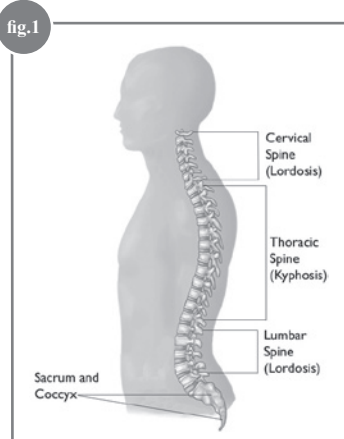


What is Kyphosis?.....	2
Non-Structural Kyphosis.....	2
Structural Kyphosis.....	3
What Are the Signs of Kyphosis?	3
What Should Be Done?	4
Non-Operative Management.....	4
Surgical Treatment	5
Frequently Asked Questions about Kyphosis.....	6
Summary	7
Where Can I Get More Information?	7

What is Kyphosis?



Kyphosis is a term that describes increased rounding of the spine when viewed from the side. When kyphosis is increased, some people refer to it as a “round back” or “hunchback”. A normal spine has a straight appearance when viewed from the front or back, and several gentle curves when viewed from the side. The chest area has a normal rounding called thoracic kyphosis, while in the lower spine there is an opposite curve called lumbar lordosis. The two opposite curves of the spine work together to provide balance and an upright posture. (Figure 1)



A normal thoracic spine consists of twelve vertebrae, each with two ribs, labeled T1-T12 (T for thoracic) from top to bottom. The natural, normal roundness of the thoracic spine can be measured by your doctor on an X-ray, and typically ranges from 10° to 45°. When the kyphosis of the thoracic spine increases past 45° it is called “hyperkyphosis”.

Figure 1

When viewed from the side, a normal spine has three normal curves.

Reproduced with permission from OrthoInfo. © American Academy of Orthopaedic Surgeons. <http://orthoinfo.aaos.org>.

Patients with kyphosis often have poor posture and complain of back pain that can interfere with daily activities. Kyphosis is more likely to be painful when the apex (most angular section) is in the mid-to-low back instead of the upper back. In severe cases, children may not be able to lie on their back without several pillows under their head. Increased kyphosis can be classified as either structural or non-structural.

Non-Structural Kyphosis



Non-structural kyphosis is flexible, can usually be corrected by standing upright, and does not change the shape of the bones of the spine. “Postural Kyphosis” is the most common form of non-structural increased kyphosis. As the name implies, the increased kyphosis is caused by a slouched posture and can correct itself when the patient stands up straight. People commonly refer to postural kyphosis simply as “poor posture”. Typically, it is not painful and the bony structures of the vertebrae are normal when seen on X-rays or other scans. (Figure 2A) Postural kyphosis is natural for some people, and typically cannot be permanently corrected, though exercises for the back muscles and posture awareness may help people sit and stand with a straighter spine.

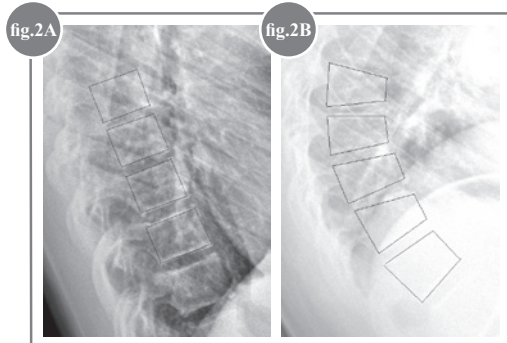


Figure 2A:

Close-up X-ray of a patient with postural kyphosis. Note that the vertebrae are shaped like rectangles.

Figure 2B:

Close-up X-ray of a patient with structural Scheuermann's kyphosis, as seen from the side. Note the wedged shape of each vertebra.



Structural Kyphosis



Structural kyphosis means that the vertebrae have an abnormal shape. Structural kyphosis can occur with or without other deformities like scoliosis (a curvature seen from the front or back, rather than from the side). Structural kyphosis can result from abnormally shaped vertebrae that develop before birth, known as congenital kyphosis, or can develop from abnormal growth of the vertebrae, most commonly called Scheuermann's kyphosis. (Figure 2B) Less common causes for structural kyphosis include infections of the spine, tumors in the vertebrae, changes following other spine surgeries, and fractures related to accidents or weakened bones from osteoporosis.

Congenital Kyphosis

The term “congenital” means that patients were born with abnormal vertebrae. If the spine does not form completely or the vertebral segments do not separate properly before birth, the spine can form a sharp, abnormal curve called congenital kyphosis. Failure of formation or failure of segmentation are the two basic types of congenital kyphosis, meaning that the vertebrae failed to develop the way they normally do.

Scheuermann's Kyphosis

Scheuermann's kyphosis is a type of kyphosis that occurs in teenage years (ages 12 to 15 in boys or 10 to 14 in girls) as a result of abnormal growth along the spine. The front sections of the vertebrae grow slower than the back sections, producing wedge-shaped vertebrae and a progressive increase in kyphosis. Instead of normal, rectangular vertebrae with a smooth kyphosis, wedge-shaped vertebrae exaggerate the forward bend of the spine and cause increased kyphosis. (Figure 3)

This abnormal, increased kyphosis is best viewed from the side with the patient bending forward, attempting to touch their toes. A sharp, angular hump is clearly visible. Most cases of Scheuermann's kyphosis that develop with growth remain mild and require only periodic examinations with X-rays to monitor the condition.

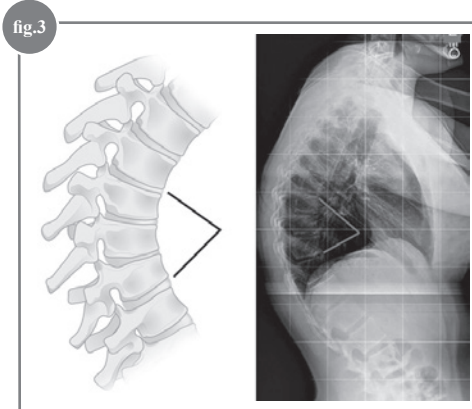


Figure 3:

Illustration and lateral X-ray of patient shows the vertebral wedging that occurs in patients with Scheuermann's kyphosis.

Reproduced from JF Sarwark, ed: Essentials of Musculoskeletal Care, ed 4. Rosemont, IL, American Academy of Orthopaedic Surgeons, 2010

What Are the Signs of Kyphosis?



1. There is increased roundness of the upper back (thoracic spine) giving a “hunchback” appearance.
2. The head may be positioned in front of the hips when viewed from the side.

What Should Be Done?



It is important to recognize that increased kyphosis can occur in children or adults. Treatment options vary depending on the age of the patient as well as the cause of kyphosis. Surgery may be needed to treat some types of kyphosis; however, non-operative management is more common.

Non-Operative Management

Observation

Observation is typically recommended for postural kyphosis, small-sized structural kyphosis in patients that are still growing, and even large-sized kyphosis in patients that have completed their growth. Patients will return to see their surgeon periodically for an examination and X-rays to make sure the kyphosis is not worsening. Children may require X-rays every 6-12 months while they are growing, but adults can typically monitor their kyphosis less frequently.

Exercise and Physical Therapy

If the patient experiences pain or increasing kyphosis, physical therapy or an exercise program may be recommended. A physical therapy program often includes stretching and strengthening exercises that are done with the physical therapist or by oneself at home. The goal of physical therapy is to help improve posture and to make the spine stronger and more flexible. Exercises for kyphosis focus on strengthening the muscles that support the spine (core muscles). The muscles between the shoulder blades are also important. Although exercises and physical therapy are not expected to correct structural kyphosis, they will often help a patient with back pain by making the back muscles stronger.

Bracing

In the structural form of kyphosis called Scheuermann's kyphosis, brace treatment may be recommended. (Figure 4) The subset of patients who will benefit from brace wear typically includes those who are still growing, have moderate-sized kyphosis, have a body type that will tolerate brace wear, and who are willing to be compliant with brace use. Protocols for kyphosis bracing, including what type of brace to use, how many hours per day to wear the brace, and how many months or years of use will be required are variable and will be determined by your surgeon. Braces must be regularly evaluated and adjusted to ensure proper fit.

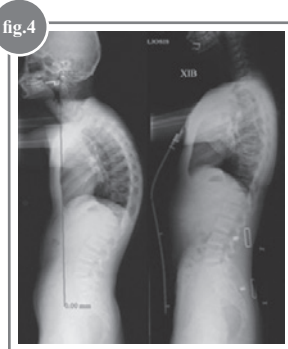


Figure 4:

(Left) Side-view of a patient with Scheuermann's kyphosis.

(Right) The same view with the patient in a hyperextension brace.

Permanent correction of kyphosis from brace use is unusual, but the goal is for bracing to slow or stop progression, decrease pain and help avoid surgery. Using braces can be challenging for many patients and a thorough discussion with the surgeon is needed prior to initiating brace treatment to determine if it is a good choice.

Bracing may be beneficial in other types of structural kyphosis, especially kyphosis from fractures or osteoporosis. However, there is little role for bracing in congenital kyphosis, when patients are born with abnormally-shaped vertebrae, or in postural kyphosis.



Surgical Treatment

Spinal Fusion

Surgical treatment may be recommended for some cases of kyphosis, especially if the curve is large, is worsening, or is associated with back pain. Surgery can provide significant correction without the need for postoperative bracing. Correcting the shape of the back is the main benefit of the operation. Pain relief following surgery is less certain, but many patients do experience less pain following their recovery from surgery. During the surgery, the vertebrae that cause the deformity are joined together in a corrected position. Metal implants such as pedicle screws, hooks, or cables are attached to the spine, and are then connected with two strong rods. These metal implants provide stability for the vertebrae in the months following surgery as bone grows between the vertebrae (called a fusion). (Figure 5)

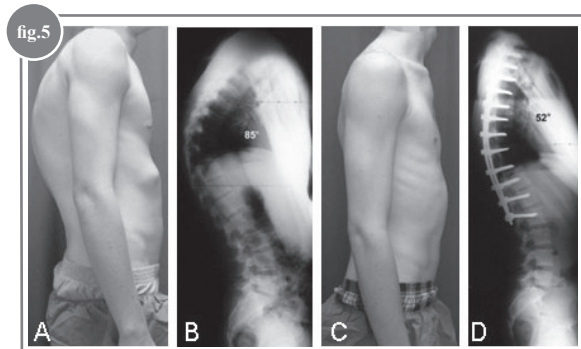


Figure 5:

Figure 5A: Preoperative photo of patient with severe kyphosis.

Figure 5B: Preoperative X-ray of the same patient.

Figure 5C: Postoperative photo of the same patient one year after surgical correction of the kyphosis.

Figure 5D: Postoperative X-ray of the same patient.

Most surgeries are performed through a back incision. However, in severe cases, some physicians may recommend additional surgery on the front of the spine. Patients are usually able to return to all activities after surgery. Your surgeon will tell you how long your activities might be restricted after surgery.

Spine Osteotomies

Spine osteotomies are a surgical technique used during some fusion surgeries for structural kyphosis. “Osteotomy” means to create a cut in a bone. This means that parts of the vertebrae will be removed to create flexibility and allow the surgeon to move the spine into a corrected position. In some cases, osteotomies may include removal of parts of ribs. Because osteotomies often involve greater risks of injury to the spinal cord, blood vessels and nerves, they are only done when needed to achieve correction that cannot be accomplished by other methods.

Goal of Surgery

The goal of surgery is to fuse the spine in a corrected position, while keeping the nerves and spinal cord safe. There are always risks that accompany any surgical procedure. These should be discussed with your surgeon. Some important points when considering surgery are:

1. A comprehensive preoperative discussion with your treating physicians
2. Good nutritional status before and after surgery
3. Exercise program before and after surgery
4. Positive mental attitude



Frequently Asked Questions about Kyphosis



1. *Do nutritional factors cause kyphosis?*
In young, healthy people, what you eat does not appear to cause kyphosis. If you are older, osteoporosis or weak bones can result from not having enough calcium in the bones and can cause kyphosis. It is helpful to discuss with your physician how to keep bones strong as you get older.
2. *Does poor posture cause structural kyphosis?*
The exact cause of Scheuermann's kyphosis is unknown, but there is no evidence that it is caused by poor posture. Poor posture does not cause kyphosis or change the bones of the spine permanently.
3. *Can carrying a heavy book bag cause kyphosis?*
Heavy back packs and loads on the back do not cause permanent changes in the bones of the spine or kyphosis. Although carrying heavy things can certainly contribute to sore back muscles, it does not change the shape of the spine.
4. *Does kyphosis cause back pain?*
The back muscles in a person with kyphosis have to work harder during sitting and standing and can become painful as they get tired. The bones themselves are not a cause of the pain. Increased kyphosis does not make you more likely to get arthritis in the spine as you get older.
5. *Do braces make the spine straight?*
Braces can keep kyphosis from getting worse as a child grows or can provide support for a painful back. However, they do not make kyphosis better or cause permanent changes in the bones of the spine.
6. *Does smoking cause kyphosis?*
Smoking does not cause kyphosis. Smoking does make spine surgery less safe for the patient and can actually prevent bone and soft tissue healing after surgery.
7. *Do metal implants (like spinal instrumentation) activate the metal detectors at airports?*
Most spine implants do not activate metal detectors and implants generally do not prevent patients from traveling. In the United States, doctor notes are not required for spine implants as they are not accepted by the Transportation Safety Administration (TSA).
8. *Do metal implants rust, or can the body reject them?*
Modern metal spine implants do not rust and usually do not need to be replaced, unless the patient has a complication from surgery. Some patients can have metal allergies where the body reacts into the type of metal. If a person has a specific metal allergy, different metals can be used during surgery.
9. *Does spine surgery interfere with normal childbearing?*
Spine surgery generally does not interfere with childbearing, unless the surgery includes the pelvis. In that case, the effect of the surgery on pregnancy can be discussed with your surgeon. Spine surgery can prevent routine use of an "epidural", a pain medication given directly into the spine during the birthing process. The anesthesia doctor giving the epidural will ask if you have had previous spine surgery before offering this option.
10. *Is kyphosis contagious?*
Kyphosis is not contagious and cannot be passed from person to person like the common cold. Some kyphosis can be genetic and run in families. However, we do not understand the genetics well enough to know who in the family will get a spinal deformity.
11. *Can kyphosis be prevented?*
Currently, there are no known ways to prevent kyphosis from developing.

Summary



Kyphosis is an increased rounding of the back, usually noticed in the thoracic spine, between the shoulder blades. Kyphosis can be structural or non-structural. Treatments for kyphosis may include observation, bracing, physical therapy, exercises, or surgery. If kyphosis is suspected, your physician will usually take X-rays to help diagnose or rule out the condition. If kyphosis is confirmed, your physician can help you decide the best treatment based on the type and the degree of kyphosis, your age, remaining growth, and any other associated symptoms.

Where Can I Get More Information?



The best information about your specific condition typically comes directly from your surgeon. You can check to see if your surgeon is a member of the Scoliosis Research Society by going to <http://www.srs.org/find/>. Membership in SRS indicates that at least 20% of the doctor's practice is in spinal deformity, that they attend annual meetings, and stay abreast of new information and new research.

In addition to the Scoliosis Research Society's website (www.srs.org), there are other reputable organizations groups with good reputations that may offer information about kyphosis.

Here is a list of some patient resource websites that may be of assistance:

- www.posna.org – Pediatric Orthopaedic Society of North America
- www.aaos.org – American Academy of Orthopaedic Surgeons
- www.nih.gov – National Institutes of Health
- <http://etext.srs.org/> – SRS provides information through the E-Text as an educational service. E-Text material is not intended to represent the only, or necessarily the best treatment for the medical situation's discussed, but rather is intended to present an approach, view, statement or opinion of the chapter author(s) that may be helpful to others who face similar situations. SRS disclaims liability for all claims that may arise out of the use of techniques demonstrated therein by such individuals.

Your Support Can Change the Lives of Others with Spinal Deformities



Please consider a donation to SRS.

100 percent of all contributions and donations to the Scoliosis Research Society's (SRS) Research, Education Outreach (REO) Fund are used entirely for research, outreach programs, and educational scholarships and fellowships seeking improved treatments, the causes and possible prevention of spinal deformities. Operating funds for SRS come from membership dues, educational meetings and courses, publication sales and other sources.

With your support, SRS can continue to support and offer necessary educational opportunities, beneficial research grants and maintain effective advocacy efforts that will change the lives of those living with spinal deformities.

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Scoliosis Research Society
555 East Wells Street, Suite 1100
Milwaukee, WI 53202-3823 USA

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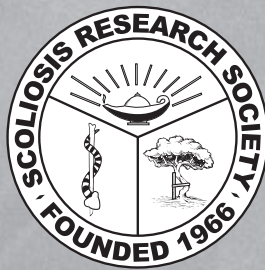
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