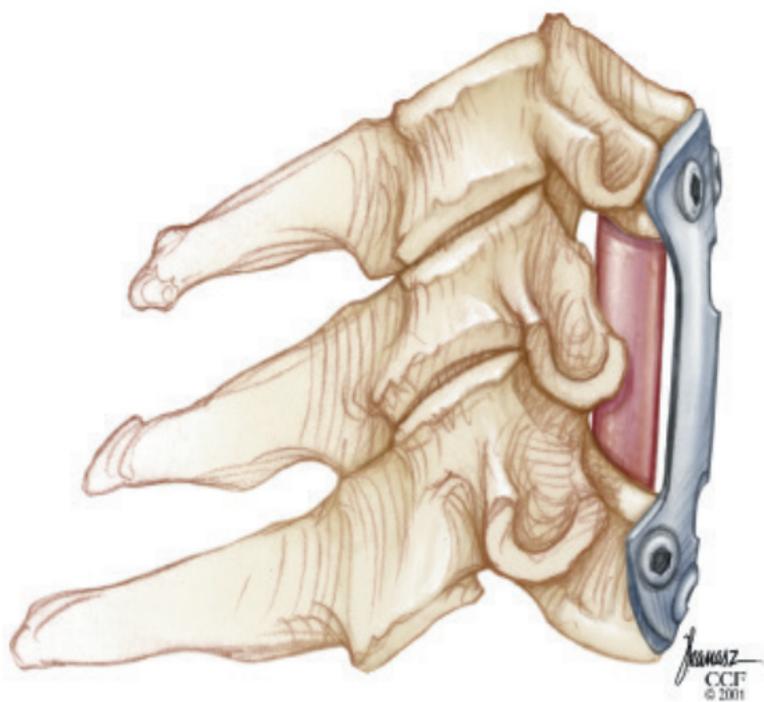


# Spinal Fusion



**North American Spine Society  
Public Education Series**

## What Is Spinal Fusion?

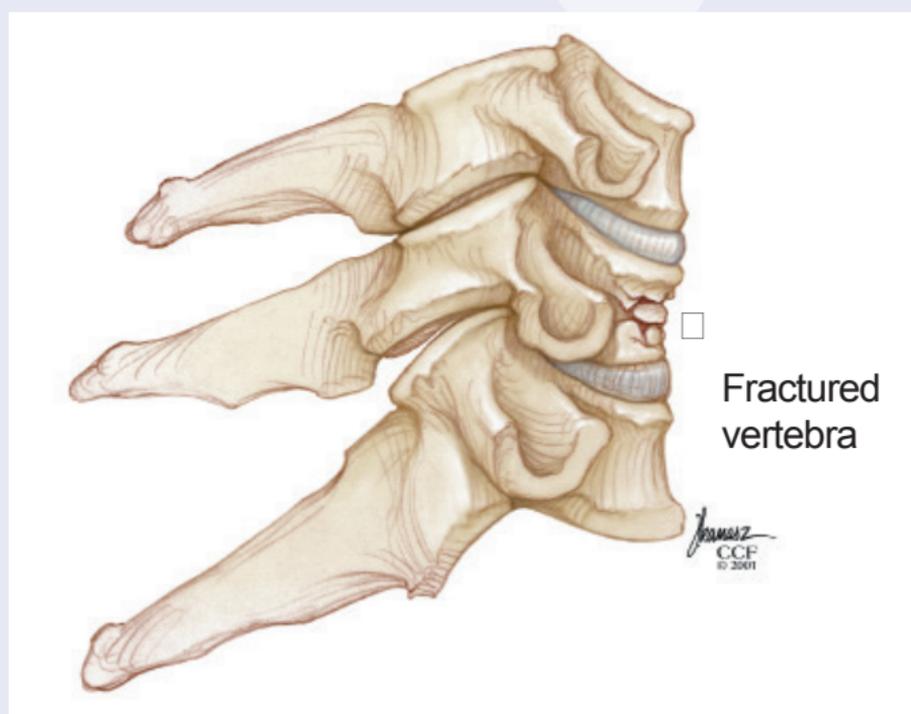
The spine is made up of a series of bones called “vertebrae”; between each vertebra are strong connective tissues called discs which hold one vertebra to the next and act as cushions. The disc allows for movements of the vertebrae and lets people bend and rotate their neck and back. The type and degree of motion varies between the different levels of the spine: cervical (neck), thoracic (chest) or lumbar (low back). The cervical spine is a highly mobile region that permits movement in all directions. The thoracic spine is much more rigid because of the presence of ribs and is designed to protect the heart and lungs. The lumbar spine allows mostly forward and backward bending movements (flexion and extension).

Fusion is a surgical technique in which one or more of the vertebrae of the spine are united together (“fused”) so that motion no longer occurs between them. The concept of fusion is similar to that of welding in industry. Spinal fusion surgery, however, does not weld the vertebrae during surgery. Rather, bone grafts are placed around the spine during surgery. The body then heals the grafts over several months—similar to healing a fracture—which joins, or “welds,” the vertebrae together.

## When Is Fusion Needed?

Fusing the vertebrae may be considered for several reasons. These include: treatment of a fractured (broken) vertebra; correction of deformity (spinal curves or slippages); elimination of pain from painful motion; treatment of instability; and treatment of some cervical disc herniations.

One of the less controversial reasons to do spinal fusion is vertebral fracture. Although not all spinal fractures need surgery, some fractures—particularly those associated with spinal cord or nerve injury—generally require fusion as part of the surgical treatment.



Certain types of spinal deformity, such as scoliosis, are commonly treated with spinal fusion. Scoliosis is an “S” shaped curvature of the spine that sometimes occurs in children and adolescents. Fusion is indicated for very large curves or for smaller curves that are getting worse.

## When Is Fusion Needed? ...continued

Sometimes a hairline fracture allows vertebrae to slip forward on top of each other. This condition is called spondylolisthesis (see North American Spine Society brochure on Adult Isthmic Spondylolisthesis), and can be treated by fusion surgery.

Another condition that is treated by fusion surgery is actual or potential instability. Instability refers to abnormal or excessive motion between two or more vertebrae. It is commonly believed that instability can either be a source of back or neck pain or cause potential irritation or damage to adjacent nerves. Although there is some disagreement on the precise definition of instability, many surgeons agree that definite instability of one or more segments of the spine is an indication for fusion.

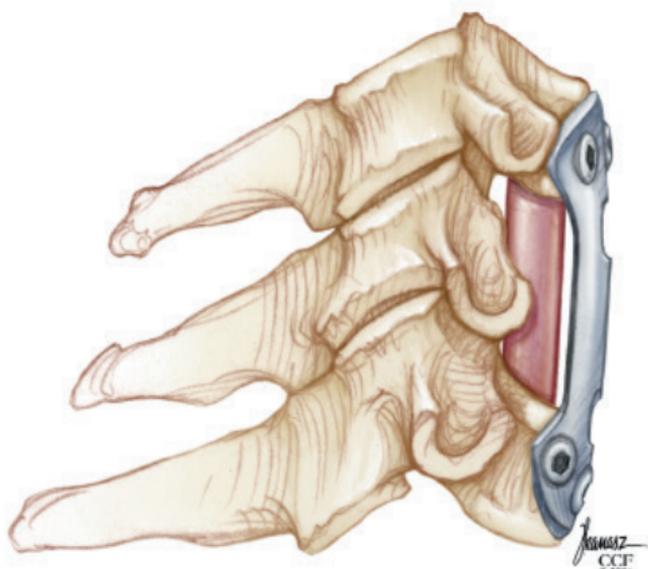
Cervical disc herniations that require surgery usually need not only removal of the herniated disc (discectomy), but also fusion. With this procedure, the disc is removed through an incision in the front of the neck (anteriorly) and a small piece of bone is inserted in place of the disc. Although disc removal is commonly combined with fusion in the neck, this is not generally true in the low back (lumbar spine).

Spinal fusion is sometimes considered in the treatment of a painful spinal condition without clear instability. A major obstacle to the successful treatment of spine pain by fusion is the difficulty in accurately identifying the source of a patient's pain. The theory is that pain can originate from painful spinal motion, and fusing the vertebrae together to eliminate the motion will get rid of the pain. Unfortunately, current techniques to precisely identify which of the many structures in the spine could be the source of a patient's back or neck pain are not perfect. Because it can be so hard to locate the source of pain, treatment of back or neck pain alone by spinal fusion is somewhat controversial. Fusion under these conditions is usually viewed as a last resort and should be considered only after other conservative (nonsurgical) measures have failed.

# How Is Fusion Done?

Different surgical approaches and methods can be used to fuse the spine, and they all involve placement of a bone graft between the vertebrae. The spine may be approached and the graft placed either from the back (posterior approach), from the front (anterior approach) or by a combination of both. In the neck, the anterior approach is more common; lumbar and thoracic fusion is usually performed posteriorly.

The ultimate goal of fusion is to obtain a solid union between two or more vertebrae. Fusion may or may not involve supplemental hardware (instrumentation) such as plates, screws and cages. Instrumentation is sometimes used to correct a deformity, but usually is used simply as an internal splint to hold the vertebrae together while the bone grafts heal.



Bone graft with plate

Whether hardware is used or not, it is important that bone or bone substitutes are used to get the vertebrae to fuse together. The bone may be taken either from another bone in the patient (autograft) or from a bone bank (allograft). Fusion using bone taken from the patient has a long history of use and results in predictable healing. Autograft is currently the “gold standard” source of bone for a fusion. Allograft (bone bank) bone may be used as an alternative to the patient’s own bone. Although healing and fusion is not as predictable as with the patient’s own bone, allograft does not require a separate incision to take the patient’s own bone for grafting, and therefore is associated with less pain. Smoking, medications you are taking for other conditions, and your overall health can affect the rate of healing and fusion, too.

Currently, researchers are conducting studies on the use of synthetic bone as a substitute for either autograft or allograft. It is likely that synthetic bone substitutes will eventually replace the routine use of autograft or allograft bone.

With some of the newer “minimally invasive” surgical techniques currently available, fusion may sometimes be done through smaller incisions. The reasons for minimally invasive surgery (MIS) are identical to those for traditional large incision surgery; however, it is important to realize that a smaller incision does not necessarily mean less risk involved in the surgery.

## How Long Will it Take to Recover?

The immediate discomfort following spinal fusion is generally greater than with other types of spinal surgeries. Fortunately, there are excellent methods of postoperative pain control available, including oral pain medications and intravenous injections. Another option is a patient-controlled postoperative pain control pump. With this technique, the patient presses a button that delivers a predetermined amount of narcotic pain medication through an intravenous line. This device is frequently used for the first few days following surgery.

Recovery following fusion surgery is generally longer than for other types of spinal surgery. Patients generally stay in the hospital for three or four days, but a longer stay after more extensive surgery is not uncommon. A short stay in a rehabilitation unit after release from the hospital is often recommended for patients who had extensive surgery, or for elderly or debilitated patients.

It also takes longer to return to a normal active lifestyle after spinal fusion than many other types of surgery. This is because you must wait until your surgeon sees evidence of bone healing. The fusion process varies in each patient as the body heals and incorporates the bone graft to solidly fuse the vertebrae together. The healing process after fusion surgery is very similar to that after a bone fracture.

In general, the earliest evidence of bone healing is not apparent on X-ray films until at least six weeks following surgery.

During this time, the patient's activity is generally restricted. Substantial bone healing does not usually take place until three or four months after surgery. At that time, activities may be increased, although continued evidence of bone healing and remodeling may continue for up to a year after surgery.

The length of time required you must be off of work will depend upon both the type of surgery and the kind of job you have. It can vary anywhere from approximately four to six weeks for a single level fusion in a young, healthy patient with a sedentary job to as much as four to six months for more extensive surgery in an older patient with a more physically demanding occupation.

In addition to some restrictions in activity, a brace is sometimes used for the early post-operative period. There are many types of braces that might be used. Some are very restrictive and are designed to severely limit motion, while others are intended mainly for comfort and to provide some support. The decision to use a brace or not, and the optimal type of brace, depends upon your surgeon's preference and other factors related to the type of surgery.

## What Can I Expect in the Long Run?

Following spinal fusion surgery, a postoperative rehabilitation program may be recommended by your surgeon. The rehabilitation program may include back strengthening exercises and possibly a cardiovascular (aerobic) conditioning program, and a comprehensive program custom-designed for the patient's work environment in order to safely get the patient back to work. The decision to proceed with a postoperative rehabilitation program depends upon many factors. These include factors related to the surgery (such as the type and extent of the surgery) as well as factors related to the patient (age, health and anticipated activity level.) Active rehabilitation may begin as early as four weeks postoperatively for a young patient with a single level fusion.

Although fusion can be a very good treatment for some spinal conditions, it does not return your spine to “normal.” The normal spine has some degree of motion between vertebrae. Fusion surgery eliminates the ability to move between the fused vertebrae, which can put added strain on the vertebrae above and below the fusion. Fortunately, once a fusion has healed it rarely, if ever, breaks down. However, it does place more stress on the vertebrae next to the fusion. This has some potential to accelerate degeneration of those segments, but this risk varies between individuals. Many surgeons therefore recommend that spinal fusion patients avoid repetitive strenuous activities that involve combined lifting and twisting maneuvers to minimize the stress on the areas around the fusion.

The decision whether to undergo spinal fusion is complex and involves many factors related to the condition being treated, the age and health of the patient, and the patient’s anticipated level of function following surgery. This decision must therefore be made carefully and should be discussed thoroughly with your surgeon.



## DISCLAIMER

This brochure is for general information and understanding only and is not intended to represent official policy of the North American Spine Society. Please consult your physician for specific information about your condition.

Special thanks to Dr. Jonathan Schaffer and the Cleveland Clinic for the illustrations used here.

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