PROCEDURE

# Spinal fusion

Spinal fusion is surgery that permanently joins two or more vertebrae to stabilise part of the spine

**PURPOSE**
Stabilise painful or unstable spinal segments by joining vertebrae

**PROCEDURE TYPE**
Therapeutic surgery joining two or more vertebrae

**WHERE IT IS DONE**
Operating theatre

**ANAESTHESIA**
General anaesthesia

**HOW LONG IT TAKES**
Usually 2-6 hours, based on approach and number of levels

**PREPARATION**
Fasting, medicine review, smoking plan, and home recovery arrangements

**RECOVERY**
Same day to several days; no driving until medically cleared

**MAIN RISKS**
Infection, nerve injury, blood clots, failed fusion

**RESULTS**
Early symptom assessment; fusion checked with imaging over several months

## Overview

Spinal fusion is an operation that permanently joins two or more bones of the spine, called vertebrae. The aim is to stop movement between them and make that part of the spine more stable.

The surgeon places bone graft material between the vertebrae. This may come from your own body, donated bone, or a manufactured bone-graft substitute. Screws, rods, plates, or cages often hold the bones steady while new bone grows across the treated area.

Fusion can be performed in the neck, chest-level spine, or lower back. The surgeon may reach the spine from the front, back, or side of your body. Some operations use smaller incisions, but "minimally invasive" fusion is still major surgery.

Other procedures may be performed at the same time. For example, decompression removes bone or tissue pressing on nerves. Fusion itself stabilises the spine; it does not always release a compressed nerve.

## Why the procedure is performed

Spinal fusion may be offered when movement between vertebrae is causing instability, pain, deformity, or a risk of further damage. Reasons include:

The operation is intended to improve stability and, in some cases, reduce pain or nerve symptoms. It cannot guarantee complete pain relief. Your surgeon should explain which finding is being treated and why fusion is expected to help.

- One vertebra slipping over another, called spondylolisthesis
- An unstable spine after injury, infection, or removal of a tumour
- A spinal curve or deformity, such as scoliosis
- Severe disc or joint damage in carefully selected cases
- Instability created or worsened by necessary decompression surgery
- A previous fusion that has not healed or no longer provides stability

## Who should and should not have it

Fusion may be reasonable when imaging, examination findings, and your symptoms point to a specific unstable or damaged spinal level. It is often considered after suitable non-surgical treatments have not provided enough relief, unless an injury or another urgent problem requires earlier surgery.

It is not the right operation for every type of back or neck pain. The benefit is less certain when there is no clear source of pain or evidence that instability is part of the problem.

Elective surgery may be avoided or delayed if you have an active infection, an uncontrolled medical condition, or cannot safely have general anaesthesia. Poor bone strength can make it harder for screws to hold and for fusion to develop. Severe osteoporosis may need assessment and treatment before surgery.

Nicotine from smoking, vaping, or other products interferes with bone healing and increases the chance that the fusion will not join. Your team may ask you to stop before and after surgery. Elective fusion is also usually postponed during pregnancy.

The decision should consider your overall health, bone quality, treatment goals, and ability to manage recovery. Ask what is likely to happen both with and without surgery.

## How to prepare

Your treating facility's own instructions take priority over general information. Follow its directions about fasting, medicines, arrival time, and skin preparation.

Give the surgical team a complete list of prescription medicines, over-the-counter products, vitamins, and supplements. Blood thinners and some diabetes medicines may need changes, but do not stop them unless the clinician responsible for your care tells you to.

Tell the team about allergies, previous anaesthesia problems, bleeding conditions, infections, sleep apnoea, and nicotine use. You may have blood tests, imaging, an electrocardiogram, or other checks based on your health and planned operation.

Arrange transport home and help with meals, shopping, children, or pets. Prepare frequently used items so that you will not need to bend, twist, or lift them. Ask whether you will need a brace or equipment at home.

## What happens during the procedure

You will usually receive general anaesthesia, so you are unconscious and do not feel the operation.

The surgeon makes an incision and reaches the affected vertebrae from the front, back, or side. The exact approach is chosen for the spinal level and problem being treated.

If nerves are compressed, the surgeon may remove part of a disc, joint, or bone to create more space. Bone graft is then placed between or around the vertebrae. A cage may be inserted into the space where a disc was removed.

Screws, rods, or plates usually hold the area still. These implants provide immediate support, but the biological fusion takes much longer. Over the following months, new bone should grow across the treated level.

The incision is closed with stitches, staples, or skin adhesive. Some people have a temporary drainage tube.

## Recovery and what to expect afterward

Pain: Pain around the incision and muscle soreness are expected. You may also notice temporary numbness or altered sensation near the wound. Pain should become more manageable over time, although nerve symptoms can improve slowly.

Eating: You may begin with drinks and light food when you are awake and not nauseated. Surgery through the front of the neck can cause temporary throat soreness or difficulty swallowing. Abdominal bloating or constipation can follow anaesthesia, reduced activity, and opioid pain medicines.

Activity: Staff will usually help you sit, stand, and walk soon after surgery. Walking supports circulation and recovery. Follow restrictions on lifting, bending, twisting, exercise, and brace use. Do not stay in bed for long periods unless your team has given a medical reason.

Driving: Do not drive while taking medicines that make you sleepy, while wearing a brace that limits safe movement, or until you can control the vehicle and perform an emergency stop comfortably. Your surgical team should tell you when driving is reasonable.

Work: Return timing is based on the operation and your job. Desk work may be possible sooner than work involving lifting, climbing, driving, or vibration. Recovery from a small single-level fusion is different from recovery after a complex, multi-level operation.

## Risks and possible complications

Possible complications include:

The risks also reflect the surgical approach. Neck surgery from the front can cause swallowing difficulty, voice changes, or swelling. Fusion through the abdomen can affect nearby blood vessels, organs, or nerves.

Fusion stops movement at the treated level. Over time, nearby spinal levels may carry more stress and develop wear, although this does not always cause symptoms or require treatment.

- Infection or problems with wound healing
- Bleeding or a blood collection near the spine
- Blood clots in the legs or lungs
- Injury to a nerve, the spinal cord, or nearby blood vessels
- Leakage of fluid surrounding the spinal nerves
- Persistent or new pain, weakness, numbness, or bladder problems
- Movement, breakage, or incorrect position of an implant

- Failure of the bones to join, called nonunion or pseudarthrosis
- A need for another operation

## Results and follow up

You may notice early improvement if compressed nerves were released, but swelling can make symptoms fluctuate at first. Numbness or weakness may take weeks or months to improve and may not fully recover if a nerve was damaged for a long time.

The hardware supports the spine immediately. The bones usually take several months to form a solid fusion. Follow-up appointments and X-rays are used to check alignment, implant position, and bone growth. More detailed imaging may be needed if healing is uncertain or symptoms return.

Attend routine appointments even if you feel well. Contact the team before the scheduled visit if pain is worsening rather than gradually settling or if the wound is not healing.

## Alternatives

The realistic alternatives depend on why fusion has been proposed.

Physical therapy, activity changes, pain medicines, and selected spinal injections may reduce symptoms without surgery. They preserve spinal movement and avoid surgical recovery, but they do not correct major instability or deformity.

Decompression without fusion removes pressure from nerves while preserving more movement. Recovery may be shorter, but it may not be suitable if the spine is already unstable or decompression would make it unstable.

Artificial disc replacement preserves movement instead of joining vertebrae. It is an option only for selected people and spinal levels. It may not be appropriate with marked arthritis, poor bone quality, deformity, or instability.

Continued observation avoids immediate surgical risks. The tradeoff may be ongoing symptoms or progression of an underlying structural problem. For a fracture, tumour, infection, or severe instability, delaying treatment may carry different risks.

A second surgical opinion can help if the expected benefit, the need for fusion, or the number of levels being treated is unclear.

## When to call your healthcare team

Contact the surgical team promptly for:

Seek emergency help for trouble breathing, chest pain, coughing blood, fainting, or sudden severe weakness. New loss of bladder or bowel control, numbness around the genitals or buttocks, or rapidly worsening difficulty walking also needs emergency assessment. After front-of-neck surgery, rapidly increasing neck swelling or breathing difficulty is an emergency.

Routine questions about activity, medicines, work, or follow-up imaging can usually wait for normal office hours.

- Increasing redness, warmth, swelling, drainage, or opening of the wound
- Fever or chills with worsening wound pain
- Pain that is rapidly worsening or not controlled as expected
- New leg or arm swelling
- Persistent vomiting, inability to drink, or severe constipation
- New or worsening numbness or weakness

## Common questions

Will I be asleep?

Yes. Spinal fusion is usually performed under general anaesthesia, so you are unconscious throughout the operation.

Can I drive home?

No. Arrange for another adult to take you home. Do not resume driving until your team agrees and you can drive safely without sedating medicines.

How painful is spinal fusion?

Surgical and muscle pain are expected, especially during the first days. Pain control may include several types of medicine, early movement, and positioning. The pain should gradually become easier to manage.

When will I know if it worked?

Stability is provided immediately by the implants, but symptom improvement may take time. X-rays over several months help show whether the bones are joining successfully.

Will I lose movement?

Movement is permanently lost at the fused level. How noticeable this is depends on the

location and number of levels. Nearby joints and other parts of your body still provide movement.

Will the screws and rods need to come out?

They are usually left in place. Removal may be considered if there is infection, implant movement, irritation, or another specific problem.

## Sources

- American Academy of Orthopaedic Surgeons, OrthoInfo. Spinal Fusion . Patient education review.
- American Association of Neurological Surgeons. Spinal Fusion . Patient information.
- MedlinePlus Medical Encyclopedia, U.S. National Library of Medicine. Spinal Fusion .
- National Institute for Health and Care Excellence. Low Back Pain and Sciatica in Over 16s: Assessment and Management . Guideline NG59.
- NHS. Lumbar Decompression Surgery: Recovery and Risks . Patient guidance on recovery after spinal surgery.