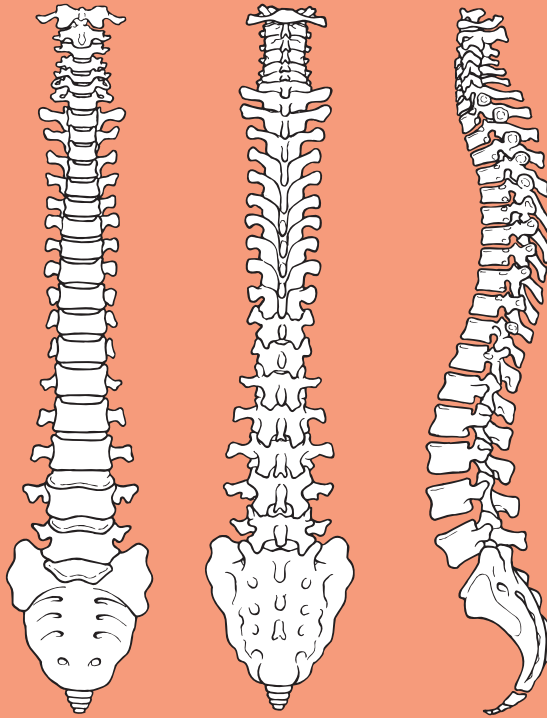




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British Association of Spine Surgeons

Transforaminal Lumbar Interbody Fusion

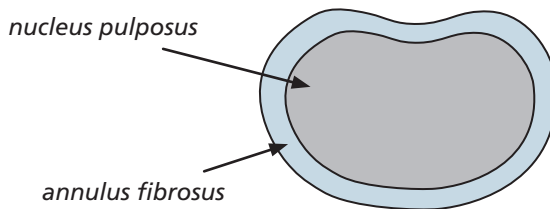


Issue 6: March 2016
Review date: February 2019

Following your discography investigation and consultation with your spinal surgeon, the possibility of undergoing **lumbar spinal interbody fusion** has been discussed with you. This is an operation where the intervertebral disc, the structure between the bones of the spine (vertebrae), is removed and the space fused with a bone graft.

The healthy intervertebral disc acts as both a spacer and a shock absorber and is composed of two parts: a soft gel-like middle (nucleus pulposus) surrounded by a tougher fibrous wall (annulus fibrosus).

Overhead view of an intervertebral disc (simplified)



Sometimes the intervertebral discs can lose their flexibility, elasticity and shock absorbing characteristics and the tough layer of ligaments that surrounds the disc may weaken and no longer be able to contain the gel-like substance in the centre. This disc degeneration can cause inflammation in the surrounding area and some of these discs can be a source of continuing back pain and pain in the thighs and buttocks, stiffness, muscle tightness and tenderness. This is known as discogenic pain (pain arising from the disc) and is diagnosed following a discography investigation.

Occasionally, as a result of the continued disc degeneration, the intervertebral disc can protrude because the tough fibrous wall weakens and is therefore no longer able to contain the gel-like substance in the centre. This material may bulge or push out through a tear in the disc wall (herniation) causing pain when it touches a nerve. Lumbar nerve root pain (often called sciatica) generally goes below the knee and is felt in the area of the leg that the particular spinal nerve supplies. Symptoms also associated with sciatica include altered sensation, pins and needles, burning, numbness or even weakness of the muscles in the leg that the nerve supplies.

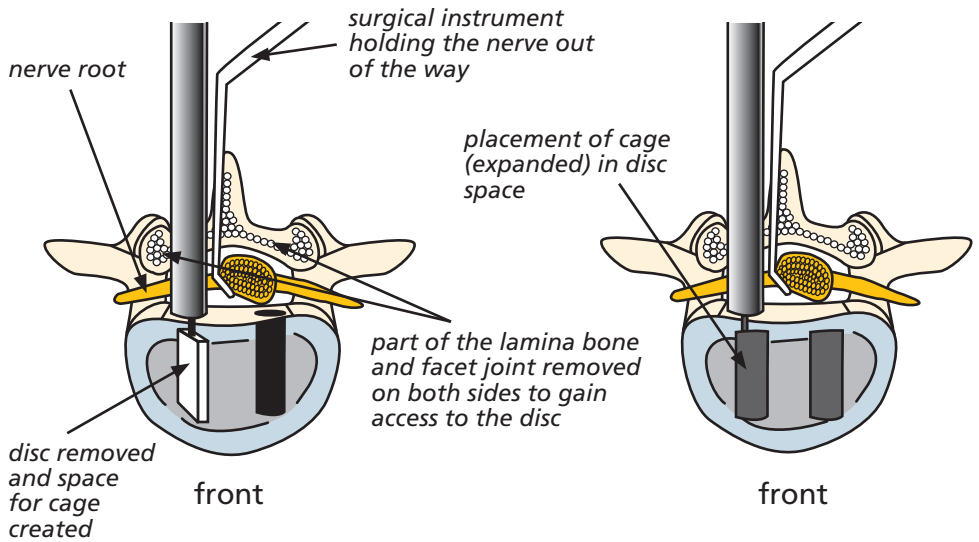
Treatment varies depending on the severity of the condition. Most patients only require treatment such as physiotherapy and medication, combined with some lifestyle changes or less extensive surgery, such as disc decompression. For patients whose pain does not settle with treatment or surgery, lumbar fusion surgery may be necessary. Surgery for lower back pain caused by degenerative disc disease is only considered an option for patients who:

- have not had sufficient pain relief from extensive non-surgical treatment (such as physiotherapy, medications and pain management programmes) for at least a year;
- have recurrent disc protrusions;
- have ongoing lower back pain that limits their ability to perform everyday activities at work or at home; or
- have received a diagnosis that a specific disc is the pain generator and other possible causes of the lower back pain have been considered and ruled out.

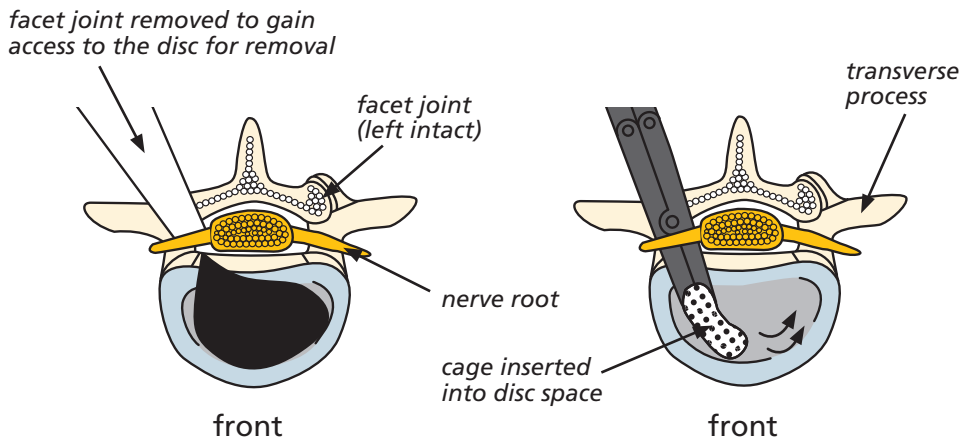
The decision to have a lumbar interbody spinal fusion operation to treat lower back pain caused by degenerative disc disease is a very personal one. For the most part, degenerative disc disease is a non-progressive type of back condition and for the majority of people their symptoms will improve over time (up to 10 years). Patients need to carefully consider the risks and possible complications along with the potential benefits of surgery, as well as consider the full range of alternatives to interbody fusion surgery.

Technically, there is a wide variety of surgical procedures that can be performed to fuse the spine, including different cages or spacers to insert into the disc space with a bone graft. The approach to the spine can also vary but in this case will be from the back, either by posterior lumbar interbody fusion (PLIF) or transforaminal lumbar interbody fusion (TLIF).

Posterior lumbar interbody fusion (PLIF)



Transforaminal lumbar interbody fusion (TLIF)



Once the diagnosis of degenerative disc disease and the decision to undergo spinal interbody fusion have been made, the goal is then to obtain a solid fusion and stop the movement at that level.

The operation

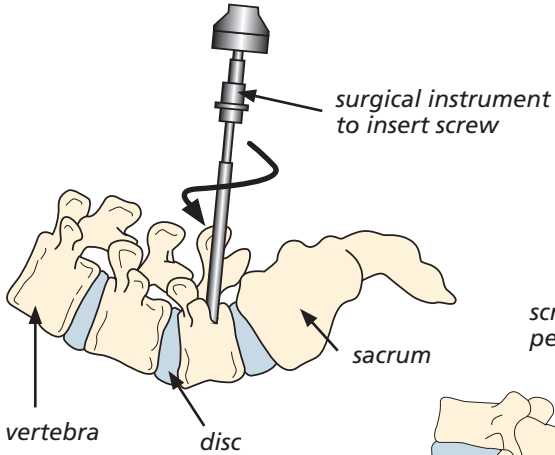
The operation is performed under general anaesthetic so you are fully asleep. First, an incision is made in the midline of your back and the muscles are lifted off the bony arch (lamina).

A high-speed burr (like a dentist's drill) is used to go through the bone to gain entry into the spinal canal. The bone is clipped away as required and the disc is then removed, right back to the bone edge of the vertebral body (end plates). Bone graft is then placed in the space created; either contained in a small metal cage or in between a metal spacer and also laid between the outer segments of the spine in between the transverse process (inter-transverse region). Your own bone will, over time, grow into the bone graft. There are several techniques to get the bone graft needed for spinal fusion:

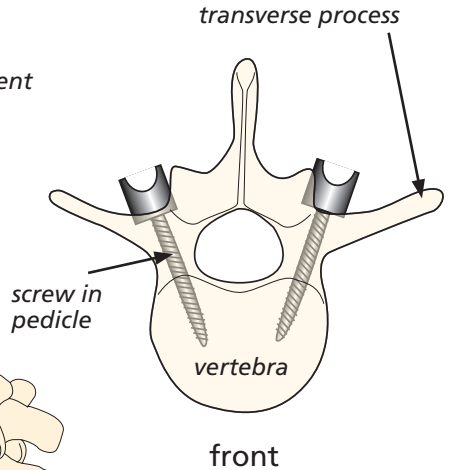
- **patient's own bone (autograft bone).** The bone that is removed during surgery can be used as a bone graft. If more is needed then it is usually taken from the pelvis (iliac crest);
- **donor bone (allograft bone).** This eliminates the need to use your own bone. The donor bone graft acts as a calcium scaffolding which your own bone grows into and eventually replaces; or
- it is also possible to use **artificial bone (bone substitutes).**

An internal system of screws and rods may be necessary to aid stability while the fusion takes place. These are called pedicle screws because they are placed into the part of the vertebral body of the same name, which goes directly from the back of the spine to the front. They are placed on both sides of the vertebra, above and below the disc space. These screws then act as firm anchor points to which rods can be connected. This construction then prevents movement at the part of the spine being fused.

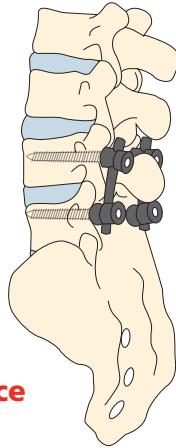
Side view of pedicle screw placement



Overhead view of pedicle screw in vertebral body

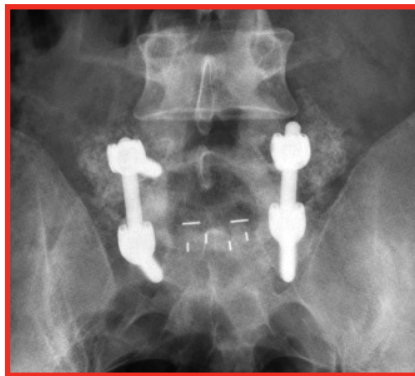
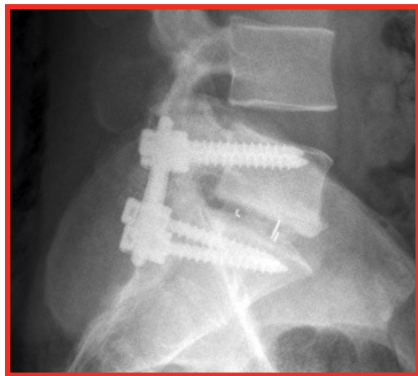


Complete system in place

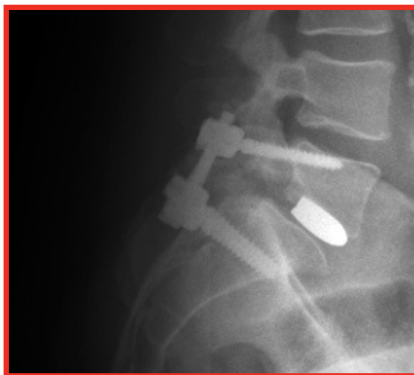


After the bone graft grows and fuses to the spine (after many months), the rods and screws are no longer needed for stability. However, most surgeons do not recommend removing them except in rare cases.

X-rays showing PLIF cages in place, side and front views



X-ray showing TLIF cage in place, side view



Risks and complications

As with any form of surgery, there are risks and complications associated with this procedure.

These can include:

- damage to the nerve root and the outer lining or covering which surrounds the nerve roots (dura). This is reported in < 5% of cases (fewer than 5 out of 100 people). It may occur as a result of the bone being very stuck to the lining and tearing it as the bone is lifted off. Often the hole or tear in the dura is repaired with stitches or a patch. This could result in back or leg pain, weakness or numbness, leaking from the wound, headaches or, very rarely, meningitis;

- leg pain (sciatica) as a result of scarring around the nerve root;
- problems with positioning during the operation which might include pressure problems, skin and nerve injuries and eye complications including, very rarely, blindness. A special gel mattress and protection is used to minimise this;
- infection. Superficial wound infections may occur in 2–4% of cases (up to 4 out of 100 people). These are often easily treated with a course of antibiotics. Deep wound infections may occur in < 1% of cases (fewer than 1 out of 100 people). These can be more difficult to treat with antibiotics alone and sometimes patients require more surgery to clean out the infected tissue. This risk may increase for people who have diabetes, reduced immune systems or are taking steroids;
- blood clots (thromboses) in the deep veins of the legs (DVT) or lungs (PE). This occurs when the blood in the large veins of the leg forms blood clots and may cause the leg to swell and become painful and warm to the touch. Although rare, if not treated this could be a fatal condition if the blood clot travels from the leg to the lungs, cutting off the blood supply to a portion of the lung. It is reported as happening in fewer than 1 out of 700 cases. There are many ways to reduce the risk of blood clots forming. The most effective is to get moving as soon as possible after your operation. Walk regularly as soon as you are able to, both in hospital and when you return home. Perform the leg exercises illustrated in the 'Preventing Blood Clots' leaflet and keep well hydrated by drinking plenty of water. Ladies are also advised to stop taking any contraceptive which contains the hormone oestrogen four weeks before surgery, as taking these during spinal surgery can increase the chances of developing a blood clot;
- bleeding. You must inform your consultant if you are taking tablets used to thin the blood, such as warfarin, aspirin or clopidogrel. It is likely you will need to stop taking them before your operation as they increase the risk of bleeding;
- difficulty with screw placement, including injury to the nerves or screw breakage;
- bone graft non-union or lack of solid fusion (pseudoarthrosis). This can occur in up to 5% of cases (5 out of 100 people). See below for factors which can affect fusion;

- cage/implant movement can occur in up to 2 out of 100 cases, with 1 out of 100 requiring re-operation. In extremely rare cases, cage movement can cause severe damage and cauda equina syndrome (paralysis, bladder or bowel incontinence);
- although rare, the surgery may make your symptoms worse than before;
- ongoing pain. Fusion surgery is a complex procedure and not all patients get complete pain relief; and
- there are also very rare but serious complications that in extreme circumstances might include damage to the cauda equina and paralysis (the loss of use of the legs, loss of sensation and loss of control of the bladder and bowel). This can occur through bleeding into the spinal canal after surgery (a haematoma). If an event of this nature was to occur, every effort would be made to reverse the situation by returning to theatre to wash out the haematoma. Sometimes, however, paralysis can occur as a result of damage or reduction of the blood supply of the nerves or spinal cord and this is unfortunately not reversible; and a stroke, heart attack or other medical or anaesthetic problems, including death, which is reported as happening in 1 out of 250,000 cases under general anaesthetic.

Factors which may affect spinal fusion and your recovery

There are a number of factors that can negatively impact on a solid fusion following surgery, including:

- smoking;
- diabetes or chronic illnesses;
- obesity;
- malnutrition;
- osteoporosis;
- post-surgery activities (see note on recreational activities); and
- long-term (chronic) steroid use.

Of all these factors, the one that can compromise fusion rate the most is smoking. Nicotine has been shown to be a bone toxin and inhibit

the ability of the bone-growing cells in the body (osteoblasts) to grow bone. Patients should make a concerted effort to allow their body the best chance for their bone to heal by not smoking.

What to expect after surgery

Immediately after the operation you will be taken to the recovery ward, where nurses will regularly monitor your blood pressure and pulse.

Oxygen will be given to you via a face mask for a while, to help you to recover from the anaesthetic. You will have an intravenous drip for about 24 hours, or until you are able to drink adequately again after the anaesthetic.

A drain (tube) may come out of your wound if there has been significant bleeding during the operation; this prevents any excess blood or fluid collecting. This will be removed when the drainage has stopped, usually after 24 hours. You will have some discomfort or pain after surgery but the nursing staff will give you appropriate medication to control this.

Usually, on the first or second day after your operation, the physiotherapist will help you out of bed. They will also show you the correct way to move safely.

Going home

You will normally be able to leave hospital when you and your physiotherapist are happy with your mobility. This is usually 2–4 days after your operation.

Please arrange for a friend or relative to collect you, as driving yourself or taking public transport is not advised in the early stages of recovery. If you will need hospital transport please inform one of the nurses as soon as possible.

Wound care

Your wound will usually be closed with clips. You may shower if you are careful when you get home but baths should be avoided for two weeks, until the wound is completely dry. Please do not remove your

wound dressing, unless it accidentally gets wet, until your clips are removed. If a new dressing is required then a simple dry dressing from the pharmacist (chemist) is sufficient.

Please contact your GP if you have:

- redness around the wound;
- wound leakage; or
- a high temperature.

The ward staff will tell you if a community (district) nurse has been arranged to come to your home to remove the clips, or ask you to arrange an appointment with your GP practice nurse for the clips to be removed. This will usually be 10 days after your surgery.

Date of clip removal: / /

Recreational activities

Walking is the best activity to do after your surgery. It promotes healthy circulation and aids the healing process. You should avoid activities which involve repetitive bending or twisting in the first few months. Sports should also be avoided until you can discuss them with your consultant during your follow-up appointment. Once the bone fuses, a gradual return to normal activity is then advised.

Driving

Sitting for prolonged periods is not advisable after your surgery, including driving a car. If you have no altered sensation or weakness in your legs then you may return to driving when you feel safe to do so, but don't travel long distances without taking regular breaks to stretch your legs. Please discuss driving with your surgeon before you leave hospital.

Lifting and carrying

Please refer to the physiotherapy advice sheet and other advice from your physiotherapist. You should avoid heavy lifting and carrying for a few months after your surgery.



Follow-up

You will be sent a clinic appointment for 8–12 weeks after your surgery. If you have any queries before this appointment please contact the nurse specialist for your consultant's team.

If you have any questions about the information in this booklet, please discuss them with the ward nurses or a member of your consultant's team.

Produced, researched and revised by spinal nurse specialist Helen Vernau at The Ipswich Hospital NHS Trust, in association with and on behalf of the BASS Consent and Patient Information Committee.

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DPS ref: 01622-16(RP)