www.langdonspine.com
+44 1582 714 304
langdonpa@spirehealthcare.com

Lumbar fusion

What is a lower back fusion and why do we do it?

A spinal fusion is an operation to stabilise an area of the spine. It can be done by a variety of techniques depending upon the condition of the spine that is being treated, and the underlying pathology. There are different types of spinal fusion, the names of which reflect how the operation is carried out. The different types of lumbar fusion are a Transforaminal Lumbar Interbody Fusion (TLIF), a Posterior Lumbar Interbody Fusion (PLIF), an Anterior Lumbar Interbody Fusion (ALIF / OLIF), or surgery with a surgical approach from the side (Extreme Lumbar Interbody Fusion (XLIF). PLIF and TLIF operations are carried out from the back. The other approaches are carried out from the front, through your abdomen. There are advantage and disadvantages to both approaches.

The aim of a spinal fusion is to 'weld' two vertebrae together to prevent painful movement. Spinal fusion is achieved by the use of bone graft between two bony surfaces of the spine. The idea is to make the body behave as if there has been a fracture, so that the two bony surfaces are joined together with new bone. This is called 'fusion'. The fusion is enhanced by the use of instrumentation.

There are 3 main indications for fusion surgery:

1. To treat a spondylolisthesis. This is a slip forward of one of the spinal bones (vertebral body) over the vertebral body below. This causes nerve compression, either in the spinal canal (spinal stenosis) or where the nerve come out the side of the spine (foraminal narrowing).
2. When symptoms persist or recur after previous surgical decompression or discectomy.
3. To treat chronic mechanical spinal pain arising from one or more of the lower three spinal segments.

Although the success of surgery with regards to achieving fusion is excellent, this operation remains uncertain with regard to clinical outcome. The clinical outcome varies according to the underlying pathology.

Before you come into hospital

Smoking has been shown to have an adverse effect on the outcome of fusion surgery. We therefore strongly advise you to stop smoking before you have your operation. If you are overweight, then please try to reduce it as this will lower your anaesthetic risk and optimise your recovery.

Posterior spinal surgery: how do we do a TLIF / PLIF?

The surgery is done under a general anaesthetic. You will meet the anaesthetist on the ward prior to your surgery who will explain the anaesthetic to you. The operation takes about three hours. Once asleep the patient is placed on their front on the operating table. X-ray is used to identify the correct area of the lower back. Either one or two incisions will be made, depending on the underlying pathology. A TLIF / PLIF involves the following steps:

- The spinal nerves are decompressed
- The disc is removed. The disc space is filled with a spacer, called a 'cage'. Bone graft is packed in front of the cage. The bone graft used is bone that is removed as a part of the surgical approach.
- The adjacent vertebral bodies are rigidly fixed with rods and screws.

When appropriate minimally invasive techniques will be used for your surgery. These techniques cause less muscle damage, result in less post-operative pain, and lead to a quicker recovery.

At the end of the operation the wound(s) will be closed with dissolvable stitches and covered with a dressing.

What are the risks?

Infection – The risk of infection is less than 1%. All patients receive a dose of intravenous antibiotics when they are going off to sleep. If you develop an infection it is most likely to be a superficial wound infection that will resolve with a short course of oral antibiotics. Occasionally patients develop a deep infection. This is much more serious and may require a prolonged course of intravenous antibiotics or additional surgery.

Bleeding – You will lose some blood during the operation. We would normally expect your body to be able to deal with this blood loss without needing a blood transfusion. There are large blood vessels in front of the disc and there are reported cases of these blood vessels being damaged during surgery resulting in a very serious and potentially life-threatening blood loss. This type of bleeding is extremely rare and is reported to occur in approximately 1 in 25,000 cases.

If you are on any medication that has the potential to thin your blood such as aspirin, clopidogrel, warfarin, rivaroxaban or any other blood thinning medication then we do need to know about this prior to the date of your operation as this will usually need to be stopped prior to your operation.

If you take anti-inflammatory tablets, then you must stop taking them seven days before your operation as these drugs can also affect blood clotting.

DVT – Developing blood clots in the legs (deep vein thrombosis – DVT) is a risk of any surgery. We worry about DVTs as bits can break off a travel around your body. This is called an embolus. An embolus can affect your breathing, cause you to have a stroke, and could potentially be fatal. DVTs occur in approximately one in 200 patients having back surgery. An embolus is a much less common occurrence. We minimize the risk of DVT by asking patients to wear hospital stockings following their surgery (TEDS), and mechanical pumps during and immediately after surgery. These pumps squeeze your lower legs, helping the blood to circulate. They are put on when you go to sleep and

stay on until you start to mobilise. We encourage early mobilisation as this also helps to prevent DVTs. If a patient is considered to be high risk for a DVT then we will prescribe blood thinning medication for a couple of weeks after your surgery.

Please tell your surgeon if you take the oral contraceptive pill as certain types of pill need to be stopped pre-operatively as they increase the risk of blood clots.

Metalwork problems - Difficulty with screw placement or screw breakage can occur during surgery. Incorrect screw placement can occur in two out of 100 cases and could potentially injure the nerves. Breakage of the screws or rods can also happen, and occasionally this can occur sometime after surgery. In one to two cases out of every 100, the cage can move or subside into the bone. Sometimes this does not affect the outcome, but on occasions the cage may need to be revised.

Nerve injury – The spinal instrumentation is inserted very close to the emerging spinal nerves. In doing this there is a risk of physical damage to the nerve. This can lead to loss of nerve function with persisting pain, weakness, and numbness in the territory of that nerve. This complication can occur in up to 5% of patients. Although further surgery may be undertaken to remove or adjust an implant, the loss of function and pain from a damaged nerve may be permanent.

With any lower back surgery there is a risk of nerve injury which could cause leg pain and weakness including a floppy foot. It is possible that a nerve injury could also affect your bladder and bowel function, as well as erectile function in men.

Dural tear – Occasionally the lining to the nerve (the dura) can be damaged causing the leakage of the fluid that surrounds the nerves (the cerebro-spinal fluid). Some tears are managed conservatively, whilst others require surgical repair. Patients who have had a dural tear may be asked to stay in bed for a short period of time following their operation on flat bed rest. This would normally be for between 24 hours and five days. Occasionally a persistent leakage of spinal fluid occurs which may require further surgery.

Scar tissue – Scar tissue can form around the nerve and can cause persisting neurological symptoms. This is not common. We will usually try and treat this with injections rather than further surgery.

Back pain – Even is a successful fusion is achieved, it does not guarantee the relief of back pain. 5-10% of patients will report increased back pain following this type of surgery.

Failure of fusion – A small number of patients do not develop a satisfactory fusion. In these cases, there can be on-going pain, usually back pain. In this situation your fusion may need to be redone. This can occur in up to 5% of patients having fusion surgery.

Adjacent level problems – As spinal fusion is preventing a moving part of your spine from moving, there is an increase in the mechanical forces across the adjacent discs. There is therefore a risk that the discs above and below may become problematic at some point in the future, and this may necessitate further fusion surgery.

Risks associated with positioning on the operating table – when getting you ready for surgery, care is taken to ensure that everything is protected. The does however remain a small risk of pressure

damage. This can cause some temporary skin damage to areas such as the tip of your nose and chin as well as to your torso. This would be expected to recover within two to three weeks. When having an anaesthetic lying on your front there is a very small risk of some damage to your vision. Visual damage is reported as occurring in 1 in 10,000 cases.

Medical complications - Prior to being admitted to hospital you will go through a pre-operative assessment process. This is to ensure that you are as fit as possible for your operation. If you have a chronic condition that is found to be poorly controlled or if a new condition is identified by the pre-operative assessment, then your operation may need to be delayed in order for your medical condition to be optimised. General anaesthesia for elective surgery is very safe. Occasionally unexpected medical events (such as a stroke or heart attack) can occur under general anaesthetic or in the early post-operative recovery period. Fortunately, the risk of death under anaesthesia is very rare. Death as a direct result of general anaesthesia is reported as occurring in 1 in 100,000 cases.

Following any operation there is a small risk of post-operative medical complications, such as chest infections or urine infections.

What can I expect following my fusion?

When you wake up following your operation you will feel bruised in your lower back. We try and minimise this by injecting local anaesthetic around the wound. You will also be given a patient-controlled morphine pump (PCA) to help with your pain relief for the first 24 hours after your operation. Some patients require a urinary catheter.

Day 1 post-op – You will be seen by a physiotherapist with the aim of getting you up on to your feet. You should continue to practice getting up.

Days 2-5 post-op – Gradually increase your mobility about the ward with the aid of the physiotherapists and nursing staff. When resting, it is good to alternate between sitting and lying down. If you place a pillow between your knees, then you can lie on your side. You will be discharged home when you are moving around comfortably and safely. Before you go home the nurses will explain how you need to look after your wound(s).

What next?

The post-operative discomfort will take a few weeks to settle down. The wound will be closed with a dissolvable suture, so there will be no stitches that need to be taken out. Your wound will require minimal attention after discharge but will need to be kept dry.

Following your operation, you should not take any anti-inflammatories. This is because they reduce the potential for fusion, and therefore reduce the likelihood of a successful outcome.

For the first six weeks you will need to take things relatively easy. During this time, you should gradually increase your walking distance. You should aim to walk twice a day. During the first six weeks you should limit activity to gentle walking and stretches. You must avoid any lifting. You should continue to wear your hospital stockings for the first six weeks.

After six weeks you can increase your activity level and start to do some gentle non-impact exercise as comfort allows (gentle swimming, light cycling, cross-trainer). You can start to do some light lifting but should not lift more than 10kg until three months following your operation. Do not return to impact or increased torsion exercise (e.g. jogging, golf) for six months.

Returning to work – People with non-manual jobs will normally be able to return to work after four weeks, pending a satisfactory review. It will be three months before you can return to manual work.

Driving – There is no restriction with the DVLA, though there will be with your insurance company. You will need to be able to undertake an emergency stop and be in complete control of your car at all times without being distracted by pain. If this is not the case, then your insurance will NOT be valid. Most patients are back to driving within four weeks of their surgery.

Flying – You should not fly for six weeks following your surgery. You should not undertake any long-haul flights for three months. If traveling on a long-haul flight within six months of your operation then you should wear your hospital stockings when flying.

Follow-up

You will be seen back in the clinic a few weeks after your operation. An appointment will be made for you before you are discharged.

Anterior lumbar fusion surgery (ALIF / OLIF)

The benefit of using the ALIF / OLIF / XLIF approach as opposed to a TLIF / PLIF is that these approaches allow direct access to the front of the spinal column allowing placement of a much larger 'cage' into the disc space. This means that:

- There is much less damage to the back muscles
- There is no intra-operative nerve retraction, reducing the risk of nerve damage
- The bone graft is placed in compression against a large surface area of the endplates increasing the rate of satisfactory fusion.
- The natural curvature of the spine can be restored more efficiently and effectively

How do we perform anterior spinal surgery?

The surgery is done under a general anaesthetic. You will meet the anaesthetist on the ward prior to your surgery who will explain the anaesthetic to you. The approach to the front of the spine is carried out by a General Surgeon. An incision is made on the abdomen. Depending on the approach being used and the level of the disc in the back that we are aiming for, this may be a transverse, oblique or more vertical incision. The abdominal muscles are split and the abdominal contents (contained in a covering called the "peritoneum") are moved to the side. This allows visualisation of the front of the spine. There are several important blood vessels in front of the spine that take the blood supply to the legs. These vessels are protected with a special retractor.

The spine surgeon then carries out the second part of the operation. This involves removing the

disc. A spacer called a 'cage' is then inserted into the disc space. This cage is often filled with bone grafting materials. Screws are sometimes placed through the cage to secure it in place or a plate may be placed over the front of the cage. Once the spine surgeon is happy, the General surgeon will then close the wound.

In many case, additional stabilisation maybe inserted from the back. If this is required, the patient will be turned over onto their front. A further incision will then be made in the back to allow for placement of screws and rods. If direct decompression of the nerve roots is required, then this is also carried out from the back.

What are the risks?

Many of the risks of anterior surgery are the same as those for posterior (PLIF / TLIF) surgery. These are:

Infection – The risk of infection is less than 1%. All patients receive a dose of intravenous antibiotics when they are going off to sleep. If you develop an infection it is most likely to be a superficial wound infection that will resolve with a short course of oral antibiotics. Occasionally patients develop a deep infection. This is much more serious and may require a prolonged course of intravenous antibiotics or additional surgery.

Bleeding – You will lose some blood during the operation. We would normally expect your body to be able to deal with this blood loss without needing a blood transfusion. There are large blood vessels in front of the disc and there are reported cases of these blood vessels being damaged during surgery resulting in a very serious and potentially life-threatening blood loss. This type of bleeding is extremely rare and is reported to occur in approximately 1 in 25,000 cases.

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Please tell your surgeon if you take the oral contraceptive pill as certain types of pill need to be stopped pre-operatively as they increase the risk of blood clots.

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gery. Incorrect screw placement can occur in two out of 100 cases and could potentially injure the nerves. Breakage of the screws or rods can also happen and occasionally this can occur sometime after surgery. In one to two cases out of every 100, the cage can move or subside into the bone. Sometimes this does not affect the outcome, but on occasions the cage may need to be revised.

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Risks associated with positioning on the operating table – when getting you ready for surgery, care is taken to ensure that everything is protected. The does however remain a small risk of pressure damage. This can cause some temporary skin damage to areas such as the tip of your nose and chin as well as to your torso. This would be expected to recover within two to three weeks. When having an anaesthetic lying on your front there is a very small risk of some damage to your vision. Visual damage is reported as occurring in 1 in 10,000 cases.

Medical complications - Prior to being admitted to hospital you will go through a pre-operative assessment process. This is to ensure that you are as fit as possible for your operation. If you have a chronic condition that is found to be poorly controlled or if a new condition is identified by the

pre-operative assessment, then your operation may need to be delayed in order for your medical condition to be optimised. General anaesthesia for elective surgery is very safe. Occasionally unexpected medical events (such as a stroke or heart attack) can occur under general anaesthetic or in the early post-operative recovery period. Fortunately, the risk of death under anaesthesia is very rare. Death as a direct result of general anaesthesia is reported as occurring in 1 in 100,000 cases.

Following any operation there is a small risk of post-operative medical complications, such as chest infections or urine infections.

Additional risks with anterior surgery:

Damage to the large blood vessels – damage to the large blood vessels that sit in front of your spine can result in excessive blood loss. This is reported as happening in up to 15 out of 100 cases, although it is much less common when the anterior approach is carried out by an experienced vascular surgeon. Usually, small tears in the blood vessels can be controlled reasonably simply, though there remains the very small risk of catastrophic bleeding that could, in extremely rare circumstances, lead to death.

Sympathetic nerve damage - there are small nerves directly over the disc space which can be damaged during surgery. These nerves are responsible for many involuntary organ functions, including the heart rate, peristalsis (gut movement), kidney function and, in men, the ability to ejaculate. If these nerves are damaged it can cause problems including:

Retrograde ejaculation in males. This risk is unique to males. Lying over the L5/S1 disc are very small nerves that control a valve that causes the ejaculate to be expelled during intercourse. Dissection over the disc space may cause the nerves to stop working, forcing the ejaculate to take the path of least resistance, which is up into the bladder. Retrograde ejaculation occurs following 2%. If a patient has post-operative retrograde ejaculation it can recover over time but there is no guarantee that it will. If you suffer with retrograde ejaculation, the sensation of ejaculating is largely the same, but it affects fertility. As the erection is controlled by different nerves, retrograde ejaculation does not affect your ability to have an erection. A surgeon may consider posterior approaches in younger male patients. If a man is having anterior spinal surgery and they have not finished their family then it would be recommended that you 'bank' some sperm pre-operatively.

Paralytic ileus – A paralytic ileus is when your bowel stops contracting and essentially goes to sleep. It is a common post-operative side effect of anterior surgery. For a few days the abdomen can be very uncomfortable. This will usually settle over a few days.

Warm leg - This is usually felt in just one leg, usually the left leg as this is the side from which we approach the spine. This sensation can resolve over time but may be permanent.

There is also a very small risk (less than 0.1%) of bladder or bowel injury. Very occasionally a patient may get a hernia in their anterior scar.

What can I expect following my fusion?

When you wake up following your operation you will feel bruised and sore in your abdomen and also in your lower back if you have had screws inserted from the back as well. We try and minimize this by the anaesthetist giving you a 'block' before your operation and by injecting local anaesthetic around the wound. You will also be given a patient-controlled morphine pump (PCA) to help with your pain relief for the first 24-hours after your operation. You will have urinary catheter in place when you wake up.

Day 1 post-op – You will be seen by a physiotherapist with the aim of getting you up on to your feet.

Days 2-5 post-op – Once your wounds are 'dry' you will be started on some blood thinning medication to help prevent blood clots. You will gradually increase your mobility about the ward with the aid of the physiotherapists and nursing staff. When resting, it is good to alternate between sitting and lying down. Many patients have a post-operative ileus. For the first few days this can be quite uncomfortable. It is important that you are staying well hydrated, but you may not feel like eating very much until your bowels have woken up. As you start to pass wind you will start to feel more comfortable and will feel more inclined to eat. Once you are mobile the catheter will be removed. You will be discharged home when you are moving around comfortably and safely. You do need to have opened your bowels before you go home. Before you go home the nurses will explain how you need to look after your wound(s).

What next?

The post-operative discomfort will take a few weeks to settle down. The wound will be closed with a dissolvable suture, so there will be no stitches that need to be taken out. Your wound will require minimal attention after discharge but will need to be kept dry for four weeks.

Following your operation, you should not take any anti-inflammatories. This is because they reduce the potential for fusion, and therefore reduce the likelihood of a successful outcome.

For the first six weeks you will need to take things relatively easy. During this time, you should gradually increase your walking distance. You should aim to walk twice a day. During the first six weeks you should limit activity to gentle walking and stretches. You must avoid any lifting. You should continue to wear your hospital stockings for the first six weeks.

After six weeks you can increase your activity level and start to do some gentle non-impact exercise as comfort allows (gentle swimming, light cycling, cross-trainer). You can start to do some light lifting but should not lift more than 10kg until three months following your operation. Do not return to impact or increased torsion exercise (e.g. jogging, golf) for six months.

Returning to work – People with non-manual jobs will normally be able to begin to return to work after four weeks on a 'phased return' basis, pending a satisfactory review. It will be 3-months before you can return to manual work.

Driving – There is no restriction with the DVLA, though there will be with your insurance company. You will need to be able to undertake an emergency stop and be in complete control of your car at

all times without being distracted by pain. If this is not the case, then your insurance will NOT be valid. Most patients are back to driving within a month of their surgery.

Flying – You should not fly for six weeks following your surgery. You should not undertake any long-haul flights for three months. If traveling on a long-haul flight within six months of your operation, then you should wear your hospital stockings when flying.

Follow-up

You will be seen back in the clinic a few weeks after your operation. An appointment will be made for you before you are discharged.

More information can be found in the booklets section of the patient's area on the British Association of Spine Surgeons website (www.spinesurgeons.ac.uk)